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American Indians with African Ancestry: Differential Fertility and the Complexities of Social Identity

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Abstract Interethnic marriage represents a major trend in the demographic history of American Indians. While the majority of these unions involved Indian women and Caucasian men, a sizeable number occurred between Indians and African Americans. The children of these bicultural marriages were "mixed bloods" who in turn typically married non-Indians or other mixed bloods. Using data from the 1910 Census on American Indians in the United States and Alaska, this article explores why American Indians with African ancestry enjoyed high fertility. Differential rates of fertility among American Indians in the past were due to a number of underlying genetic, cultural, and environmental factors. By identifying these factors, the paradox of why Indian women with African heritage did so well in terms of fertility largely disappears. African admixture, however, greatly complicates Indian social identity.

Keywords American Indians · African admixture · Fertility · 1910 census · United States · Alaska

Introduction

The demographic history of American Indians is characterized by a number of major trends, the most dramatic being the immense loss of life resulting from the introduction of several Old World diseases, including smallpox, measles, influenza, cholera, and malaria. While the exact size of indigenous populations in the Americas on the eve of European contact will never be known with certainty, scholars agree that up to 90% of the aboriginal population perished as a direct result of these introduced diseases (Thornton 1987, 1997; Ubelaker 1988; Ramenofsky 1987; Dobyns 1983). By 1900, the population of American Indians in the United States reached its nadir of 237,196 individuals (Thornton 1987:160). Although Ubelaker's estimate (1988:291) for 1900 is more than twice as high (536,562), it does not alter the fact that millions of Indians died from these and other infectious disorders, as well as from other causes including famine, exposure, alcohol-related trauma, and armed combat with whites and other Indians (see also Larsen and Milner 1994; Bianchine and Russo 1992).

Another highly significant demographic trend explored in this article is an increasing number of interethnic marriages between American Indian women and non-Indian men. Although a limited number of white women married Indian men, this practice was certainly not common nor widely approved (Ellinghaus 2006; Jacobs 2002). The children of such marital unions were "mixed bloods," who in turn typically married non-Indians or other mixed bloods (e.g., Perdue 1998, 2003). Such "assortative" mating leads to an expansion of the gene pool, which, according to Quiggins (1990), may explain why highly admixed Cherokee are at lower risk of developing type-2 diabetes than full blood individuals. A similar finding has also been reported for the Pima of Arizona (Williams *et al.* 2000). Using data from the 1980 U.S. census, Sandefur and McKinnell observe "intermarriage of Indians and whites is much more prevalent than that of blacks and whites, and … the extent of Indian/white intermarriage has increased dramatically in recent decades" (1986:348). The scholarly literature on Indian-white marriages for the nineteenth and early twentieth century is quite extensive (Logan and Ousley 2001; Sturm 1998; Moore

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and Campbell 1995; Mihesuah 1991; Swan and Campbell 1989; Hrdlicka 1931; Boas 1894).

A significant number of marriages also occurred between American Indians and American blacks. In his 1928 survey of African-American students (n=1551) attending Howard University, Herskovits noted that 27% claimed some degree of Indian ancestry (cited in Lovett 1998:203). Several historians and others have addressed Indian-black marriages in the past (Miles 2005; Perdue 1979, 1998, 2003; Brooks 1998; Lovett 1998; Mandell 1998; McDonald 1998; Dramer 1997; Forbes 1988, 1993; Katz and Franklin 1993; Katz 1986; Littlefield 1977, 1979; Nash 1974; for additional references see Frank 2005:136–137). However, few scholars have examined the fertility of these couples. As will be demonstrated here, during the late nineteenth and early twentieth century admixture with African-Americans conferred reproductive advantages to American Indian women. While this may appear paradoxical, especially given the racial prejudice directed towards blacks at this point in American history, differential rates of fertility among American Indians in the past were due to a wealth of underlying genetic, cultural, and environmental factors that collectively had a pronounced affect on their reproduction. By identifying these factors, the paradox of why Indian women with African heritage did so well in terms of fertility largely disappears.

The 1910 Census

The data for this study are drawn from the 1910 U.S. Census on American Indians in the United States and Alaska (see Dixon 1915). The tables and text were developed by Roland B. Dixon and F. A. McKenzie, two experts hired by the Bureau of the Census expressly for this project. The materials appearing in the 1910 Census were generated using questions that appeared on the general census schedule, as well as a special interview schedule of 46 questions designed to gather information on tribal affiliation and purity of blood. Moreover, as Dixon notes (1915:9), "Special agents, most of whom had had some experience in the service of the Office of Indian Affairs, were appointed for the collection of statistics by means of the special schedule." The census, published in June 1915, contains a wealth of information on ethnicity, marital unions, female fecundity, and rates of offspring survivorship for thousands of couples living during the early 1900s. It is the only document of this period that includes systematic data on the reproductive profiles of American Indians with African ancestry. Because the census gives fertility related data for "full bloods" as well as mixed bloods of varying degrees of white, black, and Indian ancestry, comparative analyses are possible to better understand the ways in which ethnicity affected human reproduction in American society during the late 1800s and early 1900s.

It should be stressed that there are a number of limitations within the 1910 Census, the most notable being the small sample sizes reported for couples of mixed Indian-black ancestry. Another is that the census does not state how the ethnic or racial affiliation of a given subject was determined. The data are also skewed geographically in that the majority of full bloods in the United States at this time were members of tribes in the West and, unsurprisingly, the proportion of mixed bloods is highest among tribes located in the East. As a result, some regions are overrepresented, or underrepresented, depending on the type and degree of ethnic admixture of subjects. While these shortcomings invite questions about representativeness or accuracy of the published findings, it should be noted that similar trends in differential fertility and quantum appear in data collected by Franz Boas and his coworkers on more than 15,000 American Indians just a few years prior to the initiation of surveys for the 1910 Census (Logan and Ousley 2001). Because these two data-sets share temporal proximity, wide geographic coverage, and similar patterns concerning quantum and fertility it seems reasonable to conclude that the 1910 Census accurately reflects major trends in the demographic history of American Indians.

The tribal affiliation of women with African ancestry for whom fertility related data were collected is not given in the 1910 Census. However, it does list several tribes in the Atlantic and Gulf coastal states that were enumerated, each of which is known to contain varying degrees of African admixture, notably the Croatan or Lumbee of North Carolina (n=5,865); the Choctaw (n=1,162) of Mississippi; the Powhatan (n=131), Chickahominy (n=115), and Pamunkey (n=83) of Virginia; and the Alabamu (n=111), Koasati (n=85), Chitimacha (n=50), and Tunica (n=43) of Louisiana, as well as the Seminoles (n=1,503) of Oklahoma (originally Florida) (Dixon 1915: 22–24). While biracial and tri-racial individuals were also found in most Eastern tribes, including those removed to Indian Territory, it seems likely that many of the Indian-black women whose fertility profiles appear in the 1910 Census were members of these highly admixed tribes in North Carolina, Mississippi, Virginia, Louisiana, and Oklahoma. The Croatans, for example, exhibited the most pronounced degree of admixture among all of the "principal tribes" - mixed bloods comprised 92% of the total tribal population (1915:40). However, their Indian identity, at least in the eyes of the U.S. Census, was short-lived: in the 1920 Census they were reclassified as black (Dramer 1997:56; 75).

The reproductive histories of 295 female subjects of mixed Indian-black (n=101) and Indian-black-white (n=194) heritage were collected by census personnel. Unfortunately, their tribal affiliation or state of residence is not provided. While this combined sample is small compared to Indian-white mixed bloods, it is still the largest known of its type. Moreover, this sample allows researchers to assess what impact intermarriage with blacks had on the reproductive success of Indian women during the late nineteenth and early twentieth century.

The data of interest here fall into three broad areas: sterility, fecundity (the average number of births per woman), and vitality (the number of children surviving at the time of the survey). All females for whom fertility related data were collected had been married for a minimum of 1 year, and their ages ranged from 15–44 years. The Census contains information on 21,532 married couples, including the ethnic affiliation of each partner. These couples are placed into eight categories based on the specific ethnic identity and quantum level (degree of admixture) of each spouse: 1) Full bloods of the same tribe (e.g., Cheyenne-Cheyenne); 2) Full bloods of different tribes (e.g., Cheyenne-Kiowa); 3) Full blood and mixed blood (Indian-white); 4) Full blood and white; 5) Mixed white Indian and mixed white Indian; 6) Mixed black Indian and mixed black Indian; 7) Mixed white, black, Indian and mixed white, black, Indian; and 8) White and mixed white Indian. The census contains data on the average fecundity of all couples in each category. Comparative analysis allows identification of broad trends in the reproductive histories of those enumerated. The data also facilitate an assessment of the relative impact that ethnicity and quantum had on differential fertility of these couples. While these analytic procedures are simple, explaining significant differences among categories is a great deal more complex because a large number of factors – genetic, cultural, and environmental – can individually and more frequently collectively affect human fertility and offspring longevity.

The most striking pattern to emerge from the data is that full bloods lagged far behind their mixed blood contemporaries in all areas pertaining to fertility. Considering the data on marital sterility (Fig. 1), of 10,379 full blood couples sampled, 10.7% (n=1,111) were childless at the time of the survey.[1] The occurrence of marital sterility among full blood couples is almost double the rate recorded for all mixed bloods, where 6.7% (n=717) of 10,752 couples remained childless. The range in sterility for all mixed bloods was pronounced, however, with couples of Indian-black ancestry scoring highest at 9.9% (n=10), yet the sample size for this group is regrettably small (n=101). The lowest rate was recorded for couples of white and mixed white-Indian ancestry, a total of 5,066 couples, at 5.8% (n=292). Percentages for other admixed couples were: 6.2% (n=12) for individuals of mixed white-black-Indian ancestry (n=194), 6.9% (n=254) for mixed white-Indian couples (n=3,675), 7.7% (n=16) for white and Indian-white couples (n=208), and 8.8% (n=133) for full blood and mixed blood couples (n=1,508). As can be seen, quantum levels and ethnic heritage have a pronounced impact on marital sterility.

The correlations between rates of marital sterility and admixture are also statistically significant. When full bloods are compared to Indian-white couples, Chi Square analysis reveals a p value of <0.0001. Similarly, Indian-black couples expressed lower average sterility than their full blood contemporaries, also significant with a p value of <0.032. Sterility rates were comparable for couples with white ancestry and couples with African ancestry (Table 1). It becomes clear that full bloods were at a disadvantage regarding the frequency of childless unions.

A similar pattern holds for fecundity, or the average number of births per woman in a given sample. The census data on fecundity refer only to women who had been married for 10–20 years.[2] Once again, full blood females exhibit lower rates of fecundity (4.5 children) than their mixed blood peers (5.1 children).The disparity becomes even greater, however, when full bloods are compared to certain clusters of mixed bloods. For women of mixed white-black-Indian ancestry (n=63) the figure rises to 5.5 children, the highest value among all mixed bloods. The elevated reproductive status of Indian women with African ancestry becomes even more apparent when one looks at the number of couples with six or more children. For couples where both husband and wife are of Indian-black heritage (n=36), 55.6% had six or more children. This was followed by couples where both partners are of tri-racial heritage (n=63), where 49.2% had produced six or more offspring. The figure for Indian-white couples was 46.3%. For full bloods, however, the figure falls to 32.9%, significantly below that for Indian parents of mixed African ancestry (Figs. 2 and 3).

As with sterility, Chi Square tests were used to determine if the variation in fecundity for full bloods and mixed bloods was statistically significant. The 1910 Census lists the number of couples having 1 to 2 children, 3 to 5 children, and 6 children or more at the time of the survey (Fig. 3). When full bloods are compared to couples of

[1] It must be noted here that the total of 1,111 was derived by combining the data for tribally endogamous full blood couples who were infertile [n=1,018] with that given for bi-tribal full bloods who also experienced infertility [n=93] (Fig. 1).

[2] Sample sizes here are smaller than those reported on rates of marital infertility.

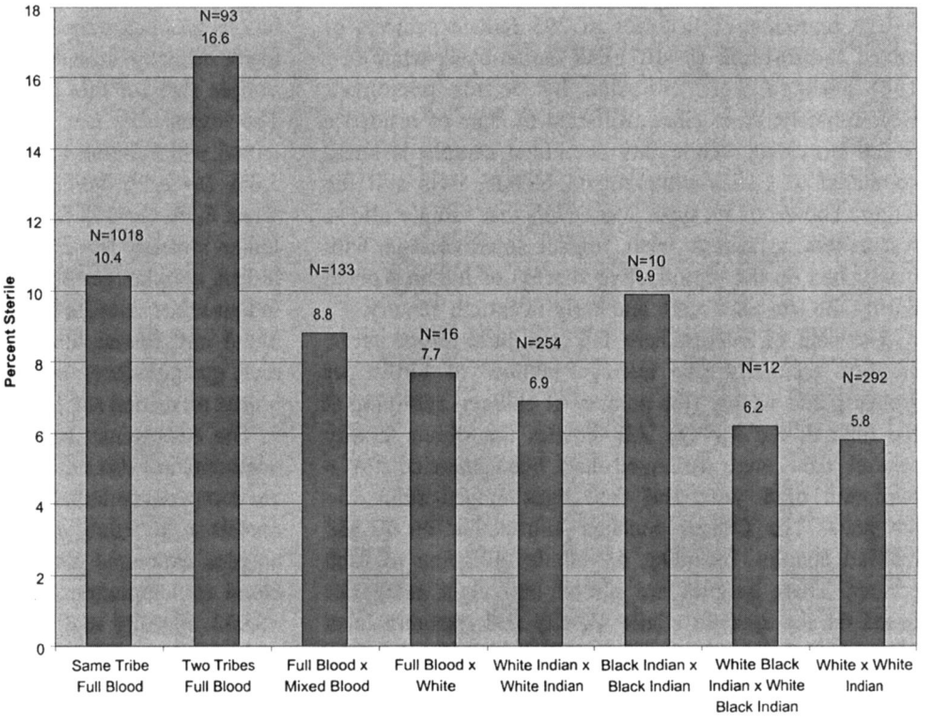

Fig. 1 Sterile couples (number and percent) by 1910 census categories

Indian-white ancestry, the latter group had significantly more children, with a p value of <0.0001. A similar finding is seen for couples of Indian-black and Indian-black-white ancestry - a p value of <0.0001. The recorded fecundity for mixed bloods having white ancestry did not differ significantly from those with African heritage. The critical factor in variation in fecundity was not the type of non-Indian heritage (white vs. black), but simply admixture itself. These results demonstrate that interethnic marriage carried a sizeable, though most likely unrecognized, reproductive reward for those who broke from long-standing norms of tribal endogamy (Table 2).

In terms of vitality, striking group differences are seen in rates of offspring survivorship (Fig. 4). Again, full blood Indian couples lagged behind their mixed blood counterparts. Nearly 30% of the 14,469 offspring produced by full blood parents had died at the time of the survey. The percentage for white and Indian-white couples, in contrast, was 17%, the lowest rate of mortality recorded in the 1910 Census. Parents of mixed Indian-African ancestry ranked closely behind at 20%.[3] The lower infant-childhood death rates recorded for admixed couples, when coupled with variations in sterility and fecundity, help to explain why mixed bloods as a population grew so rapidly in comparison to full bloods during the late nineteenth and early twentieth century. These results closely parallel those for sterility and fecundity. African admixture carried some type of advantage that affected offspring survivorship. Although mixed-white and mixed-black couples were not found to be significantly different from each other with respect to vitality, each varied importantly from full bloods concerning the number of children still living at the time of the survey (Table 3).

Table 1 Quantum and marital sterility

Quantum	Sterile	Not Sterile	Total
Full Blood Couples	1,111 (11%)	9,268 (89%)	10,379
Mixed Indian-White Couples	254 (7%)	3,421 (93%)	3,675
Mixed Indian-Black Couples	22 (7%)	295 (93%)	317
Total	1,387	12,984	14,371

Chi Square = 47.5, 2 Degrees of Freedom, p=<0.0001

The correlations reported in the 1910 Census between quantum, the independent variable, and sterility, fecundity, and vitality, the dependent variables, are statistically significant. Because the central question addressed here concerns the relationship between admixture and differential fertility, only three sub-samples appear in Tables 1, 2, and 3. These are full blood couples (same and different tribes), mixed blood couples (Indian-white), and mixed

[3] The variation in offspring survivorship was assessed by means of Chi Square analysis. The ratio of children living by total number born is significantly greater for Indian-white couples than for full bloods: p=<0.0001. For Indian-black (including tri-racial) couples p=<0.011 (Table 3). Ch-squares were calculated using rxc Contingency Table software (www.physics.cslsju.edu/stats/contingency_NROW_NCOLUMN_form.html)

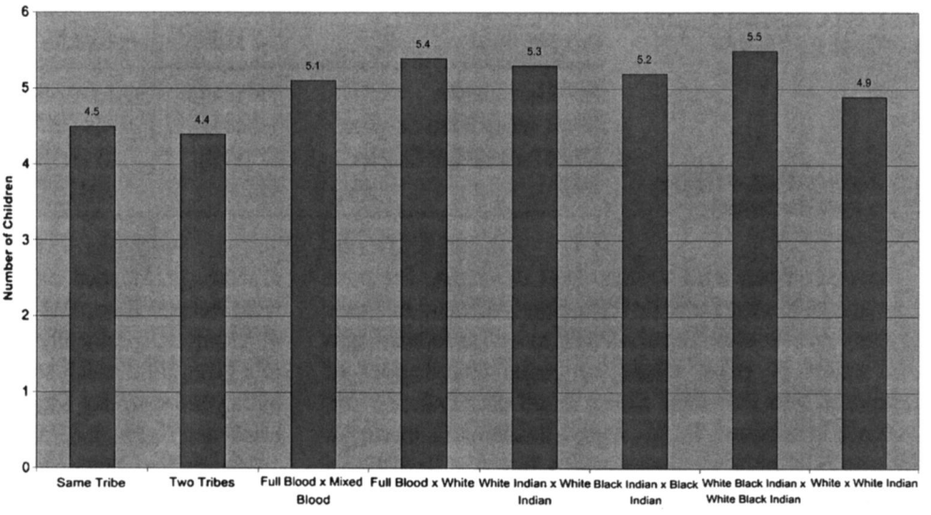

Fig. 2 Average number of children born by 1910 census categories

blood couples (Indian-black, as well as Indian-black-white). In each case the p value is less than <0.0001. Interestingly, however, when mixed bloods with white ancestry are compared to those having African heritage the differences are not statistically significant. This means that admixture itself conferred a reproductive advantage. It may also mean that white and African heritage brought different sets of qualities or traits –specific to each group - that proved to be advantageous during this period, although neither set conferred a decided advantage over the other. Nonetheless, these traits set mixed bloods apart from their full blood contemporaries (Thornton *et al.* 1991).

Interethnic Marriage

This trend in differential population growth rates between full bloods and mixed bloods had been noted long before the 1910 Census. For example, Mandell (1998:471) reports that by the mid-1800s investigators in Massachusetts and Connecticut found that individuals of mixed ancestry had nearly replaced full bloods in Indian settlements throughout the region. Officials in Rhode Island claimed that in 1858 there were no "pure" Narragansett left. Sources prior to the American Revolution also refer to ethnic intermarriage and the increasingly evident number of mixed bloods in various tribal nations in the East. O'Brien (2006) argues, however, that such surveys underestimated the true number of full bloods that remained in these New England states because residents of New England "needed to have Indians disappear in order to justify colonialism, absolve themselves of wrongdoing and guilt, and place Indians firmly and safely in the past" (p.415). However, this does not negate the fact that the admixed population in New England and elsewhere was increasing at a rapid rate. A number of interdependent factors contributed to the mixing of different ethnic groups during the nineteenth century.

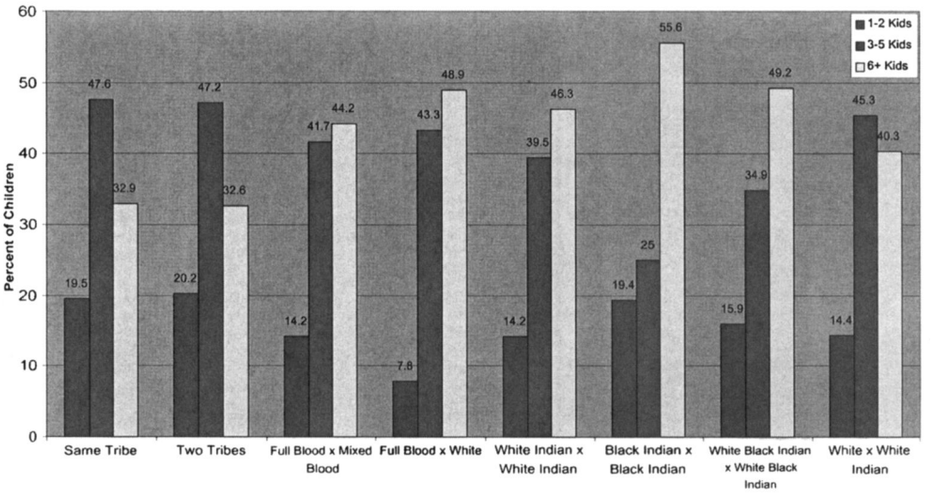

Fig. 3 Differential fertility (percent) by 1910 census categories

Table 2 Quantum and fecundity

Quantum	1-2 Kids	3-5 Kids	6 Kids or More	Total
Full Blood Couples	716 (20%)	1,739 (48%)	1,203 (32%)	3,658
Mixed Indian-White Couples	183 (14%)	508 (40%)	595 (46%)	1,286
Mixed Indian-Black Couples	17 (17%)	31 (31%)	51 (52%)	99
Total	916	2,278	1,849	5,043

Chi Square = 85.45, 4 Degrees of Freedom, p=<0.0001

Several authors have written about this topic. The most common motivating factor for Indians and African-Americans to marry outside of their natal cultures, as well as for marriages that united all other ethnic categories and degrees of admixture, was individual choice based on admiration and romantic attachment. In this regard Indian-black marriages were no different than countless others. However, there were a number of demographic, economic, and cultural factors that, over time, favored intermarriage between Indians and African-Americans. Skewed sex ratios certainly played a role. Indian women frequently faced a limited pool of potential mates due to the elevated mortality of Indian men resulting from lethal combat and a variety of other factors. For those tribes with unilineal descent groups the rule of clan-exogamy would further restrict the number of possible mates. Similarly, the majority of escaped African slaves were men, who encountered few single black women in the regions to which they had fled. Peoples of color were also frequently confined to certain communities or zones of settlement in larger towns and proximity invariably increases the chance of intermarriage. Indians and African-Americans in urbanizing areas typically found employment in the same or similar economic sectors. Moreover, African-Americans could gain access to lands held collectively by Indians through ties of marriage to a tribal member, in the vast majority of cases a woman. Perhaps the most compelling reason why Indian-black marriages occurred with increasing frequency was that a person's skin color was of little importance among Indian peoples in matters of marriage (Mandell 1998:478). Marital unions of this type were welcomed because of communal concerns over control of resources, specifically lands held in common by members of a given tribe which could be worked and made profitable by anyone marrying into the tribe. And children of Indian-black marriages inherited a "symbolic ethnicity" (Gans 1996), in that they could, and frequently did, "maintain emotional and social ties to both groups" (Mandell 1998:485). This symbolic identification was especially valued by Indians because it helped them maintain a sense of solidarity and community despite enormous pressures to assimilate totally into mainstream society, which would only translate into greater loss of communal resources.

The enhanced fertility of mixed bloods was a consequence of numerous factors working in tandem. Similarly, an equally complex set of conditions thwarted the overall fertility of full bloods. Although these will be discussed separately below, it must be kept in mind that the combination of variables produced a synergistic impact on fertility. For organizational clarity, the variables of interest are grouped into three broad areas: genetic, cultural, and environmental.

Genetic Variables

Human geneticists have long suggested that heterosis, or genetic distance, can profoundly affect the relative fecundity of women, although consensus on this correlation is far

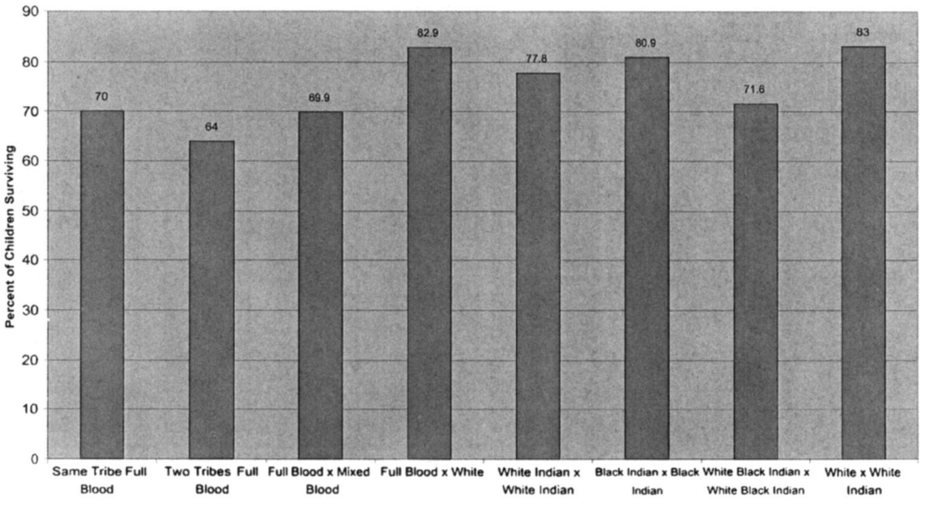

Fig. 4 Offspring survival (percent) by 1910 census categories

Table 3 Quantum and offspring vitality

Quantum	Surviving	Not Surviving	Total
Full Blood Couples	11,476 (70%)	4,993 (30%)	16,469
Mixed Indian-White Couples	5,280 (78%)	1,506 (22%)	6,786
Mixed Indian-Black Couples	401 (75%)	135 (25%)	536
Total	17,157	6,634	23,791

Chi Square = 159.75, 2 Degrees of Freedom, $P=<0.0001$

from being reached (e.g., Bittles *et al.* 2002). However, numerous studies demonstrate that the closer the genetic proximity between partners the greater the interval between known pregnancies, reducing the total number of children a woman will deliver over the course of her reproductive years. Among Hutterites, the underlying causal mechanisms responsible for reduced fecundity in consanguineous marriages may involve "gametogenesis, hormonal cycling, sperm transport, ovulation, fertilization, or implantation" (Ober *et al.* 1999:225). Beer and colleagues (1983) found that when couples share closely related alleles for the major histocompatability complex (MHC), a set of genes affecting the immune system, there is an increased risk of fetal loss due to failed implantation and inadequate protection of the developing fetus. This will also have a negative impact on female fecundity. Tribal endogamy among full bloods, especially in small tribes, would increase the likelihood of consanguineous unions, which are known, at least in other populations, to reduce fertility. On the other hand, marriages between Indians and non-Indians would largely remove genetic factors that impair reproductive potential. This undoubtedly affected the reproductive history of mixed bloods, whose average fecundity far surpassed that of full bloods in the 1910 Census.

Offspring survivorship is also affected by genetic traits, particularly those that confer an advantage with respect to disease. Increased mortality is especially prevalent in small populations that lack pronounced heterozygosity. Measles, for example, is much more virulent in these populations, and has caused high death rates among Native Americans in diverse environmental settings (Black 1992; Thornton 1987). When measles spreads among hosts who are genetically related the likelihood of a fatal outcome increases dramatically for those infected last in a sequential chain of illness episodes. For example, if the victims are siblings the chance of death from measles is 16 times greater for the fourth host than for the first (Black 1992). This increase results from minor mutations in the virus as it spreads from one sibling to another becoming progressively pre-adapted to fight the immune system of each new host. Timing of infection could also be a contributing factor; measles and other infectious diseases are usually less severe during childhood than adulthood (Bianchine and Russo 1992:229). During the nineteenth century, many Native Americans were acutely aware of the virulence of measles. One resident on the Pine Ridge Sioux Reservation remarked: "To white people measles seemed a small matter and whooping cough was nothing specially bad, but among the Indians these childish complaints assumed a deadly form, and they often attacked adults and killed them"(Hyde 1956:236, citing Bishop Hare 1889).

Some of the variation in vitality rates reported in the 1910 Census stemmed from specific genetic factors that conferred either an advantage or risk with respect to Old World diseases. Anthropologists and others have long shown that certain heritable traits affecting red blood cells provide some degree of protection from various types of malaria which is particularly deadly for children. Several researchers have demonstrated that individuals who are heterozygous for the sickle cell trait enjoy partial immunity against falciparum malaria despite being exposed to infected mosquitoes (e.g., Beeson 1999; Firschein 1984; Friedman and Trager 1981; Livingstone 1957). Similar findings have been reported for hemoglobin C (Agarwal *et al.* 2000), which is found most commonly in central West Africa. This variant also confers resistance to falciparum malaria (Mielke *et al.* 2006:155). Individuals who have both recessive alleles for Duffy negativity (Pogo and Chaudhuri 1997), another genetic trait adaptive in some malarial areas, are completely immune to vivax malaria. Some Indian children with African heritage could have inherited an allele for hemoglobin S or hemoglobin C. If both parents had African admixture, a child could also inherit the recessive alleles required for the expression of Duffy negativity. In each case these children gained protection from malaria, a major health problem in the Southeast until the mid-twentieth century (Andrews 1948). Livingstone, in his world- wide study of abnormal hemoglobins, remarks that the Seminole of southern Florida "seem to have the highest frequency of hemoglobin S among the tribes" (1967:97). Just under 10% of those sampled possessed this variant (p.430), whose presence was due to admixture with individuals of African descent (Mulroy 2004). The 1910 Census enumerated only 16 Seminoles in Florida because the majority had been removed to Oklahoma, where 1,503 individuals were interviewed by census personnel.

Pollitzer's (1964) analysis of genetic traits in a "tri-racial isolate" in lowland North Carolina is also relevant in this context. While members of this population (the Croatan,

better known today as the Lumbee) call themselves Indians, at least in a cultural context, Pollitzer found that nearly 2% of those sampled possessed the allele for either hemoglobin S or C. Of those tested for the Duffy factor, 50% proved to be type "a" revealing Caucasian admixture. For the remaining half, Pollitzer does not report frequencies for Duffy "b" negative. However, since the Lumbee possess a significant degree of African heritage, the frequency of Duffy negative could be as high as 20%. It also follows from these findings that approximately 4% of this population (those having hemoglobin S or C) would not contract falciparum malaria, and up to 20% would not succumb to vivax malaria, the predominant type in the piedmont zone in the Southeast (Livingstone 1967:98). In other populations having African admixture the frequency of hemoglobin S reached 20% (Livingstone 1967:98–99). Although it is impossible to assess the frequency of such traits among the individuals enumerated in the 1910 Census, the high vitality rates reported for children with Indian-black or Indian-black-white ancestry strongly suggest that at least some of the offspring of marriages involving African-Americans acquired genetic defenses against malaria.

This is certainly the case among the Black Caribs (Garifuna) residing along the coast of Honduras, Guatemala, and Belize. These admixed populations were "exposed to severe selection by both falciparum and vivax malaria" (Crawford 1998:188). Local Indians and Hispanics were also at risk of contracting malaria, as were the relatively few residents in Belize of English descent. However, Crawford further states that individuals "who carried hemoglobin S and C and the Duffy (negative) genotype would have had a higher probability of surviving malaria. The probability is higher that individuals carrying the abnormal hemoglobins and the Duffy null phenotypes would be more African. Thus, selection may indirectly be operating in favor of those individuals with the greatest amount of African ancestry" (p.188). Much the same undoubtedly occurred among the Croatan, Powhatan, and other tribes in the South that regularly intermarried with Africans. Individuals who had the greatest degree of African ancestry would have been less likely to contract malaria than full bloods or mixed bloods having only Caucasian ancestry.

Another important point is that there is some evidence women who are heterozygous for the sickle cell trait exhibit higher fecundity than women who are not even when malaria is no longer a threat. In a retrospective study of 9,310 African American women in Alabama during the 1990s, Hoff *et al.* (2001) observed that women who possessed one allele for sickle cell had significantly more children than those who lacked this allele. Similar findings are reported among black women living in England (Tuck *et al.* 1983). The mechanism responsible for this elevated rate of fecundity is not known. Other studies focusing on sickle cell and fertility, based on samples drawn from the Caribbean and Central America, failed to find a positive correlation between these variables (Madrigal 1989; Custodio and Huntsman 1984).

The findings of Hoff *et al.* are particularly interesting given the 1910 Census data on differential fertility. While it is possible the sickle allele not only protected some Indians with African ancestry from malaria, and perhaps also favored higher rates of fecundity, any advantage would have been essentially idiosyncratic since they did not vary significantly from mixed bloods with white heritage. This is also the case for hemoglobin C and Duffy negativity. While some individuals undoubtedly benefited from these genetic traits linked to African admixture, although only in locales where malaria was endemic, their frequency among all mixed bloods having black ancestry was apparently quite low, and their impact was not sufficiently great to give this group a collective advantage over mixed bloods having only Caucasian ancestry.

Cultural Variables

Age at marriage has long been recognized as a factor affecting the reproductive histories of women. Generally, the younger a woman is at marriage the greater the likelihood that her overall fertility will surpass that of women who marry later (e.g., Kabir *et al.* 2001). Unfortunately, the 1910 Census does not contain data on age at marriage. However, most Americans at this time, especially women, married quite young, and it is unlikely that full bloods varied significantly from mixed bloods regarding this variable.

Cultural behaviors and attitudes that affected parity, or the spacing of births, had a pronounced affect on a woman's reproductive history. The relatively low fecundity of full bloods can be attributed, in part, to a postpartum sexual taboo so a couple would ideally have a child every 4 or 5 years (e.g., DeMallie 1983:256; Axtell 1981:22–23). More frequent births were viewed in a decidedly negative light. Moreover, closely spaced births put the older child at risk due to the scarcity of resources, including mother's milk. Prolonged nursing was widely valued in traditional Native American cultures.[4] Prolonged lactation reduces the chance that a woman will ovulate. According to Ellison,

[4] Among African slaves in the United States, particularly those born here, the length of breast feeding was generally about 1 year (Klein and Engerman 1978:358), affecting their fertility rate, which was noticeably higher than that observed among slaves in the West Indies, who typically nursed their infants for 2 years or longer, a pattern more consistent with the norm in West African cultures. Whites in the U.S. also nursed for a shorter period.

"considerable evidence links the duration of postpartum amenorrhea to the duration and intensity of lactation" (1994:267). Ellison argues that amenorrhea is "the most important single component of variation in the length of interbirth intervals in natural fertility populations" (1994:267). Even if intimate relations resume, lactational amenorrhea would reduce the likelihood of pregnancy. Native American women also used herbal concoctions to prevent fertilization or terminate a pregnancy (Moerman 1998; Vogel 1970:238–244). The fertility rates of full blood couples lagged far behind those recorded for mixed bloods. With increasing intermarriage with whites and African-Americans, the post-partum taboo and preference for extended nursing faded rapidly, and the fecundity of married females of mixed ancestry rose significantly.

Marriage structure also affects fecundity. A wealth of comparative data demonstrates that female fertility is typically lower in polygynous marriages than in monogamous unions (Bean and Mineau 1986). The chance of pregnancy decreases for each woman according to the number of co-wives. In monogamous unions the chance of pregnancy remains relatively constant throughout the duration of a wife's reproductive years or the duration of the marriage. When indigenous peoples have been forced to abandon polygyny in favor of monogamy there is typically an increase in female fertility (Hern 1992). The 1910 Census contains data on 401 women in polygynous marriages (Dixon 1915:157–158), all between full blood husbands and co-wives. It should be noted that polygygny was most common in the northern Plains (Driver 1969:230), where many of the full bloods enumerated for this census lived. As predicted by Bean and Mineau (1986), the fecundity of women in polygynous unions was lower (4.7 children) than the rates recorded for all classes of mixed bloods (4.8 to 5.5 children) in monogamous unions (see Dixon 1915:158). As monogamy replaced polygyny as the only acceptable form of marriage, the fertility of Indian women increased.

Offspring survivorship also varied because of certain cultural practices that affected the health and nutritional status of infants and young children. Weaning represents a significant transition for all children, crucially changing the nutritional quality of the foods given to the child. A diet of low nutritional quality or insufficient daily caloric intake will compromise the child's health, rate of growth, and its immune system, which may increase the severity of infectious diseases. Researchers have long known that most full blood American Indians cannot successfully metabolize cow's milk (e.g., Swagerty *et al.* 2002). Adult American Indians do not produce sufficient amounts of lactase, an enzyme needed to break down lactose, which is the principal sugar in cow's milk (McCracken 1971). Severe digestive discomfort after consuming milk is common among individuals deficient in lactase. This deficiency, however, is extremely rare among individuals of northern European ancestry (2–15% are affected) (also see Durham 1991:234–235).

The custom of keeping cattle diffused (during the Neolithic) from the Middle East into Africa, where several cultures adopted a pastoral economy, with milk as a mainstay in their diet. [5] The prevalence of lactase deficiency in American blacks, however, varies from 60% to 80% (Swagerty *et al.* 2002:1847). Though this is significantly higher than that reported for American whites (6–22%), it still falls well below the rates seen for adult American Indians, which range from 80%–100%. While lactose tolerance has an underlying genetic component, age is also a contributing factor. Bose and Welsh, in their analysis of milk intolerance among a sample (n=36) of Indians in Oklahoma, report that all five children under 2 years of age in their study could tolerate lactose (1973:1322). However, by age 10, if not earlier, symptoms associated with non-absorption were typically present. They also observed an interesting correlation between quantum and lactose intolerance: "Two-thirds of the non-absorbers were full-blooded and the remainder were at least 75% American Indian." Moreover, "Two of the seven adults with normal lactose absorption were one-half American Indian, one was full-blooded, and the remainder were 75% or more" (Bose and Welsh 1973:1321).

These data suggest that mixed bloods, especially those with increasing degrees of European admixture, could have employed cow's milk in the diet of their weaned children. It is also known that many African-Americans also owned dairy cows and regularly consumed milk (Dirks and Duran 2001). Some individuals of Indian-black and Indian- black-white heritage undoubtedly consumed milk, but this was not an option for most American Indian full bloods. It must be noted that the ability to tolerate lactose was of little significance if the children of full bloods were well nourished after being weaned. However, the ability among many mixed bloods to ingest cow's milk most likely served as a significant buffer against malnutrition for their weaned children. And this may partially explain why the childhood mortality rate for full bloods was higher than that for mixed bloods (Table 3).

Another dietary factor that varied along ethnic lines occurred in the South where peanuts (*Arachis hypogaea*) were widely grown as a cash crop. The nuts provided valued cooking and industrial oil, and were also ground

[5] Tishkoff and colleagues recently demonstrated (2007) that selection favored a lactose-tolerant gene among the Maasai of Kenya. The mutation responsible for the production of lactase beyond early childhood proved so advantageous that it is nearly universal in this population. Much the same occurred in the Congo among the Tussi (Durham 1991:234).

into a meal or eaten whole after being boiled or roasted. However, many whites considered peanuts, commonly called "goobers," an African- American food (Smith 2002). It was also a source of fodder for pigs. Because of the low status of peanuts in the mind of white tenant farmers, they unknowingly eliminated a rich source of niacin (nicotinic acid) from their diet, which otherwise depended heavily on corn (*zea mays*), notoriously deficient in niacin.[6] Furthermore, "a diet low in good protein and containing large amounts of corn actually increases the requirements for nicotinic acid" (Sydenstricker 1958:414). The disdain many whites had for peanuts, coupled with their heavy reliance on grits and corn bread, resulted in pellagra, a niacin-deficiency disease, ravaging the South during the 1800s and well into the 1900s. This nutritional disorder, which was poorly understood at the time, causes severe neurological symptoms and eventually dementia, and if not treated can prove fatal. While affecting both whites and blacks, the prevalence of this disease varied along lines of class and ethnicity. The well-off were free of pellagra due to their diet of meat, dairy products, eggs, and other foods of high protein content. Pellagra was a disease of the poor. It was also a disease that affected whites over blacks at a ratio of six to one (Etheridge 1972:48), since African-Americans gained a measure of protection through their consumption of peanuts and collard and turnip greens (Etheridge 1972:192). Many persons with Indian-black heritage who lived in the South most likely consumed peanuts as well. They also gained an additional measure of protection from pellagra through the Native American custom of making hominy with lye derived from firewood-ash. This method of producing hominy "dramatically increases the amount of the amino acid lysine and the amount of niacin ..... this technique probably reduced the incidence of pellagra" (Hudson 1976:304).

Tribes appearing in the 1910 Census differed considerably regarding the percentage of adults who could speak English. Those with the highest ratio of full bloods, for example the Navajo and Zuni, had the lowest frequency of adult English speakers (less than 10%). However, among the Cherokee, Chickasaw, and other highly admixed tribes, more than 80% of adults and 93–97% of children were proficient in English (Dixon 1915:235). The primary catalysts underlying rapid linguistic acculturation were forced schooling of Indian youth and interethnic marriage, specifically those unions where the husband spoke only English. While this correlation between extent of tribal admixture and number of English speakers is not surprising, it nonetheless highlights yet another point of cultural variation between mixed bloods and their full blood contemporaries.

English language proficiency can frequently offer meaningful economic dividends in the U.S. With few exceptions, average annual earnings are significantly higher for foreign workers who know English than those who do not (Rivera-Batiz 1992). The same was likely true for American Indians in the early twentieth century, especially for those living off of reservations. While the 1910 Census contains data on the number of males and females in a given tribe who held "gainful occupations," it does not, unfortunately, provide information on the relative annual earnings linked to these activities (Dixon 1915:252). However, proficiency in English must have been an advantage, if not a requirement, for those working (n=11,960, 16.2%) in the manufacturing and mechanical industries (1915:255). Moreover, their pay most likely surpassed that realized by those (69%) engaged in agriculture, animal husbandry, and forestry.

The taxation status of those enumerated in the 1910 Census also sheds light on variation in the economic condition of Indian families. A subject was considered "taxed" if he/she was living in the white community away from his/her tribe, or had been allotted land from the government and thus acquired U.S. citizenship. The Census reveals (1915:283–285) that all adult Indians in 33 states in the East, South, or Midwest were subject to general taxation in 1910. States with the lowest ratio of taxed Indians are Montana (9.6%), Wyoming (12.0%), and Arizona (17.4%). It should be noted that the costs of living were greater for "taxed" Indians living "... scattered among the general population" (Dixon 1915:283) than on a reservation, so that income of some type was essential. While most mixed bloods held a social advantage by being able to speak English, to what degree this had a favorable outcome on their health is difficult to determine. However, it is clear from census data on childhood survival rates that mixed bloods fared better than full bloods (Dixon 1915:158). And economics undoubtedly contributed to this disparity.

Environmental Variables

The quality of life of those enumerated in the 1910 Census varied significantly. Inter-racial relations had a profound impact on access to resources, diet, residence, hygiene, and health, which produced significant skewing in rates of fecundity and offspring survivorship. This was particularly true for American Indian full bloods. Campbell (1991), for example, provides clear evidence of the causal ties between environment and fertility in his demographic analysis of the Northern Cheyenne on the Tongue River Reservation in Montana during the late 1800s. The inhabitants of this

[6] Corn contains only .5 mg per 100 gm edible portion, whereas peanuts contain 14.2 mg per 100 gm (Watt and Merrill 1963; Wu Leung and Flores 1961; see also Heinz 1959:89).

reservation were forced, like so many others on reservations elsewhere, to endure pronounced hardships. Malnutrition and infectious disease were common features of daily life. "For women," Campbell concludes, "the most significant impact of ill-health and malnutrition is the suppression of fertility through a decline in milk quality, a lengthening of postpartum amenorrhea, and an increase in spontaneous abortion and interuterine mortality" (1991:345; see also Ellison 1994:265–267).

Campbell also reports (1991:347) that by 1898 tuberculosis was the leading cause of death for the Northern Cheyenne. Other tribal populations confined to reservations were also plagued by this disease. For example, among the Couer d'Alene of Idaho the death rate from tuberculosis in 1912 was seven times greater than the national average (Heiner 2008:1). Moreover, in populations where pulmonary tuberculosis is highly prevalent, genital tuberculosis is typically quite common. Epidemiological data suggest that women are most susceptible to this infectious disease during their childbearing years (Heiner 2008:5). Genital tuberculosiscan adversely affect fecundity by causing "conceptive failure, coital inability, and pregnancy loss" (Campbell 1991:347). If not controlled through use of antibiotics, it can also lead to infertility resulting from blockage of the fallopian tubes.[7] The relatively high rates of sterility and low fecundity values reported for full bloods in the 1910 Census were due to some degree to infectious disease, specifically tuberculosis.

The health of mixed bloods, especially those married to whites, was considerably better than that of full bloods, and their children also enjoyed better health than children of full blood couples. The principal reason for this was differential access to resources. The Cheyenne, like other tribes on reservations in the West, were forced to rely entirely on government rations for their daily subsistence (Campbell 1991:344). There was no infrastructure on these Federal trust lands to support wage labor and many areas were not well suited for dry-land farming. At times delivery of rations was delayed or quantities were reduced to punish certain families, or the entire tribe, for not complying with government policies. The political economy on reservations certainly took a heavy toll on the health of those residing there. Many mixed bloods, however, lived elsewhere and improved health was certainly an outcome of living beyond the confines of a reservation.

In American society in 1910 peoples of color suffered greatly from discrimination. The disparity in quality of life for whites and blacks is most clearly seen in comparisons in longevity and death rates. In a longitudinal study of U.S. Census reports from 1900 through 1999, Guyer *et al.* (2000) observed that black Americans lagged behind white Americans according to several health-related trends. For example, in 1915 the rate of infant deaths under 1 year of age per 1,000 live births was nearly double for blacks (2000:1312), and while the infant mortality rate declined significantly over the decades for all races, the disparity between whites and blacks persisted. As late as 1998, the infant mortality rate "was 6.0 for white infants and 14.3 for black infants, a figure more than twice the rate for white infants" (2000:1312). One cause of this racial disparity in infant death rates is low birth weight. From 1950 through 1999, African-Americans exhibited the highest percentage of infants of low birth weight (less than 2500 grams), easily surpassing the average for all other census groups (Guyer *et al.* 2000:1313). The underlying reasons remain unknown but environmental factors associated with ethnicity and daily life, especially those that impact pregnant women, are most likely involved. Although low birth weight is highest among black Americans, black infants are more likely to survive this period of stress than white infants for reasons that are also unknown (Gage and Therriault 1998). Interestingly, American Indian birth weights exceed those for blacks and whites (Adams and Niswander 1973). From 1980 through 1999, the American Indian infant mortality rate, as well as the percentage of infants of low birth weight, were well below those recorded for black Americans (Guyer *et al.* 2000:1312–1313; the U.S. Census Bureau did not regularly collect data specifically on American Indians before 1980). These findings show that during the nineteenth century the health of white Americans was considerably better than that of black Americans, and the same holds true today (Barr 2008). It is thus particularly striking that the 1910 Census data on Indians with African admixture indicate rates of fecundity and offspring survivorship that far surpassed that recorded for full blood American Indians. The reproductive profiles of Indians with African ancestry nearly matched, and sometimes exceeded, those recorded for Indian-white mixed bloods, as well as mixed bloods married to whites, despite rigid segregation and the Jim Crow laws of the late nineteenth century, which applied to all persons with any observable degree of African ancestry. American Indians with African ancestry nonetheless attained a robust reproductive profile despite racial barriers.

Ethnicity, Marriage, and Identity

Interethnic marriage between American Indians and non-Indians was frequently sequential, in that mixed bloods typically married other mixed bloods or non-Indians, usually whites (Perdue 1998, 2003; Sturm 2002;

[7] Researchers in India found that nearly 30% of the infertility cases they examined resulted from tubal closure arising from genital tuberculosis (Parikh *et al.* 1997:498).

Mihesuah 1991; Thornton 1990). With each new generation the quantum level for children produced in these marriages declined. As a result, some members of federally recognized tribes possess only a small fraction of Native American ancestry. Among the Oklahoma Cherokee, for example, where direct lineal descent from someone on tribal rosters taken between 1899 and 1906 is the only criterion for membership, one enrolled member has a quantum level of 1/2,048 (Sturm 2002:88; see also Sturm 2011).

Most tribes, however, set their own quantum minimum for membership, which can create problems. As one critic remarked, "the problem is marriage" (Heriard 2000:54). In other words, Indians are marrying themselves out of "existence," at least according to the federal government (Strong and Van Winkle 1996). Similar sentiment is expressed by other critics. "To tighten or even adhere to quantum requirements in the face of such realities (intermarriage to non-Indians) is to engage in a sort of autogenocide by definitional and statistical extermination" (Churchill 2001:46).

A majority of American Indians today dislike the use of quantum to measure their ethnic affiliation or identity. For example, the Cherokee artist Jimmie Durham quipped "I think I must be a mixed blood. I claim to be male, although only one of my parents was male," (Strong and Van Winkle 1996:551). Nevertheless, most recognize that "Indian identity is fixed, quantified, and delimitated through an elaborate calculus operating on blood…" (Strong and Van Winkle 1996:551). This can affect much that individuals value, including tribal membership, access to health care, eligibility for loans, possession of certain religious materials, and the sharing of profits from tribally-owned casinos. Intermarriage can also give rise to situations where one parent may be on the tribal roster but his or her child may not qualify for membership due to low quantum.

Black Americans with Indian ancestry express a different perspective on mixed heritage. As Lovett (1998:209) remarks, "Claiming kinship with Native Americans provided African Americans in the late nineteenth and early twentieth century with a way of rebelling against a system of segregation, discrimination, and 'civilization' imposed on them by White society. …African-Americans propagated the image of the rebellious Native American in their families as an expression of their own resistance to both slavery and legalized segregation." Believing that American Indians have always lived outside the boundaries of white civilization, many African-Americans invoke their Indian heritage as a mechanism of protest against a long history of forced subordination. Blacks who impersonate American Indians through costume and dance during Mardi Gras, for example, invariably emphasize a rebellious, war-like persona, also a gesture of defiance against a system of racial categorization where known and documented degrees of Indian-black admixture are ignored by white Americans today as in the past.

While American Indians and American blacks differ in their perspectives on interethnic heritage, neither group remains free of racial prejudice directed towards the other (see Sturm 2002:163–165). For example, on March 3, 2007, 77% of the members of the Cherokee Nation of Oklahoma voted to exclude all persons known collectively as Cherokee freedmen from membership in the tribe.[8] While phenotypically black, many freedmen rightfully claim some degree of Native American ancestry (Sturm 1998:230). One Cherokee freedman that Sturm interviewed expressed his displeasure with racial discrimination within the tribe. "'I think you should write about the racism that permeates these Indian programs…many of the so-called Indians running the Oklahoma tribes are exclusive if the hyphenated Indian is Black, and inclusive if the hyphenated Indian is White. … it is ridiculous to allow White people to take advantage of Indian programs because they have blood on a tribal roll a 100 years ago, when a Black person suffers infinitely more discrimination and needs the aid more is denied it because his Indian ancestry is overshadowed by his African ancestry'" (Sturm 1998:230). Racial tensions prompted one tribal member to claim "There is no such thing as a Black American Indian or a White American Indian! You're American Indian or you're not! If you're Black or White and have some Indian heritage, that is all you can and should claim. It's an insult to the American Indian community for people of another race to claim their Indian heritage while doing so through their dominant race color" (Graham 2007:2–3).

Because intermarriage is so common among American Indians, ambiguities regarding personal identity frequently surface (Eschbach 1995:95). When admixture with African-Americans is involved, many individuals view themselves as Native Americans, while at the same time recognizing their ties to Africa. A case in point is the "Black Utes" of San Ignacio, Colorado, many of whom speak the Ute language (Brooks 1998:126). This is particularly interesting because many Ute children lacking African heritage do not speak their ancestral language. Some black Utes also use their African-American background to distance themselves from other tribal members who have chronic problems with alcohol, unemployment, school, and the law. In another example, a 23-year-old Navajo woman with black ancestry "received the crown of Miss Navajo Nation and was

[8] A similar decision had been reached several years earlier among the Seminole of Oklahoma (Mulroy 2007). On August 22, 2011 the Cherokee Supreme Court upheld the 2007 referendum vote, thus denying tribal citizenship to some 2,800 freedmen. The tribe, however, reversed this decision on September 20, thereby granting the freedmen the right to vote in an upcoming election for Principal Chief.

designated the tribe's goodwill ambassador" for 1983 (Brooks 1998:132). Some tribal members, however, denounced this award, and one critic wrote in the Albuquerque Journal that the recipient "should focus on her African American heritage and stay out of Navajo affairs" (ibid.). The award had made no reference to her mixed background.

Among many tribes in the Southeast, an individual's identity was determined by their mother. If she was Creek, then all of her children were full members of both her clan and tribe. When whites or blacks married a Creek woman, as many did, the children of these unions were also Creek. As Frank notes (2005:10), "these Creek children grew up and otherwise lived indistinguishably from the rest of their tribe. In these instances neither paternity nor race mattered." Perdue (2000) presents a similar case among the nineteenth century Cherokee, who adopted an African woman by the name of Molly, a former slave accepted as a replacement for a slain member of the Deer clan. Molly later married a local white man, yet her two children, without a drop of Cherokee blood, were still viewed as full members of the tribe.

However, as Miller notes (2004:14) "if a group's visible racial and cultural traits appear white, black, or otherwise 'non-Indian,' it faces a long road to [Federal] acknowledgment…" (see also Lowery 2009; Paredes 1992; Berkhofer 1988). The largest tribes lacking Federal recognition are the Lumbee of North Carolina (Lowery 2010; Blu 1980, 2004) and the Houma of Louisiana (Campisi 2004). Indian identity today is frequently challenged and at times trumped by racial admixture. This is certainly ironic in that race had little importance in matrilineal Indian cultures in the past.

Many argue, correctly, that race is a social construct devised and maintained for the purpose of exclusion. But to claim, as Buchholtz (2003:301) does, that "race, color, and blood" are "biological fictions" draws attention away from the important fact that genetic and physiological differences are not. Numerous biological traits frequently seen in some populations but only rarely or not at all in others, should not be relegated to the realm of fiction. Rather, they have a very real impact on the lives of individuals. They can affect fecundity and survivorship rates, as well as marital infertility and spontaneous abortions. There is nothing fictitious about heterosis and conceptual loss or hemoglobins and malaria. Biological factors are every bit as real as the discrimination minorities have endured over the centuries. To suggest otherwise is, at the very least, misleading.

For many American Indians, interethnic marriage represents a powerful force that is progressively eroding their tribal identity. Sturm notes (2002:146) that "It is race mixing, born of Cherokee exogamy, that many traditional Cherokee believe is the greatest threat to their cultural, racial, and to a lesser extent, national survival," a sentiment echoed by members of many other tribal nations despite the prominence of interethnic marriage in the demographic history of Native Americans. While these marriages fueled the loss of indigenous cultural traits (e.g., Logan *et al.* 2003), and resulted in a sharp decline in the number of native language speakers (McCarty 2003), interethnic marriage and admixture carried certain rewards related to fertility and health in a rapidly changing environment. As the 1910 Census clearly demonstrates, Indians with African-American ancestry, when compared to their full blood American Indian contemporaries, exhibited higher rates of fecundity and offspring survivorship despite racial prejudice. Black Indians were also less susceptible to certain diseases or to dying from others, and their rate of marital infertility was lower than that recorded for full bloods; this was especially true for Indians who had admixture with both blacks and whites. The reproductive advantages enjoyed by Indians with African ancestry resulted from a variety of factors, ranging from genetics to diet and disease. Moreover, with admixture certain cultural practices held by full bloods that worked against high fertility, were abandoned by the growing number of mixed bloods.

Conclusions

Two overriding conclusions can be drawn from the present analysis. First, a host of interrelated factors affected the fertility and health of persons enumerated in the 1910 Census. To fully understand why differential reproductive rates were observed among those surveyed, I have focussed on a wealth of variables that pertain to genetics, cultural practices, and the environment; in short, a biocultural perspective that incorporates data from a variety of disciplines. From this perspective, certain variables not typically associated with fertility can be shown to affect human reproduction, for example, tuberculosis. Similarly, behaviors that might initially appear to be costly to an individual's well being, for example selecting a spouse from another racial or ethnic group, especially when members of that group have been marginalized both economically and politically, may prove in the long run to be advantageous in terms of fecundity and offspring survivorship. The case of Indian-black marriages is certainly instructive in this context, despite the fact that those who entered into these interethnic unions were unaware of the underlying factors that bolstered their reproductive success.

Second, and perhaps most importantly, it should be remembered that the 1910 Census data were gathered only some 20 years after the slaughter of the Minniconju Sioux at Wounded Knee. That mixed blood Indians with African

ancestry did so well reproductively speaks to their resolve to make the best of life for themselves and their children in a social and political milieu marked by pronounced racism against all peoples of color. It should also be noted that American Indians did not universally gain American citizenship until 1924, even though large numbers of American Indians served, as volunteers, in the U.S. armed forces during WW1. Long before and well after the collection of materials for the 1910 Census all blacks, regardless of admixture and ethnic heritage, endured the constraints of segregation, prejudice, and, for most, economic hardship. In the South they were also the targets of violent criminal attacks by white racists. The sociopolitical climate in America prior to the publication of the 1910 Census was equally laden with obstacles for Native Americans. Yet as these data so clearly demonstrate, those who faced the most challenges from racism also fared well reproductively despite the many hurdles they encountered.

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References

Adams, M. S., and Niswander, J. D. (1973). Birth Weight of North American Indians: Correction and Amplification. Human Biology 45: 351–357.

Agarwal, A., Guindo, A., Cissokou, U., Taylor, J. G., Coulibaly, D., Koné, A., Kayentao, K., Djimde, A., Plowe, C. V., Doumbo, O., Wellems, T. E., and Diallo, D. (2000). Hemoglobin C. Associated with Protection from Severe Malaria in the Dogon of Mali, A West African Population With a Low Prevalence of Hemoglobin S. Blood 96:2358–2362.

Andrews, J. M. (1948). What's Happening to Malaria in the U.S.A.? American Journal of Public Health 38: 931–942.

Axtell, J. (1981). The Indian Peoples of Eastern America: A Documentary History of the Sexes. Oxford University Press, New York.

Barr, D. A. (2008). Health Disparities in the United States: Social Class, Race, Ethnicity, and Health. The Johns Hopkins University Press, Baltimore.

Bean, L. L., and Mineau, G. P. (1986). The Polygyny – Fertility Hypothesis: A Re-evaluation. Population Studies 40(1): 67–81.

Beer, A. E., Quebbeman, J. F., Semprini, A. E., Smouse, P. E., and Haines, R. F. (1983). Recurrent abortion: Analysis of the roles of parental sharing of histocompatability antigens and maternal immunological responses to parental antigens. In Isojima, S., and Billington, W. D. (eds.), Reproductive Immunology. Elsevier Science Publishers, New York, pp. 185–195.

Beeson, G. K. (1999). Plasmodium faciparum Isolates from Infected Pregnant Women and Children Are Associated with Distinct Adhensive and Antigenic Properties. Journal of Infectious Disease 180: 464–472.

Berkhofer Jr., R. F. (1988). White conceptions of Indians. In Washburn, W. E. (ed.), Handbook of North American Indians. History of Indian-White Relations. Smithsonian Institution, vol. 4. U.S. Government Printing Office, Washington, pp. 522–547.

Bianchine, P. J., and Russo, T. A. (1992). The Role of Epidemic Infectious Diseases in the Discovery of America. Allergy Proceedings 13(5): 225–232.

Bittles, A. H., Grant, J. C., Sullivan, S. G., and Hussain, R. (2002). Does Inbreeding Lead to Decreased Human Fertility? Annals of Human Biology 29(2): 111–130.

Black, F. L. (1992). Why Did They Die? Science 258: 1739–1740.

Blu, K. I. (1980). The Lumbee Problem: The Making of an Indian People. Cambridge University Press, New York.

Blu, K. I. (2004). Lumbee. In Fogelson, R. D. (ed.), Handbook of North American Indians Southeast. Smithsonian Institution, vol. 14. U.S. Government Printing Office, Washington, pp. 319–327.

Boas, F. (1894). The Half-Blood Indian: An Anthropometric Study. Popular Science Monthly 45: 761–770.

Bose, D. P., and Welsh, J. D. (1973). Lactose Malabsorption in Oklahoma Indians. The American Journal of Clinical Nutrition 26: 1320–1322.

Brooks, J. F. (1998). Confounding the Color Line: Indian-Black Relations in Historical and Anthropological Perspective. American Indian Quarterly 22(1/2): 125–133.

Buchholtz, D. (2003). Review: Blood Politics: Race, Culture, and Identity in the Cherokee Nation of Oklahoma (Circe Sturm). Plains Anthropologist 48(187): 301–302.

Campbell, G. R. (1991). Changing Patterns of Health and Effective Fertility among the Northern Cheyenne of Montana, 1886–1903. The American Indian Quarterly 15(3): 339–358.

Campisi, J. (2004). Houma. In Fogelson, R. D. (ed.), Handbook of North American Indians Southeast. Smithsonian Institution, vol. 14. U.S. Government Printing Office, Washington, pp. 632–641.

Churchill, W. (2001). Crucible of American Indian identity: Native tradition versus colonial imposition in postconquest North America. In Lobo, S., and Talbot, S. (eds.), Native American Voices: A Reader. Prentice-Hall, Upper Saddle River, pp. 31–47.

Crawford, M. H. (1998). The Origins of Native Americans: Evidence from Anthropological Genetics. Cambridge University Press, New York.

Custodio, R., and Huntsman, R. G. (1984). Abnormal hemoglobins among the black caribs. In Crawford, M. H. (ed.), Current Developments in Anthropological Genetics. Black Caribs: A Case Study in Biocultural Adaptation. Plenum, New York, pp. 335–343.

DeMallie, R. J. (1983). Male and female in traditional lakota culture. In Albers, P., and Medicine, B. (eds.), The Hidden Half: Studies of Plains Indian Women. University Press of America, Lanham, pp. 237–265.

Dirks, R. T., and Duran, N. (2001). African American Dietary Patterns at the Beginning of the 20th Century. The Journal of Nutrition 131: 1881–1889.

Dixon, R. B. (1915). Indian Population in the United States and Alaska, 1910. Bureau of the Census. U. S. Government Printing Office, Washington.

Dobyns, H. F. (1983). Their Number Become Thinned. University of Tennessee Press, Knoxville.

Dramer, K. (1997). Native Americans and Black Americans. Chelsea House Publishers, Philadelphia.

Driver, H. E. (1969). Indians of North America, 2nd ed. University of Chicago Press, Chicago.

Durham, W. H. (1991). Coevolution: Genes, Culture and Human Diversity. Stanford University Press, Stanford.
Ellinghaus, K. (2006). Taking Assimilation to Heart: Marriages of White Women to Indigenous Men in the United States and Australia, 1887–1937. University of Nebraska Press, Lincoln.
Ellison, P. T. (1994). Advances in Human Reproductive Ecology. Annual Review of Anthropology 23: 255–275.
Eschbach, K. (1995). The Enduring and Vanishing American Indian: American Indian Population Growth and Intermarriage in 1990. Ethnic and Racial Studies 18(1): 89–108.
Etheridge, E. W. (1972). "The Butterfly Caste": A Social History of Pellagra in the South. Greenwood, Westport.
Firschein, I. L. (1984). Demographic patterns of the garifuna (black caribs) of Belize. In Crawford, M. H. (ed.), Current Developments in Anthropological Genetics. Black Caribs: A Case Study in Biocultural Adaptation, vol. 3. Plenum, New York, pp. 67–94.
Forbes, J. D. (1988). Black Africans and Native Americans: Color, Race, and Class in the Evolution of Red-Black Peoples. Basil Blackwell Inc, New York.
Forbes, J. D. (1993). Africans and Native Americans: The Language of Race and the Evolution or Red-Black Peoples. University of Illinois Press, Urbana.
Frank, A. K. (2005). Creeks and Southerners: Biculturalism on the Early American Frontier. University of Nebraska Press, Lincoln.
Friedman, M. J., and Trager, W. (1981). The Biochemistry of Resistance to Malaria. Scientific American 244: 154–164.
Gage, T. B., and Therriault, G. (1998). Variability of Birth-Weight Distributions by Sex and Ethnicity: Analysis Using Mixture Models. Human Biology 25(1): 91–100.
Gans, H. J. (1996). Symbolic ethnicity: The future of ethnic groups and cultures in America. In Stollers, W. (ed.), Theories of Ethnicity: A Classical Reader. New York University Press, New York, pp. 460–487.
Graham, M. (2007). Cherokee Nation Vote: No Such Thing as a Black Indian or White Indian. http://americanchronicle.com (article ID = 2354). Accessed 4-16-2007.
Guyer, B., Freedman, M. A., Strobino, D. M., and Sondik, E. J. (2000). Annual Summary of Vital Statistics: Trends in the Health of Americans during the 20th Century. Pediatrics 106: 1307–1317.
Heiner, C. (2008). "Scantily Dressed and Wearing Moccasins in Wet Weather" – Tuberculosis and Death in the Coeur d'Alene Tribe 1911 to 1937. Journal of Northwest Anthropology 42(1): 1–15.
Company, H. (1959). The HEINZ Handbook of Nutrition. McGraw-Hill, New York.
Heriard, J. B. (2000). Debating What It Takes to be Considered an American Indian. Whispering Wind Magazine 31(1): 54.
Hern, W. M. (1992). Family Planning, Amazon Style. Natural History Magazine 12: 31–36.
Hoff, C., Croft, I. T., Wilson, F., and Williams-Murphy, M. (2001). Protection Afforded by Sickle-Cell Trait (HbAS): What Happens When Malarial Selection Pressures Are Alleviated? Human Biology 73(4): 583–586.
Hrdlicka, A. (1931). Fecundity in the Sioux Women. American Journal of Physical Anthropology 16(1): 81–90.
Hudson, C. (1976). The Southeastern Indians. University of Tennessee Press, Knoxville.
Hyde, G. E. (1956). A Sioux Chronicle. University of Oklahoma Press, Norman.
Jacobs, M. D. (2002). The Eastmans and the Luhans: Interracial Marriage between White Women and Indian Men. Frontiers 23 (3): 29–54.
Kabir, A., Jahan, G., and Jahan, R. (2001). Female Age at Marriage as a Determinant of Fertility. Journal of Medical Science 1: 372–376.
Katz, W. L. (1986). Black Indians: A Hidden Heritage. Simon Pulse, New York.
Katz, W. L., and Franklin, P. A. (1993). Proudly Red and Black: Stories of African and Native Americans. Atheneum, New York.
Klein, H. S., and Engerman, S. L. (1978). Fertility Differentials between Slaves in the United States and the British West Indies: A Note on Lactational Practices and Their Possible Implications. The William and Mary Quarterly 35(2): 357–374.
Larsen, C. S., and Milner, G. R. (eds.) (1994). In the Wake of Contact: Biological Responses to Conquest. Wiley-Liss, New York.
Littlefield Jr., D. F. (1977). Africans and Seminoles: From Removal to Emancipation. Greenwood, Westport.
Littlefield Jr., D. F. (1979). Africans and Creeks: From the Colonial Period to the Civil War. Greenwood, Westport.
Livingstone, F. B. (1957). Sickling and Malaria. British Medical Journal 1: 762–763.
Livingstone, F. B. (1967). Abnormal Hemoglobins in Human Populations. Aldine, Chicago.
Logan, M. H., and Ousley, S. D. (2001). Hypergamy, quantum, and reproductive success: The lost Indian ancestor reconsidered. In Bonney, R. A., and Paredes, J. A. (eds.), Anthropologists and Indians in the New South. University of Alabama Press, Tuscaloosa, pp. 184–202.
Logan, M. H., Sparks, C. S., and Jantz, R. L. (2003). Cranial Modification among 19th Century Osages: Admixture and Loss of an Ethnic Marker. Plains Anthropologist 48(187): 209–224.
Lovett, L. L. (1998). "African and Cherokee by Choice": Race and Resistance under Legalized Segregation. American Indian Quarterly 22(1/2): 203–229.
Lowery, M. M. (2009). Telling Our Own Stories: Lumbee History and the Federal Acknowledgment Process. American Indian Quarterly 33(4): 499–522.
Lowery, M. M. (2010). Lumbee Indians in the Jim Crow South: Race, Identity, and the Making of a Nation. University of North Carolina Press, Chapel Hill.
Madrigal, L. (1989). Hemoglobin Genotype, Fertility, and the Malaria Hypothesis. Human Biology 61: 311–325.
Mandell, D. R. (1998). Shifting Boundaries of Race and Ethnicity: Indian-Black Intermarriage in Southern New England. The Journal of American History 85(2): 466–501.
McCarty, T. L. (2003). Revitalizing Indigenous Languages in Homogenising Times. Comparative Education 39(2): 147–163.
McCracken, R. D. (1971). Lactose Deficiency: An Example of Dietary Evolution. Current Anthropology 12: 479–517.
McDonald, D. S. (1998). Intimacy and Empire: Indian-African Interaction in Spanish Colonial New Mexico, 1500–1800. American Indian Quarterly 22(1/2): 134–156.
Mielke, J. H., Konigsberg, L. W., and Relethford, J. H. (eds.) (2006). Human Biological Variation. Oxford University Press, New York.
Mihesuah, D. A. (1991). To Dark to Be Angels: The Class System among Cherokees at the Female Seminary. American Indian Culture and Research Journal 15(1): 29–52.
Miles, T. (2005). Ties That Bind: The Story of an Afro-American Family in Slavery and Freedom. University of California Press, Berkeley.
Miller, M. E. (2004). Forgotten Tribes: Unrecognized Indians and the Federal Acknowledgement Process. University of Nebraska Press, Lincoln.
Moerman, D. E. (1998). Native American Ethnobotany. Timber Press Incorporated, Portland.
Moore, J. H., and Campbell, J. E. (1995). Blood Quantum and Ethnic Intermarriage in the Boas Data Set. Human Biology 67(3): 499–516.
Mulroy, K. (2004). Seminole maroons. In Fogelson, R. D. (ed.), Handbook of North American Indians Southeast. Smithsonian

Institution, vol. 14. U.S. Government Printing Office, Washington, pp. 465–477.
Mulroy, K. (2007). The Seminole Freedmen: A History. University of Oklahoma Press, Norman.
Nash, G. B. (1974). Red, Black, and White: The Peoples of Early America. Prentice-Hall, Englewood Cliffs.
Ober, C., Hyslop, T., and Hauck, W. W. (1999). Inbreeding Effects on Fertility in Humans: Evidence for Reproductive Compensation. American Journal of Human Genetics 64: 225–231.
O'Brien, J. M. (2006). "Vanishing" Indians in nineteenth-century New England: Local historians erasure of still-present Indian peoples. In Kahn, S. A., and Strong, P. T. (eds.), New Perspectives on Native North Americans: Cultures, Histories, and Representations. University of Nebraska Press, Lincoln, pp. 414–432.
Paredes, J. A. (1992). Federal recognition and the Porch Creek Indians. In Paredes, J. A. (ed.), Indians of the Southeastern United States in the Late 20th Century. University of Alabama Press, Tuscaloosa, pp. 120–139.
Parikh, F. R., Nadkarni, S. G., Kamat, S. A., Naik, N., Soonawala, S. B., and Parikh, R. M. (1997). Genital Tuberculosis – A Major Pelvic Factor Causing Infertility in Indian Women. Fertility and Sterility 67(3): 497–500.
Perdue, T. (1979). Slavery and the Evolution of Cherokee Society, 1540–1886. University of Tennessee Press, Knoxville.
Perdue, T. (1998). Cherokee Women: Gender and Culture Change, 1700–1835. University of Nebraska Press, Lincoln.
Perdue, T. (2000). Clan and Court: Another Look at the Early Cherokee Republic. American Indian Quarterly 24(4): 562–568.
Perdue, T. (2003). "Mixed Blood" Indians: Racial Construction in the Early South. University of Georgia Press, Athens.
Pogo, A. O., and Chaudhuri, A. (1997). The Duffy blood group system and its extension in nonhuman primates. In Blancher, A., Klein, J., and Socha, W. W. (eds.), Molecular Biology and Evolution of Blood Group and MHC Antigens In Primates. Springer-Verlag, Berlin, pp. 219–235.
Pollitzer, W. S. (1964). Analysis of a Triracial Isolate. Human Biology 36: 362–373.
Quiggins, P. A. (1990). Non-Insulin Dependent (Type II) Diabetes Mellitus in the Eastern Cherokee of Western North Carolina. Ph. D. Dissertation. The University of Tennessee.
Ramenofsky, A. F. (1987). Vectors of Death: The Archaeology of European Contact. University of New Mexico Press, Albuquerque.
Rivera-Batiz, F. L. (1992). English Language Proficiency and the Earnings of Young Immigrants in U.S. Labor Markets. Review of Policy Research 11: 165–175.
Sandefur, G. D., and McKinnell, T. (1986). American Indian Intermarriage. Social Science Research 15: 347–371.
Smith, A. F. (2002). Peanuts: The Illustrious History of the Goober Pea. University of Illinois Press, Urbana.
Strong, P., and Van Winkle, B. (1996). "Indian Blood": Reflections on the Reckoning and Refiguring of Native American Identity. Cultural Anthropology 11(4): 547–576.
Sturm, C. (1998). Blood Politics, Racial Classification and Cherokee National Identity: The Trials and Tribulations of the Cherokee Freedmen. American Indian Quarterly 27(1/2): 230–259.
Sturm, C. (2002). Blood Politics: Race, Culture, and Identity in the Cherokee Nation of Oklahoma. University of California Press, Berkeley.
Sturm, C. (2011). Becoming Indian: The Struggle over Cherokee Identity in the Twenty-first Century. School for Advanced Research, Santa Fe.
Swagerty Jr., D. L., Walling, A., and Klein, R. M. (2002). Lactose Intolerance. American Family Physician 65(9): 1845–1850.
Swan, D. C., and Campbell, G. R. (1989). Differential Reproduction Rates and Osage Population Change. Plains Anthropologist Memoir 23: 61–70.
Sydenstricker, V. P. (1958). The History of Pellagra: Its Nutrition, Its Recognition as a Disorder of Nutrition, and Its Conquest. American Journal of Nutrition: 6(4): 409–414.
Thornton, R. (1987). American Indian Holocaust and Survival: A Population History since 1492. University of Nebraska Press, Lincoln.
Thornton, R. (1990). The Cherokees: A Population History. University of Nebraska Press, Lincoln.
Thornton, R. (1997). Aboriginal North American Indian Population and Rates of Decline, ca. 1500–1900. Current Anthropology 38: 310–315.
Thornton, R., Sandefur, G. D., and Matthew Snipp, C. (1991). American Indian Fertility Patterns: 1910 and 1940 to 1980. American Indian Quarterly 15: 359–367.
Tishkoff, S. A., *et al.* (2007). Convergent Adaptation of Human Lactase Persistence in Africa and Europe. Nature Genetics 39: 31–40.
Tuck, S. M., Studd, J. W. W., and White, J. M. (1983). Pregnancy in Women with Sickle Cell Trait. British Journal of Obstetrics and Gynaecology 90: 108–111.
Ubelaker, D. H. (1988). North American Indian Population Size, 1500–1985. American Journal of Physical Anthropology 77: 289–294.
Vogel, V. J. (1970). American Indian Medicine. University of Oklahoma Press, Norman.
Watt, E. K., and Merrill, A. L. (1963). Composition of Foods, Raw, Processed, and Prepared. Agricultural Handbook, vol. 8. U. S. Department of Agriculture, Washington, pp. 1–190.
Williams, R. C., Long, J. C., Hanson, R, L., Sievers, M. L., and Knowler, W. C. (2000). Individual Estimates of European Genetic Admixture Associated with Lower-Body Mass Index, Plasma Glucose, and Prevalence of Type 2 Diabetes in Pima Indians. American Journal of Human Genetics 66(2): 527–538.
Wu Leung, W. T., and Flores, M. (1961). Food Composition Table for Use in Latin America. I.N.C.A.P. National Institutes of Health, Bethesda.