Health and Demography of Native Amazonians: Historical Perspective and Current Status

Warren M. Hern[*]

[*] *University of Colorado, Boulder, Colorado, 80309-0233*

Os nativos da Amazônia foram vítimas de dois grandes ataques históricos: um na época da Conquista e outro durante o século XX. Devido a doenças epidêmicas e à destruição ambiental, inúmeras tribos passaram a vivenciar problemas de deslocamentos, dizimação e extinção em uma única geração. A aculturação e a construção de grandes projetos desenvolvimentistas tiveram efeitos catastróficos sobre as populações indígenas. Em diversos aspectos, os nativos da Amazônia sofreram uma "Transição Epidemiológica". Paradoxalmente, um dos efeitos da dilaceração cultural para alguns dos nativos da Amazônia foi a perda de controles culturais sobre a fecundidade, fazendo com que a elevada fecundidade se tornasse um importante problema de saúde. Com o rápido crescimento de populações amazônicas não indígenas, o desmatamento e a urbanização, os nativos da Amazônia enfrentam sérios obstáculos para a sua sobrevivência a longo prazo.

INTRODUCTION

On a recent excursion to *Chapada dos Guimarães* to photograph Brazilian wildlife, I had the good fortune to encounter a young *Boróro* man who was now living near the town of that name. He offered to show me a special waterfall near his home. We descended through the brush to a beautiful scene. The falls cascaded some ten meters to a shallow pool. The young man slipped off his shorts and plunged under the waterfall. He whooped and called me to

join him, so I did. I imitated his joyful *Boróro* whoop and we both roared with laughter. The water in that pristine place was cool and wonderful. It was a precious moment.

My new friend is only one generation from a tribal life in the bush. He now lives a marginal existence as an artist and day laborer with his pleasant wife, a *"branca"*, who was pregnant and about to deliver their first child. The waterfall he loves and shared with me is in a pathetically small patch of undisturbed forest surrounded by the devastation on an advancing "civilization". The natural forest and wildlife is being replaced by cultivated crops. Pesticides and fertilizers now flow into the Brazilian *Pantanal*, the greatest wetland wildlife refuge in the Americas.

We sat my friend's house after a dinner of vegetables and sipped *mate* as we watched the moon rise. The evening air was filled with the smoke of great fires on the plains below. *"Estão matando o pulmão do mundo"*, he said. "First they kill us and then they kill the earth." The government would not let him return to his village, he said. He had lived away too long. His family was gone, but he wanted to be with his friends, to speak *Boróro*, to take part in rituals. His tribe, he said, is dying. They will soon be gone, he said.

This was a moving personal experience for me, but more than that, it seems to capture a little bit of the fate of the Amazonian Indians.

To speak of the health and biology of native Amazonians, one must first see that they are victims of two massive historical assaults, one at the time of Conquest and the other, an even more inexorable twentieth century. Many of them have been in highly isolated enclaves until the past few decades, but these have gone from contact to displacement and decimation in a generation. The ultimate enemies of the native Amazonians are the loss of their pristine environment and the loss of their unique cultures.

HISTORICAL PERSPECTIVE

The first people to enter the South American tropical lowlands probably arrived around 10,000 years ago, according to Martin (1973). Carneiro (1974) agrees with this estimate. Lathrap (1977) estimates that intensive cultivation of bitter manioc in alluvial flood plains began

6000 to 7000 years ago, but Roosevelt (1980, 1989) suggests a date of 4000—5000 BP. Lathrap (1970) especially thinks that riverine populations were relatively dense by the time of conquest. Both Lathrap and Roosevelt agree with other authors (Dobyns, 1966; Lipschutz, 1966; Denevan, 1976; Thornton, 1987; Myers, 1988) that indegenous populations collapsed following the Conquest.

Dobyns (1966) estimated a 20:1 loss of population among indigenous groups following the conquest due to the introduction of European disease, slave trading, and intertribal warfare, although Denevan (1976:212) states that a 35:1 ratio may be more accurate. It is not unlikely that depopulation ratios reached 50:1 on the basis of reports cited by Dobyns. Meggers (1971:151) states that a smallpox epidemic occurred in the lower Amazon in 1621 and reached the upper Amazon in 1651. Meggers also states that yellow fever and malaria were introduced to the South American continent following the importation of slaves from Africa. Steward and Metraux (1948) note that smallpox epidemics also occurred in 1670-80 following Western contact and decimated native populations in the upper Amazon Basin. Myers (1989) estimates a reduction of as much as 99.5% of the Omagua, Cocama, and indigenous populations of the lower Huallaga in the 150 years following European contact.

Wagley (1974a) and Chagnon and Melancon (1983) have described the catastrophic effects of depopulation on native tribes including the loss of many cultural traditions.

In studying two Brazilian tribes, the *Tenetehára* and *Tapirapé*, Wagley (1974b) noted that they had two quite different approaches to controlling fertility and natality. The *Tapirapé*, valuing small families with no more than three children and no more than two of the same sex, sanctioned infanticide to maintain this norm. The *Tapirapé* also practiced postpartum sexual abstinence. Among the *Tenetehára*, infanticide was permitted only occasionally. Both tribes were encouraged by missionaries to have as many children as possible. Their success in dealing with the loss of population as the result of Western contact was quite different. Wagley reported that the *Tenetehára* were growing in numbers and that the *Tapirapé* culture was disintegrating. Among other things, the *Tapirapé* social

organization is much more vulnerable to disruption by population loss.

In addition to severe population loss in the time after European contact, native Amazonians have been subjected to unprecedented destruction of their environment since World War II with the construction of numerous highways across the Andes and across the Brazilian Amazon (Saffirio and Hames, 1983; Moran, 1983). This has been accompanied by widespread colonization and deforestation (Stearman, 1983; Hecht, 1983; Moran, 1989; Lisanskky, 1990; CNP/CIPA, 1984). Various countries, including Brazil, Bolivia, Ecuador, and Peru, have sponsored colonization of the Amazon as the partial result of population growth in other parts of those countries (Stearman, 1983:52; Bedoya, 1981; Moran, 1981:75; Whitten, 1981:5; Fearnside, 1986:7). In 1987 alone, 47 million acres were burned in Brazil, of which 40% was primary rainforest (Simons, 1988; Brown, 1989:4). Other development projects such as hydroelectric dams have destroyed or threaten to obliterate colossal areas of native Amazonian environments (Treece, 1987; Smith, 1982). Aside from the abundantly documented fact these projects have had catastrophic effects for native populations (Ramos and Taylor, 1979), the long-term implications for biodiversity and for regional and global climate change are extremely ominous (Gómez et al, 1972; Shukla et al, 1990; Tans et al, 1990).

DEMOGRAPHIC STUDIES OF NATIVE AMAZONIANS

Denevan (1976:291) estimates that 8,500,000 indigenous people lived in Amazonia at the time of Conquest, although Myers (1988) estimates that there may have been as many as 10,000,000 in parts of the upper Peruvian Amazon. Denevan estimates that, following a reduction of the Indian population to approximately 250,000, it has increased now to around 500,000. Population nadirs probably occurred at around the end of the 19th century. Gunter Tessman, for example, estimated that the *Shipibo* numbered approximately 3,000 in 1920, whereas the *Shipibo*-Conibo population now numbers between 25,000

and 40,000 (Bergman, 1981; Hern, 1988). Many tribes have become extinct; others have flourished or have absorbed others. Thorough contemporary demographic studies of Amazon Indian societies are uncommon. Studies of the *Xavánte* (Neel et al, 1964), *Kaingang* (Salzano, 1961), *Yanomamo* (Chagnon, 1977), and *Shipibo* (Hern, 1971, 1977, 1988), appear to be among the main demographic reports available until recently, but they are often not comparable. Black et al (1978) studied eight unacculturated tribes in northeast Amazonia. Flowers (1990) gives a report of repeated observations of the post-contact demography of the *Xavánte*. An exceptionally thorough report of the *Mucajai Yanomámá* by Early and Peters (1990) provides one of the only longitudinal demographic studies of a single group. There are no integrating studies that give overall demographic information about all Amazonian tribes.

A principal difficulty in obtaining accurate demographic information, of course, is that Amazon tribes have not had written languages until recently, and in any case, systems of counting are often lacking. Categories of time are general and do not allow precise interpretations. The *Shipibo* word for "yesterday", for example (*vakish*), is the same as the word for "tomorrow". *Moatian* means "a long time ago" and serves for most reckonings of over a year. Even having birth "documents" are not certain guides to birth dates. Birth certificates are sometimes not sought immediately after a birth. Reports of dates to recording officials are approximate, and they may be misunderstood or recorded improperly. Owners may cheerfully change documented birth dates in order to attain certain objectives such as military induction. Stillbirths may not be counted as term births, thereby complicating the calculations of birth interval length or reproductive span. Children who have died or been killed may be forgotten or ignored. Requests for estimates for time or dates are sometimes interpreted as entertaining opportunities for the creative imagination, not to be taken seriously. As a result, the only way it is possible to obtain some accurate demographic data is to live permanently with a group and observe every vital event. This, obviously, is not practical for most observers.

Data collected by Maybury-Lewis, Salzano, Chagnon, Neel, and Peters in connection with ethnographic and genetic studies are among the most detailed demographic reports.

Neel and Salzano (1970) found that one group of *Xavánte* had a Mean Completed Fertility of 5.7 and speculated that the *Xavánte* practiced postpartum sexual abstinence in order to control fertility. Neel and Chagnon (1968) found an overall Mean Completed Fertility for the *Xavánte* of 3.6 and 3.2 for the *Yanomámá*. They described these numbers as "unbelievably low" and suspected that births resulting in infanticide are not reported as live births. The result is one live birth every 4.4 years for the *Xavánte* and one every 6.6 years for the *Yanomamo*. Both the *Xavánte* and *Yanomamo* (Chagnon, 1977) practice sororal polygyny, with a 50% polygyny rate among *Yanomamo* males. Mean age for the *Xavánte* is 18; mean age for the *Yanomamo* is 22. Infant mortality is 18% for the *Yanomamo*. Neel and Chagnon reported that the proportions of the populations under the age of fifteen for the *Xavánte* and *Yanomámá* was 39% and 32%, respectively. The authors judged that both birth rates and infant-child mortality rates were lower for the *Yanomámá* than for the *Xavánte*. Salzano, Neel, and Maybury-Lewis (1967) also found that 39% of the *Xavánte* population was under 15 years of age. Flowers (1983) found that a comparable *Xavánte* group was younger in 1977, with 48.6% under the age of 15. Mean birth intervals were 20.9 months, although for women whose babies had died, intervals were only 16.6 months. In a 1988 follow-up study, Flowers (1990) showed that, after an initial post-contact decline, fertility increased markedly among the *São Domingos Xavánte*. I have found exceedingly high fertility rates among the *Shipibo* (Hern, 1977, 1988, 1991) that appear to have been partially the result of disruption of traditional cultural patterns such as polygyny, which dampened fertility.

Neel and Weiss (1975) calculated a general fertility rate of .250 for the *Yanomámá* with a Net Reproduction Rate of 1.25. *Yanomámá* women complete a pregnancy every 3-4 years, with 85% of the births resulting in a live birth. The authors estimated annual population growth

rates at between 0.5 and 1.0%. 50% of the women who reach age 15 die before menopause. Childhood mortality rates have dropped considerably, but overall combined infant and child mortality, including infanticide, stood at about 50% at the time of the report.

Early and Peters (1990:20) show an increase in mortality among the *Mucajai Yanomámá* in the two years immediately preceding contact compared with lower mortality in the two years before that, with general diminution of death rates and population increase in post--contact years. Even with data from 28 years of observation by Peters, the authors could not reach firm conclusions concerning changes in longevity following contact (Early and Peters, 1990:73, Table 7.2).

In a study of the health status of *Kayapó* Indians, Ayres and Salzano (1972) found that 48.4% of the population was under 15 years of age. In an earlier study of the *Kaingang*, Salzano (1961) found that 35.7% of the population was under 15, whereas 54.5% of a mestizo population was under 15.

Neel (1970) reports a 15-20% infanticide rate for primitive tribes in the Amazon, with weaning at 3 years for *Yanomamo*. Polygyny provides an important device for natural selection, according to Neel. Polygyny is common throughout South American tropical forest societies (Siskind, 1973), although its effects on fertility are not well documented.

Goldman (1979) observed among *Kubéu* that women are not eager to bear children. *Kubéu* women had knowledge of abortifacients and acknowledge performing infanticide. An unwanted child is buried alive on the spot where it is born. Childbirth is considered a dangerous period. Sexual abstinence is practiced by both parents for one year.

Infanticide is practiced among the *Mundurukú* in the cases of twins and congenital birth defects (Murphy and Murphy, 1974: 166).

Larrick (1979) reports a high incidence of infanticide and stillbirth among the *Waorani* of Ecuador, who otherwise appear to be quite healthy.

Devereaux (1955) reported use of *"imi rau"* among *"Kashinaia"* [*Kaxináwa*] as a contraceptive and as an abortifacient. The *Jivaro* of Ecuador used *"sacha mangue"*. The words *"imi rau"* as reported by Devereaux are virtually identical to the *Shipibo* words *jimi* "blood" and *rao* "medicine". Johnston and Kensiger (1969; 1971) found a 27% *polygyny* rate among the *Kaxináwa*, a *Panoan* tribe, and noted that the medicine man proscribed the use of either modern or herbal contraceptives. A conscious decision to cease using abortifacients has contributed to a high fertility rate. Also, the practice of infanticide is not observed to the same degree as before. This tribal "population policy" was reported to have been a response to a declining population seen as the result of Western contact and an epidemic in 1951. The effective fertility ratio for the *Kaxináwa* was 113.5 compared to 96.3 for the *Hutterites* (Smith, 1960).

Siskind (1973) observes that the *Sharanahua*, also a *Panoan* group, have abortions in order to have three-year birth intervals. The *Sharanahua* have three ways of making women scarce: through limited sexual access, polygyny, and female infanticide.

Bugos and MacCarthy (1984) cite the example of the *Ayoreo* of southwestern Bolivia, who practice infanticide. The *Ayoreo* total fertility rate is 6.185; infanticide lowered it to 4.02. The strength of the authors' conclusions are diminished by the fact that women who did not practice infanticide were excluded from the sample.

Early and Peters (1990:76) report that both induced abortion and infanticide are practiced among the *Mucajai Yanomamo*, and infanticide may account for as much as 44% of all infant deaths.

Holmberg (1985) reports that *Siriono* women observe a one-month period of postpartum sexual abstinence.

A comparison of various demographic indices in different tribes is shown in Table I.

TABLE I

Authors	Yr	Tribe	<15	Polygyny rate (%)	EFR	GFR	TFR	GRR	NRR	RONI	MCF
Salzano	61	Kaingang	35.7%	—	—	—	—				6.6
Hern	77	Shipibo	54.7%	7.1	130.0	.305	9.9	4.9	—	4.89%	9.3
Hern	88	Shipibo	49,3%	13.0	93.2	.278	8.5	4.4		3.70%	7.6
Neel	78	Yanomámá					7.0				8.2
N & C	68	Yanomámá	32.0%								
N & C	68	Xavánte	39.0%								
N & W	75	Yanomámá				.250			1.25	0.5%	
J & K	69	Kaxináwa	—	27	113.5						
SN & M	67	Xavánte	38.9%	40.2							5.7
A & S		Kayapó	48.4%								
S & C	80	Wapixána	39.0%								
SC & N	79	Tikúna	41.0%								
Salzano	84	Makuxí	51.0%								
NS, et al	64	Xavánte	39.3%								
Buck	68	Mestizo	54.1%								
Flowers	83	Xavánte	48.6%								

KEY: N & C = Neel & Chagnon, 1968; N & W = Neel & Weiss, 1975; J & K = Johnston & Kensinger, 1969;
A & S = Ayres & Salzano; SN & M = Salzano, Neel & Maybury-Lewis, 1967; NS, et al = Neel, Salzano, et al, 1964

Demographic indices:

Effective Fertility Rate (EFR): $\frac{\text{\# Children >5 y/o}}{\text{\# females 5-49}}$
(a.k.a. Child-womam ratio)

General Fertility Rate (GFR): $\frac{\text{\# of live births}}{\text{\# of females ages 15-49}}$

- Total Fertility Rate (TRF): Sum of age-specific birth rates
- Gross Reproduction Rate (GRR): Sum of age-specific female birth rates
- Net Reproduction Rate (NRR): Sum of age-specific female survival rates
- Mean Completed Fertility (MCF): average number of live births among women of completed fertility age 50+
- Rate of Natural Increase (RONI): Crude Birth Rate minus Crude Death Rate

One interpretation of Table I is to note that earlier studies of tribal groups showed lower proportions of individuals under 15 years of age, whereas later studies (Salzano, 1984; Flowers, 1983) shower higher proportions of approximately 50%. The earlier studies, with the 0-15 age group under 40%, may be correlated with higher rates of polygyny (compare Salzano, Neel, and Maybury-Lewis, 1967, with Hern, 1977). While these studies are not strictly comparable, it appears that acculturation (or deculturation, as the case might be), is associated with higher fertility and a younger population.

Generalizing from these sparse data is hazardous, but it seems that following a catastrophic depopulation in the first 400 years following Western contact, at least some Amazonian populations are experiencing high fertility and rapid population growth, whereas others have become extinct or nearly so. It remains to be seen whether those experiencing rapid population growth can maintain their traditional cultures in any respect.

In many ways, native Amazonians have experienced a reversal of the "epidemiologic transition" described by Omran (1971). Whereas Omran's theory begins with an "Age of Pestilence and Famine" and proceeds to an "Age of Receding Pandemics" and thence to an "Age of Degenerative and Man-made Disease", the Amazon Indians have had a mirror image of this experience since European contact. Roosevelt (1989) and Greene (1986) describe few except chronic diseases in *Marajó* skeletons, which preceded European contact. The pandemics began when the Europeans arrived. Coimbra (1989), in describing the health effects of disruptions of social networks and substistence patterns among the *Suruí*, shows that the group is experiencing all three phases of the "epidemiologic transition" at once.

HEALTH STATUS OF NATIVE AMAZONIANS

Our information about the health status of early Amazonians is almost nonexistent except for some skeletal remains found at *Marajó* (Roosevelt, 1989). There is evidence that tuberculosis, hookworm, *Trypanosoma cruzi*, and treponemal diseases were present in prehistoric South

American populations (Allison, 1973; Coimbra, 1988; Baker & Armelagos, 1988; Hackett, 1963; Cockburn, 1961; Allison et al, 1974). However, most of the evidence for these diseases comes from West coast archeological remains, and we do not know the extent to which these diseases affected those in the lowlands. These afflictions are not reported in the *Marajó* individuals. In the rest of the Amazon, paleo-pathological evidence is lacking due to the unsuitable conditions for the preservation of human remains (Coimbra, 1988).

We must surmise a fundamentally vigorous and ingenious aboriginal population, however, which survived in a exceedingly complex and hostile environment by identifying a wide variety of food, technical, and medicinal resources (Berlin & Berlin, 1978; Dufour, 1987; Posey, 1983; Tournon, 1984; Hern, 1976; Milton, 1984; Ross, 1978; Behrens, 1981; Pollock, 1988). The simple fact is that Amazon societies, however vigorous and complex, were overwhelmed by the introduction of Old World diseases and Europeans aggression. Black (1990) asserts that the severe impact of epidemic disease introduced from the Old World was due both to social disruption and to genetic isolation.

INTRODUCED DISEASES

Measles (rubeola)

Black et al (1982) states that the measles virus probably did not exist at the time the Western Hemisphere was populated across the Bering land bridge, and probably dit not even exist at the time of European contact. His basis for this assertion is that Amazonian tribes having first contact typically display no evidence of exposure to the measles antigen, nor do they have antibodies to many other common viral disease agents. The antibody response of Ameridians to measles vaccination is essentially the same, if somewhat more symptomatic, as other populations, indicating no genetic immunodeficiency in this regard (Neel, Centerwall et al, 1970; Black et al, 1982; Black et al, 1970; Black et al, 1974).

Smallpox (Variola major)

Smallpox has been a great killer in Amazonia since the time of Conquest. From the time of the first reported epidemic of smallpox in 1621 (Meggers, 1971) until the last in 1964 (personal observartion), smallpox probably killed millions of native Amazonians. Working as a medical student in the upper Peruvian Amazon in 1964, I encountered numerous cases of smallpox in what was the last epidemic in the Western Hemisphere. Most of the several hundred *Shipibo* and mestizos whom I vaccinated had never previously been vaccinated. Throughout the region, virtually 100% of the populations of whole native villages were afflicted with high mortality rates (R. Eichenberger, personal communication). Thornton et al (1991) have shown that native American populations may have had variable recovery rates following decimation by epidemics such as smallpox.

Tuberculosis

Tuberculosis has been endemic in the Americas since prehistoric times, and there is a high incidence of the diseases among contemporary Amerindian populations (Clark et al 1987). The introduction of tuberculosis into the Amazon is fairly recent (Black, 1975), but it is the main health problem in many native Amazonian groups today (Flowers, 1983; Black et al, 1974). Clark speculates that the current epidemic may stem from either exposure to more virulent strains of *Mycobacterium tuberculosis* or environmental change leading to a loss of exposure to natural vaccination, presumably when Amazonians were separated from their hemispheric ancestors. The widespread Amazonian practice of communal eating and drinking has unquestionably contributed to the epidemic spread of tuberculosis. In the Peruvian Amazon, in particular, the preparation of *masato* from masticated manioc is a popular and probably deadly custom in this regard.

Yellow fever

Cockburn (1961b) stated that the principal vector of

yellow fever, *Aedes aegypti*, has probably been in South America for only 400 years. Black found high frequencies of antibodies to arboviruses, including yellow fever, among three Carib and four *Kayapó* Indian villages (Black et al, 1974), indicating prolonged exposure to these agents.

Chaga's Disease and Leishmaniasis

Cutaneous and mucocutaneous leishmaniasis is widespread throughout the upper Peruvian Amazon basin (personal observation), but documentation of the distribution of these diseases in Amazonia is sparse. Coimbra (1988) notes that *Trypanosoma cruzi* are found in Chilean mummies dating from 470 b.C. and that both the organism and its vector, the triatomina insect, are found throughout the Amazon basin. In spite of this long history in the Americas and wide distribution in the Amazon basin, according to Coimbra, the number of autochtonous parasitic infections is small among native Amazonians by comparison with other populations. Coimbra attributes the low Chaga's disease infection rate to the high human mobility and small settlement size of Amazon Indians. Chaga's disease is a serious potential threat to native Amazonian populations, however, as development and urbanization permits the domiciliation of triatomines.

In Coimbra's view, mobility is of adaptative value among preindustrial Amazon populations and minimizes contamination of surroundings with pathogens. Also, he notes that animal domestication was not generally practiced until recently.

Onchocerciasis

Microfilaria are found in various Amazon Indian groups (Lawrence et al, 1979; Beaver et al, 1976; Lawrence et al, 1980) and exposure to onchocerciasis has been found in Ecuador (Guderian et al, 1987) and Brazil (Moraes et al, 1974). While clinical manifestations of the disease have not yet become widespread (Salzano & Neel, 1976), it is only a matter of time before this severely debilitating disease affects large numbers of native Amazonians.

Schistosomiasis

Schistosomiasis has become widespread throughout the hemisphere but has not yet become in the Amazon. It is endemic in Northeastern Brazil (Lee, 1985:69), and it threatens to become a major health problem for Amazonians. The Amazon habitat is highly suitable for the spread of schistosomiasis, especially if large dams are constructed in the region.

Helminthiasis

Infection with multiple species of intestinal parasites is the rule in relatively undisturbed Amerindian tribes, according to Lawrence (Lawrence et al, 1980). When native Amazonians become sedentary, however, they may be at higher risk of clinically important parasite burdens. Chernela and Thatcher (1989) found that the nomadic *Máku* had ascaris infection rates as low as 34%, whereas the 75 to 100% of sedentary *Tukáno* were infected. Schwaner and Dixon (1974) found that hookworm egg counts were six times higher in a sedentary unacculturated *Tukúna* Indians and among a mixed *Tukúna-mestizo* population living in a more urbanized settlement.

Chronic Diseases

The incidence of cardiovascular disease has not been found to be high in native Amazonian populations. Weinstein, Neel, and Salzano found that chronic and degenerative diseases were rare in a population of *Xavánte* Indians, and that blood pressures were generally low (1976), a result replicated by Ayres and Salzano in the *Kayapó* (1972). Both Oliver (Oliver et al 1975) and Larrick et al (1982) found that blood pressures did not increase with age among the *Yanomámá* and *Waorani*, respectively. Both groups of investigators attributed the low blood pressure levels to low dietary salt levels. Glanville and Geerdink made the same observation earlier in the *Trio* and *Wayaná* tribes (1970). Lowenstein (1961) found that unacculturated *Karajás* Indians had lower blood

pressures than sedentary *Mundurukú*, and that the *Mundurukú* experienced blood pressure increases with age. Tenbrinck (1964) found lower blood pressures among Peruvian Amazon Indians of different tribes tham among *Mestizos* from the same region. Nowaczynski et al (1985), stydying relationships between blood pressure and serum aldosterone levels, determined that the salt-free diet of the *Yanomámá* gave them higher aldosterone and lower blood pressure levels by comparison with the more acculturated *Guaymi* Indians of Panama. Fleming-Moran and Coimbra (1990) found that the lifestyles of lowland South American Indians include many protective factors against hypertension, but these conditions are rapidly changing and native Amazonians are being exposed to more stress.

Obesity is uncommon in native Amazonians; Glanville and Geerdink found that skinfold thickness among the *Tiriyó* and *Wayána* tribes remains constant throughout life (Glanville and Geerdink, 1976).

Diabetes is virtually unknown among native Amazonians. In their study of two tribes in Brazil, the *Yanomámá* and *Marúbo*, Spielman et al, found that the less acculturated group, the *Yanomámá*, showed no significant rise in one-hour blood glucose levels characteristic of glucose-intolerant North American control subjects (1982).

Donnely et al (1977) found that dental deterioration was positively associated with exposure to Western culture.

Violent and Accidental Death

In their study of the *Waorani*, Larrick et al (1982) found that 4% of all deaths were due to snakebite. While I have not calculated cause-specific death rates among the *Shipibo*, I have observed an increasing proportion of deaths due to accidental gunshot wounds, homicide, and vehicular accidents since 1964. Reports of children drowning and dying from falls are common among the *Shipibo*.

Intervillage and intertribal warface has been an important cause of mortality for Amazonian tribes in the past, and Chagnon (1988) reports that 30% of all adult male deaths among the *Yanomámá* are due to violence.

Infanticide is still practiced in some Amazonian tribes,

but its significance as a major cause of death appears to have diminished, especially in the past century.

CURRENT HEALTH STATUS

In their general assessment of health and physical status of the *Xavánte*, Weinstein, Neel, and Salzano recorded their impression of "exuberant health and vitality" among the children and adult males, but *premature aging in the women* (emphasis supplied). Larrick et al, made the same observations concerning the *Waorani* (1982). Black found the nutritional status of Brazilian *Kayapó* Indians to be generally good (Black et al, 1977). *Kayapó* infants were small but gained with age. Moran notes that no survey has ever noted signs of protein deficiency among autochthonous South Americans in their native habitats (Moran 1981:207). In fact, protein intake is frequently higher than minimum daily requirements. Bergman observed that the *Shipibo* consume up to 75 grams of protein per day (Bergman, 1980). Chagnon and Hames (1979) found that the *Yanomamo* consume approximately the same amount of protein per day.

Flowers (1983) observed that the *Xavánte* people she studied in 1977 were in generally good health, although tuberculosis was a major health problem. She recorded a 27% mortality rate up to the age of 2, with most deaths occurring as the result of respiratory diseases.

In a study of the nutritional status of Indian children in the *Alto Xingu* region, Fagundes-Neto et al. found that 96% of the children were well nourished and only 3% were malnourished (1981). Height was normal for 84.8%. By contrast, 54% of the children in low-income urban families were malnourished. In tribal life, food was available and equally distributed, fertility control was practiced, and there was an absence of socioeconomic unevenness. This was offset by the presence of endemic malaria.

Hodge and Dufour (1991) found that high infant mortality rates and growth retardation among *Shipibo* children may be the result of an interaction of suboptimal nutrition and infectious diseases.

While nutrition assessment is critical to evaluation of

general health, an extended discussion of the nutritional status of native Amazonians is not included in this chapter since it is thoroughly reviewed by Darna Dufour elsewhere in this volume (Dufour, 1991).

In my own studies of the *Shipibo*, I have found them to be in excellent health but extremely vulnerable to tuberculosis and the acute infectious diseases of childhood (Hern, 1971). The infant mortality rate of 97.5 per 1000 live births that I reported in 1977 is minimal (Hern, 1977), since subsequent studies have shown infant mortality rates up to 50% (Hern, 1988). The vast majority of *Shipibo* infant and child deaths are due to acute gastrointestinal and respitatory diseases. Infant and child gastrointestinal diseases are facilitated by the ubiquitous fecal contamination of water and food in spite of almost obsessive *Shipibo* cleanliness. Neonatal tetanus is a major cause of neonatal death for *Shipibo* and other Amazonian tribes, which generally have no immunologic experience with the tetanus antigen (Black et al, 1974).

A major cause of death for *Shipibo* women is cervical cancer, owing, I think, to a combination of high fertility, lack of male circumcision, and the desperate use of caustic substances for contraception (Hern, 1976). Women also experience significant mortality associated with childbirth, although actual rates of maternal mortality have not been established for native Amazonian women. The early onset of childbearing and high fertility over a prolonged period undoubtedly contributes to the "premature aging" of women noted by Weinstein and others. The discouragement of polygyny by missionaries has resulted in shorter birth intervals and higher individual fertility for Indian women (Hern, 1988). The consequences are inimical to the health of both women and their children.

CONCLUSION

In the future, the health and wealfare of native Amazonians will affected by numerous external factors over which they have little or not control. Among the most important of these, aside of the lack of access to the same level of health care afforded to other national populations, will be the environmental policies of national governments.

Salzano (1990) points out that these include the construction of colossal dams for hydroelectric energy, as in Brazil, that destroy the environments necessary for the survival of indigenous groups. Another is the seemingly inexorable highway construction, colonization, and deforestation that accompanies the expansion of other populations.

Pucallpa, which was probably an aboriginal *Shipibo* settlement, had no more than three thousand inhabitants in 1943. These had arrived at about the time the first trans--Andes highway in Peru was pushed through to the Ucayali River. By 1964, when I made my first trip to the Peruvian Amazon, *Pucallpa*'s population was estimated at 25,000. There were dirt streets and Saturday night gunfights. The *Shipibo* were displaced and treated as sub--humans. By 1984, the population os *Pucallpa* was estimated at between 125,000 and 200,000. That is at least a 5,000% increase in 40 years. Mestizo fisherman from *Pucallpa* now regularly exploit *Ucayali* waters some 200 kilometers from *Pucallpa* in areas previously fished exclusively by *Shipibo* and a few local mestizos. Aramburu estimates that the annual population growth rate of the upper Peruvian Amazon basin has been between 4 and 5% per year between 1940 and 1981 (Aramburu, 1982:16), and it may be as much as 10% including immigration (personal communication).

The aboriginal environment of the native Amazonians is shrinking rapidly and under great pressure from outside sources of development and exploitation. A significant factor in this is that the populations of nearly all Amazon Basin countries are growing at rates from 3 to 4% (World Resources Institute, 1987). By the year 2000, the Amazon Basin countries will add *at least* the following numbers to their populations (from 1990):

Brazil	28.	Million
Bolivia	2.	Million
Columbia	5.5	Million
Ecuador	3.	Million
Guyana	0.9	Million
Peru	5.	Million
Suriname	0.1	Million
Venezuela	4.	Million
	48.5	Million

The countries that ring the Amazon Basin will add the equivalent of half the current population of Mexico or roughly twice the current population of Canada over the next 10 years (Zachariah & Vu, 1988). Population pressure from outside is likely to have an enormous destructive effect on the Amazon environment and its native inhabitants. Combined with accelerating deforestation and urbanization (Merrick, 1986: 25), it means that much of the Amazon will have been transformed within 100 years from a sparsely settled wilderness rainforest with tiny, isolated settlements of indigenous inhabitants to a scrub desert interrupted by rapidly growing cities.

There is nothing in the history of the human species to prepare us or our native Amazonian friends for this experience.

Native Amazonians have been the victims of two massive historical assaults, one at the time of the Conquest and the other during the Twentieth century. Due to epidemic disease and environmental destruction, many tribes have gone from contact to displacement, decimation, and extinction in a single generation. Deculturation and the construction of large development projects have had catastrophic effects on native populations. In many ways, native Amazonians have experienced a reverse of the "Epidemiologic Transition". Paradoxically, one of the effects of cultural disruption for some native Amazonians has been the loss of cultural controls on fertility with the result that high fertility has become a major health problem. Combined with rapid growth of non-indigenous Amazonian populations, deforestation, and urbanization, native Amazonians face grave obstacles to long-term survival.

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