Subsistence Strategy and Demographic Impact of Virgin Soil Disease Epidemics

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Introduction

It has long been acknowledged that New World Indian populations were devastated in terms of demographics by the introduction of Old World communicable diseases immediately subsequent to European contact. The term “virgin soil populations” was coined by Alfred Crosby in the 1970s to refer to the fact that New World populations had no previous contact with these diseases, no immunity (variously conceived) to them and therefore had a catastrophic mortality rate in response. Pertinent literature from the North American Subarctic and from highland regions of Mesoamerica and the Andes indicates local and regional mortality rates in virgin soil populations in these areas to be from 30% to close to 100% in some cases.

By way of example, it is today accepted that the population of Mesoamerica stood at time of European contact in 1520 at 16 million and was reduced by 1600 to two million. The contact figure for the Peru, Bolivia, and Ecuador distribution of the Inca Empire is widely estimated at 12 to 16 million persons. By the time of the 1575 Toledo census, this figure was reduced to less than one million. Some of this overwhelming mortality is attributable to warfare and some to abuses associated with the colonial mining industry. However, Old World communicable diseases were the predominant cause of death. Particularly devastating were some of the initial disease epidemics immediately after contact of Old and New World people (Brian Evans, personal communication).

Marshall Hurlich (1983:158) records overwhelming mortality rates due to early epidemic disease among many northern Algonquian groups for which data are available. Northern Algonquian groups touched by epidemic lost three-fifths of their populations on average during the 1781–1782 small-
pox epidemic. Not all northern Algonquian groups were affected. During the same epidemic, Subarctic Athabaskan groups infected lost 75% of their population.

One finds scattered throughout the literature on northern Algonquian and northern Athabaskan hunter/gatherers statements and implications to the effect that the direct resource procurement strategy of these groups, involving the minimal use of food storage options, was a direct contributor to the high mortality rate due to Old World diseases in these virgin soil populations (Krech 1978:718; Krech 1983:124–137; Black-Rogers 1985:8–41). The argument, which is logically sound, states that disruption of a direct procurement strategy brought about by Old World epidemic disease, where all members of a local group might sicken and become incapacitated at the same time, would lead to death by starvation as the compounding factor in mortality. Inferentially, an abundant presence of stored food resources would have greatly mitigated mortality. Looking only at these variables then, one would reasonably expect that, in a local group where food production and food storage was the basis of subsistence strategy, the mortality rate incurred by the same or similar diseases would be less. However, when we look at contact time Andean food producers (Inca), where perhaps the best data are available, we see that the epidemic disease mortality rate for these virgin soil groups is of the same order of magnitude as for northern hunter/gatherer groups (Joralemon 1982:112–120; Sanchez-Albornoz 1974:41–65). Questions I ask then are:

1. What is the relationship, if any, between the subsistence strategy characteristic of a virgin soil population and the mortality rate and depopulation which newly introduced diseases will occasion?

2. What other factors, not directly related to subsistence mode, are (were) at work to bring about such high mortality rates among northern and Andean groups and how do these factors differ (if they differ) in character and effect between these two kinds of societies?

These two questions are to be addressed simultaneously.

Health, Disease and Subsistence Strategy in Human Populations

The subsistence strategy of any human population refers to its traditional manner of selecting certain resources for use in maintaining that population throughout a yearly seasonal cycle and to the way in which the members of that society organize themselves into groups for the procurement, distribution and consumption of those resources (cf. Morgan 1978). The subsistence strategy of a group represents the conscious choices that have been made to articulate that group systematically with the other living and non-living components of the ecosystem in which the group resides. Groups thus fulfill their biological needs and those of individual group members by adapting through culturally organized behaviour to the ecosystem. The subsistence strategy of a group, in order to be successful short and
long-term, must keep the human population in balance with the ecosystem. An attempt is thereby made to keep the biological well-being of the group and individual members in balance, that is, to produce a state of individual and group health so defined (McElroy and Townsend 1985:5–16). Over the long run, and in the absence of outside perturbation of the adaptive balance achieved by a given human society, that society will achieve a balanced participation in the ecosystem. Threats from inside the long term ecosystemic set-up to the balance and functioning of a group are met by traditional cultural and usual biological compensatory measures to counteract them, to restore balance to the society and its adaptation.

Endemic contagious diseases — diseases which are present in larger scale human populations on a more or less constant basis (e.g., measles in European populations) — remain under control to a great extent and do not massively disrupt a human society’s adaptive balance. Such control is effected by biological factors present in a population accustomed to a particular endemic disease and, in addition, by culturally institutionalized means of effectively dealing with the disease. These behavioural means have been acquired through long term familiarity with a particular disease.

In the instance of concern for this paper, the introduction of a highly communicable disease to a human population from outside the sphere of ecosystemic adaptation of that population, the likelihood of the presence of appropriate biological and cultural responses to that potential disruptor or destroyer of the adaptive system is low. The disease spreads and, if of lethal potency, kills rapidly and widely. The biological and cultural homeostatic mechanisms which keep endemic diseases in check do not exist to maintain the systemic balance of the human population’s adaptation to the ecosystem, that is, to maintain the health of the population. The disease may spread rapidly, killing or incapacitating, causing breakdown of the group’s adaptive system on at least a temporary basis. The disease precipitates positive feedback, or events which will change, not maintain, the adaptive system of the infected group. This latter is the virgin soil epidemic situation.

It is useful to address this question along dual biological and cultural lines. The following factors may be seen to operate to maintain the adaptive health of a human population faced with disease threat:

Biological Mechanisms:

1. Genetic immunity. This is the notion that a human population exposed over generations to a given disease will accrue a biologically inherited resistance to that disease. Such immunity has not satisfactorily been demonstrated to exist (Crosby 1976:291–293; McElroy and Townsend 1985:84).

2. Immunological reaction potential of individuals. This does not appear to differ widely from society to society (McElroy and Townsend 1985:84).
3. Inherited individual immunity. The reference here is to a resistance to a disease acquired by an individual through his or her mother's milk or placenta when that parent has previously had exposure to the disease. In the instance of Virgin Soil populations, while individual immunological response is brought into play, the presence of inherited individual immunity is impossible by definition.

Cultural Mechanisms:

1. Isolation of local groups. This is a function of the settlement pattern of a society and of mobility and contact characteristic between groups.

2. Efficacious medical treatment of infected individuals by means of medicines and vaccinations.

3. Quarantine of individuals to prevent the spread of contagion.

4. Appropriate nursing care for infected individuals by the provision of food, water, sanitation facilities and shelter.

5. General vitality of response to disease contact by variously giving up, running away, or attempting to fight the disease.

The following feedback factors may occasion a breakdown of the adaptive system of a group faced with disease threat:

Biological Factors:

1. Low immunological reactions on the part of infected individuals. It has not been demonstrated that human groups differ with respect to this.

2. No individual inherited immunity (certain to be the case in virgin soil populations).

Cultural Factors:

1. Inappropriate or even harmful medical treatment.

2. Lack of quarantine of infected individuals.

3. Lack of effective nursing care due to breakdown of logistical support in terms of food, water, shelter/warmth, sanitation.

4. Lack of intergroup isolation, i.e., a relatively high degree of mobility and contact between groups.

The kind of adaptive system breakdown which would occur in the context of these latter biological and cultural factors is isomorphic with virgin soil epidemics.
Subarctic Hunters and Gatherers (Algonquian and Athabaskan)

Despite the obvious and major differences between northern Algonquian people and northern Athabaskans, their societies share certain structural features resulting from a common basic subsistence strategy adapted to Subarctic ecosystems. There continues, of course, in the case of Algonquian and Athabaskan scholars, to be controversy surrounding what are aboriginal pristine features of northern hunter cultures and what are features derived through direct or indirect influence of European colonists, with particular reference to the fur trade. Some general observations about northern Algonquian and northern Athabaskans outside of the western Pacific drainage area can be made. Hunters do not directly control their resource base; they are mapped on to the seasonal cycling in time and space of those free-ranging animal and plant resources which economic calculations dictate be utilized throughout the year. Due to a relative unpredictability in time and place of occurrence and of accessibility of the resource species, northern hunters traditionally lived in small local groups for much of the year practicing considerable group mobility with visiting and contact between members of those local groups which aggregated for communal hunting or fishing purposes for short periods during appropriate times of the year.

The pattern of establishing large camps close to fur trade posts is also of great antiquity. A long term strategy of food storage, large scale residential groups and sedentary residence was not a viable subsistency strategy under these ecosystemic circumstances. It would appear these hunters were quite free of communicable diseases until direct or indirect contact with Old World people. Varieties of the Old World viral disease smallpox were the primary cause of much epidemic death in the north. Smallpox thrives in cold conditions. The virus has a very long survival time on objects and on people. It is most frequently transmitted by airborne particles and was rapidly spread among the small local groups of many northern hunting peoples through visiting and trading throughout the year. Summer fish camps were major sources of contagion as were the aggregations at fur trading posts. High mortality rates were experienced rapidly. Whole camps would be stricken almost simultaneously, with most infected persons dying within two to four days after the full onset of the disease, long before starvation, which becomes a threat for survivors, could take a toll. It is with the survivors of this “sledgehammer strike” of such an epidemic that the inability to directly procure food resources becomes a problem, but this is not the major contributor to the group mortality rate.

The northern hunting communities were virgin soil peoples in not only a biological sense, possessing no inherited immunity, but in a cultural sense too. Those cultural homeostatic mechanisms listed above as potentially countervailing massive disruption of the adaptation and therefore the health
of these populations did not exist in a form which could deal with a monstrous perturbation to the system from outside of its ken — Old World infectious diseases. There was no quarantining of infected individuals since the spirit world, not disease organisms, was held to be responsible for the disease. Rather, members of the community gathered round the ill in misguided attempts to help.

Efficacious medical treatment in the form of vaccinations was of course lacking. It should be observed that even today western medicine does not cure individuals with viral diseases such as smallpox and measles, but quarantines them and through appropriate nursing care (water, food, sanitation etc.) keeps the patients free of killing secondary infections such as pneumonia (Crosby 1976:293–294). Traditional remedies for illness and fever such as sweat baths and jumping into a cold lake were disastrous for infected members of virgin soil northern populations. Appropriate nursing care was totally lacking: first, the knowledge of how to nurse such Old World disease (quarantine for the patient immediately, for example) was absent in Virgin Soil New World populations; second, everyone became ill within a short time and there was no one to provide nursing logistics, had such skills been known. There are references in northern literature to a lack of “general vitality” in response to the onset of disease epidemics in virgin soil populations. A fatalistic attitude was adopted, little care taken other than initial appeals to the spirit world (Krech 1978:714–715). Often individuals would flee their local groups for another, thereby spreading the disease.

Andean Food Producers

The Inca Empire at the brink of contact with European peoples represented a very tightly and complexly structured state organization. The majority of the food producing population in the highlands was organized into small communities comprised of a number of patrilineally organized households. Ties of kinship structure overarched different communities to create a web of reciprocal economic rights and duties which was then cross-cut by class stratification as an important organizing principle (Stern 1982:1–25). The model of food production had a local self-sufficiency focus with trading networks (Andean “verticality”) cross-cutting different ecozones and providing variable resources to all. Mobility between communities was high for purposes of trading and for a constant lending of manual labour for labour-intensive projects. State officials carefully reckoned the subsistence needs of individual communities and of individuals within those communities. The sick, the crippled, the widowed, the aged, and the needy were provisioned from the public granaries which were easily accessible in time of need (Stewart and Faron 1959:119–136). These magazines of grain often
contained sufficient food for surrounding peoples for several years if needs be. Families had their own grain storage bins in the yard and in the house under the floor (de la Vega 1966:248-255).

No matter how ill these families of villagers are, there is food available. But they surely did die of virulent epidemics. Perhaps half the Peruvian highland population had perished of smallpox before the Spanish made their way into that region. Indirect contagion from the Antilles meant that the Inca empire was heavily troubled by disease by 1520. There were incredibly heavy losses due to Old World diseases during early colonial times here. On a local scale, the mortality rates of 30 to 75% for virgin soil village populations parallels very closely the situation for North American Subarctic virgin soil populations. Starvation due to lack of access to food was not at the root of these initial and staggering figures, although clearly the massive societal disruption occasioned by epidemic disease here led to some subsistence problems in subsequent years even with plentiful food storage capacity.

The literature containing references to the reaction of infected Andean communities makes it clear that the lack of medical practices appropriate to viral diseases such as smallpox, influenza, measles and other killing secondary infections was as pronounced as for northern hunter societies (de la Vega 1966:121-125; Karsten 1949:199). Whereas for these Andean peoples lower spirits and demons usually caused illness in individuals, only the higher Gods feeling neglected could bring on such epidemic devastation. Little was attempted, little could be done. Quarantining was not practiced, to the detriment of the individual and the group, and when everyone in the locality therefore became simultaneously deathly ill, no nursing or other logistical support was available even if they had had the appropriate skills for handling Old World diseases. Many persons died of rapid dehydration when stores of water were in the household. The ingestion of food by the severely ill was out of the question but this was not a contributor to rapid mortality.

The high degree of contact, communication and mobility of persons between Andean communities facilitated the rapid spread of killing viral infections such as smallpox which thrived in this high cool climate, similar to the Subarctic where smallpox also flourished (Crosby 1972:46; Joralemon 1982:119).

**Conclusions**

The picture of Subarctic hunting populations perishing of Old World disease epidemics at a very high rate due to the fact that they practiced a direct resource procurement strategy, is not supportable. The picture
of Andean food producing villagers of the collapsing Inca empire dying at an equally high rate of Old World diseases, and with plenty of food and water on hand, does meet with the data. A lack of genetic immunity (an undemonstrated concept) can not at this point be regarded as instrumental in the high virgin soil epidemic death rates among Andean and Subarctic peoples. Neither does a lower individual immunological reaction of these New World peoples compared with Old World populations stand the test of accounting for the high mortality.

High mortality rate in the face of Old World disease epidemics does not correlate with subsistence strategy in a causal fashion. It does co-vary directly with a lack of individually inherited immunity as a biological variable. More importantly, high mortality rates due to Old World diseases have been seen to co-vary with a lack of appropriate culturally based homeostatic mechanisms. Settlement pattern, medical treatment, the character of nursing and logistical care, quarantining practices, and a fatalistic response to events in the case of both Algonqian and Athabaskan Subarctic hunter/gatherers and Andean food producers led in both instances to breakdown of the adaptive system and of the health of these populations and the viability of their cultures.

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