Household economic strategies and nutritional anthropometry of women in American Samoa and highland Bolivia

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Abstract

This study compares findings from research projects involving different genetic, environmental, and cultural contexts: a study of lifestyle and health from American Samoa (ASLS) and the Bolivian project, Reproduction and Ecology in Provincia Aroma (REPA). This paper presents analyses of varying economic strategies and their association with nutritional status indicators in each population. The ASLS sample includes 66 Samoan women and the REPA sample includes 210 Aymara women. Principle components analysis of household economic resources within each sample extracted two significant factors: one represents modernizing influences including education and occupational status, and the other represents ethnographically salient traditional economic behavior. The traditional pattern includes adding household members in Samoa and selling agricultural products in Bolivia. This analysis places each woman along two continua, traditional and modern, based on her household mobilization of economic resources, permitting an understanding of the patterns underlying household economic behavior that is not possible in univariate analyses of socioeconomic variables. For the Bolivian women the strategy involving more education and higher occupational status was associated with higher measures of several nutritional status indicators, including body mass index, arm muscle area, and peripheral skinfolds. But among the Samoan women, where substantial obesity was the norm, there were no significant differences in anthropometric measurements based on economic strategies. These data argue for the importance of directly measuring the potential consequences of variation in household economic strategies rather than merely inferring such, and of assessing ethnographically relevant aspects of household economic production rather than limiting analyses to non-context-specific economic indicators such as income. This focus on household strategy is likely to be fruitful especially where economic and nutritional conditions are marginal. The findings from Bolivia also support efforts in developing countries to improve girls’ education, and thereby occupational prospects, as a means to improve their health status as women. © 2002 Elsevier Science Ltd. All rights reserved.

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Introduction

Individuals and families in all societies make culturally informed choices about their strategies for obtaining economic resources for their households. In modernizing and developing contexts, where options other than subsistence production are available, these choices proliferate as households manipulate their labor and capital to meet both subsistence and cash income needs and goals. The set of strategies applied by any given society will vary substantially from that used by any other group based on local historical, environmental, and cultural conditions (Fleuret & Fleuret, 1980). Especially in societies where nutritional status is marginal and household income is required to purchase a substantial portion of the diet or to purchase foods of greater nutritional quality, the choice of economic strategy is likely to play a very important role.
role in the nutritional status of individuals in the household.

Many aspects of varying household economic strategies have been described for populations in developing contexts, but few of these studies have also looked at indicators of nutritional or health status. Moreno-Black and Price (1993) reported on the impact of sales of gathered food by women in northeastern Thailand. The women who marketed gathered food contributed more to family income than their husbands. While the foods that were sold were also those that were traditionally consumed by these families, over half of the cash gained from sales was used to purchase other foods; however, there is no indication of the nutritional implications of this strategy. Holden, Coppock, and Assefa (1991) surveyed Borana pastoral households in Ethiopia and found that poor families tried to increase the milk offtake from their cattle in order to sell the excess to purchase grain for human consumption. The researchers point out that this strategy may produce a short-term nutritional gain but that the loss of milk for calves is likely to result in smaller, less healthy herds and a long-term reduction in household economic well-being. While this study hypothesizes both short-term and long-term nutritional effects, there were no nutritional status measurements reported for the Borana. Waters (1997) described a pattern of temporary rural to urban migration for participation in the informal economy among males in Ecuador that supplements rural household incomes and may serve to reduce permanent rural to urban migration. These patterns could have profound effects on a variety of health parameters, but no data were presented to document the hypothesized associations. Luerssen (1993) studied the impact on health of the differing economic strategies pursued by households in Nuñoa, Peru. She found that the low-income households existing on a combination of subsistence production and informal employment were most at risk for health problems. In a comparative analysis, Durrenberger and Tannenbaum (1992) studied Liu and Shan households in Southeast Asia and described how the differing cultural contexts in these two groups influenced the economic decisions they made. These findings were not extended to consider diet or health in these populations.

A few researchers have explicitly investigated household economic strategies and diet but have rarely measured nutritional status. Kaiser and Dewey (1991) examined the impact of household economic strategies on intrahousehold food allocation in rural Mexico. They found associations between several aspects of economic strategy and food consumption, including the findings that households with higher incomes had greater meat consumption regardless of the source of the income. While this study provided important information about food intake there was no direct assessment of nutritional status. Huss-Ashmore (1996) reported on work in Kenya where livestock production is critical to household resources. She found that larger farm size was related to increased consumption of animal products in her survey households, but there was no direct assessment of nutritional status. In one of the very few studies assessing both economic strategies and nutritional status, Huss-Ashmore and Curry (1994) investigated household economics, diet, and nutritional status in Swaziland. Among other findings, they demonstrated that families using more modern agricultural techniques had higher food consumption and women's nutritional status was better among those who were employed.

It has recently been asserted that the number of overweight individuals in the world is approximately equal to the number who are underweight (Gardner & Halweil, 2000), suggesting that overnutrition has become as great a nutritional problem as undernutrition. However, most studies of economic strategies have been done in populations where attaining adequate nutrition, not overnutrition, is the primary concern. By contrast, the analysis presented here compares an overweight and a low-to-normal weight population differing in genetic background as well as environmental and cultural context. In the anthropological tradition of cross-cultural comparison, this paper attempts to describe and compare household economic strategies in American Samoa and highland Bolivia, and to examine whether these strategies are associated with nutritional status among adult women in each setting. Since both of these settings are in the developing world, we hypothesize that economic strategies will fall into two categories in each population: intensification of traditional patterns versus increasing engagement in the world economy. The traditional economic patterns must be defined by the ethnographies of the groups, while increasing engagement in the world economy is defined by common items such as educational attainment and occupational status. Secondly, we hypothesize that these economic strategies should be associated with nutritional status of the women, and that the nature of this association should be for those pursuing westernized economic strategies to have higher measurements of lean and fat body mass.

**Methods**

**The settings**

While there is much interest in the household as the locus of production, it must be remembered that the nature of the household differs dramatically from culture to culture. Samoan households have traditionally been defined as the matai, the titled head of a household, and his 'auaiga, or “family cluster” (Shore,
1982). This group “comprises all the people who are directly under (the matai), who serve him, reside on a single household compound in which he has his main house, and all of whom cook and eat from the same ground oven” (Shore, 1982:52). Shore goes on to note the complex nature of household formation in Samoa:

(while) it is assumed that most of the ‘au’aiga members will be cognatic kin or affines and usually closely related, household compounds include not only nuclear or extended families, but also kin who are classed as ‘aiga faimai (literally, “increasing kin” or “outside kin”) who are more distant relatives, temporarily resident in the ‘au’aiga exercising their rights as kinsmen to hospitality and potential residence with any of their families. Because of the frequency of such visitors in a household and the absence of those normally resident who have gone temporarily to live in other households, household composition and thus census figures are very unstable. (Shore, 1982:53)

This pattern of household formation can be found today in American Samoa, especially among families who recruit ‘aiga faimai from the independent nation of Samoa to increase earning potential and economic resources of the family. At the same time, especially since the 1960s, more and more families have been adopting western household formation patterns with nuclear families accounting for an ever increasing segment of the population. These latter households rely on education and upward mobility in the occupational status hierarchy for increasing resources, based primarily on the employment of the household head and spouse. While many families in American Samoa maintain gardens and occasionally fish for consumption, these activities account for a very small percent of dietary intake, with most food being purchased, and so dietary intake is heavily dependent on income.

In Bolivia, rural Aymara households are typically multigenerational, with married adult sons often continuing in or near their natal homesteads. Altiplano farms commonly comprise a cluster of small adobe buildings with one to several separate quarters for sleeping and another for cooking and eating. Such clusters are scattered over the landscape, separated by farming and grazing lands. Although a wife usually transfers to the household of her spouse, it is not uncommon for a married woman, with her husband, to remain in or near her parents’ homestead instead. Unmarried adult children, especially women, often also maintain their natal residence although there is an increasing tendency to migrate to the cities. Decisions of residence are determined in part by the availability of agricultural land and the need for labor, the need to care for aging parents, and the availability of alternative economic opportunities whether temporary (usually married men traveling to the city, mines, or jungles) or permanent (typically unmarried men and young married couples). Subsistence is based upon agropastoralism — sheep, cattle, potatoes, barley, onions, carrots — augmented to varying extent by cash income generated principally through males’ labor outside the household and the selling of farm products (e.g., wool, potatoes, milk) in the regional markets or to “middlemen.”

**Samples**

American Samoa: Research was conducted on the island of Tutuila, the largest and most populous island of American Samoa, during July and August, 1992. The population of American Samoa was reported as 46,773 for the 1990 census. Of that total, 45,043 resided in the 57 villages of Tutuila, comprising 6334 households. For this study, 66 Samoan women representing 66 different households in 22 villages from all geographic areas of the island of Tutuila, American Samoa, completed the interviews and measurements. This sample represents about 1% of the households on Tutuila in 1992. Further details on sampling and documentation of the representativeness of the sample are available elsewhere (Bindon, Knight, Dressler, & Crews, 1997).

Bolivia: Representing more than 80% of the eligible participants, Project REPA (Reproduction and Ecology in Provincia Aroma) recruited 316 women, 19–40 years of age and currently in stable sexual unions, from 30 rural altiplano communities scattered over approximately 200 km² situated about half-way between La Paz and Oruro, Bolivia, during 12 months beginning in November 1995 (Vitzthum, et al., 1998). Of those, 210 had data complete enough to be considered in this study.

**Nutritional status measurements**

American Samoa: In order to be consistent with other earlier surveys undertaken as part of the Samoan Studies Project, all measurements were taken following the techniques described by Weiner and Lourie (1969). Stature was measured on barefooted subjects with a GPM anthropometer to the nearest millimeter. Weight was measured on lightly clothed individuals with a balance scale to the nearest quarter pound and translated into kilograms. Upper arm circumference (UAC) was measured to the nearest millimeter using a flexible steel tape. Skinfolds were measured to the nearest millimeter at the triceps (TSF), subscapular, suprailliac, and calf locations using a Lange caliper.

Bolivia: All measurements were made by a single individual (VJV) according to the protocols described in Lohman, Roche and Martorell (1988). Weight to the nearest 0.1 kg was taken on barefoot subjects wearing only a light “housedress” of known weight using a Seca
electronic scale. Stature without shoes was measured to the nearest mm with a stadiometer. Upper arm circumference to the nearest mm was measured with a non-stretching anthropometric tape and all skinfolds (triceps, biceps, subscapular, suprailiac, calf, thigh) to the nearest mm with a Harpenden caliper.

In addition to the measurements noted above, two indices were calculated: body mass index (BMI) and upper arm muscle area (AMA) as follows:

\[ \text{BMI} = \frac{\text{weight (inkilograms)}}{\text{stature (inmeters)}^2}, \]

\[ \text{AMA} = \frac{\text{UAC} - (\pi \times \text{TSF})}{(4 \times \pi)}, \]

where UAC is the upper arm circumference in millimeters and TSF is the triceps skinfold measurement in millimeters.

While the measurement techniques were slightly different in the two populations, this would only affect the comparison of the two groups to one another and not the primary analyses of interest, the intrapopulation analyses of the relationship of economic strategy to nutritional status.

Economic resources

American Samoa: Socioeconomic data were obtained by interviews with the subject primarily conducted in English by research team members, but there was always a team member or nurse present to assist if the subject preferred to do the interview in Samoan. Such language problems were minimal. Economic resources were gauged using four variables: the household occupational status, which is a sum of the subject’s and spouse’s occupational statuses assessed on a six-point scale from unemployed or home-tender to executive level professional; the subject’s years of education, the number of wage earners living in the household, and the household annual income assessed on a six-point scale.

Bolivia: All interviews of participants were conducted in the woman’s native language (Aymara or Spanish) by bilingual female members of the research team. At the initial recruitment interview, a woman reported on her own educational history and the occupation of herself and her husband. Over the course of several months, as the communities became accustomed to the research team, additional socioeconomic data were collected through interviews and observations according to a set instrument. Economic resources were assessed by five variables: the woman’s job and salary frequency, an index calculated as the occupational status of the woman assessed on a four-point scale from housewife to teacher times the frequency that she reported getting paid on a three point scale; frequency of sales of goods by the woman on a four-point scale from never to daily; the number of years of education of the woman; spouse’s job and salary frequency calculated the same as for the woman; and frequency of sales of goods by the spouse on a four-point scale.

Data analysis

All statistics were calculated using SPSS\textsuperscript{\textregistered} version 8. Descriptive statistics have been produced by the Frequencies routine. The Factor Analysis procedure using the Varimax rotation technique was used to explore the pattern of variability of economic resources in the two samples. Factor scores were calculated for each factor with an Eigenvalue greater than 1.0, using the regression method. Finally, the association between economic resource factor scores and anthropometric measurements were calculated using the Partial Corr procedure, controlling for age.

Results

Descriptive results

As illustrated in Table 1, the women from American Samoa were older than the Bolivian women and they were significantly larger in every anthropometric dimension measured. Aside from being significantly taller, the Samoan women exhibit the excessive obesity previously noted for this population (Bindon & Baker, 1985). Only four of the Samoan women (6\%) had BMIs of less than 25, the current overweight standard, and one-third had BMIs of 40 or greater, indicating extreme or morbid obesity. By contrast, among the Bolivian women, 78\% had BMIs of less than 25, and only one woman had a BMI exceeding 30.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Bolivia ((N = 210))</th>
<th>Samoa ((N = 66))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>28.5 (\pm) 5.2</td>
<td>56.8 (\pm) 8.3</td>
</tr>
<tr>
<td>Stature, cm</td>
<td>149.1 (\pm) 11.3</td>
<td>160.5 (\pm) 5.2</td>
</tr>
<tr>
<td>Weight, kg</td>
<td>52.0 (\pm) 7.3</td>
<td>96.6 (\pm) 20.1</td>
</tr>
<tr>
<td>Body mass index, kg/m(^2)</td>
<td>23.2 (\pm) 2.5</td>
<td>37.5 (\pm) 7.7</td>
</tr>
<tr>
<td>Arm circumference, cm</td>
<td>22.9 (\pm) 8.1</td>
<td>38.9 (\pm) 6.5</td>
</tr>
<tr>
<td>Arm muscle area, cm(^2)</td>
<td>35.8 (\pm) 5.3</td>
<td>49.1 (\pm) 17.6</td>
</tr>
<tr>
<td>Calf skinfold, mm</td>
<td>9.9 (\pm) 4.6</td>
<td>34.3 (\pm) 15.6</td>
</tr>
<tr>
<td>Subscapular skinfold, mm</td>
<td>13.3 (\pm) 7.6</td>
<td>56.5 (\pm) 7.4</td>
</tr>
<tr>
<td>Suprailiac skinfold, mm</td>
<td>15.8 (\pm) 9.5</td>
<td>57.2 (\pm) 7.8</td>
</tr>
<tr>
<td>Triceps skinfold, mm</td>
<td>12.7 (\pm) 7.6</td>
<td>46.1 (\pm) 12.9</td>
</tr>
</tbody>
</table>

\textsuperscript{a}All differences between means for Bolivia compared to Samoa significant at \(p \leq 0.001\); all differences between variances significant at \(p \leq 0.001\) except for height, arm circumference and subscapular skinfolds (n.s.)
Economic resources available to women in these two populations differ in important ways dictated by their differing cultural context, and the measurements of those resources also differ in the two surveys. Table 2 presents descriptive statistics for salient socioeconomic variables for the women. In American Samoa, just over two-thirds of the women were married at the time of the survey. Their median number of years of education was nine, indicative of the termination of schooling at the ninth grade when most of these women were growing up in American Samoa. Approximately 10% of the Samoan women reported some college education. Just over one-third of the women were employed for wages with most of the women being employed as teachers, nurses, or clerical workers. Slightly less than half of the women had employed spouses, with most of their husbands working as laborers, carpenters, mechanics, and similar jobs. Seventy-five percent of the women's households had multiple numbers of wage earners, with the median being two earners, but 17% of the households had three or more wage earners. The median income of the Samoan households was between $8000 and $15,000 (1992 US dollars).

Among the Bolivian women, the median years of education was five, with just two women reporting college experience. Over 95% of the Bolivian women reported that they do not earn wages, while 57% of the women reported that their spouses worked for wages. Ninety-two percent of the women and 46% of their spouses made income for the household by selling agricultural products.

Economic strategies

Factor analyses were performed on the economic resource data for the two samples separately. Table 3 presents the factor analysis of economic resources for the Samoan women. Two factors were extracted with eigenvalues of more than 1.0, with each accounting for greater than one-third of the variance. The first factor loads heavily and positively on the number of wage earners and the household income. This factor represents the traditional Samoan approach to maximizing household resources by increasing the number of workers. The second factor loads heavily and positively on the education of the woman and the occupational status of the woman and her spouse. This factor represents the modern or western approach to increasing family resources through increasing education and increasing occupational status.

Table 4 presents the factor analysis of relevant economic resource variables for Bolivian women. Two factors were extracted with eigenvalues greater than 1.0, each accounting for more than one-fourth of the variance. The first factor loads heavily on the spouse’s job/salary variable (negatively) and on the frequency of agricultural sales by the spouse (positively). This factor represents the continuation of highland Andean economic trends of peasant agriculture with higher scores being reflective of excess agricultural production and sales by the male in the household. The second factor loads heavily and positively on education and the woman’s job/salary variable, and negatively on the frequency of sales by the woman of agricultural products. This factor represents a more modern attempt at increasing household resources through increasing education and employment of the women.

Factor scores were computed for each sample for both factors using the regression technique. These factor scores represent the relative weighting of the more traditional (factor 1 score in both cases) or more modern (factor 2 score in both cases) economic strategies being pursued by the women and their families. This results in non-dichotomous scores along two continuous dimensions of economic resource mobilization for each woman based on her household economic strategy. That is, each woman is located in a two-dimensional

<table>
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<th>Table 2</th>
<th>Descriptive statistics for social and economic variables</th>
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<tbody>
<tr>
<td>Variable</td>
<td>Percent or median</td>
</tr>
<tr>
<td>Samoan women (N = 66)</td>
<td></td>
</tr>
<tr>
<td>Percent married</td>
<td>68.2%</td>
</tr>
<tr>
<td>Median years of education</td>
<td>9.0</td>
</tr>
<tr>
<td>Percent employed for wages</td>
<td>34.8%</td>
</tr>
<tr>
<td>Percent of spouses employed</td>
<td>47.0%</td>
</tr>
<tr>
<td>Median number of wage earners in household</td>
<td>2.0</td>
</tr>
<tr>
<td>Median annual income category</td>
<td>$8000–$15,000</td>
</tr>
<tr>
<td>Bolivian women (N = 210)</td>
<td></td>
</tr>
<tr>
<td>Median years of education</td>
<td>5.0</td>
</tr>
<tr>
<td>Percent earning salaries</td>
<td>4.5%</td>
</tr>
<tr>
<td>Percent of spouses earning salaries</td>
<td>57.1%</td>
</tr>
<tr>
<td>Percent selling agricultural goods</td>
<td>92.3%</td>
</tr>
<tr>
<td>Percent spouses selling agricultural goods</td>
<td>46.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Factor analysis of economic resources for Samoan women (N = 66)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varimax rotated component matrix</td>
<td>Factor 1</td>
</tr>
<tr>
<td>Household occupational status</td>
<td>0.198</td>
</tr>
<tr>
<td>Number of wage earners</td>
<td>0.915</td>
</tr>
<tr>
<td>Years of education of women</td>
<td>−0.052</td>
</tr>
<tr>
<td>Estimated household income</td>
<td>0.823</td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>1.557</td>
</tr>
<tr>
<td>Percent of variance</td>
<td>38.9</td>
</tr>
</tbody>
</table>
space according to her score on the traditional factor and the modern factor.

### Economic strategies and nutritional status

Partial correlation coefficients, controlling for age, between economic factor scores and the anthropometric measurements were calculated for the samples separately. For the Samoan women, none of the correlation coefficients were very large and none achieved statistical significance, indicating that the economic strategy pursued is not strongly associated with nutritional status for the Samoan women.

These same partial correlations were tabulated for the Bolivian women in Table 5. Among these women, there were several significant associations between the factor 2 (modern strategy) factor score and nutritional status measurements. All of the significant correlations were positive, indicating that women with higher levels of education and job/salary values and low frequencies of sales have higher body mass indices, larger arm circumferences and arm muscle areas, and larger calf and triceps skinfolds.

Partial regression coefficients, controlling for age, were calculated for each sample using each economic variable from the factor analysis. For the Samoan women, as with the factor scores, none of the variables (household occupational status, education, number of wage earners, and household income), was significantly correlated with any of the anthropometric measurements. For the Bolivian women, woman’s occupational status, husband’s occupational status, education, frequency of sales by the woman or her husband all showed no significant association with any of the nutritional status measurements. The frequency of earning a salary by the woman is significantly associated with height ($r = -0.16$, $p = 0.03$), BMI ($r = 0.15$, $p = 0.05$), arm muscle area ($r = 0.15$, $p = 0.04$), calf ($r = 0.15$, $p = 0.03$) and triceps skinfolds ($r = 0.20$, $p = 0.007$) and the frequency of earning a salary by the spouse is significantly associated with calf skinfolds ($r = 0.18$, $p = 0.02$).

### Discussion

#### Limitations

Several limitations should be considered before interpreting the results. First, these studies were both devised for purposes other than assessing the relationship between economic strategies and nutritional status so the sampling protocols and survey techniques were formulated appropriate to the primary goals of the studies. Nonetheless, in both studies the socioeconomic and anthropometric data formed integral parts of the studies. While the anthropometric techniques were comparable, different aspects of the socioeconomic context of households were surveyed in the two groups. In each case, the surveyed features were chosen for their ethnographic salience. One of the most pronounced differences between the two groups is the average age of the women based on the differing sampling goals. In a larger study of Samoans, 332 women aged 25–35 were significantly lighter than the 66 older Samoan women in the current study (82.6kg vs. 96.6kg, $p < 0.001$), but their average BMI was still above the current obese standard (32.0kg/m²), and significantly greater than the Bolivian women (23.2kg/m² vs. 32.0kg/m², $p < 0.001$ using independent samples t-test). In other words, the age difference in the current study accentuates the weight, BMI, and skinfold differences between the Samoan women and the Bolivian women, but the differences in these measurements would hold even if the Samoans were the same age as the Bolivians. While the Samoan women are much taller than the Bolivian women, the substantial difference in BMI and skinfolds indicates that the height difference alone does not account for all of the weight differences in the two groups. These limitations notwithstanding, there are several intriguing aspects of these data that should be considered.
Economic strategies

There are many ways to define economic strategy. We are using the term to refer to the differential mobilization of economic resources by households. We have defined the basic economic resources in each group on the basis of how cash income is generated by the family. We are looking at a combination of formal and informal sector resources based on the observation that most households in our study areas, as in most developing contexts, make use of both sectors. The factor analyses of economic resources suggested two patterns for each group. In each case one of these patterns involves an intensification of traditional economic strategies and the alternate pattern indicates intensification of the household interaction with the world economy. That is, the nature of the two factors is very similar in concept in each group, in spite of the differences in specific economic resources in the two populations. For the women in Samoa, the second pattern involved increasing educational attainment by the women and higher occupational status for both the women and their spouses. In Bolivia, this pattern also included increasing education for the women, as well as their occupational/salary status and less frequent sales of agricultural products by the women. All of these characteristics are trending in the direction of modern or Western patterns of economic interaction.

The traditional pattern of interaction is indicated in Samoa by increasing numbers of wage earners in the household and higher household income. This economic strategy embraces the longstanding Samoan practice of a very extended family household residing in a single compound and economically producing under the direction of the matai. Household structure has always been very flexible and the addition of workers to enhance family standing is an understandable tactic on the part of the matai. Additional impetus has been lent to this practice by the substantial difference in per capita income between Samoa and American Samoa, and the willingness of family to relocate to American Samoa.

In Bolivia, intensification of the traditional pattern involves additional household agricultural production for sale. This economic factor is also represented by a negative association with the spouse’s occupation/salary status, indicating that this strategy is used to increase income when the employment income of the woman’s husband is very low. It may also be the case that if the cash income from this traditional strategy is deemed sufficient, husbands may not seek wage labor in addition to or instead of farm labor. Labor migration, the strategy identified by Waters (1997) as an important economic factor in maintaining household economic status in Ecuador, accounts for 29% of the economic activity of these Bolivian husbands, and of course, since they are removed from the household, they are not selling items on any regular basis. As with the Thai women studied by Moreno-Black and Price (1993), the vast majority of the Bolivian women (64.5%) are selling items that they are also using for their own household consumption.

Economic strategies and nutritional status

In this study, there was no association found between economic strategy and nutritional status for the Samoan women, while in Bolivia such an association was found. In Samoa, most of the women are obese and overnutrition is the primary nutritional problem for this population. In this context of caloric over-sufficiency, it appears that neither economic strategy produces a better nutritional outcome. No one is going hungry because of economic decisions, rather it is likely that the overall low activity levels in the face of abundant and calorically dense foods are accounting for most of the obesity among these women (Bindon, 1996). As noted elsewhere, high rates of obesity occur among Samoan women with relatively low levels of engagement in the modern economy (Bindon & Baker, 1985), leading to high rates of obesity-associated illness, especially diabetes. While this is a severe public health problem, it is one that will require lifestyle changes going well beyond economic strategies as conceptualized here.

The body mass indices of the Bolivian women are much lower than those of the Samoans, over three-fourths of them being either normal or underweight. It appears from our results that household economic strategy does make a difference in this context, with households pursuing a more Western economic strategy of increasing education and employment producing women with greater muscle mass and fat stores, probably because of greater quantity and/or quality of foods consumed and, for some, lesser physical activity. This finding is similar to that of Huss-Ashmore & Curry (1994) who observed that the strongest predictor of BMI among the Swazi women in their study was the factor they labeled female employment. This factor included employment of the women off the farm and the purchase of labor, which likely replaced some of the weeding and farming activity of women. Thus, a combination of increasing cash income through employment and likely decreasing physical activity was responsible for increasing BMI among the Swazi women.

Kaiser and Dewey (1991) found that per capita income was an overriding factor in the nutritional intake of mothers and children in rural Mexico, and it is likely that much of what loaded into the economic strategy factor scores in the current study is predicting overall income. For the Samoan women, where income data are available, both factors were significantly and positively correlated with income. It is likely that among the Bolivian women the education and occupation/
salary factor is also predicting the income available to these women. If the household food distribution is similar in Bolivia to that in Mexico (Kaiser & Dewey, 1991) the women are likely to be nutritionally favoring their children at their own expense and only those with more than adequate income to purchase additional food, particularly foodstuffs of higher quality, would be able to consume enough calories to achieve a higher BMI.

Increasing BMI with an increasing reliance on a Western, relative to a traditional, strategy among Bolivian women should not be taken as indicating that Western economic strategies are inherently superior (in terms of effects on nutritional status) in all cultural contexts, nor even when compared to any traditional altiplano strategy other than that specific to the time and place of this study. It should be remembered that in the process of modernization, traditional practices that were once adaptive can be disrupted by numerous factors and thereby rendered relatively less beneficial. Our goal is not to generalize about the effects on nutritional status of different economic strategies, but rather to evaluate the current conditions and consequences in specific locales, and to encourage a more sophisticated approach to evaluating the relationship between economic practices and indicators of health status.

Several studies in developing countries have noted an association between maternal education and/or employment and indices of child health including nutritional anthropometrics (Pebley & Goldman, 1995; Lamon-tagne, Engle, & Zeitlin, 1998; Terra de Souza et al., 1999) although some have found evidence of a more complex or even absent relationship (Reed, Habicht, & Niameogo, 1996). For populations considered in this study, among Samoan children living in Samoa, American Samoa, and Hawaii, occupational status of mother and father was significantly and positively associated with size-for-age of children, but this was not true for the education of either the mothers or fathers (Bindon, 1987). It is likely that the underlying reasons for such an association (or lack thereof) vary in different settings, depending in part upon the significance of education for improving a woman’s economic opportunities. In a study of data from Demographic and Health Surveys of 22 countries, Desai and Alva (1998) argued that education is acting as a proxy for socioeconomic status of the family and that statistically significant effects are reduced in most settings when controlling for husband’s education and access to piped water/toilet. The significant effects of maternal education on child’s height-for-age do remain, nonetheless, in several locales. The reasonable inference is that whether having a direct causal impact on offspring’s growth or acting as part of a constellation of attributes that contribute to a successful household economic strategy, improvements in maternal education in at least some settings are associated with better child health.

It is worth emphasizing, however, that the focus on the possible relationship between maternal skills/activities and child health tends to overshadow the potential benefits to women themselves of improvements in their own education and occupation. There are surprisingly few examinations of the relationship between household economic strategies and direct measures of adult nutritional status. However, two studies in one of the world’s poorest countries, characterized by a very high rate of maternal mortality, 850/100,000 live births (Population Reference Bureau, 1998), suggest such benefits to the women themselves do exist. In the slums of Dhaka, Bangladesh, researchers found significant associations between maternal weight, BMI, and mid-upper arm circumference against maternal education and household economic status (Baqui, Arifeen, Amin, & Black, 1994). Similarly, in Matlab, Bangladesh, maternal height, weight, and hematocrit were all found to be positively associated with maternal education (Huffman, Wolff, & Lowell, 1985). The data from the Bolivian altiplano presented here, like the data from Bangladesh, argue that where conditions are marginal and difficult, variations in household economic strategies can have a pronounced effect on the nutritional status of adult women.

The results in this analysis show the value of investigating household economic strategies rather than attempting to evaluate more conventional measures of socioeconomic status such as occupation, income, or education. In the first place, by evaluating the economic resources available to a household as in the present study, the individual becomes contextualized within the household, which forms the primary locus of interaction with the larger society. In this way, the different modes of household economic production (e.g., traditional versus modern strategies) are highlighted, and knowledge of these patterns can suggest what economic program recommendations are likely to be most beneficial. Secondly, conventional SES measures might mask the type of patterning shown by this analysis. Income, in particular, may be comparable between households practicing different strategies, but the effects on health and nutritional status may be very different. For example, of the economic resource components in Bolivia, when considered singly, neither the woman’s occupational status nor that of her husband, nor her education, nor the frequency of sales by the woman or her husband is associated with any of the nutritional status measurements. The frequency of earning a salary by the woman is significantly associated with height (negatively), BMI, arm circumference, arm muscle area, calf and triceps skinfolds and the frequency of earning a salary by the spouse is significantly associated with calf skinfolds. By evaluating household strategies it can be seen that the frequency of the woman earning a salary is part of a larger pattern that includes her educational
level and is inversely related to her frequency of agricultural sales. The ability to bring out this patterning through the use of factor analysis should inform future research on economic resources, with the caveat that collection of the appropriate economic data is dependent on understanding the cultural context of the population. It is not the case that one standard economic survey instrument would have captured the patterning in the two populations in this study. It is essential to collect different, culturally salient, information in different cultural settings. The factor analysis is important in being able to discern the similar types of economic strategies (intensification of traditional patterns versus increasing engagement with the world economy) based on the types of ethnographically salient economic resource data collected.

In conclusion, in economically developing societies, choice of household economic strategy may play an important role in the nutritional status of women. In the hyper-obese population of American Samoa, strategy was not related to degree of overnutrition, but that does not rule out the possibility that economic strategy could be related to the development of obesity in populations at an earlier stage of overnutrition. The exact nature of the role of economic strategy in the nutritional status of women will be determined by the social, behavioral, and nutritional context of the women. It is very likely that there are intrahousehold differences such as those found by Kaiser and Dewey (1991) in most societies and future work should seek to investigate the intracultural and intrahousehold patterning of the associations of economic strategy and nutritional status.

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