

Culture Change and Health Among the Makushi

Project Summary

The Makushi Amerindians of Central Guyana are experiencing rapid cultural change. The objective of the proposed research is to collect and analyze sociodemographic, biological, and epidemiological data to produce a diachronic view of the complex interaction between the Makushi and the surrounding Guyanese society. On a broader scale, our research may be seen as an attempt to understand how health in rural, disadvantaged populations is influenced by a rapid cultural transition. Since 2000, measurements of growth, development, and nutritional status have been collected as markers of welfare.

Background

In 1996 the government of Guyana established the Iwokrama International Centre for Rainforest Conservation and Development and set aside 400,000 hectares of rainforest in the center of the country as the Iwokrama Protected Area (IPA). The IPA is home to both a wealth of biodiversity and approximately 3,000 Makushi Indians who live in 13 villages in and around the park. In establishing the IPA, the government hopes to demonstrate that it is possible to both conserve biodiversity and improve the welfare of the Makushi. Following the establishment of the IPA, a number of development agencies moved into the region to assist the Makushi. As well, in 2003-2005, the government of Guyana vastly improved the road from the coast into the region, rendering it passable for throughout the year.

Makushi subsistence practices remain largely divorced from the market economy and most continue to practice traditional agriculture in the rainforest. However, traditional practices are eroding rapidly for a segment of the population due to the completion of the road, establishment of a the IPA, and influx of development agencies. The implications of these changes for Makushi health are unclear as similar developments among other Aboriginal groups have brought mixed results.

While Iwokrama is the flagship conservation effort of the Commonwealth and is a United Nations Agenda 21 success story, its impact on the welfare of the Makushi remains unclear. Given this, I approached both the Makushi and Iwokrama in 1999 and proposed several measures which would enable both groups to evaluate the impact of the IPA on the welfare of the Makushi. Traditional measures of the impact of development programs focus on economic indicators. Such measures, however, are inappropriate for the Makushi given their relative isolation from the market economy. Rather, Iwokrama, the Makushi and I agreed that measurements of physical well-being would be more telling. These measurements have been found to be valid measures of human welfare by anthropologists in other communities which are similarly divorced from the market economy. The project is designed to collect data on human health in three separate rounds over a 10 year period to determine whether or not there is any change in the welfare of the Makushi.

Research to Date

Assisted by my colleagues Janette Bulkan (Yale University), Barabara Piperata (Ohio State University), students Kathryn Hicks (Northwestern University), Shawna Ardley, Megan Nolan, and Ashley Farelly (University of Calgary), and 13 Makushi assistants known collectively as the Makushi Research Unit, we have collected the following data as of 2005:

- measurements of growth and development for 2719 Makushi
- interviews with 90 women concerning peri-natal dietary practices, infant and juvenile mortality and morbidity

- dietary intake interviews with five families in each of the 13 villages conducted two times each month for one year
- interviews conducted with female informants in 10 of the villages concerning dietary seasonality

In addition, informal interviews conducted with the Makushi during each of the visits to the region have elicited a range of informant responses concerning the impact of recent developments on their lives. Preliminary results of these data have been reported at the annual meetings of the American Association of Human Biologists and the Canadian Association of Physical Anthropologists, published in the peer-reviewed *American Journal of Human Biology*, and two manuscripts are now in preparation for publication in peer-reviewed journals (*American Journal of Human Biology* and *American Journal of Physical Anthropology*).

Funding for this research has come from the Wenner-Gren Foundation for Anthropological Research, the University of Calgary, and the Iwokrama International Centre.

Research Pending

In 2007-2008, funding permitting, we will repeat the collection of growth and development data and dietary intake data. In addition, with the collaboration of [Dr. David Proud \(University of Calgary\)](#), we will collect dried blood-spot data to assess the immunocompetence and hemoglobin levels of the Makushi and conduct interviews to assess levels of acculturation in each village. We hope to repeat these measurements in 2010 and 2011.

Significance of this Research

While many of the Makushi are excited about the changes occurring, they are understandably anxious about them as well. As such, they have asked if there is some way to evaluate the impact of these changes on their families and communities. This research is one answer to this question. These data have the potential to elucidate the welfare of a population which is undergoing a rapid cultural transition. The data generated here may assist the Makushi in coping with this transition, enable governments and development agencies working in the region to assess the efficacy of their aid programs, generate expertise which may be used to evaluate the impact of cultural transitions among Aboriginal peoples in Canada, and provide social scientists with a better understanding of the impacts of rapid cultural transitions.

As well, the proposed research provides an opportunity to enhance our understanding of human adaptation to the humid tropics. In particular, it will provide a case study in which we can evaluate whether or not traditional Amerindian resource exploitation is compatible with the conservation of biodiversity. A number of authors have proposed that indigenous practices are not compatible with the conservation of biodiversity. In addition, the project has the potential to make contributions to applied, policy-level concerns. That is, it may inform policy and management perspectives, aimed at integrating biological conservation with advancement of the welfare of Amerindians. This application may then play a useful role in the resolution of conservation/development conflicts.

Abstracts of Research Results to Date

Weaning Practices of the Makushi of Guyana and their Relationship to Infant and Child Mortality: A Preliminary Assessment of International Recommendations. Wilson, W.; Milner, J.; Bulkan, J.; and Ehlers, P. *American Journal of Human Biology* 18(3): 312 - 324, 2006.

The World Health Organization (WHO) recommends exclusive breastfeeding (EBF) for the first 6 months of life, primarily because of potential immunological benefits which are deemed to outweigh nutritive costs for infants. This recommendation is controversial, as studies of the relationship between the term of EBF and infant and child health have produced conflicting results. The purpose of this paper is to evaluate the relationship between the term of EBF and infant and child mortality among a group of swidden-horticulturalists in lowland South America. Consistent with the WHO, we hypothesized that EBF <6 months will compromise the survival of the infant or child. This relationship was assessed via recall data generated in 2001 in structured interviews with 60 Makushi Amerindian women in Guyana's North Rupununi region. The data were analyzed with t -tests, Fisher's exact test, and logistic regression. The results do not support our hypothesis; the term of EBF is not found to be related to infant or child mortality. This is surprising given the potential for contamination in nonbreast-milk foods in this environment. Notably, this is occurring among mothers who are not energetically stressed. We propose that the apparent lack of benefit of EBF ≥ 6 months is due to insufficient energy supply from breast milk alone, which may predispose the child to morbidity when subsequently stressed. This study concurs with others which revealed no significant benefits to the infant of EBF >6 months, and the recognition that universal recommendations must be situated within local ecological contexts.

Birth Order and Growth Among Makushi Indians of Guyana WM Wilson, University of Calgary, CA; BA Piperata, University of Colorado; J Forte, Iwokrama International Centre, Guyana. (Paper presented at the Annual Meetings of the Human Biology Association, April 2001)

The relationship between birth order (BO) and growth is unclear. It has been proposed that in developing countries there may be a decrease in birth weights (BW) in later-born (LB) children due to long-term depletive effects of lactation on maternal energy reserves, known as the maternal depletion syndrome. In Britain, on the other hand, researchers have documented an increase in BW for LB children. Cross culturally there appears to be variation in treatment of first-born (FB) and LB children which may affect growth. For example, FB infants in the suburban US were weaned from the breast earlier than LB infants. In Japan, LB children viewed their parents' attitudes as less caring. This research evaluates the relationship between BO and growth of Makushi Indians of Guyana. While there does not appear to be a difference in the treatment of FB and LB Makushi children, we hypothesized that LB children would be smaller due to maternal depletion during reproduction. Anthropometrics (weight, stature, sitting height, skinfolds) and BO were collected on 444 Makushi in six villages. For most age and sex cohorts we did not find a difference between FB and LB in weight, height, or skin folds. However, among the females aged 0-2 years ($n=28$), FB children were significantly heavier. Among the males aged 0-2 years ($n=29$), the FB children were significantly taller. The opposite was found among females aged 7-8 years ($n=19$), LB children were both significantly taller and heavier. LB females aged 11-12 ($n=24$) were also taller than their FB counterparts. Hence, in most age and sex cohorts, our hypothesis is not supported; that is, BO does not appear to be related to growth in Makushi children. And, where we do see significant differences between FB and LB, they are not always in the direction predicted. Measurements of dietary intake, morbidity, and an increased sample size are necessary to elucidate those factors which may contribute to the differences seen or the lack thereof.

Birth Order, Growth and Maternal Depletion Among the Makushi WM Wilson¹, J Forte², B Piperata³ ¹ University of Calgary, ² Iwokrama International Centre for Rainforest Conservation and Development, Guyana, ³ University of Colorado (Paper presented at the Annual Meetings of the Canadian Association of Physical Anthropologists, October 2001)

While birth order has been argued to be an important factor influencing a child's growth, the relationship between these two variables is unclear. In developed countries birth weight increases in later-born children. In developing countries, researchers have proposed there may be a decrease in birth weights in later-born children when short birth intervals do not allow the mother to recover from the physiological stresses of the previous pregnancy. The proposed inability to recover is known as the maternal depletion hypothesis. The objective of this paper is to assess the relationship between birth order and growth in Makushi Indians of Guyana. We hypothesized that later-born individuals will have compromised growth in comparison with first-borns due to maternal depletion. NHANES I and II were used to assess the nutritional status of 1100 Makushi. Student's t-tests were used to compare anthropometrics of first- and later-born individuals and proportional-Z tests were used to compare the frequencies of wasted and stunted first-born and later-born individuals. Body-mass index (BMI) was used as an indicator of nutritional status for mothers and a regression was calculated to evaluate the relationship between parity and BMI for 82 Makushi mothers. We found few significant differences between first and later-born individuals in weight, height, skin folds, or wasting. However, significantly more of the later-born individuals are stunted in comparison to first-borns. For those 82 women for whom we have parity data, the average parity is 5.8±2.9 and average interbirth interval is 2.3±1.6 years. Regression analysis demonstrates no relationship between BMI and parity. Hence, while we found few differences in growth parameters, later-born individuals in this population have a significantly higher frequency of stunting. The parity and BMI data suggest that this is not due to maternal depletion. Rather, the most plausible explanation for the pattern observed in these Makushi communities is that an increase in the number of children in a family decreases the food resources available to each individual. The data described here indicate that studies which seek to understand the etiology of variation in growth, should control for birth order.

Weaning practices of the Makushi of Guyana and their relation to health and growth: a preliminary assessment of international recommendations JA Milner and WM Wilson, University of Calgary, Dept. of Archaeology (Paper presented at the Annual Meetings of the Canadian Association of Physical Anthropologists, October 2002)

The purpose of this investigation was twofold: First, to assess the relationships between the age at weaning and the subsequent health and growth of Makushi infants and children. Second, to then determine the applicability of the World Health Organization's international recommendations of exclusive breastfeeding up to (about) six months of age to this particular population. Weaning is defined here as the cessation of exclusive breastfeeding. A younger weaning age of less than six months was expected to compromise both health and growth. Measures of infant mortality and rates of growth faltering were used to determine the effects of variable weaning ages by village (n= 9 villages). Analysis indicated that age at weaning does not appear to have a straightforward correlation with either infant mortality or growth faltering. Village-specific analyses are variable and highlight the importance of using a biocultural approach to understanding infant feeding practices. These results suggest that further research is needed to assess the applicability of WHO guidelines.

Anthropometric indices of nutritional status in Guyanese Makushi Amerindians WM Wilson, University of Calgary, Alberta, Canada; J Bulkan, Yale University, New Haven, CT. (Paper presented at the Annual Meetings of the Human Biology Association, April 2004)

Amerindians of South America's humid tropics are characterized by very short stature and weight for height in comparison to NCHS standards. The causes of this difference in growth are unclear. In an effort to further explore the etiology of small body size among South America's Amerindians, here we report anthropometric data for a Guyanese Makushi Amerindian population which occupies a rainforest—savanna region in central Guyana. The

Makushi included in this survey occupy 13 villages in three different ecotones and exploit both oligotrophic blackwater ecosystems and eutrophic whitewater ecosystems. The Makushi practice swidden agriculture, cultivating high-cyanogenic potential cassava as their staple crop. In year 2000 and 2001, weight, stature, sitting height, skinfold, and arm circumference data were collected on 1177 Makushi between the ages of 2 months and 82 years. Average parity in this population is 4.8+2.8 children. Compared to NCHS values, 35% of the Makushi fall at or below the fifth percentile for height for age and 7% fall at or below the fifth percentile for weight for height. In comparison to several other Amerindian groups in South America's humid tropics, the Makushi are taller. Comparisons of the Makushi villages on the basis of the ecotone occupied and proximity to the region's one road indicate that these two variables are related to the Makushi growth patterns. Support: Wenner-Gren Foundation for Anthropological Research, University of Calgary Research Grant, Iwokrama International Centre for Rain Forest Conservation and Development.