

**Tallest in the World: Native Americans of the Great Plains in the Nineteenth Century**

by

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The new anthropometric history has emerged in the past quarter century to shed considerable light on the standard of living or quality of life in the past, particularly in settings where traditional monetary measures or health indicators are lacking. Research in the field is based primarily on average height, but also uses other measures such as the body mass index to assess net nutrition, which is dietary intake minus claims made by work and disease. Using average heights, economic historians have discovered the extraordinary malnutrition of American slave children relative to adults, charted nutritional aspects of human welfare during industrialization, and estimated the contribution of improving health to long-term economic growth.<sup>1</sup>

We use the methodology of anthropometric history to investigate the nutritional status of equestrian nomads who lived on the Great Plains during the middle of the nineteenth century, a group for whom traditional measures of economic performance are unavailable. Historians have frequently portrayed Native Americans as merely unfortunate victims of European disease and aggression, with lives in disarray following the arrival of Columbus and other explorers, conquerors, and settlers. While much decimation occurred (Thornton, 1987, 1997), the data we analyze show that some Native Americans were remarkably ingenious, adaptive and successful in the face of exceptional demographic stress. Using height data originally collected by Franz Boas, we show that the Plains nomads were tallest in the world during the mid-nineteenth century, a result confirmed in travelers' accounts and by the skeletal record. The analysis provides a useful mirror for understanding determinants of health in general.

## **I. The Boas Sample**

As a founder of American anthropology, Boas is well known for collection and analysis of anthropometric data on several thousand Amerindians. The data analyzed here were collected in 1892 for use in exhibits at the Columbian Exposition. The worksheets originally coded by

Boas and his assistants were rediscovered in 1982, and placed in machine-readable form a few years later (Jantz, 1995a).

Intent on sampling a large geographic area, Boas trained and dispatched numerous observers to most regions in North America where Native Americans could be found. In a manuscript (unpublished and undated) he laid out the objectives of the exhibits and the data collection project, which are discussed in a survey piece on the data source (Jantz, 1995b). Given the inevitable trade-off between collecting copious data on few individuals versus less information on large numbers of individuals, he chose the latter strategy. Thus, his intent was to cast a very wide survey net. There is no reason to believe that individuals with unusual anthropometric features were over or under represented. His survey goals were merely to depict accurately the anthropological characteristics of the Plains tribes.<sup>2</sup>

Figure 1 shows the land areas of major Great Plains tribes in the middle of the nineteenth century. Most of the important tribes in the region are in the sample, including Blackfeet and Assiniboin in the north; Arapaho, Cheyenne, Crow, and Dakota Sioux in the central; and Comanche and Kiowa in the south. The Sioux and the Crow, however, were the most numerous, comprising nearly three-quarters of the entire sample of 1,123 adult men.<sup>3</sup>

Despite the vast land areas controlled by these tribes, their collective population was probably well under 100,000 at the beginning of the nineteenth century (Prince, 1998). Thus, the Plains were sparsely settled in relation to area and to the primary food source, buffalo. As many as 30 million bison may have roamed the Plains under times of optimal forage conditions during the 19<sup>th</sup> century (Bamforth, 1988; Flores, 1991; Hanson, 1984; Isenberg, 1993). The level of dependence upon this single critical resource for food, tools, clothing, shelter and trade was substantial (Murdock, 1967). By the 1830's the Euro-American fur trade with the Plains Indians increasingly focused on buffalo robes and hides, which helped to decimate the herds by 1890

(Isenberg, 1993; Swagerty, 1988; West, 1995). As noted below, horses replaced dogs as the major pack animals during the 17<sup>th</sup> and 18<sup>th</sup> centuries, and horses were also used for riding and hunting, thereby increasing the speed, freedom of movement and the volume goods that could be carried by these tribes within their territorial areas (Hanson, 1986).

## **II. Results**

Table 1 presents height means, standard deviations and sample sizes by tribe. Overall, the Native American men attained 172.2 cm, or the 25<sup>th</sup> percentile of height standards as tabulated by the National Center for Health Statistics.<sup>4</sup> Remarkably, these Native American men were about 1 to 2 centimeters taller than European-American soldiers of the same era. Numerous studies of military heights, given in Table 2, show that Native Americans of the mid nineteenth century were 3 to 11 centimeters taller than contemporary Europeans, and slightly taller than European-Australians.<sup>5</sup> The available record therefore indicates that Great Plains Native American men were tallest in the world during the mid-1800s.<sup>6</sup>

Because details of the sampling procedures used by Boas and his team are unknown, skeptics of the results may suspect that some type of selectivity or sampling bias was involved. Two independent sources of data, however, confirm the Boas results, both with respect to stature relative to European Americans and differences in average heights across tribes. One is descriptions recorded by travelers and explorers in the early and mid-nineteenth century.

In an expedition of 1819 and 1820, Major Stephen Long reported that the Indians of the Missouri region were “in stature, equal, if not somewhat superior, to the ordinary European standard; tall men are numerous” (James, 1823, Vol. 1, p. 282-283). Major Long also noted distinctions across tribes, and consistent with Boas’ results, reported that on the southern Plains the Kiawa, Kaskaia, Arapaho and southern Cheyenne were “less considerable in stature than the Missouri Indians” (James, vol. 2, p. 179). According to George Catlin, who spent several years among the upper

Missouri tribes in the 1830s, the Sioux were “tall and straight,” but there were “none superior in stature, excepting the Osages” to the northern Cheyenne, there being “scarcely a man in the tribe, full grown, who is less than six feet in height” (Catlin, 1880, vol. 1, p. 233 and vol. 2, p. 2). The story of the tall Indian in chapter 18 of Little House on the Prairie confirms the considerable stature of men in the Osage tribe (Wilder, 1953).

An extensive study of skeletal remains in the Western Hemisphere reveals that the equestrian tribes were remarkably tall. In a sample of 51 Native American groups, involving about 9,000 individuals who lived in North Central or South America over the past several millennia, two equestrian Plains tribes (northern Cheyenne and Crow) were among the 3 tallest to have lived in the hemisphere (Steckel, Sciulli and Rose, 1998). Average heights in both tribes exceeded that of nineteenth century U.S. soldiers. As expected based on diet and likely exposure to disease, the equestrian Crow and Cheyenne were somewhat taller than Plains village tribes and considerably taller than tribes who lived near the edge of subsistence--pre-Columbian tribes of the southwest and the collapsing Mayans.

### **III. Possible Explanations**

The net nutritional experiences of tribes on the Great Plains are important for the questions they lead one to ask about European-American history. Historians have chronicled the technological advantages of whites over Native Americans, including factories, steamboats, canals and railroads. Moreover, whites had forms of organization (government) that could bring huge quantities of resources to bear on particular problems. Yet, they were relatively disadvantaged when it came to net nutritional conditions. Why?

As little comparative study has been done, our thoughts largely amount to a sketch of a research agenda. The plainsmen clearly consumed adequate protein and energy from the abundant buffalo and game that typically roamed the Great Plains--a process made much easier and reliable

when horses became available, and with metal tools such as axes, knives, and guns.<sup>7</sup> Less well known is the dietary diversity that provided vitamins, minerals and other micronutrients. This rich diet was supplemented by an extensive network of trade in foodstuffs among tribes and by exploitation of extensive native plant resources (West, 1998; Helleson and Gadd, 1974).

Important differences in life style were density of settlement and the extent of movement. European-Americans were more densely settled and sedentary, while the Plains populations were widely spread and typically moved many times per year. As a result, the tribal populations were seldom in one place long enough for waste or parasites to accumulate. The importance of waste (or lack of it) for health has been established from sanitary measures that preceded the germ theory of disease (Szreter, 1988). The incidence of endemic diseases was worsened for European-Americans by sedentary life styles and significantly higher population densities, which increased their exposure to disease causing organisms. Thus, it seems plausible that while epidemic diseases were devastating on the Great Plains, European-Americans suffered relatively more from chronic, endemic diseases (Cohen 1989, Chap. 6).

It is possible that greater inequality among whites adversely affected their health relative to Native Americans. Height and health are known to be sensitive to inequality (Steckel, 1983, 1995). Hunter-gatherer and the Plains equestrian societies were known for their egalitarian practices of sharing food and shelter, and for their communal efforts in caring for the sick or wounded (Ewers, 1968, 1980; Isenberg, 1993; Prince, 1998; Whelan, 1993). As small communities of similar ethnic heritage where people knew each other well and misfortune was readily distinguished from shirking, sharing and helping others in need was a form of social insurance. Some status items did exist (as known from oral histories, artifacts, and trading company inventories) and some individuals such as chiefs exercised considerable power, but Plains societies also exhibited social and economic fluidity (Eggan, 1966; Ewers, 1968). Hazards such as horse raids, wars, winter

storms or disease destroyed herds of the wealthy and mitigated social entrenchment. These hazards also inclined the rich to be generous so that favors could be returned in times of need. Unlike the capitalist societies of the nineteenth century, most wealth on the Great Plains was readily moveable, which limited the amounts that could be accumulated. In contrast, vast quantities of wealth could be acquired in more impersonal capitalist societies in the form of land, structures, and financial assets. Rich European-Americans had little need for community-based social insurance programs because they could fend for themselves using the market, but the poor who lacked family connections or access to markets were at risk. Thus, it is likely that the social safety net was considerably more porous in European-America compared with the smaller, more cohesive societies of the Great Plains.

Plausibly, the net nutritional success of the equestrian Plains tribes in the face of extraordinary epidemic adversity might be attributable in part to their organizational flexibility. Following huge losses through death, survivors usually regrouped quickly with other bands to resume their seasonal rounds (Decker, 1991; Taylor, 1977; Trimble, 1989; Sundstrom, 1997).<sup>8</sup> Though we have not given the matter much study, it is likely that chaos would have followed very large numbers of deaths through epidemics in any town or city of European-Americans. Many survivors would have streamed out of the community and those left behind would have faced enormously disrupted lives as the intricate networks of specialization and interdependencies came unraveled. American society anticipated continuity and gradual replacement of losses through death, and was not built to withstand major demographic shocks.

The difficult adjustments routinely faced by the Plains tribes were eased by having much of their assets in easily portable and eminently tradable forms of capital—horses and pemmican (dried buffalo meat). Though European-Americans also had portable and tradable assets (money), much of their wealth was tied-up in non-edible and non-portable land, structures, and

equipment. With one third to one half of the population of New York City dying from an epidemic, for instance, who would have been willing to risk their life to bring food into the city from the outside? Under these conditions, what would physical assets in the city have been worth? For what could they have been traded that would have enhanced the chances of survival? Fortunately for European-Americans, they rarely had to test their system of production and distribution against the kinds of demographic disasters faced by Plains tribes.

#### **IV. Conclusions**

The tall stature of Great Plains tribes is dramatically at odds with preconceptions of their standard of living relative to European-Americans, an image reinforced by a misguided tendency to read backward into time the poor health of Native Americans on reservations.<sup>9</sup> Presumably technology and institutions provided advantages in many dimensions of the quality of life for European-Americans, but how did apparently ‘poor’ tribes become the tallest in the world? Why were they so successful in the dimension of nutritional status, particularly in the face of significant stress from epidemic disease? While research on these questions is still in an early stage, we think it plausible to link this extraordinary achievement to a rich and varied diet, modest disease loads other than epidemics, a remarkable facility at reorganization following demographic disasters, and egalitarian principles of operation. Whatever the actual causes revealed by later research, it is clear these equestrian tribes had something important for health that other groups lacked, and that explanations for their achievement are important for understanding determinants of health in general.

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Figure 1: Map of Plains Tribal Territory, ca. 1850

Source: Haines (1976), p. 156.

Table 1: Mean Heights, Standard Deviations, and Sample Sizes of Adult Men by Tribe

Tribe	All Adult Men			Adult Men Aged 23-49		
	Height	s.d.	N	Height	s.d.	N
Assiniboin	169.6	6.0	22	169.4	7.2	9
Blackfeet	172.0	5.3	58	171.6	5.3	42
Crow	173.6	6.7	227	173.1	6.8	157
Sioux	172.8	5.6	584	172.9	5.6	376
Arapaho	174.3	6.9	57	173.1	6.2	38
Cheyenne	176.7	5.6	29	176.5	6.0	20
Kiowa	170.4	5.7	73	169.9	6.0	58
Comanche	168.0	6.4	73	166.9	6.3	53
Total Sample	172.6	6.2	1,123	172.3	6.3	753

Note: Average heights have been rounded to nearest 0.1 centimeter.

Source: Prince (1998).

Table 2: Average Height of Troops Born in the Mid-Nineteenth Century, by Country or Place

Country or Place	Height (cm)
Australia	172
Canada	171
U.S.	171
Norway	169
Ireland <sup>1</sup>	168
Scotland <sup>2</sup>	168
Sweden	168
Bohemia	167
Lower Austria	167
Moravia	166
U.K.	166
France	165
Russia	165
Germany <sup>3</sup>	164
Netherlands	164
Spain <sup>4</sup>	162
Italy <sup>5</sup>	161

Sources: Carrión and Castejón (1998, p. 215), Costa and Steckel (1997, p. 51), Dick (1995, p. 127), Drukker and Tassenaar (1997, p. 341), Floud, Wachter and Gregory (1990, p. 137), Kiil (1939, p. 12), Komlos (1989, p. 57), Mironov (1995, p. 73), Nicholas and Steckel (1997, p. 126), Pagliani (1879), Riggs (1994, p. 70), Sandberg and Steckel (1997, p. 129), Twarog (1997, p. 295), Weir (1997, p. 191), Whitwell, de Souza and Nicholas (1997, p. 395).

1. Convicts.
2. Prisoners.
3. Württemberg.
4. Elche and Murcia.
5. Average of upper and poor classes.

## Footnotes

<sup>1</sup> For a recent review of the literature see Steckel (1995).

<sup>2</sup> Consistent with our objective of investigating the Native American nutritional experience, we chose only individuals described as “full blooded” or nearly so (3/4 ‘blood quantum’), based on the tribe of the mother and tribe of the father indicated on the original worksheets.

Approximately 1.6 per cent of the individuals in the sample studied were less than “full-blooded.”

All members of a particular tribe were pooled regardless of where they were measured.

<sup>3</sup> Franz Boas was a meticulous empirical researcher, and it is safe to argue that the anthropometric measurements were taken with a great deal of care. Boas himself did some of the anthropometry, and he instructed his staff in the proper techniques of measurement, provided each observer with a standard set of instruments, and training sessions included practice in their use. Whenever possible, Boas sent more than one observer to the same tribe to minimize interobserver variation.

<sup>4</sup> Percentiles were calculated from Steckel (1996).

<sup>5</sup> One may quibble whether the Plains tribes were taller, on average, than Australians. But the Cheyenne and Arapaho were clearly taller than any social or occupational class in Australia. For comparisons see Whitwell, de Souza, and Nicholas (1997, p. 395).

<sup>6</sup> Table 1 presents results for two groups: heights for all ages, adjusted for shrinkage at older ages, and heights for adults aged 23-49, the age group often used for comparisons because adjustments for shrinkage are unimportant. The table shows that the adjustment formula has a tiny (0.3 cm) upward effect on average height and does not materially affect the results. We adjusted using a gender-specific formula estimated by physical anthropologists and clinicians from longitudinal data on height by age (Cline et al., 1989):  $\text{Max height} = \text{Standing height} + 3.277 - 0.1652 (\text{age}) + 0.00209 (\text{age})^2$ . The formula is parabolic in age, and calls for no

adjustment at age 39.5. The curve is rather flat near this age, with the addition of only 0.2 cm at age 30 and 0.24 cm at age 50. The adjustment is significant at old ages, and, for example, amounts to 2.0 cm at age 70. Alternative age-correction formulas give similar results (see, for example, Relethford, 1995).

<sup>7</sup> Important aspects of tribal life without horses are discussed in Ewers (1980, pp. 299-322).

<sup>8</sup> A good diet helped protect the tribes against many nutrition-sensitive diseases such as respiratory infections, tuberculosis, and gastrointestinal maladies, which had some tendency to cull shorter individuals. Instead, the Plains tribes were victimized mainly by diseases such as small pox, which essentially eliminated people at random by height. For a discussion of nutrition sensitive diseases see The Conferees (1983).

<sup>9</sup> From the turn of the 20<sup>th</sup> century the reservation populations experienced very high rates of TB and other nutrition-sensitive diseases. For a discussion of health on the reservations see Putney (1980).