# ABSTRACTS OF THE 32nd ANNUAL MEETING OF THE HUMAN BIOLOGY ASSOCIATION PHILADELPHIA, PENNSYLVANIA MARCH 28–29, 2007

## 1

A life history perspective on the relationship between reproduction and immune function in females. ET Abrams. University of Illinois at Chicago, Chicago, IL.

Life history theory suggests that organisms in resource-limited environments may demonstrate a trade-off between energetic investment in reproduction and investment in maintenance/immune function. Recent reviews of male reproductive-immune trade-offs suggest that testosterone functions to mediate both immunocompetence and reproductive behaviors, chiefly parenting and mate competition. In females, particularly mammals, the system is more complex. This complexity stems both from multiple regulatory hormones and a more variable investment in reproductive states. Pregnancy, for example, entails a 9-month energetic commitment with an increasing cost of failure as the pregnancy progresses. Immune function is normally curtailed during pregnancy, but contracting an infectious disease (like malaria) during pregnancy may upregulate immune function. Energetically, this translates into a conflict which may result in a compromised investment in a reproductive event. This paper will review the relationship between female reproductive effort and immune function, with specific emphasis on ovulation, pregnancy, and lactation in the context of infectious disease.

## 2

Mathematical models of tuberculosis: Existing applications and new directions. JT Achterberg. Departments of Anthropology and Epidemiology, University of Washington, Seattle, WA.

Tuberculosis (TB), a bacterial infection commonly expressed in the respiratory tract, is the leading infectious killer worldwide; it is estimated that one-third of the world is currently infected with TB, and it results in 3 million deaths annually. Owing to resurgence in global TB since the 1990s, there has been a significant increase in the number of mathematical models exploring the dynamics of TB spread among individuals within a population. Such models are used throughout the field of infectious disease epidemiology for a number of purposes, including to identify the most important gaps in our understanding of given diseases and to make the assumptions human biologists must make in the face of such gaps more explicit to researchers and policy makers. However, the TB literature has yet to completely fulfill these purposes, since there has been little effort among modelers to standardize the bases and applications of their models. In this poster, I review and synthesize the TB modeling literature of the last decade. Collectively, the models reveal a series of important gaps in our understanding of TB dynamics, including the definition of a potentially infectious contact; contact patterns and their determinants; the contribution of reactivation and reinfection; the effect of HIV coinfection on TB transmission; the relative fitness of TB strains; the effects of population genetic and behavioral heterogeneity; and the nature of endemic thresholds in the face of long serial intervals and changing demography. Further work with mathematical TB models should be directed toward these unresolved issues; as the impact of TB of public health continues to increase, the importance of qualitatively and quantitatively understanding factors affecting TB transmission and control also increases.

## 3

Seasonal variation in CRP levels and other measures of health status in school aged Tsimané children. MO Aiello[1], WR Leonard[1], TW McDade[1], R Godoy[2], V Reyes-García[3], T Huanca[2]. [1]Department of Anthropology, Northwestern University, Evanston, IL; [2]Heller School of Social Policy and Management, Bran-

DOI: 10.1002/ajhb.20629

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C-reactive protein (CRP) is an acute-phase protein produced during the nonspecific phase of the immune response. CRP levels rise in response to a wide range of infections, and elevated levels indicate pathogen exposure. It is a useful measure of subclinical infection, and has been used as a marker of infection, inflammation, and in westernized populations' cardiovascular risk. The present study examines seasonal variation in CRP levels and other measures of health status (e.g., anthropometric dimensions; illness recall) in school-aged children (6–12 years old) of the Tsimané Amerindians of lowland Bolivia. Previous studies among the Tsimané have shown elevated levels of CRP in association with parasitic infection and high levels of growth stunting. CRP levels for children in this sample are slightly higher than those reported in earlier studies. CRP level do not significantly differ across seasons, whereas measures of adiposity show significant variation. The relatively high levels of CRP year round in Tsimané children suggest that infectious and parasitic diseases are a pervasive to their health and nutritional status.

Supported by the National Science Foundation (BCS-0322380) and Northwestern University.

## 4

Depo provera disrupts the relationships between emotional well-being and sleep. M Arizumi, L Larkspur, V White, L Morrison, S Brown. University of Hawaii at Hilo, Hilo, HI.

Menstrual suppression achieved through injectible contraception (Depo provera) has been advocated by both medical practitioners as well as researchers of evolutionary medicine. However, it remains unclear how manipulating a woman's hormonal profile affects her physical and emotional well-being. We examined differences in 24 emotional variables and exercise, sleep, and eating patterns in sexually active women who had natural hormone profiles (NH), who were using estrogen-based oral contraceptives (EB), or who were using progesterone-based Depo provera (PB). Women reported data across five phases of the menstrual cycle, for the equivalent of three menstrual cycles. The PB group reported significantly higher overall scores for negative emotions than did the NH group ($P < 0.05$). Amount of sleep each night was positively correlated with good mental health in the NH and EB groups, but this relationship was not observed in the PB group. Phase effects were seen in both the NH group as well as the EB group, with the lowest reported negative emotions being in the ovulatory phase for the NH group and the follicular phase for the EB group. This may be due to an increase in estrogen levels occurring earlier in the cycle for the EB group. The NH group also reported feeling happier and having more energy during the ovulatory phase. The PB group had no significant phase effects across any of the emotional variables. This study concludes that use of Depo provera as a contraceptive may disrupt the natural rhythm of emotional well-being across the menstrual cycle, and that the negative effect is not remedied by increased sleep.

Study funded by NIH Grant no. S06-GM08073-33.

## 5

Prevalence of anemia and variation in hemoglobin concentration among women in Miskito communities. SL Arps. The Ohio State University, Columbus, OH.

Previous research suggests that anemia contributes substantially to maternal morbidity and mortality risk. Populations with high rates of poor maternal health outcomes are often found in remote, rural areas where information regarding variation in hemoglobin concentration is limited. This study examines the prevalence of anemia among 315 women in coastal Miskito communities in the department of Gracias a Dios, Honduras. The relationships among hemoglobin concentration, socio-demographic (age, education, economic status) and biological (reproductive status, parity, height, BMI) variables are examined using data collected in 2005 from interviews, anthropometric measurements, and health assessments. Hemoglobin concentration in a sample of capillary blood was measured using a portable HemoCue photometer. Hemoglobin values ranged from 5.7 to 15.9 g/dl with a mean value of 11.9 g/dl (s.d. = 1.64). Anemia is defined as hemoglobin concentration less than 12.0 g/dl in non-pregnant women and less than 11.0 g/dl in pregnant women. Total prevalence of anemia was 42.5% with 32.7% of

women mildly anemic (12.0 g/dl to 10.0 g/dl), 8.3% moderately anemic (9.9 g/dl to 7.0 g/dl), and 1.6% severely anemic (less than 7.0 g/dl). Pregnant women experienced higher rates of anemia than non-pregnant women (56% were anemic, n = 58), and therefore may be particularly vulnerable to morbidity and mortality. Describing associations among hemoglobin concentration and socio-demographic and biological variables holds importance for identifying the factors that place certain women at higher risk for anemia. On the eastern coast of Honduras widespread poverty, limited access to healthcare, and high fertility rates characterize indigenous communities. Designing and implementing effective public health initiatives to prevent and treat maternal health problems requires a clear understanding of the challenges women face in these marginalized communities.

Research supported by the Wenner-Gren Foundation.

## 6

Growth among Makushi Amerindians and nonindigenous peoples in central Guyana: Possible evidence for a genetic explanation for variation in stature. EK Barr, WM Wilson. Department of Archaeology, University of Calgary, Calgary, AB.

The purpose of this study is to evaluate the applicability of international growth standards for the Makushi Amerindians of Guyana. Well-nourished children of diverse ethnic backgrounds around the world follow similar growth curves (WHO, 2006). Consequently, NCHS and WHO growth standards are considered appropriate for use among all ethnic groups. In lowland South America, indigenous populations exhibit high levels of growth retardation relative to these standards (Stinson, 1990). The short stature of Amerindians has been attributed to poverty, malnutrition, and infectious disease. Stinson (1996) adds that growth retardation among the Chachi Amerindians of Ecuador may also have a genetic component, calling into question the applicability of international growth standards for indigenous peoples of South America's tropical lowlands. Here we compare the growth of individuals <21 years of age in neighboring villages. All of the villages considered occupy similar environments and practice swidden agriculture in the rainforest, cultivating manioc as their staple crop. Two of these villages were settled by nonindigenous immigrants ($n$ = 107 subjects), and 11 villages are predominantly Makushi ($n$ = 684 subjects). We find that 33% of the individuals in the Makushi villages have a height-for-age $Z$ score $<-2$ compared to 7% in the two villages with nonindigenous ancestry ($\chi^2 = 30.00$, $P < 0.0001$). Consistent with Stinson (1996), these data suggest a genetic difference in growth potential between these two groups and that international growth standards may not apply to indigenous peoples of South America's tropical lowlands.

This research project was funded by the Wenner-Gren Foundation for Anthropological Research, University of Calgary, and Iwokrama International Centre for Rainforest Conservation and Development.

## 7

Americans with relatively longer legs have lower BMI and are less fat. B Bogin, MIV Silva. Behavioral Sciences, University of Michigan, Dearborn, MI.

The body mass index (BMI = weight in kg/height in square meters) is the most widely used indicator of body fatness for adults. Higher BMI generally equates with greater levels of fatness. The sitting height ratio (SHR = [sitting height/stature] $\times$ 100) is a measure of body proportions. A larger SHR indicates relatively shorter leg length for total stature. We assess the influence of SHR on the BMI and fatness of the United States adult population, using the National Health and Nutritional Examination Survey of 1988–1994 (NHANES III). This nationally representative sample of 8,639 subjects, 20–49 years of age, includes men and women of white, black, and Mexican-American ethnicity. Using multiple regression, we find that the BMI is most closely associated with body fatness (sum of four-skin folds) and then, in decreasing order of significance, sex, ethnicity, SHR, and age. Adults with relatively longer legs have lower BMI and lower body fatness in both sexes and all ethnic groups. There are significant differences in SHR between adults categorized into the BMI groups of "normal," "overweight," and "obese." The reason for this relationship is not well-understood. We offer a hypothesis that fetal and early postnatal undernutrition and disease inhibits the growth of the legs and promotes a metabolic syndrome leading to greater body fatness.

## 8

Population variation in serum leptin independent of adiposity: A comparison of Ache Amerindian men of Paraguay and lean American male distance runners. RG Bribiescas[1], MS Hickey[2]. [1]Department of Anthropology, Yale University, New Haven, CT; [2]Department of Health and Exercise Science, Colorado State University, Ft. Collins, CO.

Leptin is a hormone that is associated with fat %, body mass index (BMI), and is of interest to human evolutionary biologists investigating energy allocation mechanisms. While activity contributes to leptin variation, population differences are emerging. We report differences in leptin levels in healthy men as well as comparative associations, with fat % and BMI that may reflect variation resulting from chronic environmental conditions. Male American distance runners ($n = 13$, mean age 32.2 ± 9.2 SD) and a highly active male Amerindian community (Ache of Paraguay, $n = 20$, mean age 32.8 ± 9.2) were compared to examine population variation in leptin, between physically active populations living under different environments independent of adiposity and BMI. While the Ache were hypothesized to exhibit higher leptin due to greater adiposity (fat %, Ache 17.9 ± 1.8 SD; runners 9.7 ± 3.2, $P < 0.0001$), leptin was significantly higher in American runners (Ache 1.13 ng/ml ± 0.38 SD; runners 2.19 ± 1.15; $P < 0.007$). Differences in the association between leptin and fat % were also evident. Although fat % was related with leptin in runners ($r = 0.90$, $P < 0.0001$), it was negatively associated in Ache men ($r = -0.50$, $P < 0.03$), although the elimination of one outlier negated this result. This illustrates that ecological conditions are likely factors that contribute to population leptin differences and is an important source of variation, especially in light of ethnic differences in the incidence and etiology of obesity, diabetes, and other metabolic conditions.

## 9

Tracking of overweight from early to late childhood. N Cameron[1], MM Wright[1], PL Griffiths[1], SA Norris[2], JM Pettifor[2]. [1]Centre for Human Development and Aging, Department of Human Sciences, Loughborough University, UK; [2]Mineral Metabolism Research Unit, University of Witwatersrand, Johannesburg, South Africa.

Significant tracking of BMI occurs from midchildhood (6 years) through adolescence into early adulthood (19+ years), with 60% of those in the highest quartile for BMI in childhood maintaining that status into adulthood. However, tracking is less impressive between infancy (<1 year) and midchildhood, and not significant between infancy and adolescence. There is a paucity if information on the tracking of BMI from early to late childhood (2–10 years). Effective intervention to prevent obesity requires early identification of those at risk, so that maximum time is available for lifestyle and dietary changes. Knowledge of the tracking of BMI from early to late childhood would allow greater sensitivity in the timing of intervention strategies.

BMI data 2–3 years and 8–9 years on 368 black (African) children (191 boys) from the Birth to Twenty birth-cohort set in Soweto, Johannesburg, South Africa were used for the analysis. Overweight was classified according to IOTF cut-offs. Forty percent of overweight children at 2–3 years were also overweight at 8–9 years, and were six times more likely than normal weight children to maintain their overweight status (OR 6.3; 95% CI 2.9–13.5). However, 60% of children did not track for overweight and evidence, for increased tracking between midchildhood and adolescence in other studies suggests that the immediate postinfancy period is critical for creating a setpoint for BMI that will determine the risk of adolescent and adult obesity. These findings suggest that early childhood is an essential time to assess BMI and to identify those at risk of later obesity.

## 10

The dopamine d4 receptor gene (DRD4) 48bp polymorphism in Ariaal pastoralists of northern Kenya. BC Campbell[1], DTA Eisenberg[2], PB Gray[2], BW Stankiewicz[3], MD Sorenson[3]. [1]Harvard University; [2]Department of Anthropology, University of Nevada, Las Vegas; [3]Department of Biology, Boston University.

DRD4/48bp polymorphism has been associated with ADHD, novelty seeking, substance abuse, BMI, food craving, sexual desire, and function (in developed countries). DRD4/48bp varies by population with higher frequencies of the seven-repeat alleles (7R) in populations who have migrated farther or are nomadic rather than sedentary. The Ariaal pastoralists from Northern Kenya are an interesting popu-

lation to study, because some are recently settled while others remain nomadic. They are also chronically undernourished. We preliminarily examined how DRD4/48bp varies with residence, nutritional status, erectile function, number of wives, and children. Results are based on hair samples collected from 85 settled and 66 nomadic males aged 17–84. The frequency of DRD4/48bp-7R alleles did not differ in the nomadic (17.4%) versus sedentary men (20%). Men with at least one 7R (7+) were more likely to be married ($P = 0.03$) but do not have more children. There was a significant interaction between DRD4/48bp and residence on arm muscle plus bone area (MPBA) ($P = 0.02$); 7+ settled men had lower MPBA, but 7+ nomadic men had higher MPBA. DRD4/48bp was not related to erectile function or BMI. Though we found no difference in DRD4/48bp-7R frequency between nomads and settled men, these results suggest that the DRD4 genotype may still have demonstrable effects. Despite radical cultural differences, increased marriage among 7+ males is consistent with previous results on the desire for marriage among a sample of U.S. undergraduates. Furthermore, the significant interaction of residency and genotype suggests potential differences in the effect of the 7R allele on body composition between the two subpopulations.

This work supported by Wenner-Gren Foundation.

## 11

Origin of the "Sea Gypsies": Inference from mtDNA analysis of the Moken and the Urak Lawoi of Thailand. CW Chan[1], Narumon Hinshiranan[2], JK Lum[3]. [1]Laboratory of Evolutionary Anthropology and Health, Department of Anthropology, Binghamton University, NY; [2]Chulalongkorn University Social Research Institute, Bangkok, Thailand; [3]Laboratory of Evolutionary Anthropology and Health, Departments of Anthropology and Biological Sciences, Binghamton University, NY.

Roaming the west coast of the Malay Peninsula and the islands of the Mergui Archipelago are the "Sea Gypsies" of the Andaman Sea. Within the Thai border, these sea nomads consist of three groups: the Moken, the Moklen, and the Urak Lawoi. The origin of these groups and the relationships among one another are as yet unclear. Although all three languages spoken by these groups are classified as Malayo-Polynesian, the Urak Lawoi language is more closely related to the Malay language, while the Moken and the Moklen are mutually intelligible, suggesting a more recent, shared ancestry. To investigate the relationships among these maritime nomadic groups, we sequenced the mtDNA HVSI from 12 Moken individuals from four islands (Dung, Jadiak, Polao, and Lanbi), and nine Urak Lawoi individuals from Jam island. Although the Moken samples were collected from four islands, their mtDNA sequences were nearly homogeneous ($H = 0.153$). In contrast, the Urak Lawoi were sampled from a single island and yet showed substantially greater diversity ($H = 0.765$). The lower mtDNA genetic diversity within the Moken is consistent with extreme isolation or a more recent population bottleneck event. When compared with populations from both mainland and island Southeast Asia, sequence polymorphisms suggest a close relationship between the Moken and ethnic Thais and Dais from Thailand and the Thai/Chinese border.

Financial support for this research was provided by a start-up grant from the Research Foundation of SUNY Binghamton to JKL.

## 12

Effects of fasting versus nonfasting on levels of serum lipids, lipoproteins, total cholesterol, and association with body composition, age, sex of Mennonites from Henderson, Nebraska. G Chittoor, MH Crawford. Laboratory of Biological Anthropology, University of Kansas, Lawrence, KS.

This study attempts to ascertain the relationship among serum lipid levels and lipoprotein profiles, body composition, age, and sex between fasting and nonfasting Mennonites from Henderson, Nebraska. The three main objectives of this research include (1) to determine the degree to which nonfasting elevates lipid levels; (2) whether all lipids are elevated equally or are some unaffected by nonfasting; and (3) to explore relationship between age, sex, body composition, and lipid levels in a rural farming community. A total of 454 individuals (224 males, 230 females) were characterized for demographic, anthropometric, biochemical, dietary, physiological, and behavioral traits, with age ranging from 18 to 91 years. The analyses indicate higher triglycer-

ide levels in males, whereas the total cholesterol and high density lipoprotein (HDL) cholesterol were elevated in females among fasters and nonfasters. Significant differences ($P = 0.000$) in means of total cholesterol, triglycerides, HDL cholesterol, and percent fat were observed in males and females. The ANOVA performed on the means of fasting and nonfasting data showed that, except HDL cholesterol, total cholesterol, triglycerides, and low density lipoprotein (LDL) cholesterol were statistically significant ($P < 0.05$). Among both the sexes other than LDL cholesterol, remaining variables were significantly different at $P < 0.05$. Linear regression analysis showed a significant association of age and total cholesterol among total population, and in both the sexes ($P = 0.000$). There was direct association of BMI and LDL cholesterol ($P < 0.05$), BMI and percent fat ($P < 0.05$), in both men and women. The fasting and nonfasting lipid concentrations were significantly correlated at $P < 0.05$.

Grant Sponsors: National Institute of Aging: No. AG01646; Kansas Attorney General Settlement Grant: No. KUCR KAN 30471.

## 13

Household and genetic influences on physical activity and body composition: The Southwest Ohio Family Study. AC Choh, EW Demerath, M Lee, B Towne, RM Siervogel, SA Czerwinski. Boonshoft School of Medicine, Wright State University Dayton, OH.

Physically active individuals tend to be leaner and have lower chronic disease risk than do inactive individuals, but the determinants of individual differences in physical activity (PA) are still poorly understood. Family studies suggest that genetic factors play a role, but these results are controversial, with heritability estimates for PA ranging from 0.09 to 0.83. It is also unclear how genetic factors that lead to increased PA are related to body composition (BC). The purpose of this study is to (1) estimate the household and genetic influences on PA and (2) determine the extent to which PA and BC share genetic and household effects. Study participants included 476 adults aged 18 years from five large extended families. PA was measured using the Baecke questionnaire, from which scores for SPORT and LEISURE (nonwork, nonsport PA) were calculated. BC variables included body mass index, lean and fat mass, as well as percent body fat (%BF) from dual energy X-ray absorptiometry. Heritabilities ($h^2$) of each PA trait and genetic correlations ($\Delta_G$) were estimated using maximum likelihood variance components methods. Covariates included age, sex, race, education, and current smoking status. Heritability estimates for BC measures were significant, ranging from $h^2 = 0.42–0.65$. Significant genetic effects ($h^2_{SPORT} = 0.20 \pm 0.09$) but no significant household effects ($c^2$) were found for SPORT, while significant household effects ($c^2_{LEISURE} = 0.31 \pm 0.09$) but no significant genetic effects were found for LEISURE. Bivariate analyses indicated that only %BF and SPORT shared genetic influences ($\Delta_G = -0.44 \pm 0.19$). The study suggests a heritable component for sports participation. These genetic factors that increase SPORT PA may be partially responsible for lower %BF.

Support: NIH HL69995, DK64870.

## 14

Measures and methods for social support and dietary intake analysis. J Chrzan. University of Pennsylvania, Philadelphia, PA.

Eating with others is the preferred means of taking meals in most cultures and for most people. Processes of commensality often define the structures of potential human action within a society and provide essential cultural meanings and symbolisms in addition to nutrition. The shared or family meal is iconic, and stands for hearth, home, and family/community solidarity, and thus the cultural value of commensality dictates that the shared meal influences and partially determines individual nutrient intake. And indeed, recent research and the American popular press argues the "Power of the Family Meal" to influence variables as diverse as behavior, achievement, and nutritional intake. However, the what, where, why, when, how, and above all, who of the social meal as an element of dietary determination remains relatively untested in relation to patterns of intake and represent a fertile area for action in nutritional anthropology. Our capacity to design, measure, and analyze sociality in relation to food intake must be better understood in order to avoid primary errors of research and to enable continued study of a potentially vibrant area of human

dietary behavior. This paper explores the process of designing a study to measure explicit social network interactions with teen mothers-to-be, in order to document associations between social-support assisted dietary intake and health-enhancing behaviors in relation to mother and child health outcomes. Problems of scale, design, and category construct will be addressed in light of the analytical needs and theoretical concerns of the case study. Variables important to mother and child health will be considered in relation to social eating to assess the importance of shared commensality to healthy pregnancy outcomes.

## 15

Endometrial function as a tool for studying implantation variation and early pregnancy. KB Clancy. Department of Anthropology, Yale University.

Recent studies have found previously unexplained variation in estradiol concentrations of ovulatory cycles that result in clinical pregnancy, early pregnancy loss or non-conception. As hormones and ovulation are not likely the only factors necessary for achieving pregnancy, there may be other functional purposes for variation in estradiol concentrations beyond selection and ovulation of a dominant follicle that contribute to fecundity. The endometrium is a logical arena for the continued study of fecundity and ecological variation as its proliferation and maintenance are under ovarian hormonal control. I suggest endometrial function modulates blastocyst implantation success via ovarian function variation. The endometrium's added role in early fetal nourishment makes it relevant to an examination of the causes of early pregnancy loss. I present data on fieldwork in the US and Poland in 2004 and 2005 that infers a relationship between sonographically-imaged endometrial thickness and salivary hormone concentrations as well as ecological variables. This data supports the model proposed here that ecological factors influence ovarian function, which then influences cycle fecundity, particularly ovulation and endometrial thickness and receptivity. Endometrial function provides the link between the ovaries and implantation variation to complete the picture of the mechanism of human female fecundity.

## 16

The back door to obesity: Deprivation and later adiposity. PF Clarkin. Department of Anthropology, University of Massachusetts, Boston, Boston, MA.

Links between social deprivation and higher rates of obesity in developed nations may stem from a range of factors experienced disproportionately by those in poverty, including limited purchasing power and a necessarily greater reliance on cheaper but more energy-dense foods. However, there is also evidence that malnutrition may lead to physiological adjustments that may predispose individuals to developing obesity. This poster will present a biocultural approach, exploring the multiple links (social, economic, and physiological) between deprivation and frank and/or centralized obesity. For example, studies related to developmental plasticity, particularly in the prenatal and infancy periods, suggest that early malnutrition has immediate effects on adiposity and body composition, and that these effects may persist into adulthood. Such plasticity may lead to an adaptive "thrifty" phenotype in a specific set of circumstances, that is, where malnutrition is likely to continue, and this was possibly favored by natural selection in our ancestry. However, under different circumstances, such as a rapid economic development and nutritional transition, a thrifty phenotype may be maladaptive and predispose individuals to obesity. Thus, paradoxically, while poverty and malnutrition traditionally have been associated with anthropometric markers of underweight, they may have a synergistic effect on obesity when coupled with economic development and a nutritional transition. The public health implications of this are that developing countries and the poor in developed countries are likely to continue to face a double burden of malnutrition and obesity, unless steps are taken to interrupt the cycle.

## 17

Refining biocultural models: a case study from Zambia. SM Cole, IL Pike. Department of Anthropology, University of Arizona, Tucson, AZ.

Previous refinements to biocultural research argued for the inclusion of historically situated political economic approaches to understanding health disparities. Such approaches are now common in biocultural

research, particularly when applied within marginalized environments. Merely identifying the political-economic factors that influence health, however, fails to take notice of how people assimilate, biologically, the social and material worlds in which they live. We suggest that embodiment offers an opportunity to bridge the multiple levels that influence health. Embodiment, as a heuristic tool, links the upstream and downstream experiences of peoples' daily lives. These experiences ultimately pattern variation in population health. Zambia provides a setting in which to test the concept of embodiment. Zambia is a highly unequal society, with one of the most uneven income distributions in the world. Income inequality decreases the positive effect social relationships have on health because those at the bottom of the income distribution compare themselves to those at the top. Negative emotions follow such as depression and envy, which lead to the adoption of stress-reducing behaviors that negatively impact health. We examine the health consequences of inequality among Chewa communities in Eastern Province, Zambia, where DHS data show that the percentage of stunted children has increased from 48–59% between 1992 and 2000. Income inequality structures the ways people draw on their social support during periods of food insecurity, which may be contributing to the high rates of malnutrition in communities within Eastern Province. Embodiment recognizes that ill health is socially produced and is not only determined by unequal access to material resources, but also the social factors that create such disparities, offering a more nuanced understanding of how Chewa population health is patterned.

## 18

Cortisol and the evolutionary design of child developmental competencies: Family function predicts adrenocortical responses during a normative ecological challenge. JA DeCaro[1], CM Worthman[2]. [1]Department of Anthropology, University of Alabama, Tuscaloosa, AL; [2]Department of Anthropology, Emory University, Atlanta, GA.

Adult scaffolding of child development is a key component of the "expectable environments of rearing"—the conditions encountered with sufficient regularity across human history to have exerted selective pressure on developmental design. Consequently, in young children, stressor-responsive systems, such as the hypothalamic–pituitary–adrenal axis (measured peripherally through cortisol), are sensitive to the ability and willingness of caretakers to moderate the impact of psychosocial demands. This study examines associations between everyday family life and adrenocortical activity in young children ($n = 28$), before and after the normative challenge of starting a new school year. During the relatively stable period toward the end of the prekindergarten year, higher cortisol at bedtime (a marker for the acute impact of recent experience) was associated with maternal employment and single parent status. By contrast, during the socially challenging period at the beginning of kindergarten, higher bedtime cortisol was associated with a poorer mother–child relationship. The cortisol awakening response, a stable marker of adrenocortical activity linked to chronic stress but not acute context, was persistently associated with maternal employment. These findings concur with theory: proximal personal relationships with caregivers should have the greatest impact on children's sense of security during a period of social challenge. Family structure and everyday experiences within the family influence child cortisol regulation in different contexts, and adaptive trade-offs that inform different modes of family function may become evident only during ecological stress. Further, parenting behaviors can be seen as strategies that leverage evolved capacities for the developmental programming of arousal regulation to produce culturally valued affective and motivational profiles in children.

## 19

Socially supportive networks and biological measures of acculturative stress in immigrant Mexican women. AA Estrin, M Muehlenbein, JP Gray, T Turner. Department of Anthropology, University of Wisconsin-Milwaukee, Milwaukee, WI.

Acculturation to migratory living conditions is a stressor that is psychologically and physiologically measurable. Coping with changing locations, adjusting to new conditions, and accustoming oneself to a foreign society are psychological products of acculturative stress. Acculturative stressors have also been related to physiological markers of stress, including elevated blood pressure and cortisol concentration, which eventually produce symptoms of stress-related sequelae or depression, diabe-

tes, obesity, and cardiovascular disease. These sequelae are mediated by the quality of socially supportive networks that are formed in acculturating communities and covary by socioeconomic status variables, including income, education level, and language abilities. There are numerous reports on the high incidence of stress-related sequelae in US-immigrant Mexican women. Immigrant Mexican women of Milwaukee, WI, have formed socially supportive networks through English classes, wellness education groups, and church participation in order to combat the symptoms of acculturative stress sequelae. Here we report a pilot study that analyzes physiological markers (blood pressure and morning salivary cortisol concentrations) of acculturative stress (as assessed through culturally relevant, validated inventories) from immigrant Mexican women of Milwaukee. It is hypothesized that size, number, and types of socially supportive networks will mediate any relationship between the physiological markers and perceived acculturative stress. The applicability of physiological stress markers in identifying and quantifying acculturative stress is discussed.

Research support: Center for Latin American and Caribbean Studies, University of Wisconsin-Milwaukee, Milwaukee, WI; Roberto Hernández Center, University of Wisconsin-Milwaukee, Milwaukee, WI; Sigma Xi, The Scientific Research Society, Research Triangle Park, NC.

## 20

Climatic variables and basal metabolic rate: Meta-analysis and derivation of a general predictive equation. AW Froehle. Department of Anthropology, University of California, San Diego, CA.

Estimation of energy expenditure in extinct hominids is an emerging approach to understanding human origins, and climate is an influential variable in such studies. Current estimation methods vary, however, hindering comparisons between studies. Methodological variation likely results from the absence of a global model of human basal metabolic rate (BMR) that accounts for the influence of climate. The present meta-analysis of published BMR from over 90 studies investigates whether the inclusion of climate variables can produce a generally applicable model for human BMR. From stepwise regression, fat-free mass (FFM) alone explains 0.789 of BMR variation in this sample ($P < 0.001$); age improves the estimate to 0.819 ($P < 0.001$). Of seven climate-related variables (including low/high temperature, temperature range, elevation), only mean temperature ($T_{MEAN}$) and latitude improve $r^2$, to 0.844 and 0.847, respectively ($P < 0.001$ for both). Analysis of covariance shows BMR to differ between tropical, temperate, and circumpolar climate groups when only FFM and age are covariates ($P < 0.001$). When $T_{MEAN}$, latitude, or both, are added, between-group differences disappear ($T_{MEAN}$: $P = 0.279$; latitude: $P = 0.242$; both: $P = 0.333$). These results generate the following equation:

$$\begin{aligned}\text{BMR} = {} & 19.6(\pm 1.3) \times \text{FFM (kg)} - 3.20(\pm 0.9) \\ & \times \text{AGE (yr)} - 3.08(\pm 2.8) \\ & \times T_{\text{MEAN}}(^{\circ}\text{C}) + 732(\pm 75)\end{aligned}$$

This equation predicts BMR in all climate groups more accurately than many existing equations, even when the latter are climate-specific. This illustrates the importance of including climate variables in predicting BMR. Where paleoclimate data can be estimated, such an equation could be used to estimate energy expenditure in a variety of species and habitats (e.g. Neanderthals vs. contemporaries in Africa and East Asia).

Climate data: Data Support Section of the Scientific Computing Division, National Center for Atmospheric Research (supported by National Science Foundation). Geographic data: US Geological Survey/National Imaging and Mapping Agency, via http://heavens-above.com/countries.asp.

## 21

Asian American birth outcomes by parametric mixtures of logistic regressions. T Gage[1], F Fang[1], E. O'Neill[1], H. Stratton[2]. [1]Department of Anthropology, University at Albany, Albany, NY; [2]Department of Epidemiology and Biostatistics, University at Albany, Albany, NY.

Previous estimates of Asian American birth outcomes based on samples from New York State 1985–1988 suggested that Asian birth weights were low, similar to those of African Americans, but that mortality was very low,

about half the rate of European Americans. Mixture models indicated low heterogeneity as a potential cause. This paper examines a much larger national sample of Asian Americans, 1995–2000, using covariate defined mixtures of logistic regression. Results for males and females are similar. The males are presented here. The mean birth weights are 3,316, 3,381 and 3,487 of 1985–1988 Asians, and contemporary Asians and European Americans. Infant mortality has increased slightly from 4.06 to 4.46/1,000 and is now similar to that for contemporary European Americans, 4.43/1,000, which has declined from 6.42/1,000. The mixture modeling, which subdivides the birth cohort into "compromised" and "normal" subpopulations (like normal versus low birth weight), indicates that the proportion of compromised female births declined from 10 to 7% since 1985–1988 and that mean birth weight among compromised Asian births has declined from 3,179 to 2,673 g. On the other hand, the mean birth weight of normal births has increased from 3,332 to 3,432 g. The birth weight specific mortality of normal and compromised births are similar in both Asian cohorts, except that the mortality distribution of normal births has shifted to the right, while that of compromised births has shifted to the left, mirroring the changes in mean birth weight. These results suggest that birth weight in Asian Americans is converging on European American birth weight and becoming more heterogeneous, while European American mortality is converging on Asian American mortality. The results are consistent with the hypothesis that birth weight is not on the causal pathway to infant mortality. The role of nativity on Asian births is also explored.

This work supported by NIH grant R01 HD037405.

## 22

Is there an effect of persistent organic pollutants on anthropometric measures among youth? MV Gallo[1], L.M. Schell[2]. [1]Department of Anthropology, University at Albany, SUNY, Albany, NY; [2]Department of Anthropology and the Department of Epidemiology and Biostatistics, University at Albany, SUNY, Albany, NY.

Most humans have low but detectable body burdens of persistent organic pollutants (POPs) such as polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB) and dichlorophenyldichloroethylene (p,p′-DDE) resulting from chronic, mundane exposure. The effect of these burdens on biological variation and health is not well known. This study investigates the relationship between PCB, p,p′-DDE, and HCB levels and seven skinfolds, 5 circumferences, and three breadths among adolescents ($n = 271$) of the Akwesasne Mohawk Nation who have measurable body burdens through ingestion of locally caught fish, ducks, and other wildlife. Organochlorines and serum PCBs were assessed by congener specific analysis allowing separate measurement of persistent and non-persistent PCB congeners, reflecting long-term and recent exposure respectively. Principal component analysis (PCA) was used to estimate subcutaneous fat distribution (skinfolds) and body size (breadths and circumferences). Separate regression analyses were performed for each PCA factor (PC1, PC2) to test whether POPs, individually and together, predicted changes in adiposity or body size. Regression analyses controlled for covariates and potential confounders. Results indicate that persistent PCBs, HCB, and p,p′-DDE have a significant inverse relationship with the adiposity factor (PC1). In contrast, p,p′-DDE and HCB exhibit a strong, positive relationship with the body size factor (PC2). This study suggests that toxicant levels increase with body size and decrease with adiposity. The decrease may be due to lower circulating toxicant levels and increased storage of toxicants in adipose tissue.

Supported by NIEHS Grant # ES04913-09 and #ES10904-06.

## 23

Measuring children: Methodological aspects of collecting growth and obesity data from children in a school setting. T Galloway[1], T Moffat[2]. [1]Health Sciences Program, University of Northern British Columbia, BC; [2]Department of Anthropology, McMaster University, ON.

This paper considers methodological aspects of collecting growth and obesity data from children. The authors draw on their experiences conducting two school-based studies of child growth and obesity prevalence conducted in the province of Ontario, Canada. Ethical and practical considerations shape the range of methods available to researchers

working with young children in school settings. In addition, the schools themselves impose spatial and time constraints on the research, necessitating a degree of flexibility and creativity on the part of the researcher. Attention to the processes of informed consent and assent can address the legal and ethical responsibilities of researchers working with child participants. Particular attention to the structural relationships between students, teachers, and researchers, and between the students themselves, is necessary in order to maintain a research environment that ensures both sensitivity and methodological rigor.

## 24

Determination of percent body fat using 3D whole body laser scanning: A preliminary investigation. TN Garlie[1], JP Obusek[1], B Corner[1], EJ Zambraski[2]. [1]U.S. Army Natick Soldier Center, Natick, MA; [2]U.S. Army Research Institute of Environmental Medicine, Natick, MA.

The quantification of body fat (BF) and muscle tissue is critical to the Army for evaluating the health and physical performance capacity of soldiers. The Army currently uses manually obtained measurements of body lengths, circumferences, and weight entered into gender-specific prediction equations to estimate percent BF. This method can be time-consuming and prone to error when employed by less than highly trained personnel. Three-dimensional whole body laser scanning is a relatively new technology that accurately and rapidly produces a 3D digital model of the human form, using low-power laser light and digital cameras, without making contact with the subject. We present the analysis of percent BF derived from 51 white men and women ranging in age from 18 to 62. Percent BF was estimated using body measurements obtained manually and extracted from 3D scans and input into Army prediction equations, and from dual energy X-ray absorptiometry (DEXA). Mean percent BF values were not statistically different among the three methods. The Army manual, 3D scan, and DEXA percent BF values were 18.5, 18.9, and 18.9 for males and 25.5, 23.8, and 24.2 for females, respectively ($P > 0.05$). Linear regression analysis found moderate-to-high and statistically significant ($P < 0.05$) correlation coefficients with low-to-moderate standard errors (SE) among the methods. For example, correlations between percent BF derived using manual measurements and 3D measurements were $R = 0.96$ (SE = 1.0) for males and $R = 0.96$ (SE = 1.2) for females. This preliminary study demonstrates that the application of 3D whole body laser scanning to determine percent BF is in close agreement with values determined using the current manual input/Army equations as well values obtained with DEXA.

## 25

Reproducibility of the difference in epinephrine response to work stress between women with and without a family history of breast cancer. HJ Gastrich[1], H van Berge-Landry[1], DH Bovbjerg[2], GD James[1]. [1]Binghamton University, Binghamton, NY; [2]Mount Sinai School of Medicine, New York, NY.

We recently reported that women with a family history of breast cancer (FH+) who worked outside the home had a greater epinephrine response to the stress of work than women without a family history (FH−), an effect moderated by BMI. Whether this response difference persists is unknown. The purpose of this study was to evaluate the reproducibility of the FH+/FH− difference in the epinephrine response to work. The study subjects were women (FH+, $N = 58$, age = 38.1 ± 9.3, FH−, $N = 73$, age = 36.4 ± 9.1) who were employed at one of three medical centers in NYC. Urine samples were collected across three daily environments: work (11 AM–3 PM), home (approx. 6 PM–10 PM), and sleep (approx. 10 PM–6 AM) on two midweek workdays, ~1 month apart. To assess reproducibility, a repeated measures ANCOVA was performed, and a Bland–Altman plot was constructed. The ANCOVA results showed that the FH+ women maintained higher epinephrine excretion at work over the 2 days (environment × FH and environment × FH × BMI interactions significant at $P < 0.049$ and $P < 0.053$, respectively). This was in spite of the fact that, overall, epinephrine levels dropped from the first to the second measurement ($P < 0.03$), which would be consistent with a habituation to the study procedure. The Bland–Altman plot showed that overall, and by FH group, 97.3% of the values fell within ±2 standard deviations of the expected mean difference, consistent with good reproducibility. These results suggest that the accentuated

stress response to work among FH+ women is reproducible, at least over 1 month.

Supported by NIH grant CA72457.

## 26

Nocturnal fall of blood pressure in blacks: The influence of site and hypertension status. LM Gerber[1], VA Pogue[2], K Warren[1], TG Pickering[3], JE Schwartz[4]. [1]Weill Medical College of Cornell University; [2]Harlem Hospital; [3]Columbia University Medical Center; [4]SUNY, Stony Brook.

This study investigates the diurnal rhythm of blood pressure (BP) in normotensive and hypertensive blacks studied at Harlem Hospital and New York Hospital, Cornell. Previous data indicated that while the nocturnal fall of BP ("dipping") was similar in normotensives recruited from the two sites, Harlem hypertensives had diminished dipping compared with Cornell hypertensives. We sought to replicate these findings in a new sample and to identify factors that might account for differences in dipping. Participants ($N = 145$), aged 18–65, wore an ambulatory BP monitor for 24 h and recorded awake/sleep times. Dipping was defined as the percentage drop in systolic BP during sleep. Cornell hypertensives dipped significantly more (12.6% ± 1.3%; mean ± 1 SE) than Cornell normotensives (8.7% ± 1.0%, $P = 0.02$), Harlem normotensives (9.1% ± 1.0%, $P = 0.03$), or Harlem hypertensives (7.2% ± 1.1%, $P = 0.002$), controlling for age, sex, and BMI (partial $\eta^2 = 7.2\%$, $P = 0.018$). We hypothesized that socioeconomic status might account for some of these differences. Years of education was significantly related to dipping, partial $r = 0.28$ ($P = 0.001$), and to group (partial $\eta^2 = 6.9\%$, $P = 0.03$). After controlling for education, Cornell hypertensives still dipped the most (11.1% ± 1.4%), but this was only marginally significantly greater than the Harlem hypertensives (7.8% ± 1.1%, $P = 0.07$); the overall group differences were not significant ($P = 0.32$), and the partial $\eta^2$ was only 2.8%, a reduction of more than 60%. These results confirm earlier findings that normotensive blacks at Cornell and Harlem exhibit similar nocturnal dipping, while the two hypertensive groups differ. The Cornell black hypertensives dip more than the other three groups. These group differences can largely be accounted for by education.

Supported by NIH grants P01HL47540, R24HL76857, and M01RR00047.

## 27

From evolution to osteoarthritis: Examining injury-related secondary osteoarthritis of the human knee joint as an evolutionary cost of bipedalism. JH Gosman, DE Crews. Department of Anthropology, The Ohio State University, Columbus, OH.

The human bipedal striding gait is a major aspect of human adaptability and our success as species. It does, however, come with costs: trade-offs. The purpose of this research is to examine the evolutionary cost of human bipedal locomotion, as observed in the knee joint. Our hypothesis is that structural and morphological changes about the knee related to bipedal locomotion provide an evolutionary explanation for the high prevalence of injury-related secondary osteoarthritis of the knee in extant humans. This is a focused synthesis of published data. We develop detailed linkages between the evolutionary comparative anatomy of hominids and osteoarthritis of the human knee joint, including pertinent anatomical changes, clinical correlations, articular cartilage biology, response to injury, proposed senescent processes, and the pathogenesis of injury-related osteoarthritis. The hypothesis presented is supported by this review. The patellofemoral joint, menisci, and anterior cruciate ligament have been placed at particular risk of injury by evolutionary changes to the knee joint related to the bipedal gait and the need for enhanced knee stability. Chondral damage from injuries to these structures can lead to increased metabolic stress, accelerated chondrocyte senescence, and biomechanical failure of the articular surface: the end result of which is secondary osteoarthritis. We are concerned with the subset of injury-related secondary osteoarthritis within the universe of constitutional susceptibilities and mechanical risk factors: heredity, gender, obesity, osteoporosis, smoking, aging, trauma, joint, shape, alignment, and usage. An evolutionary perspective on knee osteoarthritis as a correlate to human bipedalism offers insights into advanced preventative measures, innovative therapeutic interventions, and a more nuanced anthropological interpretation on pathological conditions affecting the knee joint.

## 28

Investigating hormones and implicit social cognition: No relationships between salivary testosterone and cortisol and computer-based tests among Jamaican males. PB Gray[1], JC Parkin[1], M Samms-Vaughan[2]. [1]Department of Anthropology, University of Nevada, Las Vegas, NV; [2]Section of Child Health, University of the West Indies, Mona, Jamaica.

Testosterone and cortisol have been linked with male mating effort (mate seeking and male–male competition). Male interest in mating effort can be assessed through implicit (subconscious) tests of social attentional bias. Here, we pilot the use of computer-based tests of implicit male social cognition through research in Jamaica. Computer tests employed a pictorial Stroop task. Subjects identified colors overlaying facial images; reaction times served as measures of implicit social cognition. We recruited 27 males aged 18–38 (mean = 27.9) to participate in the greater Kingston area. Subjects provided two saliva samples from which testosterone and cortisol levels were measured and averaged. Subjects also completed questionnaires and computer-based tasks. Results revealed no significant relationships between either testosterone or cortisol levels and attentional biases toward angry faces, alluring female faces, faces of warm mates, and faces of babies (all $P > 0.05$). Results remained unaffected when adjusting for potential confounding variables of subject age, BMI, and time of saliva collection. We discuss possible factors underlying these negative results. We also suggest directions for future research, utilizing tests of social attentional bias in crosscultural settings.

This research was funded in part by the Yale Center for Human and Primate Reproductive Ecology.

## 29

Fertility of agropastoralist Karimojong women in Northeast Uganda. SJ Gray. Department of Anthropology, University of Kansas, Lawrence, KS.

Nomadic pastoralists in East Africa have experienced profound ecological and social stress in the last three decades, resulting from increasingly dry conditions, frequent droughts and famines, disease outbreaks, political and economic turmoil, and escalating armed violence. This study examines fertility responses to these effects among 304 Karimojong women, monitored between 1998 and 2004. Fertility differentials in two cohorts of women—one born before 1955, and one, in 1955 or later—in two territorial sections of the Karimojong, Mazeniko, and Bokora are considered. Total fertility rates are higher among women in the younger cohort, a consequence of significantly shorter birth intervals (2.7 vs. 3.9). The role of infant and child mortality in this differential was estimated using (maternal) age-specific child mortality rates. Mazeniko mortality was higher than Bokora for both cohorts. By age 44, a Mazeniko woman born before 1955 had given birth to 6.4 children, of whom 2.7 had died (42%). Estimates for the post-1955 cohort are 8.3 births and 3.4 deaths (41%). In the pre- and post-1954 Bokora cohorts, estimates are 6.2/2.2 (33%) and 8.4/2.2 (26%), respectively. Higher fertility in post-1955 Bokora is not explained by higher child mortality; rather, both increased fertility and declining child mortality are explained by increased maternal literacy and utilization of medical services since the 1970s—results of modernization in the wake of cattle losses. In Mazeniko, where the preservation of livestock herds through armed violence is embraced as an ethos, improvements in health care have been countered by multiple stressors, which include violence, alcohol abuse, and marital instability.

This research was funded by Wenner-Gren Foundation Grant 7131, the General Research Fund of the University of Kansas, and the Harry Frank Guggenheim Foundation.

## 30

Plant neurotoxins and brain development: Implications for encephalization in Homo. EH Hagen[1], RJ Sullivan[2]. [1]Institute for Theoretical Biology, Humboldt University, Berlin, Germany; [2]Department of Anthropology, California State University, Sacramento, CA.

Successful development of the mammalian brain depends crucially on highly coordinated inter- and intracellular signaling cascades. Expression of several nicotinic acetylcholine receptors (nAChRs) subunit mRNAs, for example, is increased in fetal vs. adult brains, suggesting an important developmental role for nAChRs in modulating dendritic outgrowth, establishment of neuronal connections, and

synaptogenesis. Serotonergic receptor levels also peak in fetal or early neonatal life, later declining to adult levels. And in the dopamine system, the highest number of D1 and D2 receptors occurs in the immature brain. Developmental diseases characterized by severe cognitive deficits, such as Down syndrome and autism, have been linked to disruption of serotonergic and other neurotransmitter systems.

Plant toxins evolved to target and disrupt key cell signaling pathways in the peripheral and central nervous system. Nicotine targets nAChRs, ergot alkaloids target serotonin receptors, and cocaine targets the dopamine system, for example. Owing to its large size and extended period of development, the human brain is, arguably, uniquely vulnerable to disruption by plant neurotoxins. Thus, the reduced exposure of Homo to plant neurotoxins relative to other primates and other mammals, as suggested by a reduced compliment of xenobiotic metabolizing genes and other evidence, may have been an important factor in the encephalization of this genus.

## 31

A comparison of characteristics of cerebral activity of prefrontal region and behavior between the young adults and the elderly whilst driving. H Harada[1], H Nashinhara[1], K Morozumi[1], H Ota[1], E Hatakeyama[2]. [1]Department of Industrial Design, Tohoku Institute of Technology, Sendai, Miyagi; [2]Kansei Fukushi Research Center, Tohoku Fukuchi University, Sendai, Miyagi.

The purpose of this study is to investigate the difference of cerebral activity characteristics of prefrontal region between young adults and elderly during driving. The procedure of the experiment was explained to the subjects, and informed consent was obtained from them. Fourteen male young adults (21.6 ± 0.76 years), seven male (71.3 ± 4.03 years) and seven female elderly (66.6 ± 6.02 years) volunteered as subjects for the experiments. Noninvasive measurement of regional cerebral blood flow was estimated by measuring deoxygenated hemoglobin, oxygenated hemoglobin, and total hemoglobin of both sides of prefrontal region, using the near-infrared spectroscopy and the time resolved spectroscopy. The distance between the experiment car and the car in front, speed, and braking were recorded, and the behavior of the drivers were obtained using the CCD camera and video recorder. Temperature and relative humidity in the experiment car were 23–25°C and 30–40% RH, respectively. Background noise in the car was 50–65 dB (A). Cerebral activity of prefrontal region of elderly showed lower than that of young adults. Cerebral activity of prefrontal region might decrease faster in male than in female, with aging. Cerebral activity of prefrontal region of elderly did not show much changes compared with young adult subjects during driving. The experienced young adult subjects showed lower prefrontal activity than that of the less-experienced subjects during driving. In the present experiment, it was revealed that cerebral activity of prefrontal region decreases with experience for driving and aging, especially for male. It could be possible to evaluate the driving characteristics and adaptability of driving by means of analyzing the behavior of driving and brain hemodynamics changes.

This research was supported in part by a Grant-in-Aid for Scientific Research (A) (2) No.15207025 from the Japan Society for the Promotion of Science.

## 32

Reduced bone cortical thickness in boys with autism or autism spectrum disorder. ML Hediger[1], LJ England[2], CA Molloy[3], KF Yu[1], P Manning-Courtney[3], JL Mills[1]. [1]DESPR, NICHD, Bethesda, MD; [2]NCCDPHP, CDC, Atlanta, GA; [3]CCHMC, Cincinnati, OH.

Comorbid gastrointestinal absorption disorders and dairy-free diet use are frequent, but no studies have determined whether bone development is suboptimal in boys with autism/ASD. We evaluated the bone development of 75 boys with autism/ASD, ages 4–8 years, along with special diet (casein-free), supplement, and medication usage. On hand-wrist radiographs, we measured second metacarpal medullary width and cortical thickness (CT), an indicator of appositional bone growth. CT was compared with reference medians (% deviation) and analyzed, adjusting for stature, bone age, dairy-free diets, and antiepileptic drugs. Subjects were 6.6 ± 1.5 years old, 88% white, 12% on dairy-free diets, relatively tall ($z$-score +0.59 ± 1.01), and heavy ($z$-score +0.87 ± 1.12) for age. CT significantly increased from 4 to 8 years, 2.3 ± 0.4 to 2.9 ± 0.4 mm ($P < 0.001$); MW was constant (3.2 ± 0.5 mm, $P = 0.59$). At ages 4 and 5, CT did not

differ from reference medians. At ages 6 through 8, % deviations were significant ($P < 0.01$), as was the progressive fall-off with age ($P = 0.02$ for trend): (+3.1 ± 4.7)%, (−6.5 ± 4.0)%, (−16.6 ± 3.4)%, (−19.4 ± 3.7)%, (−24.1 ± 4.4)%, ages 4–8, respectively. Boys on dairy-free diets had CT % deviations of –(18.9 ± 3.7)%, nearly twice that with unrestricted diets (−10.5% ± 1.3%, $P < 0.04$). Boys with autism/ASD show a progressive slowing of appositional bone growth between 4 and 8 years, with the discrepancy being significant by age 6. Bone development should be monitored at these ages, especially if the boys are on dairy-free diets. More precise measurement of bone development may be warranted to confirm these findings.

This work was supported by an intramural grant (Z01 HD008742) from the NICHD.

## 33

The influence of household composition on the relationship between social support and health status among women of El Alto, Bolivia. KA Hicks, WR Leonard. Department of Anthropology, Northwestern University, Evanston, IL.

As in other parts of the developing world, Bolivia has experienced rapid urbanization associated with economic difficulties in rural areas. Over the past 50 years, El Alto, the largely indigenous satellite of the capital city La Paz, has grown from a small settlement to a large city in its own right. However, the harsh realities of life in this periurban community include limited access to formal employment and social services. An important phenomenon associated with urbanization in many areas is the increasing prevalence of single parent households headed by women. These households are generally poorer and have fewer economically active members. We predict that instrumental (economic) social support is a critically important coping mechanism for women in this marginal urban environment, and that women's use of social resources will have important implications for their health. Further, we propose that instrumental social support will be particularly important for female-headed-households, given their relative poverty. This poster uses multiple linear regression analysis to examine the interactive influence of household composition and access to instrumental social support on variation in body composition among 92 women from a knitting cooperative in El Alto, Bolivia. We expect that social support will be a stronger predictor of nutritional status among women heading their own household than among women in male and dual-headed households. These analyses highlight the importance of socioeconomic context in shaping the influence of social support on health outcomes.

Funded in part by a Graduate Research Fellowship from Northwestern University.

## 34

Nutritional status, gender and caregiving among Luo elders—revisited. G Ice[1], J Yogo[1], E Juma[2]. [1]Department of Social Medicine, Ohio University College of Osteopathic Medicine, Athens, OH; [2]Kenya Medical Research Institute, Kisumu, Kenya.

The high mortality rate of adults with HIV/AIDS has produced ~11 million orphans in Africa, the care of which has largely been left to grandparents. While there is an increasing awareness of the effect of HIV/AIDS on families and family structure, little is known about the effect of caregiving on older adults. Previous studies of the Luo indicated that there was a gender difference in the impact of caregiving on nutritional status, such that female caregivers had lower fat levels than noncaregivers and male caregivers had higher fat levels than noncaregivers. In this study, 389 Luo elderly (age = 73 ± 8) were recruited from Nyanza, Province, Kenya. Participants were interviewed for demographic and social variables. Anthropometric measurements were used to assess nutritional status. Energy expenditure was measured using Actical activity monitors. In this sample, all caregivers, regardless of gender were found to be relatively advantaged nutritionally than do noncaregivers. Arm circumference ($P = 0.02$), BMI ($P = 0.04$), triceps skinfold ($P = 0.002$), and sum of skinfolds ($P = 0.01$) were all greater among caregivers. The number of orphans in the household was positively associated with triceps skinfold ($P < 0.05$) and sum of skinfolds ($P < 0.05$). Caregivers were found to have greater average energy expenditure than noncaregivers ($P = 0.05$). Energy expenditure was positively correlated with several measures of body habitus. Currently, grandparents appear to benefit from taking orphans into the homestead. Although this sample differ somewhat

from previous samples, it is not clear why the relationship between gender, nutritional status, and caregiving have changed over the years.

This project was funded by the National Science Foundation Grant No.0515890.

## 35

Nocturnal urine flow rate increases with age in working women. GD James. Binghamton University, Binghamton, NY.

Studies of diurnal urinary metabolite variation often adjust the values for urine flow rate (UFR), as it can affect the total amount of metabolite excreted. While it is recognized that UFR is critical in assessing these values, the diurnal variation in UFR itself is rarely if ever evaluated. Therefore, the purpose of this study was to examine the diurnal variation UFR in women who worked outside the home. The study subjects were 124 women (age = 33.0 + 8.1) who were employed at a major medical center in NYC. Urine samples were collected across three daily environments: work (11 AM–3 PM), home (approx. 6 PM–10 PM), and sleep (approx. 10 PM–6 AM) on a midweek workday. UFR in these samples was calculated as (sample volume/number of minutes per collection period) and is expressed as ml/min. To evaluate UFR variation, the women were classified into three age groups (20–29.9, $N = 47$; 30–39.9, $N = 48$; 40–49.9) and by ethnicity. Iterative repeated measures ANCOVA models were used to evaluate the diurnal variation in UFR. The results showed that in the total sample, on average, there was a significant linear decline in UFR from work to sleep ($P < 0.008$), which was also influenced by BMI ($P < 0.03$). There was no significant variation by ethnicity, nor by age group overall; however, there was an age group × environment interaction, such that women in the 40–49.9 age group tended to have a higher UFR than women in the 30–39.9 age group ($P < 0.05$) and 20–29.9 age group ($P < 0.07$) during sleep. The average UFR of the 40–49.9 age group also tended to increase from work to sleep. These data suggest that UFR varies significantly over the day in women, and that the pattern of variation may change with age.

Supported by NIH grant HL47540.

## 36

Nutrition transition and health consequences among Kenyan elders. KN Jackson, SL Horwitz, J Yogo, GH Ice. Department of Social Medicine, Ohio University College of Osteopathic Medicine, Athens, OH.

For centuries, third world countries have been devastated by undernutrition. Currently, however, more nations have encountered a dual burden of both overnutrition and undernutrition within the same households. This phenomenon has been labeled by some as the "nutrition transition." With overweight and obesity on the rise, many have predicted increasing prevalence of chronic diseases, such as cardiovascular disease and diabetes. Few studies have focused on Africa in regards to the nutrition transition. This study aimed to examine the prevalence of undernutrition, overweight, and obesity among Kenyan Luo elders, and to examine associated disease prevalence. Three hundred and eighty-nine Luos (age 73 ± 8 years) were recruited from Western Kenya. A number of anthropometric measurements were taken to assess levels of body fat, and glucose and lipids were assayed by finger stick. Undernutrition was found in 116 individuals, normal weight in 234 individuals, overweight in 28 individuals, and obesity in 12 individuals. BMI categories were associated with total cholesterol ($P = 0.002$), glucose ($P = 0.02$), and systolic and diastolic blood pressures ($P = 0.006$ and $P < 0.001$, respectively). Several anthropometric variables (waist, tricep, calf and subscapular skin folds and arm, waist and calf circumferences) were associated with BMI, blood pressure, body weight, and total cholesterol. This study demonstrates that the dual burden of overnutrition and undernutrition coexist in this population, and with increasing levels of weight and obesity, there are significant health consequences.

## 37

Fetal programming and early childhood growth insult: Neglected in discussions of the causation of US adult health disparities. SO Keita[1], P Payne, Jr[2], AK Pascalev[2,3], C Royal[2]. [1]Department of Anthropology, Smithsonian Institution, Washington, DC. [2]GenEthics Unit, National Human Genome Center at Howard University, Washington, DC; [3]Department of Philosophy, Howard University, Washington, DC.

Health disparities between the adult segments of the traditional socially and politically defined United States census and/or ethnoancestral groups, sometimes erroneously called races, are well-known. The explanations for the differences have usually invoked social, environmental, cultural, and political factors acting on adults, or even suggested a hereditary genetic or so-called racial origin. The discussion of the environmental impact on health has not generally considered the fetal programming/developmental hypothesis in the causation of adult chronic disease in more affected groups in the US case. The fetal programming and early life insult (ELI) (Barker) hypothesis is based on historical observations, especially those related to the "Dutch famine," and now experimental work. The core idea of the hypothesis is that adult disease has its origins in intrauterine adaptive physiological changes that occur within a fetus, in response to factors affecting the mother. Fetal programming/ELI is stated to account for the emergence of various chronic diseases during middle age, in individuals who had been apparently healthy as children, adolescents, and young adults. (It is of some interest to consider whether or not the children, and even grandchildren of those women born into US and South American slavery in some cases, would also provide historical data supporting the fetal programming/ELI hypothesis.) Here, this neglected model of disease origin is considered as possibly having an unrecognized role in explaining the adult intergroup disparity statistics currently observed for chronic diseases. It is suggested that given the cost to individual, community, and national well-being, the issue of maternal and child well-being might well be considered an issue of human rights, and just not one of "nice" social policy.

## 38

Mitochondrial DNA variation of ancient and contemporary Andean populations of Peru. BM Kemp[1], TA Tung[1], S Summar[2], J Canter[2], ML Summar[2]. [1]Department of Anthropology, Vanderbilt University, Nashville, TN; [2]Center for Human Genetic Research, Vanderbilt University Medical Center, Nashville, TN.

Analysis of mitochondrial DNA (mtDNA) has been instrumental in aiding reconstruction of Native American prehistory and determining population relationships. The study of ancient DNA (aDNA) combined with archaeological data provides a unique way to reconstruct the past because the unified datasets can identify and locate genetic types both spatially and temporally. Combining data from both modern and ancient populations allows one to document genetic change through time and contributes to more nuanced views of past and current population relationships. To this end, we conducted an extensive study of mtDNA variation found in central Peruvian Andean communities. During the Summer of 2006 we collected 110 DNA samples, in the form of saliva, from four highland Peruvian communities in the Department of Ayacucho, all of whom reside at >2,700 m above sea level. DNA was extracted from samples using the Oragene DNA Self-Collection kit. This noninvasive technique facilitated the collection of these samples in the field and resulted in high quantities of DNA. Mitochondrial DNA variation exhibited by these communities was determined by screening the samples for the coding region mutations definitive of Native American mtDNA haplogroups. Furthermore, haplotypes were determined by sequencing the entire d-loop region of the mitochondrial genome. These data effectively double current knowledge of Peruvian haplotypic variation and, combined with previous studies of indigenous Peruvian genetic variation, form the basis through which we contextualize additional data obtained from ancient skeletal remains in the same region. Here we present preliminary data on genetic variation and change over several millennia in Peru.

## 39

Allostatic load among elderly residents of Hizen, Oshima island. Y Kusano[1], DE Crews[2], Y Sone[3], H Harada[4], Y Sawada[5]. [1]Faculty of Contemporary Social Studies, Nagasaki Wesleyan University, Japan; [2]Anthropology and Public Health, The Ohio State University, Columbus, OH; [3]Graduate School of Human Life Science, Osaka City University, Japan; [4]Department of Industrial Design, Tohoku Institute of Technology, Japan; [5]Public Health and Welfare, Saikai City, Japan.

A composite estimate of physiological responses to stressors, allostatic load (AL), was developed using United States samples. Its applicability in crosscultural settings has not been verified. We examine AL as a predictor of health-related measures in a rural Japanese sample. Between July and September

2005, elders from Hizen, Oshima Island, Nagasaki Prefecture, Japan were measured. Our first 27 participants had an average age of 71 years, range 52–89 years, SD 7.4 years. In total, 33 aspects of physical and physiological variation were assessed for these 15 women and 12 men. As expected from previous studies of Japanese, our sample shows slightly elevated blood pressure on average (142/81 mm Hg, SD 16/10) and is relatively lean (waist/hip = 0.9: SD 0.06) when compared to European or American standards. However, their average total cholesterol (TC = 210 mg/dl, SD = 42.8) is rather high compared to standards, as is their high-density lipoprotein cholesterol (HDLc = 55.4 mg/dl, SD = 15.1). Means, standard deviations (SD), ranges, and upper bounds for quartile cut-points for all 10 variables used in the calculation of allostatic load (AL) were assessed. The overall average estimate for AL is 3.1 (SD = 1.58) and ranges from 1 to 7. AL was associated significantly with variation in blood glucose, dopamine, and uric acid, and varied between men and women, but was poorly correlated with age. These results suggest that AL may be usefully applied crossculturally.

## 40

Analysis of orbital roof thickening in association with cribra orbitalia within a medieval population in Nubia's Batn el Hajar. B Kyle[1], DP Van Gerven[2]. [1]Department of Anthropology, Ohio State University, Columbus, OH; [2]Department of Anthropology, University of Colorado, Boulder, CO.

Cribra orbitalia, a porotic lesion of the orbital roof, has been associated with iron deficiency anemia in a wide range of prehistoric populations, including remains from the Medieval Christian site of Kulubnarti, in Sudanese Nubia (Carlson et al., 1974; Lallo et al., 1977; Mensforth, 1985; Stuart-Macadam, 1987a). Other cranial changes have also been observed and associated with anemia—particularly thickening of the diploic space of the cranial vault (Stuart-Macadam, 1987b). A clear association between the orbital and vault changes has also been established. It is now generally accepted that cribra orbitalia is a childhood manifestation, while diploic thickening has been associated with the adult years (Stuart-Macadam, 1985). A third skeletal response has also been proposed, but this response has received virtually no investigation. Anemia, according to Stuart-Macadam, is also associated with thickening of the orbital roof (1987b, 1989).

The present investigation explores the relationship between orbital roof thickening and the better-understood manifestations of cribra orbitalia and thickening of the cranial vault using a sample of human remains from the Medieval site of Kulubnarti in Nubia's Batn el Hajar.

Our results suggest that orbital roof thickening does not represent a third skeletal manifestation, but rather an aspect of cribra orbitalia itself. Furthermore, there appears to be no association between thickening of the orbital roof and that of the cranial vault.

This research was supported by the Undergraduate Research Opportunity Program (UROP) at the University of Colorado at Boulder.

## 41

A fish tale: The Coast Salish and their comparative low prevalence of diabetes in relation to other Canadian First Nations. JL Lamont. Department of Archaeology, University of Calgary, Calgary, AB.

Aboriginal ancestry is a known risk factor for type 2 diabetes (T2D). The Coast Salish of British Columbia, Canada, exhibit comparatively low rates of T2D in spite of this association. Current day political intervention provides the Coast Salish with annual allotments of salmon for their dietary use. The consumption of salmon is argued here to be beneficially affecting their rates of T2D. Previous studies have noted such an association in other populations; however, connecting this phenomenon at the molecular level has been both promising and problematic. Most works attempt to focus on just one component of fish, usually long-chain polyunsaturated fatty acids (n-3 LC PUFAs), but results regarding glycemic control have not always been consistent. This paper hypothesizes more specifically that the consumption of fish, such as salmon, contributes to a synergistic relationship between n-3 LC-PUFAs, including eicosapentaenoic acid and docosahexaenoic acid, and arginine. The n-3 LC-PUFA content is suggested to be advantageously contributing to membrane lipid profiles, in addition to offering protection against impaired glucose tolerance and insulin resistance. L-Arginine, as a precursor to ni-

tric oxide (NO) production, is attributed here to countering the often-cited detrimental effects that fish oil supplementation has been shown to have on glycemic control. Additionally, L-arginine through NO production is acknowledged for its contribution to endothelial health, which allows for the delivery of insulin to the interstitial space. Combined, these dietary factors are suggested to be positively affecting the low prevalence of diabetes in the Coast Salish First Nations of British Columbia.

## 42

Social determinants and childhood overweight and obesity in elementary school children. R Lazenby[1], S Angus[1], T Galloway[2], H Huynh[3]. [1]Anthropology Program, University of Northern British Columbia, Prince George, BC; [2]Health Sciences Program, University of Northern British Columbia, Prince George, BC; [3]Northern Medical Program, University of Northern British Columbia, Prince George, BC.

Overweight and obesity (OW-OB) is recognized as a serious health problem of pandemic proportions, and one no longer restricted to adult ages. In this study, we examine OW-OB prevalence in 283 children (grades 1–6; ages 6–14 years) from four elementary schools representing high, moderate, and low socioeconomic status neighborhoods. Means from triplicate measures for height (m), weight (kg), waist, and hip circumference (cm) are translated as body mass index ($kg/m^2$), height-for-age and weight-for-age, and the waist-hip ratio, and contrasted against established standards (e.g., CDC, 2000), from which *z*-scores were obtained for ANOVA and crosstabulation analysis. Social determinants of health were derived from 2001 Canadian census data for income parameters, attained education of parent(s), single parent household incidence, and ethnicity (aboriginal versus "other"). Results indicate that (1) significant differences exist for social determinants among the four neighborhoods; (2) prevalence of OW children (>85th percentile) in two of four neighborhoods exceeds age- and sex-matched standards, while OB (>95th percentile) rates in all schools match standards, though the lowest SES neighborhood has OB prevalence almost twice as high; (3) OW-OB rates are greater among aboriginal children and among younger children (<9 years of age). This study demonstrates that the trend to OW-OB transcends a simple social determinants analysis. In our sample, children across all social strata are progressing toward higher body mass, although the trend is more marked among the relatively disadvantaged.

## 43

Health transitions in school children: Obesity and overweight in Broome County, New York. MJ Lichtenfeld[1], H Worne[1], S Walker[1], A Tavares[1], D Lynch[1], C Chan[1], C Arber[1], D Gebo[1], S Sunderman[1], L Soloway[1], K Needham[1], CA Edwards[2], S Delafield[2], MA Little[1], RM Garruto[1]. [1]Graduate Program in Biomedical Anthropology, Binghamton University, Binghamton, NY. [2]Broome County Health Department, Binghamton, NY.

The prevalence of obesity in adults and children has risen drastically over past decades, becoming a global epidemic affecting millions of individuals. This obesity epidemic is a likely result of modernization and lifestyle changes. The goal of this study was to test the central hypothesis that levels of child obesity seen in first and second generation children of immigrants aged 10 and 11 years in public schools are increasing when compared to multigenerational (third generation or more) U.S.-born children of all ethnic backgrounds. The first aim of this study was to determine the cross-sectional prevalence rate of childhood obesity in 750 Broome County, NY children by ethnicity and immigration status in three middle schools through anthropometric measurements (height, weight, bioelectrical impedance analysis, tricep skinfold thickness, and middle upper arm, waist and hip circumferences). Preliminary data suggest that almost one-third of the children are overweight and almost one-third are obese. The second aim was to identify the specific factors associated with the prevalence of obesity through ethnographic analysis, to determine level of social integration and the impact of modernization. An ethnographic questionnaire addressed diet and physical activity levels (including time spent with screen media), and eating behaviors in school cafeterias were assessed through observation. The third aim, in conjunction with the Broome County Health Department, was to develop an action-based intervention and prevention program within a cultural-, school-, community-, and home-based framework to help prevent chil-

dren of all ethnic backgrounds from becoming obese.

## 44

Cognitive and behavioral effects of iron deficiency in young rhesus monkeys (*Macaca mulatta*). GR Lubach, CL Coe, HR Crispen, Harlow Center for Biological Psychology, University of Wisconsin, Madison, WI.

A number of studies have found impaired cognitive and behavioral development in iron-deficient (ID) infants and children. In our nonhuman primate model, we have been examining the consequences of naturally occurring iron deficiency in infant monkeys. This model allows us to eliminate other nutritional, socioeconomic, or infectious factors that are often associated with anemia in humans. We found that approximately one-third of the monkey infants became ID by the weaning age of 6 months. Once consuming solid foods and living away from the mother in peer groups, most infants regained a normal hematology by 8 months of age. Cognitive testing started at 8 months with adaptation to the Wisconsin General Testing Apparatus (WGTA), followed by training for a series of learning tasks. The monkeys were first trained on Black/White Discrimination, followed by Black/White Reversal. For this task, monkeys had to choose between a black or white block, of which one was always rewarded with a favorite food. After reaching criteria, the monkeys were required to learn that the opposite color was now rewarded. ID monkeys were slower at mastering the discrimination task, and were significantly slower at learning to switch to the new color ($P < 0.\ 04$). A behavioral rating was completed at the end of each test session. The ID infants were significantly less task-oriented ($P < 0.03$) and less goal-oriented ($P < 0.01$) by the second day of the reversal task. These learning tasks were undertaken while the monkeys were no longer ID, and suggest a persistent effect of ID on brain maturation. Structural analyses of brain development with noninvasive magnetic resonance imaging are now underway.

Support: HD39386.

## 45

Changes in mid upper arm somatic muscle allocation among Bangladeshi male migrants to the UK. KS Magid[1], FU Ahamed[2], GR Bentley[3]. [1]University College, London; [2]Chittagong University, Bangladesh; [3]Durham University, UK.

Reproductive ecology predicts that changes in environmental conditions that lead to increased energetic availability will result in enhanced testosterone levels and anabolic muscle tissue in human males. While apportionment of somatic muscle tissue remains plastic throughout the human male life course, the effects of increased energy availability on muscle allocation are expected to be more pronounced in younger males compared with older males. In a previous study, we demonstrated an increase in free testosterone among male migrants from Bangladesh to the UK under 40 years of age. In the present study, we assess the effects of changes in energetic availability on morphology, through measures of midupper arm muscle tissue in the same subjects.

Anthropometric measures of bone stature (standing height and arm length) and proxies of soft tissue somatic allocation (BMI, midupper arm area, mid upper arm muscle + bone area) were collected on adults aged >40 ($n = 28$) and <40 ($n = 29$) who migrated from Bangladesh to the UK, aged 1–57 years. A group of resident males who remained in Sylhet, Bangladesh, all their lives ($n = 76$) were used as a reference.

In line with our hypothesis, results show that age at migration significantly predicted an increase in mid upper arm muscle tissue for males <40 years, but was not a significant predictor for males >40. These findings suggest reproductive effort, as measured in anabolic effects of increased testosterone is responsive to changes in energetic availability subject to age at migration. Such responsiveness could hold later health implications for androgen-related disease in migrant men.

Supported by the Prostate Research Campaign (UK) and ESRC (UK).

## 46

Family characteristics of overweight Latino migrant children in southern New Jersey. DL Markowitz[1], Sheila Cosminsky[2]. [1]Rowan University, Glassboro, NK; [2]Rutgers University, Camden, NJ.

The presently agreed upon terminology labels children between the 85th and 95th percentiles and ≥95th percentile for BMI as "at-risk-of-overweight" and "overweight" instead of "overweight" and "obese," because of the labile body habitus in growing children, as well as for children's self esteem. Yet longitudinal growth studies have demonstrated that overweight in childhood is a significant predictor of overweight in adolescence which, in turn, is a significant predictor of adult obesity. All of the participants in these studies that demonstrated this were settled individuals who could be relied upon to be available for continuing measurement. Such information is not available for migrating children, because of the difficulty of following them over the growth period. In this study, it was possible to create a mixed longitudinal data base when 104 children returned to the same migrant summer school at least once over the course of 8 years. Previously, a cross-sectional study of a sample of migrant Hispanic children demonstrated that the prevalence of overweight and stunting significantly exceeds that among children in the most recent NCHS studies. The results of this study indicate that, during the successive summers when the children were examined, 23% became either at-risk-of-overweight or overweight. By the last measurement, 55% were either at-risk-of-overweight or overweight. These children had significantly greater BMI than did the children who did not return to the summer program ($P < 0.001$), but were also significantly taller ($P < 0.0001$). The results of interviews with migrant parents demonstrated a variety of factors that influence the frequency of overweight in their children and, significantly, revealed that TV viewing and eating out at fast food restaurants are not causal in their weight gain.

## 47

Temporal trends in adiposity and overweight in Samoan children and adolescents. ST McGarvey[1], ED Keighley[1], S Viali[2], J Tuitele[3]. [1]International Health Institute, Brown University, Providence, RI; [2]Ministry of Health, Apia, Samoa; [3]Department of Health, America Samoa, Pago Pago, AS.

We describe temporal trends in childhood adiposity and overweight from the 1970s to 2002–2003 in 2,403 boys and girls 6–17 years of age from American Samoa and Samoa. We report mean BMI and proportions of normal, overweight, or obese children using the standards developed by Cole et al. (2000). In 2002, in American Samoa the childhood age-specific BMI levels exceed those of Hawaii in 1975–1977 in all, but one age and sex group. For example, in Samoan girls 15–17 years of age from Hawaii in 1975–1977 mean BMI was 26.5 kg/m$^2$, and in 2002 in American Samoa in the same age and sex group mean BMI was 30.7 kg/m$^2$. Within American Samoa, there was a strongly increasing temporal trend in age- and sex-specific childhood BMI from 1978 to 2002. In adolescents 12–17 years of age, the temporal BMI increases over 24 years ranged from 3.6 to 5.8 kg/m$^2$ in boys and 4.9 to 5.8 kg/m$^2$ in girls. Approximately 70% of boys and over 80% of girls 15–17 years of age in American Samoa in 2002 are overweight or obese.

Between 1979–1982 and 2003, average BMI increased in every age group of children living in Samoa. While the increases have not been as drastic as those in American Samoan children, average BMI has increased between 0.8 and 0.9 kg/m$^2$ for boys and 0.7 and 1.7 kg/m$^2$ for girls 6–11 years. Levels of BMI rose more rapidly in adolescents, 12–17 years, with increases of 0.9–1.4 kg/m$^2$ in boys and 2.1–2.9 kg/m$^2$ in girls.

Supported by NIH Grant R01DK59642.

## 48

Scottish clan mating, marriage, and migration customs: A study of Scottish-American identity and mitochondrial lineages. ML Mealey-Ferrara, KG Beaty, MH Crawford. Department of Anthropology, University of Kansas, Lawrence, KS.

Many Americans of Scottish ancestry often define their basic identity as "Scottish." We wondered if this identity would be supported on a genetic level. This study examines mitochondrial DNA variation from 60 individuals with Scottish surnames and/or claiming Scottish descent. Mouth-rinse samples were collected at the Kansas City Scottish Highland Games and utilized for DNA extraction. These individuals represent 38 Scottish Clans based on surnames and questionnaires. mtDNA samples were characterized by sequencing the hypervariable region I, using primers: L15976 and H16401. Further typing by restriction fragment length polymorphisms allowed for

additional characterization of individuals belonging to haplogroups H, U, and V (Macaulay et al., 1999, Torroni et al., 1996, Helgason et al., 2001). Results of this study show the presence of haplogroups H, U, J, T, and K at frequencies comparable to previous published studies of Scottish individuals (Helgason et al., 2001). This study found that 46% of the individuals were typed as haplogroup H, as expected with individuals of matrilineal Scottish descent. However, several subhaplogroups that have very low frequencies in published Scottish sequences, such as U5a1 and U5b, are present in the sampled population. Additional sampling and analysis from a larger population in Cromarty, Scotland, is planned.

This research is funded by Clan Donald, USA Academic Scholarship.

## 49

Seasonal variation in leptin levels among the Tsimané of lowland Bolivia. AA Miller[1], WR Leonard[1], TW McDade[1], R Godoy[2], V Reyes-García[3], T Huanca[2], L Witt[1]. [1]Department of Anthropology, Northwestern University, Evanston, IL; [2]Heller School of Social Policy and Management, Brandeis University, Waltham, MA; [3]Universitat Autònoma de Barcelona, Bellatera, Barcelona, Spain.

Leptin is a hormone secreted primarily by adipocytes that acts as an important indicator of energy status for various physiological systems (e.g., reproduction, immune function). Much of our current understanding of the functional significance of leptin comes from studies conducted in Western populations, with relatively high levels of adiposity. Consequently, we have limited information on how leptin levels vary in response to conditions of ecological stress and marginal food availability. This paper examines the influence of body composition and seasonality on variation in leptin levels among the Tsimané Amerindians of lowland Bolivia. Anthropometric data and bloodspot samples were collected during the wet and dry seasons for 23 women and 18 men (>18 years of age). Leptin levels of both Tsimané men and women are low relative to those of adult populations of the industrialized world; however, they are similar to those of Tsimané children and adults of other Amazonian populations. Leptin levels are significantly correlated with key measures of adiposity in Tsimané females, while this relationship is unclear in males. Overall, the seasonal changes in both fatness and leptin levels appear to be relatively modest in Tsimané adults. These results provide important insights into how subsistence-level human populations regulate energy balance in the face of environmental seasonality.

Research supported by the National Science Foundation (BCS-0424396; BCS-0322380) and Northwestern University.

## 50

Evaluating the cultural value of elder women, communal responsibility for children, and implications for reproductive success. H Miller, AG Young, IL Pike. Department of Anthropology, University of Arizona, Tucson, AZ.

We take a biocultural perspective to examine the impact of elder women's presence in a household for health and survival outcomes for children. In particular, we ask if in gerontocratic societies we can expect to find improved child survival in households where supportive elder women are present. Data is drawn from two Nilotic-speaking pastoral populations, nomadic Ngisonyoka Turkana of northern Kenya, and seminomadic Datoga of northern Tanzania. Both groups are polygynous and live in large extended households where children are highly valued and linked to social standing for men and women. Preferential buffering of pregnant or lactating women and children by elder women in a compound has been documented in both groups. Variation exists in the degree to which younger women can rely on natal kin for support between the two groups, making the role of supportive elder women in the household important.

Drawing on two mixed-longitudinal samples, we examine variation in child health outcomes by younger women's perceptions of the support they receive from elder women in their household. The Turkana data were collected as part of a study on pregnancy outcomes, and the Datoga data were drawn from a study on care-taking and infant vulnerability. We examine the role of culturally sanctioned social support on health outcomes, but suggest that placing results within the larger context of collective responsibility offers a more nuanced understanding of reproductive success. Such questions inform current litera-

ture on social support and health, and cultural consonance in ideals of social support. This helps situate elder women's contributions to inclusive fitness in a broader cultural context than has previously been studied.

## 51

Implications of menstrual suppression on health, immune function, and sexuality. L Morrison, N Nicolaisen, A Kanen, T Calibuso, S Brown. University of Hawaii at Hilo, Hilo, HI.

Depo provera, a progesterone-based birth control method causing menstrual suppression, apparently mimics a condition of pregnancy or lactational amenorrhea in women. In this study of 36 sexually active women, 12 women on Depo Provera were compared to 12 women using low-dose oral contraceptives and 12 women maintaining a natural hormonal profile. A mixed ANOVA design was used to examine sexual behavior and sexual energy, or libido, across the menstrual cycle. Additionally, simple correlations were made between health symptoms, salivary IgA levels, salivary cortisol levels, and sex variables. Women with natural hormone profiles displayed peaks in sexual energy and behavior during their ovulatory phases. The oral contraception group displayed an advanced peak in sexual behavior during their follicular phase, but their sexual energy remained unchanged throughout the phases. The Depo provera group displayed no phase differences for either sexual behavior or energy. There were significant ($P < 0.001$) positive correlations in women with natural hormone cycles and those using oral contraceptives between salivary IgA and cortisol, IgA and health symptoms, and sexual energy and sexual behavior. These groups also had significant negative correlations between health symptoms and sexual energy, and cortisol and sexual energy. In contrast, women using Depo provera displayed none of the above correlations. The use of Depo provera, and thus the maintenance of high levels of progesterone throughout the menstrual cycle, disrupts normal relationships among sexuality, immune function, and health.

Project funded by NIH Grant no. S06-GM0873-33.

## 52

Male physiological ecology: Adaptive variation in hormones and metabolic rate in response to immune activation. M Muehlenbein[1], J Jordan[1], J Bonner[2], A Swartz[3], D Steeber[4]. [1]Department of Anthropology, University of Wisconsin-Milwaukee, Milwaukee, WI; [2]Norris Health Center, University of Wisconsin-Milwaukee, Milwaukee, WI; [3]Department of Human Movement Sciences, University of Wisconsin-Milwaukee, Milwaukee, WI; [4]Department of Biological Sciences, University of Wisconsin-Milwaukee, Milwaukee, WI.

Somatic and reproductive physiologies have evolved to facilitate phenotypically plastic responses to a variety of environmental stimuli, and hormones are important information transducers exhibiting pluralistic effects that coordinate interconnected responses of the reproductive, metabolic, and immune systems. The ability to alter hormone levels in response to immune challenges likely represents an adaptive mechanism to augment reproductive effort or survivorship, depending on available resources and disease risk in the environment. For mammalian males, augmenting reproductive effort is accomplished primarily through elevated testosterone levels and increased musculoskeletal performance, although maintaining such can compromise survivorship via immunosuppression and metabolic costs. Physiological variations in hormone levels and metabolic rates in response to immune activation are important aspects of our biology that are shared with most species examined to date. To further clarify the intricate interactions between these conserved responses, we are assessing immune-endocrine interactions as well as changes in androgen levels and metabolism during immune activation in a large, localized population of college students seeking treatment for acute viral or bacterial infections as well as those receiving vaccinations. In doing this, we offer an explanation for why androgen levels become optimized in mammalian males under certain ecological conditions. From an evolutionary perspective, decreased androgen levels and increased metabolic rates produce a dynamic reaction norm that facilitates differential allocation of energetic resources toward survivorship (i.e., immunocompetence) versus energetically expensive reproductive effort (i.e., muscle anabolism) in stochastic environments with few fertile mates, low resource availability, and/or high disease risk.

## 53

Four decades of changing frequencies of defects of dental enamel among the Gwembe Tonga, Zambia. KA Murphy[1], R Gillett-Netting[2]. [1]Department of Anthropology, Kenyon College, Gambier, OH; [2]Department of Anthropology, University of Arizona, Tucson, AZ.

Relocation has dramatic effects on a population's social, economic, and physical well-being. Construction of Kariba Dam in 1958 led to forced resettlement of the Gwembe Tonga in Zambia. Several distinct time periods, from prerelocation to contemporary, are identified as reflecting distinct constellations of social, economic, and environmental influences. defects of dental enamel (DDE) (developmental disturbances in tooth enamel formation) are examined as permanent records of environmental stressors within an individual's lifetime. Here we use DDE from 341 individuals spanning 40 years as a barometer of the impact of relocation among the Tonga. A total of 3,969 teeth are examined by tooth class and defect type. Defects are found most frequently on maxillary central incisors (23.82%), followed by mandibular central incisors (6.62%), and maxillary lateral incisors (5.25%). Overall frequency across all teeth is 7.13% while 44.28% of individuals examined exhibit DDE's: 50% males; and 40% females. Diachronic analysis of DDE by 3-year cohorts is examined from 1930–1990. The percentage of DDE pre-1950s is zero for females and is 12.77% for males. Additionally, very low levels of DDE (<2%) occur during 1959–1961. While females show a spike in occurrence of DDE in 1965–1967 (18.92%), males show an upward trend spanning the four cohorts from 1962 to 1973 (>20%). Throughout the 1970s, a general decrease in DDE frequencies exists for both males and females, after which time, males and females have similar frequencies. The overall DDE frequency for the Tonga is low compared with diachronic studies from other parts of the world. Differences in DDE occurrences among the Tonga over time are linked to issues of male disadvantage and individual survivorship.

## 54

Household fuel smoke and the health of young children in Bangladesh. SPK Näsänen-Gilmore, EK Rousham. Department of Human Sciences, Loughborough University, Loughborough, UK.

Domestic use of low-quality biomass fuels (e.g. wood, dung) is a significant health risk for women and children in developing countries. Inhalation of toxins from biomass fuel smoke is likely to damage pulmonary function and impair immune defenses of the lungs. This is particularly damaging to the health of young children whose immunity is still underdeveloped. Households ($N = 625$) were recruited for a 12-month longitudinal health intervention to estimate the health damage due to indoor air pollution exposure in Bangladesh. Carbon monoxide and particulate matter levels in households were obtained as a measure of household fuel smoke exposure. Children under 5 years of age participated in three-stage health assessment (anthropometry, health-history, and medical diagnosis of respiratory disease). Household-health assessment was carried out at three time-points: dry, wet, dry season. Malnutrition was highly prevalent among children (growth $z$-scores $<$ 2 SD). No significant changes in the nutritional status of children were observed between two seasons (8 months). But a significantly higher prevalence of anemia ($X^2 = 43.1$, $P < 0.001$) during the wet season indicates a poorer immune and nutrition status among children. Respiratory infections were prevalent across all socioeconomic status and contributed 60.1% of all medical diagnoses during dry season. Requirement for the medical diagnosis by children increased during the wet season. Associations between child immunity and fuel pollution exposure will be tested using selected biomarkers of immunity. The community was highly dependent on low-quality biomass fuels. Measured pollutant levels greatly exceeded the World Health Organization's recommended safety levels, indicating a high risk of chronic pulmonary damage among household members. Ventilation, household structure, and distance from the pollution source may potentially influence the pollution exposure.

Funding: Royal Society.

## 55

Effects of beer commercialization on children's health in Karamoja. KD Needham[1], SJ Gray[2]. [1]Department of Anthropology, Binghamton University, Binghamton, NY; [2]Department of Anthropology, University of Kansas, Lawrence, KS.

Beer brewed for home consumption and for sale in the informal economic sector provides an important source of calories and money for the Karimojong agropastoralists of northeastern Uganda. Environmental and political stresses have left many families without access to cattle, and women are subsequently the primary providers. Brewing and selling beer is the preferred labor source; this holds both positive and negative implications for child health. Women who brew and sell beer are able to purchase supplemental foodstuffs, particularly foods rich in animal protein, fat, and calcium. These nutrients are critical for child growth and development, and are limited in the diets of families lacking access to cattle. However, brewing and selling beer is labor-intensive, and the time women spend away from their yards selling beer is reflected in poorer child care.

This paper compares nutritional profiles and time allocation estimates of women and children in Bokora and Mazeniko territorial sections of Karamoja from September to December of 2004, to determine effects of beer commercialization on children's health. Women in the two territorial sections had differing access to sorghum, casual labor opportunities, and cattle, and thus differing dependence on beer as a source of nutrition and money. Child nutrition and health was better, in general, in Mazeniko than in Bokora. Beer accounted for a greater percentage of energy and nutrient intake in Mazeniko, and women in Mazeniko spent more time away from their yards selling beer, leaving children unattended. Children in Mazeniko consumed more beer than children in Bokora, while children in Bokora had greater access to nutrient-rich supplemental foodstuffs. The impacts of these differences on children's health are discussed.

## 56

Kin investment and body mass index in Mandeville, Jamaica. RG Nelson. Department of Anthropology, University of Michigan, Ann Arbor, MI.

Populations of the African Diaspora are broadly characterized as having highly invested and wide-reaching kin networks. Accordingly, anthropological studies in the Caribbean describe female-centered households of various compositions, including male and female relatives, conjugal partners, and/or children. This research in Mandeville, Jamaica explores the relationship between received kin investment and subject health. Understanding the relationship between received kin investment and health illuminates the biocultural aspects of adaptation and sociality unique to human evolution. This poster examines the impact of received kin investment on the body mass index (BMI) of male and female subjects. Although imperfect, BMI (weight (kg)/height ($m^2$)) is often employed as a proxy measurement of overall health and wellness. According to the World Health Organization, subjects having BMI measurements of $\leq$18.5 are considered underweight, 18.5–24.9 are normal weight, 25–29.9 are overweight, and $\geq$30 are obese. For this study, BMI was established following standard anthropometric height and weight measurements. Subjects vary in age, gender, socioeconomic status, education, and composition of familial networks. Received kin investment was determined following detailed ethnographic interviews, exploring financial dependency, occupation, household composition, childcare practices, dietary behavior, and male/female conjugal interactions. The ethnographic information and biometric measurements were collected at one primary time point. Preliminary analyses reveal correlations between subject BMI, parental migration patterns, and education levels. For males and females, overweight BMI is correlated to maternal migration out of Jamaica. These data suggest that received investment does impact health. Healthy BMI is correlated to high levels of formal education. Thus other factors, including education level, may provide alternative routes to the establishment of good health.

This research was funded by a Rackham Merit Fellowship, University of Michigan, Ann Arbor, MI.

## 57

Urinary hCG patterns during the first week after the initiation of implantation. P Nepomnaschy[1], CR Weinberg[2], A Wilcox[1], D Baird[1]. [1]Epidemiology Branch, National Institute of Environmental Health Sciences, Durham, NC; [2]Biostatistics Branch, National Institute of Environmental Health Sciences, Durham, NC.

Maternal urinary levels of chorionic gonadotropin may be useful to evaluate effects of

maternal and environmental factors on implantation and early development. However, the daily profile of human CG (hCG) excretion has not been adequately characterized for the earliest stages of pregnancy. Using data from 142 clinical pregnancies (including 13 miscarriages), we evaluated daily first-morning urinary hCG concentrations during the first 7 days postdetection (hCG $>$ 0.015 ng/ml). We estimated hCG profiles with mixed-effects regression models.

We regard the first day of detection as the day when implantation began (mode = 9 days after ovulation, range = 6–12 days). The rise in urinary hCG concentration was steepest between the first detection day and the next day (geometric mean = 3.04-fold rise, 95% CI = 2.72–3.40). hCG rise steadily decelerated to a 1.64-fold rise (95% CI = 1.48–1.83) between detection days 6 and 7. This pattern was well described by a quadratic equation (*P*-values $<$0.0001 for all terms). On average, the hCG profile for miscarriages during the first week after detection was indistinguishable from that for surviving pregnancies. The time elapsed between ovulation and implantation appeared as a significant predictor of hCG excretion (&# 967; 2 = 54.1, DF = 3, $P <$ 0.0001). On average, longer times to implantation were associated with higher hCG levels at the day of detection, but lower rates of increase during the first week. Time to implantation may, among other things, reflect aspects of uterine and embryonic quality which, in turn, appeared to be reflected in the hCG profiles.

Supported by NIH-NIEHS' Intramural Research Program.

## 58

When is birthweight on the causal pathway to infant mortality? Smoking. E O'Neill[1], F Fang[1], H Stratton[2], T Gage[1]. [1]Department of Anthropology, University at Albany, Albany, NY; [2]Department of Epidemiology and Biostatistics, University at Albany, Albany, NY.

It is a common theoretical view that (low) birthweight is a correlate of adverse birth outcomes, but not on the causal pathway to infant mortality. On the other hand, US national policy for reducing infant mortality is to reduce low birthweight. This paper tests whether smoking during pregnancy influences birth outcomes directly, and/or causally through birthweight (indirectly) in six populations (non-Hispanic whites/blacks and Mexicans by gender) using covariate density defined mixtures of logistic regressions. This model divides the birth cohort into two subpopulations, "normal" versus "compromised," similar to grouping normal versus low birthweight births. The results indicate that smoking has strong influences on the birthweight distribution. For smoking mothers, the proportion of compromised births is generally 30% higher, while the mean birthweights of both compromised and normal subpopulations decline significantly by 206–559 and 132–350 g, respectively. Furthermore, among normal non-Hispanic females, smoking moves the optimal birthweight 375–481 g higher relative to the change in mean birthweights. This is consistent with the view that birthweight is causal. Among compromised births, the optimal birthweight follows the shift in mean birthweight due to smoking, consistent with the hypothesis that birthweight is not causal. These results suggest that birthweight might be causal only among normal females, perhaps a result of "canalization" in this sex. The implications for reducing infant mortality are discussed.

This work supported by NIH grant R01 HD037405.

## 59

Linking total sleep time and total caloric intake in adolescents: Methods, difficulties, and preliminary results. K Orzech. Department of Anthropology, University of Arizona, Tucson, AZ.

Sleep is an under-researched topic in anthropology, from both a biological and a cultural point of view. Despite American minimization of sleep as desirable or necessary, media coverage has pointed out the role adequate sleep plays in good health and the links between decreased sleep and an increased body mass index (BMI) value. This contradiction between sleep as "good for you" and as something that can be minimized can be seen clearly in high-school students, and led to a biocultural research project investigating adolescent sleep. An element of this larger study of interest to human biologists is data collected on total sleep time, total caloric intake, and activity levels of 40 high-school freshmen. Animal models have shown that

sleep and food-intake interact in a number of ways, but few researchers have attempted to link these variables in humans. Specifically, animal models indicate that individuals who obtain less sleep tend to consume more calories the following day, and that individuals who consume more calories tend to sleep more the following night. However, these biological models do not incorporate cultural realities that may affect American adolescents. For example, rigid schedules may not permit teens to sleep more after eating more food than usual. Also, self or peer monitoring of food intake may prevent a teen from consuming more calories after a sleepless night. This poster presents methods used to collect data from teens on sleep and caloric intake, identifies the main difficulties associated with this data collection, and shows preliminary results from the first of three data collections aimed at describing correlations between total sleep time and total caloric intake in adolescents.

## 60

Diet and growth of Makushi Amerindian children in Guyana. P Palmer, W Wilson. Department of Archaeology, University of Calgary, Calgary, AB.

The purpose of this paper is to evaluate the etiology of growth variation of Makushi Amerindian children in neighboring villages in Guyana. The Makushi, in common with other Amazonian Indians, are among the shortest people in the world. While the etiology of this condition remains unclear, researchers have proposed that this may be explained by factors such as diet, infection, climate, and genes. By focusing on the diet and growth of Makushi Amerindian children in two villages located 8 km apart along the same river, this paper affords an opportunity to evaluate the potential relationships between nutrition and growth. Anthropometric data collected for 192 individuals indicate a height-for-age $Z$-score $<$ 2, with a prevalence of 23% in village 1 compared with a 50% prevalence in village 2 ($P <$ 0.001) and a 5% prevalence of a weight-for-height $Z$-score $< 2$ in village 1 compared with 23% in village 2 ($P < 0.001$). Given the shared ethnicity and microenvironments, we hypothesize that this difference in growth can be explained by differences in diet. The hypothesis is evaluated by comparing dietary intake data collected via 24-h recall for 23 individuals <5 years of age collected in each village. Dietary data were collected twice monthly for 1 year ($n = 304$ daily records) and were assessed with Nutribase 6.0 software. Preliminary dietary results indicate insufficient caloric intake in both villages and lower intakes of a number of micronutrients, including iron, sodium, and vitamin A in the village with the higher prevalence of stunting and wasting. The results suggest that variation in childhood growth in these two villages is the result of dietary differences, specifically micronutrient deficiencies in village 2.

Funding: Wenner-Gren Foundation, University of Calgary, Iwokrama Centre.

## 61

Health perceptions and risk of inactivity among high-school students from Mexico city. ME Peña-Reyes[1], O García-Gómez[2], C González-Alvarez[1]. [1]Escuela Nacional de Antropología e Historia, México; [2]Colegio de Ciencias y Humanidades, UNAM-México.

Urban populations have experienced a significant reduction on their physical activity levels; at the same time, overweight and obesity show a consistent increase. Mexico City youth are not an exception. Data from a national household survey indicate that, among population 15 years and older, only 15% reported participation in some type of physical activity at least once a week. Health and educational institutions are currently developing programs to promote physical activity among youth and adult to deal with sedentary behavior and help to reduce overweight and obesity. The purpose of this paper was to compare the self-perceptions of health and physical activity of high-school students in the context of a health promotion program developed in collaboration with physical education teachers. A sample of 273 students, 110 males and 163 females, 15–16 years of age, entering the first year at the institution, completed an open-ended questionnaire regarding their daily routine and perceptions of physical activity and health status. Students' self-perceptions of health status indicated that about 83% of males and 80% of females consider their health as good to excellent. Sex differences in frequency of physical activity were evident, 45% of males and 23% of females were physically active three to four times a week. Parental influences on increasing participa-

tion in physical activity appear to be important factors, as 54% of parents of males were active compared to only 36% of parents of females.

This research project was funded in part by Colegio de Ciencias y Humanidades-UNAM and Instituto Nacional de Antropología e Historia, Mexico.

## 62

Is malaria a new human pathogen? R Pennington. Department of Anthropology, University of Utah, Salt Lake City, UT.

Molecular evidence suggests that human malaria parasites are ancient parasites of humans. The most lethal malaria, caused by *Plasmodium falciparum*, dates to the ape–human split and likely emerged in Africa, while *P. vivax*, the most common of human malarias, has a more recent origin from macaque monkeys in Asia. Other evidence places the origins of genetic adaptations to falciparum malaria, such as G6PD and the sickle cell allele, within the last 12,000 years, suggesting that falciparum malaria became more deadly to humans when the malaria mosquito vectors expanded in response to climate change as well as plant and animal domestication. However, epidemiological models do not support the assumption that an expanding mosquito niche is sufficient for increased malaria prevalence. The malaria reproductive rate depends on contact rates between humans and mosquitoes, and these relevant parameters are likely to be unchanging in the proposed new mosquito habitats. This model predicts that the spread of human malaria parasites merely parallels the geographic expansion of humans, which is consistent with demographic studies of falciparum malaria from molecular data.

## 63

Perceived stress, blood pressure, and heart rate in a hospital chapel: The effect of religious affiliation. TM Pollard[1], PJ Collins[1], K Elliot[2], J Macnaughton[2]. [1]Medical Anthropology Research Group, Department of Anthropology, Durham University, UK; [2]Centre for the Arts and Humanities in Health and Medicine, Durham University, UK.

Hospital chapels in the UK are designed to be places of refuge, peace, and prayer for patients, visitors, and staff. We investigated the effect of being in a chapel on perceived stress, blood pressure, and heart rate. Medical students sat in each of three areas in a hospital (the chapel, the atrium (an attractive seating area) and a patients' waiting room) for 5–10 min before reporting their perceived stress, and measuring their blood pressure and heart rate. We hypothesized that while perceived stress, blood pressure, and heart rate for all participants would be lower in the chapel and atrium than in the waiting room, the effect of place would be different for Christians and non-Christians, with Christians experiencing lower perceived stress, blood pressure, and heart rate in the chapel. Of the 50 participants, 22 were Christian, 22 reported no religious affiliation, 4 were Hindu, 1 Muslim, and 1 Buddhist. Repeated measures analysis of variance showed that for the whole group perceived stress varied significantly by location ($P < 0.001$), being lower in the atrium and chapel than in the waiting room. Blood pressure did not vary significantly by location, but heart rate ($P = 0.002$) was lower in the atrium and chapel than in the waiting room. There was a significant difference between Christian and non-Christian participants for perceived stress ($P = 0.04$), with Christians reporting relatively low perceived stress in the chapel. There were no significant differences between Christians and non-Christians in variation in blood pressure or heart rate by place.

Funding: Department of Health.

## 64

Human milk varies in composition across ecologic contexts: Implications for adaptation and health. EA Quinn, CW Kuzawa. Department of Anthropology, Northwestern University, Evanston, IL.

It is generally believed that breast milk macronutrient content is relatively invariant across populations. The importance of breast milk composition extends beyond immediate health effects on the child, and is now believed to influence long-term risk for conditions like obesity, diabetes, and cardiovascular disease. To evaluate population variation in breast milk composition, this review collects breast milk compositional data from research published since 1960, in an attempt to understand

the physiological and ecological correlates of milk composition. Specifically, studies were included in this analysis if they included two or more macronutrient measurements, and were included in the caloric analysis if information on all three macronutrients or total caloric content of milk was published. Total milk fat (in g/l) was the most highly variable macronutrient in breast milk and was also the primary source of calories. Protein content was also variable between populations, although its total caloric contribution was small. Protein may be more important as a growth substrate than as an energy source, and this may explain why several studies have identified associations between protein content of milk and growth in infants. Lactose content was also variable between populations, and was slightly elevated in lower fat milk. Total caloric content of milk varied from 55 to 84 kcal/100 ml, suggesting that milk caloric content also varies with ecological and physiological factors, and these differences may be important for environmentally sensitive physiological development and may also be mediated by behavior. This comparative analysis highlights the population variability in milk macronutrient composition. The potential short- and long-term health significance of these differences in breast milk composition, and their possible role as an ecologic cue for the developing organism, will be discussed.

## 65

Historical demography of Beregdaróc, Gergelyiugornya, and Lónya: Population structure in Tiszahat, Hungary, 1760–1987. JA Rack[1], MH Crawford[1], T Koertvelyessy[2], M Pap[3]. [1]Department of Anthropology, University of Kansas, Lawrence, KS; [2]Department of Anthropology, Ohio University, Athens, OH; [3]Debrecen University, Debrecen, Hungary.

Hungary occupies a unique position among European countries, with a genetically European population speaking a non-Indo-European language. Surnames from the Tiszahat Region in the Northeast of Hungary were analyzed to determine the nature of the population structure and changes over time in three villages of the area. Surnames from three villages, Beregdaróc (960 individuals), Gergelyiugornya (2,256 individuals), and Lónya (3,912 individuals) were analyzed using a variety of statistical methods, including frequency distribution analysis, maintenance of surnames, isonymy analysis, and the repeated pairs method. This study found that the three villages follow a European and European New World Population pattern of a stable, endogamous core population in each village, with a smaller group of migrants moving in and out of the villages. These populations also show average levels of inbreeding (Beregdaróc = 0.001869; Gergelyiugornya = 0.005389; Lónya = 0.00586) with a higher level of the nonrandom component of inbreeding over the random component of inbreeding (Beregdaróc Fr = 0.000398, Fn = 0.001477; Gergelyiugornya Fr = 0.00131, Fn = 0.004103; Lónya Fr = 0.001653, Fn = 0.004236). This, with the indications from the repeated pairs method of preferential lineage-like mating patterns, indicate that these villages have a pattern of nonrandom mating, resulting in a decrease of genetic variation due to restrictions on mate choice and endogamous marriages within subgroups. However, inbreeding does not seem to be a significant factor in these villages, leading to the conclusion that other cultural and historic aspects have lead to the decrease in mate choice.

## 66

Migration, "white collar" lifestyle and blood pressure in female university students in China. JM Randall. Department of Anthropology and Wolfson Research Institute, Durham University, Durham UK.

The development of compelling models which incorporate biological and cultural data is of great concern to human biologists and medical anthropologists. Within contemporary Chinese society explicit models of success are detailed within media and social discourse. The saliency of these models makes them amenable to application in a congruity model like those developed by W. W. Dressler. The "White Collar Lifestyle Index" (WCLI) was informed by extensive ethnographic research conducted within the local worlds of Chinese university women. This index incorporates data collected from Chinese university women (n = 180) on multiple lifestyle dimensions, including: attitudes, experiences, behaviours, family background, and material/financial status. After controlling for BMI, WCLI demonstrates a significant relationship with systolic (SBP) and diastolic blood pressure (DBP). Those higher on the index (indicating higher congruity with the white collar lifestyle, e.g.

having a finance or accounting major, possessing material goods, having more spending money, and considering herself "modern") showed a significant decrease in both DBP and SBP ($p < 0.05$ and $p < 0.001$, respectively). A 30 percent increase in WCLI accounted for a 2.6 mmHg decrease in SBP and a 4 mmHg decrease in DBP. This relationship disappears when examined among those women whose homes are in the same province in which they attend university, whereas the women who migrated from another province demonstrate a stronger effect. After controlling for BMI, a 30 percent increase in "outside" women's WCLI demonstrate a 5.4 and 7.0 mmHg decrease in SBP and DBP respectively. Higher congruity with the predominant cultural model is more "stress-reducing", i.e. resulting in lower BP, among those who have migrated than those who have not. This would indicate that the pressure to conform to these models is higher for those from outside. Possible reasons for this relationship are presented.

This work is supported by the National Science Foundation under Grant No. BCS-0434104.

## 67

Dietary patterns and exposure to environmental contamination at Akwesasne. J Ravenscroft, LM Schell. University at Albany, Albany, NY.

Food is an important route of potential exposure to environmental contaminants in all populations, as ingestion is a primary pathway of exposure for many toxicants. Consequently, Native Americans may be at particular risk of exposure to persistent organic pollutants, like PCBs (polychlorinated biphenyls), because of economies and dietary patterns that involve consumption of locally caught fish, hunting, and small-scale farming. This paper describes the dietary patterns and serum PCB levels of 268 Mohawk youth between 10 and 16.9 years from the Akwesasne Mohawk Nation. Akwesasne, located on the banks of the St. Lawrence River, is adjacent to Federal and State Superfund sites that have discharged PCBs into the local environment.

Semiquantitative food frequency data was collected via interview by Mohawk Nation members. In a multivariate model including grouped meats, dairy, fats, and fish consumption as well as other known predictors of PCB levels (age, sex, breastfeeding status, body mass index (BMI), and triglyceride level), prior breastfeeding status, BMI, meat consumption, and fish consumption are all significant predictors of PCB levels. Consumption of fish is positively related, while consumption of grouped meats is negatively related to current PCB burden, suggesting a trade-off in protein choices with respect to overall dietary composition that impacts the adolescent's current PCB body burden. In a separate analysis of six nonpersistent PCBs indicative of ongoing exposure, BMI was not related to PCB body burden and the relationship of fish and meat consumption to PCB levels strengthened.

Nutrition-related issues have long played a central role in the health of many Native communities and culturally based exposure pathways to environmental contamination may prove to play an important role in the dynamics of food choice and decision-making.

Supported by: NIEHS ES04913-10/ES10904-06.

## 68

PMS: Diagnostic and definitional issues. C Reiber. Department of Anthropology, Binghamton University, Binghamton, NY.

Premenstrual syndrome (PMS) has been recognized at least since antiquity, and affects nonnegligible proportions of women in both rural and urban settings in countries around the world. There are many definitions, sets of diagnostic criteria, and methods of diagnosis for PMS. Thus, women who have little in common can be diagnosed with the same syndrome; and applying different definitions and diagnostic criteria to the same symptom data can yield different diagnostic outcomes. Two hundred and fifteen women completed subjective assessments of their typical experience of PMS. They then rated symptoms associated with PMS every day for the duration of one menstrual cycle on a standard prospective daily rating form. Different definitions and diagnostic criteria sets were then applied to the daily ratings to explore how different the diagnoses would be; these outcomes were also compared to the a priori general assessments made by women. While 93% of women reported experiencing PMS, only 12% met the most common clinical diagnostic criteria for PMS. Moreover, this 12% was not differentially associated

with a priori general assessments falling within the "severe" or "extreme" categories. Instead, the a priori ratings of the women who met diagnostic criteria reflected the entire spectrum from "none" to "extreme" PMS. Of the 36 women who rated their PMS severe or extreme, only six met diagnostic criteria. Definitions and diagnostic criteria for PMS do not accurately reflect women's experience. This devalues women's assessments of their own health status, and may impact attitudes toward PMS and impair treatment-seeking behavior as well as treatment options.

## 69

Cortical bone ontogeny: Activity, nutritional status, and archaeology. G Robbins. Department of Anthropology, Appalachian State University, Boone, NC.

Research on the role of activity in the ontogeny of cortical bone cross-sectional parameters has demonstrated that declining % cortical area (%CA) during infancy, once interpreted as evidence for stress, is part of a normal pattern of growth. In modern reference populations, and some archaeological samples like Pecos Pueblo, section modulus (strength) continues to increase through apposition of mass at the periosteal surface despite the appearance of declining %CA. The majority of variation in cross-section parameters is explained by body mass and timing of the acquisition of locomotor skills (crawling and walking, for example). Long bone length is not a significant predictor of %CA in normal ontogeny in the humerus ($R^2 = 0.0244$) or the femur ($R^2 = 0.0035$). This project compared data from the Denver longitudinal study with a sample from Chalcolithic Inamgaon, India (3500–2700 B.P.) to re-evaluate usefulness of cross-sectional parameters for bioarchaeological research. Humeri and femora from Inamgaon ($n = 137$) demonstrated a significant correlation between low *Z*-scores for length and reduction in cortical thickness, %CA, and section modulus. *Z*-scores for length were a significant predictor of %CA ($R_{sqd} = 0.47$) and section modulus ($R_{sqd} = 0.66$). These samples differed from the reference standard in the velocity of bone loss during infancy. Individuals 6–30 months old with low *Z*-scores for length also demonstrated greater than expected declines in cortical thickness, %CA, and section modulus, with suppression of periosteal apposition, resulting in perinatal parameters persisting to 36 months. The results support the suggestion that nutritional deficiency, small body mass, and low activity levels synergistically and significantly alter the normal pattern of development, and cortical bone mass is useful for bioarchaeological research on diet, stress, and biocultural adaptation.

## 70

Does breastfeeding help prevent childhood obesity? AS Ryan. Martek Biosciences Corporation, Columbia, MD.

The prevalence of obesity is a public health concern in both developed and developing countries. Breastfeeding has been suggested to be a potential obesity prevention strategy, but the evidence that breast-fed infants have a lower risk of later obesity is equivocal. Cohort and longitudinal studies published between 2003 and 2006 that considered the relationship between the duration of breastfeeding and risk of childhood overweight and obesity were reviewed. The 15 studies were markedly heterogeneous with respect to the definitions of breastfeeding, overweight, and obesity; breastfeeding duration; age at follow-up; and timing of introduction of solid foods. Three studies reported a protective effect (i.e., increased duration of breastfeeding was associated with a lower risk of childhood overweight/obesity), three reported a partial protective effect (i.e., only evident in a subgroup), and nine reported no protective effect. For the studies that reported no protective effect, the strongest predictors of weight status in children were maternal weight, maternal smoking during pregnancy, and low SES status. To be sure, breastfeeding should be encouraged and supported as a key component of optimal infant nutrition. While breastfeeding may help to prevent childhood obesity, it should not be viewed as the only preventative nutrition measure against childhood overweight/obesity. The fact that rates of breastfeeding in the U.S. have risen steady (1991–2003) while rates for childhood obesity have increased dramatically (45% increase from 1988–1994 to 1999–2002) reinforces the view that many factors are involved in establishing and maintaining a healthy diet and body weight.

## 71

Validity of self-assessment of pubertal stages. JI Schall, BS Zemel. Division of Gastroenter-

ology, Hepatology and Nutrition, The Children's Hospital of Philadelphia (CHOP), Philadelphia, PA.

The assessment of sexual maturity status (SMS) during puberty is critical to gaining a clearer understanding of the timing of developmental, hormonal, and behavioral changes in healthy children during puberty, and is an important tool for identifying growth and maturational delay in children with chronic illness. The onset and timing of pubertal development is associated with the risk for obesity, coronary heart disease, diabetes, and later health outcomes. Self-assessment of SMS using either photographs or line drawings of the Tanner stages of pubic hair and breast/genital development is used in research settings where physician assessments are not feasible or desirable, yet many question its validity. Results of a review of 20 studies comparing self-assessment to physician assessment of SMS showed that few studies (19%) have excellent reproducibility between child and professional assessment, 44% have good, and 37% marginal reproducibility. Girls were more accurate than boys. Subjects given clear instructions and a private setting in which to do the assessment were the most accurate. Pubic hair stage was more accurately assessed than genital/breast stage. Younger children tended to overestimate and older children to underestimate their SMS. Overweight children showed similar accuracy to normal weight children, except that overweight girls tended to overestimate breast development. There were no consistent ethnic differences and children with chronic illness showed similar accuracy to healthy children. Results are presented from studies in healthy children and children with Crohn disease, sickle cell disease, and cystic fibrosis, demonstrating that self assessment of SMS is significantly associated with measures of growth and bone mineral acquisition. Therefore, self-assessment of SMS captures information about underlying maturational processes. Strategies for improving this important technique will be discussed.

## 72

Developmental changes in the relationship between adiposity and leptin in Tsimane' children and adolescents. KCB Sharrock[1], CW Kuzawa[1], TW McDade[1], WR Leonard[1], S Tanner[1], V Reyes-Garcia[2], V Vadez[3], T Huanca[3], R Godoy[3]. [1]Department of Anthropology, Northwestern University, Evanston, IL; [2]ICTA, Universitat Autonoma de Barcelona; [3]Sustainable International Development Program, Brandeis University, Waltham, MA.

Based largely on research in clinical Western populations, leptin is thought to be an indicator of total body fat stores and energy status that is sensed by the central nervous system. These studies have consistently found strong correlations between leptin levels and measures of adiposity in both males and females. Recent work among subsistence populations, limited to adults, suggests that this relationship is not universal across ecologic contexts, and in some instances leptin is not correlated with body fatness, especially in lean males. This study examines developmental changes in the relationship between leptin and body fat among children and adolescent Tsimane' of lowland Bolivia. Anthropometric data and dried blood spot samples were collected from 493 Tsimane' between the ages of 2 and 15 years. Leptin was assayed using an ELISA protocol validated for use with blood spot samples. The relationship between body fat and leptin follows distinct developmental trajectories in males and females. In males, leptin is most strongly related to body fat in mid-childhood and becomes progressively uncoupled from adiposity by adolescence. In females, the level of body fat as well as the strength of the correlation between body fat and leptin consistently increase with age and reach peak levels in the oldest age group. These findings indicate that there are sex differences in the developmental relationship between body fat and leptin and raise important questions about the function of this system in populations living under marginal nutritional circumstances.

Support: NSF (BCS-0134225; BCS-0078801); Wenner Gren Foundation (#7250).

## 73

Human populations, protected areas, and intestinal parasites: Socioecological perspectives in the Brazilian Atlantic Forest. HP Silva. Museu Nacional/UFRJ, Rio de Janeiro, Brazil.

The Brazilian Atlantic Forest (AF) is one of the most endangered ecosystems in the world, and there are few studies about the rural populations living in this environment. As part of a bioanthropological project in the State of

Espírito Santo, Brazil, the prevalence of intestinal parasites (IP) was investigated in populations living in the vicinity of three protected areas of AF, to evaluate the possible human impacts on these areas. A total of 220 fecal samples were analyzed for the presence of helminthes and protozoa. At least one person was sampled from each house in all the properties surrounding the protected areas, representing 61.4% of the total population involved in the project. The overall prevalence of IP is 23.2% and only three species were not found in the samples (*Taenia* sp., *Hymenolepis* sp., and *E. histolytica*). People living near the larger, more rural protected area, present higher rates of infection and tend to be infested with a broader variety of parasites than those living near the smaller protected area which is more urbanized. At least 5% of individuals were infected with two or more species, and there is no statistical difference in the prevalence of IP among children and adults. Together with other socioecological data, the high prevalence of IP in these populations indicates poor health and low SES. Considering that these populations live near protected areas, their SES and health situation might have serious repercussions for the protection of the AF in the long run. Families under severe socioecological stress are likely to develop a predatory relationship with the protected areas as they struggle to survive exploiting endangered flora and fauna which reach high values in illegal markets.

## 74

Low-dose organophosphate pesticide exposure and salivary cortisol levels among farmworkers in Washington State. SA Snipes[1,2]; K O'Connor[1]; B Thompson[2]. [1]Department of Anthropology, University of Washington, Seattle, WA; [2]Fred Hutchinson Cancer Research Center, Seattle, WA.

BACKGROUND: Organophosphate (OP) pesticides are widely known as highly toxic, illness-causing agents. A lesser known characteristic of OP pesticides, however, is their ability to interrupt neural transmission, resulting in an increase in cortisol production. Several animal investigations show that cortisol levels increase after exposure to both high and low doses of OP pesticides. However, the relationship between chronic exposure to OP pesticides and cortisol has never been examined in humans. OBJECTIVE: This study investigates the association between low-dose OP pesticide exposure and salivary cortisol levels among 89 Mexican immigrant agricultural workers living in Washington State. METHODS: Data was collected during the OP pesticide spray (April 2005 – June 2005) and non-spray (December 2006 – February 2006) seasons among farmworkers who perform high OP pesticide exposure-related job tasks (hand-thinning crops). Organophosphate pesticide exposure was assessed by measuring six OP metabolites in urine. Cortisol was measured in saliva. RESULTS: Levels of cortisol were significantly higher during the OP pesticide spray vs. non-spray season among farmworkers, after controlling for the effects of psychological stress, sex, BMI and time of awakening ($p = .0093$). There is a significant, positive relationship between cortisol and OP pesticide metabolite diethylphosphate (DEP, $p = .009$). No significant relationship was found between cortisol and the remaining OP pesticide metabolites. CONCLUSIONS: This study found significant differences in salivary cortisol among farmworkers in seasons of high vs. low OP pesticide exposure. Results also suggest a direct, significant relationship between cortisol and certain measures of OP pesticide exposure. This evidence, together with results from animal investigations, suggests that OP pesticide exposure causes an increase in cortisol.

## 75

An island in trouble? Blood pressure, obesity, and modernization on Saba. L Soloway. Binghamton University, Binghamton, NY.

Many populations around the globe are passing through an "epidemiological transition," where disease morbidity and mortality switches from acute infectious to chronic degenerative causes. The population on Saba, in the Netherlands Antilles, has recently gone through such a transition, and hypertension and obesity were said to be extraordinarily high among Saban adults. In this study, all four villages (The Bottom, St. John's, Windwardside, and Hell's Gate) on Saba were evaluated for hypertension and obesity in light of recent and rapid modernization. In addition to a medical and demographic questionnaire, 278 individuals were evaluated for hypertension and obesity through single sitting blood pressure measurements, weight, height, bioelectrical impedance, waist and hip circumferences, and triceps and subscapular skinfolds.

Derived measurements included body mass index (BMI), body fat percentage, waist-to-hip ratio, central adiposity, and sum of skinfolds. Initial results indicate that 40% of the population was hypertensive and 67.7% were overweight or obese according to BMI. Using body fat percentage and waist-to-hip ratio, 52% and 72%, respectively, of adult participants were determined to be overweight or obese. Phase 2 of the project involved 124 individuals of the 278 who had participated in the original study. This cohort was administered a longer questionnaire designed to determine their relative degree of modernization. Of the 124 participants, 51 agreed to wear a 24-h ambulatory blood pressure monitor (Spacelabs, Issaquah, WA) to assess diurnal variation and confirm hypertensive status. An index of modernization has been prepared and will be presented along with the metric results. Intervention and prevention programs will be developed with the Saban Department of Public Health in a culturally and ethnically sensitive way for the population.

## 76

A biocultural consideration of dental caries prevalence: Influence of diet, fluoride exposure, and socioeconomic factors. MJ Soltz[1], J Bock[2]. [1]Department of Anthropology, The Ohio State University, Columbus, OH; [2]Department of Anthropology, California State University, Fullerton, CA.

Dental caries has a complex multifactorial etiology with widespread health consequences for the world's population. Caries prevalence is the result of complex interactions of biocultural factors, including diet, fluoride exposure, socioeconomic status, and hygiene. Caries research in epidemiology has focused on the quantity and frequency of sucrose consumption and its influence on caries prevalence in individuals and within populations. The effect of subsistence patterns and socioeconomic status on caries prevalence has received little attention within epidemiological literature. In this poster, we present a population level meta-analysis of the predictive factors associated with caries prevalence across populations. We propose that dietary status is the strongest contributing factor to caries prevalence in populations. This study uses archaeological and epidemiological data from 144 groups integrated into a meta-analysis, thus increasing the strength of analysis. Multivariate analyses were conducted to compare caries prevalence against dietary patterns, socioeconomic status, fluoride exposure, and hygiene in an attempt to identify the degree to which factors contribute to dental demineralization. A strong positive linear relationship was found between subsistence patterns and caries prevalence, with hunter–gatherer's exhibiting the lowest caries prevalence and Western populations reporting the highest caries prevalence. In addition, there is a negative linear relationship between socioeconomic status and caries prevalence. Caries rates generally increase with improved socioeconomic status, yet they exhibit a slight reduction in the wealthiest populations. These results are suggestive of the limited cariostatic effect of fluoridation treatments, whose uses are more frequent among individuals in wealthy populations. This study highlights the importance of lifestyle changes, especially dietary and socioeconomic changes, on dental health.

## 77

Seasonal variation in the amount of dietary carbohydrate not absorbed from the intestine after breakfast in elderly Japanese females. Y Sone[1], Y Tsumura[1], N Hirota[2], H Tokura[3], D Rutkowska[4]. [1]Graduate School of Human Life Science, Osaka City University, Osaka, Japan; [2]Department of Living Sciences, Nagano Prefectural College, Nagano, Japan; [3]Institute of Textiles and Clothing, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China; [4]Pulmonology Hospital of Lung Disease, Poznan, Poland.

We previously showed that there is seasonality in the amount of dietary carbohydrate not absorbed from the intestine after breakfast (UDC), the UDC in winter being significantly larger than that in autumn in young Japanese subjects. In order to investigate this phenomenon further, we repeated the experiment in 22 elderly Japanese subjects (age 61–78 years). In the older subjects also, there was a significant seasonal variation in UDC, this being largest in winter and significantly larger than in spring. These results indicate that there is a seasonal variation in the efficiency of dietary carbohydrate absorption from the intestine among elderly female Japanese subjects and that this is the same as was found among young females.

This research project was funded by Grant-in Aid for Scientific Research (No. 15207024) from Japan Society for the Promotion of Science.

## 78

Validation of Promega's PowerPlex® 16 System for use on applied biosystem's 96 capillary 3730xl DNA analyzer. R Spathis, JK Lum. Laboratory of Evolutionary Anthropology and Health, Departments of Anthropology and Biological Sciences, Binghamton University, Binghamton, NY.

Short tandem repeat (STR) loci are widespread throughout the human genome and show sufficient variability among individuals in a population that they have become important in several fields, including genetic mapping, linkage analysis, human identity testing, and evolutionary studies. The combined DNA index system (CODIS) established by the FBI constitutes the core of the United States DNA database. CODIS is comprised of 13 tetrameric STR loci and is used extensively by both forensic scientists and population geneticists. Promega's PowerPlex® 16 System allows single tube multiplex amplification of 16 STR loci, including all 13 CODIS STRs as well as additional markers including the Amelogenin gender determining locus. We report the validation of the PowerPlex 16 System on the ABI 96 capillary 3730xl DNA Analyzer. The validation protocol developed in our laboratory allows for the analysis of 1,536 loci (96 $\times$ 16) in ~45 min. We have further optimized the assay by decreasing the reaction volume to one-quarter that was recommended by the manufacturer, thereby substantially reducing the total cost per sample, without compromising reproducibility or specificity. Furthermore, this reduction in reaction volume has the ancillary benefit of dramatically increasing the sensitivity of the assay, allowing for accurate analysis of lower quantities of DNA. Owing to its substantially increased throughput capability, this updated validation of the PowerPlex 16 System should be useful in reducing the backlog of unanalyzed DNA samples currently facing public DNA forensic laboratories.

This study was funded by a start-up grant from the Research Foundation of SUNY Binghamton to JKL.

## 79

Attention deficit/hyperactivity disorder (ADHD) symptoms, 2D:4D digit ratios, and social problems in a sample of college students. JC Stevenson[1], PM Everson[1], ER Mahoney[2], DC Williams[1], G Hipskind[3]. [1]Western Washington University; [2]PeaceHealth Corp., Bellingham, WA; [3]Brain Matters, Inc., Denver, CO.

Attention deficit/hyperactivity disorder (ADHD) is one of the most frequently recognized psychiatric conditions, and is identified if there are developmentally inappropriate levels of inattention, hyperactivity, or impulsivity. There are three subtypes: inattentive, hyperactive–impulsive, and combined. Previously we found that in these same college-age females that the more masculine the 2D:4D digit ratios (proxy for prenatal androgen levels) the more ADHD symptoms for the three subtypes of ADHD. Hypermasculinization may also underlie the increased risk for social problems typical of individuals with ADHD. The objective here was to examine the relationship between two companion scales: the social phobia (SPS) and social interaction anxiety (SIAS) scales versus 2D:4D digit ratios and self-reported, subclinical ADHD symptoms, reflecting the subcategories of ADHD in a sample of European-descent college students (135 f, 52 m) not selected for ADHD.

The symptom inventories for SPS, SIAS, the three DSM-derived ADHD subtypes, and the shortened version of the Wender scale (combined subtype) were separately summarized by applying the Rasch model, and the resulting scales were used in the correlation analyses. Both SPS and SIAS represent unidimensional constructs. There were significant correlations ($P < 0.000$) between the three subtype symptom inventories of ADHD versus SPS and SIAS in females, particularly for the inattentive symptom inventory. Relationships were weaker in males. There were no correlations between 2D:4D digit ratios and SPS or SIAS. This argues against prenatal androgen exposure as a cause of social deficits. Thus, social problems may partly reflect the side effects of ADHD symptoms, e.g., less effective evaluation of socially significant cues.

## 80

Comparative reduction in cytochrome P450 genes in *Homo sapiens*: Implications for hominid diet shift and encephalization. RJ Sullivan[1], EH Hagen[2]. [1]Department of Anthropology, California State University, Sacramento, Sacramento, CA; [2]Institute for Theoretical Biology, Humboldt University, Berlin, Germany.

*Homo sapiens* have substantially fewer xenobiotic-metabolizing cytochrome P450 (CYP) genes, relative to the mouse and the rat. Although orthologous CYP genes in Homo and Pan troglodytes are >90% convergent in base sequences, comparative pharmacokinetic studies show that these species differ substantially in functional drug metabolism, with a 10-fold relative reduction in aspects of drug-metabolizing capacity in humans. These data indicate that there has been negative selection on human xenobiotic-metabolizing CYP genes relative to other omnivorous mammals, including during the period of hominid evolution after the chimpanzee–human phylogenetic split. The reduction in human CYP gene function relative to the chimpanzee, mouse, and rat indicates a reduced evolutionary exposure to dietary plant toxins in Homo. There are two nonmutually exclusive evolutionary scenarios that may explain this aspect of human gene evolution: a shift in foraging strategy and diet toward meat eating during the Plio-Pleistocene, and/or the detoxification of plant foods using cultural technologies which culminated in a contraction of vegetable diet breadth with incipient horticulture and then agriculture in the Holocene. Dietary plant neurotoxins target all aspects of nervous system development and functioning, and represent a likely major constraint on mammalian brain evolution. The comparative reduction in human CYP genes also indicates that there was reduced selection by dietary plant neurotoxins during the evolution of Homo. A decrease in selection from plant neurotoxins may have removed a major constraint on human brain evolution. An ecological niche with reduced exposure to plant neurotoxins, unique among primates, may have contributed to the rapid encephalization in Homo.

## 81

Chronic wasting disease in New York State: Spread and its implications for human health. SL Sunderman, MA Little, RM Garruto. Department of Anthropology, Binghamton University, Binghamton, NY.

Chronic wasting disease (CWD) is found today in 14 US states and 2 Canadian Provinces. The first case of CWD in Upstate New York was confirmed in March 2005; the disease is now reportable throughout NYS in both wild and captive deer. While the cross-species transmissibility from deer to humans has not been conclusively determined, prior scientific studies suggest that some individuals who died of Creutzfeldt-Jakob disease (CJD) may have been exposed to cervid untested for CWD. Additional studies have shown that CWD can be transmitted experimentally to voles, nonhuman primates, and cattle. Bovine spongiform encephalopathy (BSE) illuminated the problems of cross-species transmission of prion diseases. This research compiles information about the spread of CWD in NYS, using both scientific literature and state departmental disease surveillance. It ascertains what human activities may contribute to the spread of CWD in NYS as well as increase exposure to the disease, and discusses the human health implications of this exposure. In addition to the literature, a portion of an epidemiological questionnaire containing 18 items pertaining to venison consumption, hunting, and occupational activities is included in this analysis. This questionnaire is part of the Oneida County Surveillance Project, a Binghamton University and Oneida County Health Department collaboration. This ongoing research project began in the spring of 2005, after 150–250 people were exposed to venison from a CWD-positive deer. This event, and the continued spread of CWD in deer and elk in NYS, demonstrate a necessity for the assessment of human exposure to deer and elk and the implications this, as well as the disease's continued spread, may have for human health.

## 82

Culture, stress, and blood pressure: Examining everyday lives of urban African American youth. E Sweet. Department of Anthropology, Cells to Society (C2S): The Center on Social Disparities and Health, Institute for Policy Research, Northwestern University, Evanston, IL.

Psychosocial stress may be an important mediator of racial disparities in health and the development of chronic disease risk among African Americans. To measure stress accurately, research must account for culturally relevant sources of stress in specific social contexts. This study examines the relationship between the experience of culturally significant sources of stress and blood pressure—a biomarker of stress—among high-school-aged African American youth in Proviso Township, Illinois, a predominantly African American

community on the west side of Chicago. Lists of culturally meaningful stressors were elicited in 20 ethnographic interviews. Three-point ratings from 29 participants of the relative importance of each elicited stressor were analyzed with cultural consensus procedures to determine the extent of cultural agreement among respondents. After sufficiently high agreement was found to indicate a shared cultural model of stress in this community, a final list of 24 significant psychosocial stressors was compiled. Behavioral consonance with this model, or individual experience of the relevant stressors, was measured via self-report among 85 participants. Resting systolic and diastolic blood pressure were measured on the same individuals, as were weight (kg), height (cm), smoking status, and other covariates. Multiple regression analyses examined the association between reported stressful experiences and blood pressure, controlling for potential confounders. Since African American youth are at risk for developing stress-related chronic illness later in life, knowledge about how locally meaningful stressors relate to biological indicators of stress in this population may be significant for understanding health disparities more broadly.

This is research is supported by the National Science Foundation, Dissertation Improvement Grant no. 0514731.

## 83

Relationship between immunoglobulin E and childhood body composition among the Tsimané of lowland Bolivia. S Tanner[1], TW McDade[2], WR Leonard[2], V Reyes-García[3], T Huanca[4], V Vadez[4]. [1]Department of Anthropology, University of Georgia; [2]Department of Anthropology, Northwestern University; [3]ICTA, Universitat Autònoma de Barcelona; [4]Sustainable International Development Program, Brandeis University.

Immunoglobulin E (IgE), a component of the humoral immune system, has attracted research attention, because it is responsible for both causing allergic disease and providing an immunological defense against soil-transmitted helminths. Parasitic infections are among our oldest pathogens and, therefore, the function of the IgE system may be best understood in an environment where individuals are frequently exposed to such infections. Previous research among the Tsimané population of lowland Bolivia has demonstrated high levels of infectious disease exposure and childhood growth retardation. The goals of this study are to (1) describe the distribution of total IgE by age and gender, and (2) evaluate the relationships between total levels of circulating IgE and anthropometric measures of body composition. Anthropometric data and finger-prick blood samples were collected from nearly 350 Tsimané between the ages of 2 and 15 years in a cross-sectional survey. Parasitic infections were identified through microscopic examination of fecal samples for a subset of 100 children. Total IgE was assayed using an ELISA protocol validated for use with in-dried blood spot samples. As predicted, total IgE levels were high and positively correlated with parasitic disease burden. Additionally, elevated IgE appears to be associated with reduced short-term nutritional reserves (i.e. skinfold measures of body fat), but not long-term indicators of growth retardation (height for age). This study illustrates the need for longitudinal, population-based research in order to better understand the role of IgE in human health.

Supported by grants from the National Science Foundation (BCS-0322380, 0078801).

## 84

Baseline diet and food procurement strategies among the Gwembe Tonga of Zambia. C Taylor, SM Cole, R Gillett-Netting. Department of Anthropology, University of Arizona, Tucson, AZ.

The Gwembe Tonga of Zambia experienced forced relocation in 1958 due to construction of the Kariba Hydroelectric Dam. While many of the subsequent social consequences have been documented, no published studies have quantitatively assessed Tonga diet at the household level prior to relocation. Tracking changes in nutrition and food ecology is an important area of inquiry, given that changing patterns of subsistence often translate into changes in household nutritional status and hold implications for household structure, organization, and economic relations, both within and between households. Monitoring and assessment of a relocated community are difficult, because prelocation data are often unavailable. This study provides baseline data on the food ecology of the Tonga. To establish a dietary baseline, pre-relocation

household-level food diary data collected in 1956/57 are examined for two polygynous Tonga households. Records of meals prepared by five household wives span from November 1956 to September 1957, and include nearly 500 entries. Data on diet and food procurement strategies indicate that (1) the major staple foods consumed were millet (81%) and maize (15%); (2) fish (44%), goat (11%), guinea fowl (9%), pigeon (8%), porcupine (3%), and sheep (3%) are the major sources of animal protein; (3) while variety of food stuffs is limited at any given time, the seasonality of this subsistence-based diet provides a range of gathered and grown food stuffs ; and (4) seasonal variation in procurement strategies appears to have existed, with husband's granaries being more frequently exploited during the hunger season. This study supports pre-relocation field observations made by researchers (Colson & Scudder), while at the same time providing measurable comparisons for future analyses of Tonga food ecology.

## 85

HPG activation in infancy: Relationship to sex and size. AL Thompson, M Lampl. Emory University, Atlanta, GA.

Important both developmentally and evolutionarily, infancy is a sensitive period during which growth and development are shaped in response to salient environmental variables. Endocrine development in infancy, however, remains largely unexplored. Using novel, noninvasive fecal measures, we explored the relationship between sex steroid levels and anthropometric measures in a sample of 30 infants, aged between 1 week and 15 months. Estradiol and testosterone were assessed from fecal samples, using methanol extraction, and assayed using our previously validated microassay RIA techniques. First, area under the curve modeling approaches were employed to assess sex differences in hormonal levels. Second, mixed modeling techniques for longitudinal data were used to assess the relationship between hormonal levels and anthropometric measures. Sex-steroid levels were found not only to follow distinctive patterns in males and females, but also to contribute to interindividual variance in body size and composition. These results identify novel patterns of endocrine activity during infancy and suggest theoretical bases for mechanisms that may underlie previous reports regarding the importance of infant size on later growth and development. These observations suggest pathways by which infant development may actually prime the future tempo of maturation, entraining adult reproductive physiology and morbidity.

## 86

Reproductive health and fertility of low-income urban African-American women: The realities of economic insecurity and impoverishment. LM Trask, JH Cohen. Department of Anthropology, The Ohio State University, Columbus, OH.

A burgeoning area of interest in population studies explores how economic, political, and social forces shape individual and population level fertility and reproductive health. Previous research examines how individual attributes and socioeconomic and political forces produce differential fertility in and among ethnic groups, and investigates how reproductive behavior influences variation in reproductive health and fertility. Appreciating how economic insecurity creates variation in marginalized populations is essential. African-American women, roughly 6% of the total U.S. population, continue to experience health disparities and are disproportionately represented in poverty statistics. This study investigates the dynamic interaction between socioeconomic forces and the reproductive health and fertility of women who reside in Prince George's County, Maryland.

Data for this study was collected as a part of a microethnographic investigation of low-income urban African-American women's continued economic insecurity and impoverishment, despite welfare reform. Semistructured individual and focused group interviews obtained information regarding household composition and economics, education, employment, and reproductive history. Participants' access to health care facilities, current and previous contraceptive use, history of pregnancy and childbirth, and reproductive health were analyzed to understand how socioeconomic and political forces influenced women's reproductive health and fertility. For comparative purposes, data from the Fragile Families and Child Wellbeing Study, the U.S. Census Bureau's Current Population Survey, and the Maryland Vital Statistics Annual Report are presented to illustrate how aggregate data sets do not reflect the dynamic rela-

tionship between socioeconomic and biological processes that shape low-income urban African-American women's reproductive health and fertility.

This project was funded in part by The Ohio State University Graduate School, Alumni Grants for Graduate Research and Scholarship.

## 87

Vitamin D receptor polymorphism is associated with variation in adult height in a sample of African-American females. DJ Tyree[1], DE Crews[1], MG Sovic[2], GC Booton[2], PA Fuerst[1,2]. [1]Department of Anthropology, The Ohio State University, Columbus, OH; [2] Department of Evolution, Ecology, and Organismal Biology, The Ohio State University, Columbus, OH.

Family and twin studies have demonstrated that a significant genetic component exists in the development of adult stature, with heritability estimates ranging from 70 to 90% in most populations. Nevertheless, little is known regarding the actual genes/alleles that contribute to height variability. In recent years, the Vitamin D receptor gene (VDR) has emerged as a likely candidate because of the importance of 1,25-dihydroxyvitamin $D_3$ in bone formation. The results of previous association studies, however, have been equivocal regarding the role of the VDR gene in height variation, suggesting that this relationship may be population-specific. The present study addressed this issue by examining whether the Bsm1 (in intron 8) and Taq1 (in exon 9) polymorphisms were associated with height variability in a sample of 94 African-Americans from central Ohio. To account for the possible influence of sex, males ($n = 31$) and females ($n = 63$) were analyzed separately. Regarding the Bsm1 (A/G) polymorphism, the results of this study showed no statistically significant association with adult height among either sex. In contrast, the results based on the Taq1 (T/C) polymorphism revealed a statistically significant association between Taq1 genotypes and height among females. Specifically, females who were homozygous for the Taq1 site were significantly taller than females who either lacked the Taq1 site (161.59 + 5.96 cm vs. 166.85 + 9.21 cm) or who were heterozygous (159.74 + 4.81 cm vs. 166.85 + 9.21 cm). Based on these results, it was concluded that alleles at the VDR locus (12q13-q14) influence adult height variability in African-American females.

## 88

Social status, gender, and overweight among the Toba and Wichí of Argentina. CR Valeggia. University of Pennsylvania, Philadelphia, PA.

The prevalence of overweight and obesity is increasing at an accelerated pace in disadvantaged populations. Indigenous populations, whose lifestyle is changing drastically, seem to be particularly prone to increasing percentages of overweight people and the associated health problems. The aim of this study was to evaluate the extent of the problem and its possible determinants in the Toba and Wichí of Argentina. These indigenous groups belong to different linguistic families, and still they are both exposed to the same ecological challenges characteristic of the Gran Chaco. Originally hunter–gatherers, at present they also engage in temporary wage labor and local political positions. We studied two neighboring Toba and Wichí communities of the Western region of Formosa Province. We measured height, body mass, and percentage of body fat in 204 Toba and 129 Wichí adults. Both groups showed a considerable prevalence of overweight and obesity. Almost 50% of the adult Toba and 34% of the adult Wichí were overweight and 10% of adults in both populations were obese. Social status of men was highly correlated with obesity in men and women of both groups. Differences within and between groups can be explained by biocultural factors that include gender, metabolic processes, diet, lifestyle, and history of political power. Overweight and obesity in underprivileged populations represents a serious public health challenge. An understanding of the interactions between biological factors and social and cultural practices can make important contributions to better-tailored public policies.

This research project was funded in part by the L.S.B. Leakey Foundation, the Wenner-Gren Foundation, and the National Science Foundation.

## 89

Reproducibility of the difference in awake-sleep blood pressure (BP) decline (dipping) between African American and European American women. H van Berge-Landry[1], DH

Bovbjerg[2], GD James[1]. [1]Binghamton University, Binghamton, NY; [2]Mount Sinai School of Medicine, New York, NY.

A decline in systolic BP from waking to sleep of <10% (nondipping) has been associated with an increased risk of cardiovascular morbidity, particularly in women. A growing body of evidence indicates that African Americans (AA) are more likely to be nondippers than do European Americans (EA), but this difference is largely based on evaluation of cross-sectional data. Whether this ethnic difference in dipping persists over time has rarely been evaluated. The purpose of this study was to examine whether the difference in BP dipping between AA and EA was reproducible. The subjects of the study were 47 AA (age = 39.7 ± 8.7) and 92 EA, (age = 37.4 ± 9.2), who participated in a larger study of life stress and familial risk of breast cancer. In that study, ambulatory BP measurements were taken while subjects were awake and asleep on two midweek workdays, ~1 month apart. Dipping was calculated as a proportional awake–sleep decline (average awake − average sleep)/average sleep. Reproducibility was evaluated using repeated-measures ANCOVA and by examining Bland–Altman plots. The ANCOVA results revealed that overall, AA women dipped less than EA women for both SBP ($P < 0.003$) and DBP ($P < 0.017$), consistent with previous research, and that this ethnic difference did not vary across the months. Bland–Altman plots showed that overall and by ethnicity, dipping was reproducible, with more than 95% of the values falling within ± 2 SDs of the expected mean difference. These results suggest that not only is dipping reproducible overall, but also that the ethnic difference in dipping between AA and EA women is reproducible as well, at least over 2 months.

Supported by NIH grant CA72457.

## 90

Thymic development and disease susceptibility in Tsimane infants of lowland Bolivia. A Veile[1], H Kaplan[1], M Gurven[2]. [1]Department of Anthropology, University of New Mexico, Albuquerque, NM; [2]Department of Anthropology, University of California, Santa Barbara, CA.

Multiple factors affect disease susceptibility in South American natives. Morbidity, stress, and diet play simultaneous roles in conditioning cellular immunity, particularly in infancy, when the immune system is "learning" to combat pathogens while competing with the energetic demands of rapid brain and body growth. The thymus is a primary lymphoid organ where T-lymphocyte maturation occurs. A biomarker of cellular immune function, the thymus is diminished in size, and function by nutritional insult and infection. A protocol has been devised to assess thymic cortical volume sonographically. While thymus size at birth has been shown to correlate negatively with infant mortality, most studies are cross-sectional, and its growth trajectory remains elusive. Longitudinal studies are restricted to clinical populations from the developed world, where infants experience extremely different selection pressures from their developing world counterparts. This research examines thymic development in a forager–horticulturalist population, the Tsimane of lowland Bolivia. A study was conducted from September 2006 to February 2007 in a cohort of 45 infants (aged 0–2). Sonographic measurements of the thymus were performed monthly as part of a routine health check, using a High Technology PU-2200 ultrasound with a 7.5 MHz linear pediatric probe. Preliminary analyses suggest that Tsimane infants possess smaller thymuses than do healthy controls. Previous research in the Tsimane indicates moderate PEM and high infant mortality by infectious disease. Thymic development patterns are reported with respect to cellular immune function and infant health outcomes. The roles of disease exposure and infant feeding patterns in shaping the thymic growth trajectory are discussed.

This project was funded by a NSF GRF.

## 91

Influence of lifestyle change and disease load on CRP levels among Tsimane' adults of lowland Bolivia. M Vento[1], WR Leonard[1], TW McDade[1], R Godoy[2], V Reyes-García[3], T Huanca[2], L Witt[1]. [1]Department of Anthropology, Northwestern University, Evanston, IL; [2]Heller School of Social Policy and Management, Brandeis University, Waltham, MA; [3]Universitat Autònoma de Barcelona, Bellatera, Barcelona, Spain.

C-reactive protein (CRP) is an important biomarker for immune activation that is pro-

duced in response to injury, infection or other inflammatory stimuli. Because it is a reliable measure of underlying systemic inflammation, CRP is considered a useful predictor of chronic inflammatory diseases such as heart disease and stroke. Recent studies indicate that CRP can be produced by adipose tissue, providing a possible mechanism for explaining why elevated CRP is a risk factor for cardiovascular disease. However, the links between CRP and cardiovascular health remain unclear. Population studies examining CRP levels in varying environments can provide us with a better understanding of how inflammatory processes influence CV health. Much of what we know of CRP is limited to clinical settings with comparative data from non-Western populations being relatively scarce. The present study examines the determinants of variation in CRP concentrations among the adult (18 years and older) Tsimane' Amerindians of lowland Bolivia. The Tsimane' are a particularly interesting population for studying CRP variation because they are exposed to high infectious disease loads and they are undergoing a lifestyle and nutritional transition. Previous work among Tsimane' children has shown elevated levels of CRP associated with high parasitic and infectious disease loads. This study compares CRP levels in Tsimane' adults to levels reported for industrialized world populations and explores the relationship between CRP levels and measures of body composition. These analyses provide insights into how the correlates of CRP variation differ under divergent social and ecological conditions.

Supported by the National Science Foundation (BCS-0322380) and Northwestern University.

## 92

Adequacy of steroid levels for the regulation of gonadotrophin secretion during the ovarian cycles of Bolivian women. VJ Vitzthum[1], CM Worthman[2], H Spielvogel[3], J Thornburg[4]. [1]Anthropology Department, Indiana University, Bloomington, IN; [2]Department of Anthropology, Emory University, Atlanta, GA; [3]Department of Bioenergetics, Instituto Boliviano de Biología de Altura, La Paz, Bolivia; [4]Max-Planck-Institut für Gravitationsphysik, Golm, Germany.

Via negative- and positive-feedback mechanisms, progesterone (P4) and estradiol (E2) mediate secretion of the pituitary gonadotrophins (LH, FSH) during the human ovarian cycle. For example, ovulation depends upon a midcycle LH surge induced by sufficiently high E2 levels. Within clinical samples of US/European women, low steroid levels are often associated with disruption of the normal patterns of gonadotrophin secretion. Although mean levels of ovarian steroids are typically lower in nonindustrialized populations compared with those in US/European women, little attention has been directed to the regulation of ovarian activity in these populations. We investigated variation in LH, FSH, and E2, based on assays of blood spots (Worthman and Stallings, 1994, 1997), collected from samples of Bolivian women in which mean salivary P4 is about 70% that of US women (Vitzthum et al., 2002, 2004). Like salivary P4, serum E2 levels were substantially lower than those reported for US/European samples. Nonetheless, gonadotrophin levels were comparable to those observed in industrialized populations. As expected for normal ovarian cycles, FSH and LH levels were highly correlated, and levels of FSH and E2 were negatively correlated. The absence of elevated gonadotrophins concurrent with the relatively lower ovarian steroid levels in these Bolivian samples suggests modulation of central–peripheral feedback dynamics, insofar as can be inferred from absolute levels of these hormones. It remains to be determined if other possible differences in ovarian feedback mechanisms are associated with interpopulational variation in ovarian steroids.

Supported by NSF, NIMH, and the University of California.

## 93

Assessing fitness levels in an upstate New York middle school population using longitudinal FitnessGram standardized fitness test scores. S Walker. Department of Anthropology, Binghamton University, Vestal, NY.

Levels of physical activity, nutrition, and body composition among children are significant predictors of health outcomes later in their adult lives. Healthy habits should be established early in life to reduce the likelihood of having obesity and inactivity-related health problems as adults. To combat the current obesity epidemic, one school district in upstate New York has implemented several programs to improve dietary habits and physi-

cal fitness levels, including the statewide "Steps to a Healthier New York" and "Give Me Five" programs. In order to assess the efficacy of existing programs and evaluate progress in the health of its students, the district is using the FitnessGram program and software to maintain longitudinal records of their standardized fitness test scores. For this study, over 600 students in grades sixth, seventh, and eighth were evaluated in their regular physical fitness classes from the spring of 2005 to the fall of 2006. Students were scored on tests of aerobic capacity, including the PACER test and the mile run, as well as tests of muscular endurance, strength, and flexibility, including curl ups, push ups, and the sit and reach test. This study compares improvements in fitness tests during the summer months, with improvements during the winter months, overall and for each separate measure of endurance, strength, and flexibility. The students' strengths and weaknesses are identified, providing valuable feedback that can be used to improve the school's nutritional and physical fitness programs. This evaluation is the first of a continuing longitudinal research effort to monitor and improve the health and physical fitness of students in the school district.

## 94

Genealogical research and genetic haplotyping of American founder mutation patients point to shared ancestry in eighteenth century German-Americans. KM Walsh, H Hampel, M Clendenning, A de la Chapelle, DE Crews. Human Genetics, The Ohio State University, Columbus, OH.

Hereditary nonpolyposis colorectal cancer, the most prevalent type of hereditary colorectal cancer, accounts for 2–5% (18,900–47,500 cases) of the worldwide occurrence of colorectal cancer (CRC). In the U.S., where CRC is among the four most common types of cancer, a genomic deletion of exons 1–6 of the MSH2 gene has been identified. Originally discovered in seven apparently unrelated American families, the existence of an identical large gene deletion suggested that a founder mutation may exist in the United States, wherein an original progenitor introduced a novel mutation into the gene pool. This mutation, the American founder mutation (AFM), confers an autosomal dominant cancer predisposition with an $\sim$80% lifetime risk of HNPCC-associated cancers.

To date, 25 families have been identified which carry the AFM. DNA haplotyping confirmed that the first nine shared a common ancestry. Genealogical research is being conducted to link all 25 families to a common ancestor, who was the progenitor of the AFM. The identification of this progenitor, and the number of generations of ensuing descendants, is the basis for all AFM prevalence estimates. Previous publications claim to have linked three of the families to a common ancestor of German descent who arrived in America in 1727; however, genealogical research has shown that this may be a premature conclusion. The 1727 date falls within the range yielded by haplotype analysis, but genealogical discoveries indicate previously published data regarding the progenitor are off by one generation, altering estimates from 31,000 affected Americans to 16,000 Americans. This should not, however, belie the clinical importance of instituting AFM screening protocols.

## 95

Cow's milk consumption and growth of young children in the United States: Data from NHANES 1999–2002. AS Wiley. Program in Anthropology, James Madison University, Harrisonburg, VA.

The American Academy of Pediatrics recommends that after 1 year of age children can drink cow's milk as their primary beverage. Milk provides a rich source of calcium, Vitamins A and D (which are added to commercially available milk in the U.S.), along with other nutrients such as fat and protein. The transition from breast milk or formula to cow's milk is considered a natural progression in the dietary maturation of young children, but aside from its link to iron deficiency in infancy, relatively little is known about its effects on child growth and development. Data from NHANES 1999–2002 were used to describe cow's milk consumption patterns among 12–59-month old children in the U.S. and to test for relationships between cow's milk and growth in weight and height. Milk consumption was measured from a 24-h recall, a 30-day consumption frequency question, and from maternal reports of child-feeding practices. Fifty percent of all children in the sample were given milk daily, starting at 1 year of age, and 90% of children in the sample reported currently drinking milk at least once per day.

Those who drank milk less frequently were at significantly lower height and weight percentiles than those who drank milk daily, and this effect persisted when birthweight was controlled for. However, there was ethnic variation in milk consumption and its effects on height and weight. Milk intake reported from the 24-h recall was not associated with weight or height. Further analysis was conducted to test whether the timing of the entry of cow's milk had any effect on height and weight. These data suggest that drinking cow's milk can modulate early life history parameters.

## 96

Effect of physical activity on changes in postpartum adiposity and fitness in well-nourished, breastfeeding women. HS Williams, DL Dufour. Department of Anthropology, University of Colorado, Boulder, CO.

The role of physical activity in the postpartum weight loss of well-nourished lactating women is not well-understood. Previous studies examining the relationship between exercise and postpartum weight changes have been variable in design and have shown conflicting results. As part of an ongoing study of work efficiency in lactation, we have examined the changes in body weight and adiposity in 26 well-nourished, breastfeeding women with levels of leisure time physical activity that varied from very light to heavy. The women were measured at peak lactation (3.4 $\pm$ 1.1 month) and after weaning (11.2 $\pm$ 3.0 month). Adiposity was assessed from five skinfolds, and fitness was measured as $VO_2$max using a standard protocol on a bicycle ergometer. Leisure time physical activity was assessed via recall, and classified as sedentary-light (<3 METs, 0–2 days per week) or moderate-heavy (>3 METs, 3–6 days per week) in accordance with Centers for Disease Control guidelines. On the basis of a preliminary analysis, weight loss was not significantly different between the sedentary-light ($n = 13$) and moderate-heavy ($n = 13$) physical activity groups (9.0 $\pm$ 4.5 kg and 7.7 $\pm$ 1.8 kg, respectively). The sum of skinfolds decreased in both sedentary-light and moderate-heavy groups (10.3% and 13.4%, respectively), but the difference was not significant. $VO_2$max increased in both sedentary-light and moderate-heavy activity groups (3.9% and 8.4%, respectively), but again, the difference was not significant. These results suggest that increases in physical activity may not be a major contributor to postpartum weight loss.

This research was funded by the Wenner-Gren Foundation and the Council of Research and Creative Work, University of Colorado.

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Methods for phenotyping brachydactyly type A3 and related anomalies in an endogamous population from eastern Nepal. KD Williams[1], J Blangero[2], CR Cottom[1], S Lawrence[1], B Jha[3], J Subedi[4], S Williams-Blangero[2], B Towne[1]. [1]Wright State University School of Medicine, Dayton, OH; [2]Southwest Foundation for Biomedical Research, San Antonio, TX; [3]Tribhuvan University Institute of Medicine, Kathmandu, Nepal; [4]Miami University, Oxford, OH.

Brachymesophalangia (BMP-V), a short and broad middle phalanx of the fifth digit, is the most common of all skeletal anomalies of the hand. When this feature appears alone, it is clinically known as brachydactyly type A3 (BDA3). Previous researchers have defined this anomaly in a number of ways, but inconsistent definitions have made population comparisons difficult, and some definitions allow for phalanges that do not have the characteristic shape and size features of BDA3 to be incorrectly categorized. Our research compares previously used methods for defining the BDA3 phenotype and evaluates them for identifying key features of the trait. A high prevalence of BDA3 has been observed among children in the Jiri Growth Study, a genetic epidemiological study of child health conducted in the endogamous Jirel ethnic group of eastern Nepal. A hand-wrist X-ray is taken annually of each child to assess skeletal development. X-rays of 1,341 Jirel children (669 boys; 674 girls) were examined for presence or absence of BDA3. Initial analysis identified BDA3 in 16.1% of the males and 13.1% of the females. The large number of related participants in this longitudinal study makes it an ideal circumstance to study skeletal development. Understanding the causes of this skeletal anomaly will ultimately inform our understanding of limb and digit development, and defining this phenotype(s) is an important task in that endeavor.

Supported by NIH grants F32HD053206, HD40377, AI37091, AI44406, and MH59490.

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Perceived vulnerability associated with anemia among Datoga infants. A Young, University of Arizona, Tucson, AZ.

Epidemiological surveys suggest that irondeficiency anemia is common in subSaharan Africa; however, rates vary between populations. Research in the Tanzanian highlands indicates that regional rates of anemia are variable, and are often higher among the Datoga, a seminomadic Nilotic pastoral group. Such variation indicates a need for further work on etiologic agents and responses to anemia among the Datoga. This study examines how anemia interacts with health and nutrition to create episodes of increased vulnerability and pivotal points for natural selection among Datoga children. It examines the ways that Datoga mothers identify and respond to episodes of anemia, and the impact of chronic anemia on child growth patterns. Finally, it discusses the implications of anemia for long-term health and reproductive fitness, and the use of local disease etiologies for tailoring intervention strategies to lower anemia rates. Data for this study was collected as part of a larger project that uses infant development as a framework for examining the evolutionary implications of child health patterns among Datoga households. Data was collected between November 2004 and February 2006, and includes infant health reports, growth and nutrition information, and hemoglobin data. All data were collected in 6-month intervals for 35 infants between 2 and 24 months of age. Preliminary analyses indicate that mothers identify chronically anemic infants as more vulnerable. However, caretaking responses vary, and are limited by household and social constraints. This indicates that interventions must be targeted to local contexts, and additional research is needed to examine the long-term health and development implications of variation in maternal responses to infant vulnerability among the Datoga.

Project funded by: National Science Foundation Dissertation Improvement Grant, Fulbright Hays, and a Sigma Xi Grant in Aid of Research.

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Mitochondrial DNA haplogroup diversity in three provinces of the Basque Country, Spain. K Young[1], AG Apraiz[2], R Rubicz[1], MH Crawford[1]. [1]Laboratory of Biological Anthropology, University of Kansas, Lawrence, Kansas; [2]Bilbao, Spain.

The Basques are one of the best-characterized populations from a genetic perspective, with many studies performed involving classical, HLA, nuclear, mitochondrial, and Y-chromosome markers. Questions remain, however, concerning the origin of this population, with the consensus being that they are likely a remnant of Paleolithic inhabitants of an ice age refugium south of the Pyrenees. Mitochondrial DNA data provide an ideal means of examining questions of population structure for maternal lineages, as well as population history, as mtDNA has a fairly high mutation rate and is non-recombinant. This study presents a large set of mtDNA haplogroup data from three Basque provinces in Spain (Alava: 6 villages, $n = 116$; Bizkaia: 17 villages, $n = 225$; Guipuzkoa: 10 villages, $n = 204$). Samples were hierarchically analyzed for five of the known European mitochondrial DNA haplogroups using diagnostic RFLPs (H: −7025AluI; J: −13704BstNI; K: +12308HinfI, −9052HaeII; U: +12308HinfI, +9052HaeII; and V: −4577NlaIII). As has been reported earlier in studies using smaller samples (Bertranpetit et al., 1995, Corte-Real et al., 1996), the majority of Basques in each of the provinces are haplogroup H (Alava - 51.7%, Bizkaia —46.7%, Guipuzkoa—46.1%). The other haplogroups are present at much lower frequencies, with U the second most common at around 15%, while J, K, and V are all found at frequencies under 10%. AMOVA analysis demonstrates that 98.89% of the variation is found within the provinces, with the 1.11% variation found between provinces being only weakly significant ($p = 0.02$). These results suggest mitochondrial homogeneity among the Basques.

This work is supported by the Basque Government and National Geographic Project 6935-00.

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Caloric need in households headed by Luo grandparents. AM Zidron, J Yogo, E Juma, GH Ice. Ohio University, Athens, OH.

A major problem facing the continent of Africa as a result of the HIV/AIDS crisis is malnutrition. Current research investigating the nutritional status of orphans is conflicting

in results and conclusions. Several studies suggest that orphans suffer from a loss of food security and are therefore more susceptible to the effects of malnutrition, including increased morbidity, stunting, and wasting. However, there are researchers that suggest that orphans living with their grandmothers have an adequate nutritional status and do not differ in nutritional status from nonorphaned children. Furthermore, it has been suggested that having children in the home can be advantageous to caregivers. As part of the interview portion of the Kenyan Grandparents Study, 389 Luo grandparents (age 73 $\pm$ 8) were asked specific questions regarding each child in the household, including age and sex. The caloric need for each child in a household was determined using the American Heart Association's "Dietary Recommendations for Children" and a caloric need per household was then calculated. Caloric need was significantly higher in households headed by caregivers (3069.38 $\pm$ 20863.025 vs. 589.33 $\pm$ 1246.413, $P \leq 0.001$). No significant difference existed between the number of adults in caregiving and noncaregiving households (3.36 $\pm$ 2.149 vs. 3.00 $\pm$ 2.069, $P = 0.217$); thus, it is probable that any extra food required for the household must be acquired through extra work performed either by the grandparent or child. Caloric need was not found to be significant with either anthropometric measures or socioeconomic status. These results suggest that children are either not getting the required calories, grandparents have to work harder, or that children are contributing to enable adequate household food.

This project was funded by the NSF grant 0515890, the OUCOM D.O./Ph.D. program, and the CORE.