Human Organization, Vol. 59, No. 1, 2000
Copyright © 2000 by the Society for Applied Anthropology
0018-7259/00/010117-08$1.30/1

Markets and the Health of Indigenous People: A Methodological Contribution

Ricardo Godoy and Marina Cárdenas

Researchers disagree on whether markets and acculturation hurt, help, or produce ambiguous effects on the health of indigenous people as they become part of market economies. Past researchers have generally not measured the separate effects of markets and acculturation on health, nor have they controlled for the effect of third variables. A multivariate probit model is used to analyze the effects of integration to the market on morbidity among 106 Mojeño and 63 Yuracaré Indian male heads of household in the Bolivian rain forest. Regressions were run controlling for acculturation and for many personal, household, and village variables. Irrespective of how one defines integration to the market, markets seemed to exert weak effects on health. The inclusion of third variables probably robs markets of some of their traditional explanatory power. Only the use of farm chemicals was associated with more self-reported illness, perhaps because its use allows people to take time off when ill. Results cast doubt on the common notion that participation in the market hurts the health of indigenous people and highlights the need for a multivariate approach in estimating the effect of explanatory variables.

Key words: Bolivia, Mojeño, Yuracaré, health, multivariate analysis

For at least a half century cultural and biological anthropologists and medical professionals have debated the effects of markets and acculturation on the health of indigenous people (Lambert 1931 quoted in Bodley 1988). So far scholars have taken at least three positions in the debate.

Some researchers have said that acculturation and markets undermine the health of indigenous people (Bodley 1988; Confalonieri, Ferreira, and Araujo 1991; Kroeger and Barbira-Freedman 1982; Wirsing 1985). The expansion of markets into isolated communities leads to: introduction of new diseases; changes in diet, work patterns, and subsistence practices; a loss of land and of natural resources; and a reduction in the biological and ecological complexity of the environment. The changes, the reasoning goes, undermine the capacity to resist diseases and, in so doing, worsen health.

A second group of scholars has said that greater participation in a market economy improves health because it raises income and education, thereby allowing households to buy modern medical services and improve their nutrition and hygiene (Berry et al. 1987; Santos and Coimbra 1991; von Braun and Kennedy 1994; World Bank 1991, 1993). Some researchers have said that the magnitude of the improvement may be small, though still positive (Behrman and Deolalikar 1987; Strauss and Thomas 1988).

A third group of scholars has said that the effect of acculturation and markets on the morbidity of indigenous people is ambiguous, may change over time, and may vary depending on the degree and nature of a person's integration to the market (Brown and Whitaker 1994; Fleming-Morán, Santos, and Coimbra 1991; Leatherman 1994; Leatherman, Carey, and Thomas 1995; Packard and Brown 1997; Santos and Coimbra 1996). Kennedy (1994) reviewed case studies from many developing countries and concluded that the commercialization of agriculture did not increase child morbidity; the relation varied between countries. In Italy, Brown and Whitaker (1994) showed through historical research that morbidity from malaria and pellagra was not linked in a positive way to changes in agricultural technology. Rather, morbidity increased but then decreased as the agricultural transformation unfolded. In the southern Peruvian Andes, Leatherman and his colleagues (1995) found through a

Ricardo Godoy is a research associate in the Department of Anthropology at Brandeis University. Marina Cárdenas was an analyst at the Unidad de Analisis de Politicas Sociales (UDAPSO), Ministry of Human Development, when this paper was written. *The Cultural Anthropology and Human Dimensions of Global Change programs of the National Science Foundation financed this study (Grant #SBR-9417570). The survey was carried out with the help of Jeffrey R. Franks and Mario Alvarado Claudio. We wish to thank the following institutions and people for their support: Secretaría Nacional de Asuntos Etnicos, de Genero, y Generacionales; Centro de Información y Documentación Para el Desarrollo del Beni; Confederación Indígena del Oriente, Chaco, y Amazonía de Bolivia; Central de Pueblos Indígenas del Beni; Sub-Central San Ignacio de Moxos; Gobierno del Territorio Indígena Multiétnico; Sub-Central, Territorio Indígena Parque Nacional Isiboro-Sécure; Faustino Peña and Fidel Menacho. We would also like to thank the headmen and villagers we interviewed for their patience, kindness, and hospitality, and three anonymous reviewers of* Human Organization *for their excellent comments on an earlier draft.*

Human Organization, Vol. 59, No. 1, 2000
Copyright © 2000 by the Society for Applied Anthropology
0018-7259/00/010117-08$1.30/1

Markets and the Health of Indigenous People: A Methodological Contribution

Ricardo Godoy and Marina Cárdenas

Researchers disagree on whether markets and acculturation hurt, help, or produce ambiguous effects on the health of indigenous people as they become part of market economies. Past researchers have generally not measured the separate effects of markets and acculturation on health, nor have they controlled for the effect of third variables. A multivariate probit model is used to analyze the effects of integration to the market on morbidity among 106 Mojeño and 63 Yuracaré Indian male heads of household in the Bolivian rain forest. Regressions were run controlling for acculturation and for many personal, household, and village variables. Irrespective of how one defines integration to the market, markets seemed to exert weak effects on health. The inclusion of third variables probably robs markets of some of their traditional explanatory power. Only the use of farm chemicals was associated with more self-reported illness, perhaps because its use allows people to take time off when ill. Results cast doubt on the common notion that participation in the market hurts the health of indigenous people and highlights the need for a multivariate approach in estimating the effect of explanatory variables.

Key words: Bolivia, Mojeño, Yuracaré, health, multivariate analysis

For at least a half century cultural and biological anthropologists and medical professionals have debated the effects of markets and acculturation on the health of indigenous people (Lambert 1931 quoted in Bodley 1988). So far scholars have taken at least three positions in the debate.

Some researchers have said that acculturation and markets undermine the health of indigenous people (Bodley 1988; Confalonieri, Ferreira, and Araujo 1991; Kroeger and Barbira-Freedman 1982; Wirsing 1985). The expansion of markets into isolated communities leads to: introduction of new diseases; changes in diet, work patterns, and subsistence practices; a loss of land and of natural resources; and a reduction in the biological and ecological complexity of the environment. The changes, the reasoning goes, undermine the capacity to resist diseases and, in so doing, worsen health.

A second group of scholars has said that greater participation in a market economy improves health because it raises income and education, thereby allowing households to buy modern medical services and improve their nutrition and hygiene (Berry et al. 1987; Santos and Coimbra 1991; von Braun and Kennedy 1994; World Bank 1991, 1993). Some researchers have said that the magnitude of the improvement may be small, though still positive (Behrman and Deolalikar 1987; Strauss and Thomas 1988).

A third group of scholars has said that the effect of acculturation and markets on the morbidity of indigenous people is ambiguous, may change over time, and may vary depending on the degree and nature of a person's integration to the market (Brown and Whitaker 1994; Fleming-Morán, Santos, and Coimbra 1991; Leatherman 1994; Leatherman, Carey, and Thomas 1995; Packard and Brown 1997; Santos and Coimbra 1996). Kennedy (1994) reviewed case studies from many developing countries and concluded that the commercialization of agriculture did not increase child morbidity; the relation varied between countries. In Italy, Brown and Whitaker (1994) showed through historical research that morbidity from malaria and pellagra was not linked in a positive way to changes in agricultural technology. Rather, morbidity increased but then decreased as the agricultural transformation unfolded. In the southern Peruvian Andes, Leatherman and his colleagues (1995) found through a

Ricardo Godoy is a research associate in the Department of Anthropology at Brandeis University. Marina Cárdenas was an analyst at the Unidad de Analisis de Politicas Sociales (UDAPSO), Ministry of Human Development, when this paper was written. *The Cultural Anthropology and Human Dimensions of Global Change programs of the National Science Foundation financed this study (Grant #SBR-9417570). The survey was carried out with the help of Jeffrey R. Franks and Mario Alvarado Claudio. We wish to thank the following institutions and people for their support: Secretaría Nacional de Asuntos Etnicos, de Genero, y Generacionales; Centro de Información y Documentación Para el Desarrollo del Beni; Confederación Indígena del Oriente, Chaco, y Amazonía de Bolivia; Central de Pueblos Indígenas del Beni; Sub-Central San Ignacio de Moxos; Gobierno del Territorio Indígena Multiétnico; Sub-Central, Territorio Indígena Parque Nacional Isiboro-Sécure; Faustino Peña and Fidel Menacho. We would also like to thank the headmen and villagers we interviewed for their patience, kindness, and hospitality, and three anonymous reviewers of* Human Organization *for their excellent comments on an earlier draft.*

cross-sectional study that exposure to markets produced unclear effects on the nutrition and health of Aymara Indians.

In this article we contribute to the debate by reporting on the results of a pilot study on self-reported adult male morbidity among Mojeño and Yuracaré Indians of Bolivia with different levels of integration to the market. Using a multivariate approach, we estimate the effect of different forms of integration to the market on health while controlling for confounding covariates. We find that irrespective of how integration to the market is defined, markets seem to exert a negligible effect on health. The inclusion of third variables that researchers have typically left out, such as education, wealth, and literacy, pick up some of the credit and some of the costs that have been traditionally assigned to the markets and may explain why markets exert such weak effects.

Reasons for Divergent Views on the Topic

In the debate about how markets and acculturation affect morbidity, researchers have arrived at different conclusions for at least three reasons.

First, different forms of integration to the market may produce different effects on health. Indigenous people can take part in the market in many ways. They can sell crops, labor, and forest products, or they can take part in the market for credit (Godoy 2000). Different forms of exposure to the market may produce different outcomes on health.

Wage labor on commercial plantations seems to undermine the health of rural workers (Wirsing 1985). Hard physical labor, low wages, and poor nutrition in a place far from home may all work in the same direction to undermine health. But a well-paid, blue-collar job which allows the worker to keep a foothold in the village economy and in subsistence activities may not worsen a person's health, though it may increase obesity and hypertension (Santos and Coimbra 1996).

The same ambiguity arises when indigenous people become part of the market by selling crops. As Kennedy (1994) shows in her international statistical comparison, cash cropping has mixed effects on the health of rural people. The importance of cash cropping on health declines once researchers control for the type of crop sold and for the time spent cultivating the crop. Some cash crops absorb much time and effort, alter the local ecology, and produce large changes in how households allocate their resources (Burkhalter and Murphy 1985; Murphy 1960) and how they consume food (Behrens 1986). But other cash crops do not produce such large effects on the household or on the village economy. For instance, the occasional sale of nontimber forest goods allows villagers to gradually modify the structure of the forest and, depending on the product sold, preserve traditional patterns of subsistence and food consumption.

Taking part in the credit market may produce ambiguous effects on health, depending on the organization of the credit market. Incipient credit markets with their classic high interest rates and bonds of debt peonage (Murphy 1956) chain indigenous people to hard toil and could worsen their health. But access to better-functioning rural credit institutions could improve health by allowing sick people to borrow and buy medicines, pay for health care, or hire laborers to tend their fields. Credit may enable indigenous people to keep their food consumption and their health from deteriorating when mishaps strike (Morduch 1995; Rose 1994).

Second, acculturation and integration to the market must be distinguished because they can produce different outcomes on health. Researchers have sometimes failed to distinguish between acculturation and integration to the market and to control for both variables when studying morbidity (e.g., Wirsing 1985).

Though related, acculturation and integration to the market do not overlap in full. Just as integration to the market can be defined in different ways and can affect health in different ways, so too acculturation can be defined through language, value orientation, or through material culture, and thereby bear a different relation to morbidity (Dressler 1996). Greater integration to the market probably produces greater competence in the language of the outside society because indigenous people with close links to the market have to communicate with outsiders more often. Since acculturation and integration to the market are related and both variables affect health, researchers must measure and control for both when studying health to ensure unbiased estimates of how markets affect health. Failure to measure and control for acculturation, participation in the market, and for other third variables linked to markets and to health will produce omitted variable bias in the estimated parameters.

Third, markets and acculturation may decrease objective morbidity but may increase self-perceived morbidity. Markets and acculturation may produce opposite effects on morbidity, depending on whether researchers define morbidity through self-perceived or through objective measures. Although markets and acculturation could lower objective morbidity, they could raise self-perceived morbidity. Isolated or poorer villagers may be more willing to work even when they are ill and may be more likely to underreport morbidity. With higher income and greater participation in the market, health expectations rise and people are more likely to report illness and seek treatment (Johansson 1991; Murray and Chen 1992), and the range of diseases reported probably increases because people start to include less severe ailments in their definition of illness.

The information presented below only allows us to test two of the three possible reasons for the divergent views. We can estimate the extent to which acculturation and different forms of integration to the market affect health, but we did not collect information to measure morbidity through objective measures.

The People

We chose to study morbidity among Mojeño and Yuracaré because they are among the largest lowland

indigenous groups in Bolivia (Mojeño 19,759; Yuracaré 3,339) and because they contain more variance in socioeconomic attributes than the smaller groups (Censo Indígena 1994-1995). Most of the villages surveyed were in old-growth rain forest along several parallel rivers in the department of Beni. The two groups hunt but rely on swidden horticulture along river banks for most of their subsistence. Although they have had centuries of contact with outsiders, recent encroachment by loggers, highland migrants, and cattle ranchers has pushed households to take an increasingly greater part in the market (Thiele, Johnson, and Wadsworth 1995).

The market for crops, forest goods, and labor link the Mojeño and Yuracaré to the outside economy. The two groups sell rice, maize, manioc, fruits, firewood, logs, and thatch. Mojeño and Yuracaré also earn cash from wage labor in nearby logging camps, cattle ranches, and in towns. During the past five years, but especially since the floods of 1992 and 1993, ranchers, missionaries, and nongovernmental organizations have brought chemicals, chainsaws, rice seeders, and new varieties of rice, maize, and pasture grasses into their territory.

Mojeños have had a longer history of contact with Catholic missions and cattle ranchers than the Yuracaré (EPRM 1989: 82-83; Jones 1980, 1995). A longer (though sometimes turbulent) history of contact by the Mojeños and a more successful history of avoiding contact by the Yuracaré (Miller 1917; Paz Patiño 1991; Ribera 1983) may explain why Mojeño households and villages are more modern. The survey described below shows that Mojeño households have more education, income, and wealth, and are more likely to use credit than Yuracaré households. Mojeño villages lie closer to market towns and contain more symbols of the modern world, such as outboard motors, cars, and stores than Yuracaré villages.

The Survey

The survey was carried out among 106 Mojeño and 63 Yuracaré households during June-August 1995. With help from the indigenous government of each group, a total of 13 villages straddling different levels of contact with the market were selected. In each village we used an opportunistic sampling approach, interviewing as many male household heads as we could, including households that did not speak Spanish. The survey was carried out among 106 Mojeño and 63 Yuracaré households during June-August, 1995. Since there are a total of about 3,087 Mojeño households and 524 Yuracaré households, the samples interviewed represented 3.4 percent and 12 percent of the population of each ethnic group. We let the village headman decide who formed part of the household. In general, households in the area consist of people who clear a common piece of forest for routine agriculture. These households also often cook in the same hearth and sleep under the same roof.

We limited the survey to men because the survey was part of a study on the clearance of old-growth rain forest and men generally decide how much rain forest to cut. To minimize sampling bias from out-migration, we conducted the interviews during the dry season when people return to their villages to cut the forest for planting. Mojeño and Yuracaré guides helped translate questions and answers when interviewing monolingual speakers. From headmen and school teachers we collected statistics on the village (e.g., wages, number of abutters). Using native surveyors, we could conduct interviews in the language the interviewee felt most comfortable with and establish a level of trust unattainable by outsiders.

The Model, the Variables, and the Econometric Approach

We use a standard reduced-form probit model (e.g., Strauss et al. 1993) of adult male morbidity in which a men's self-reported illness or stock of health reflects attributes of the household (e.g., size), person (e.g., education), and village (e.g., distance). Besides reflecting these attributes, morbidity also reflects the extent to which a household is tied to the outside market of goods, labor, or capital. Table 1 contains definition and summary statistics of the variables used in the analysis. Below we discuss how we defined and measured variables.

Dependent Variable

We measured morbidity by asking adult men how many workdays they lost to illness in 1994. We used a long recall period because we wanted to link morbidity to the amount of forest cleared in 1994. Since the use of a long recall period increases measurement error, we changed the number of self-reported ill days to a dummy variable. In the regressions discussed below, the dependent variable "ill" takes the value of one if the male household head reported losing days from work to illness and it took the value of zero if he did not lose any days of work to illness.

The use of a categorical dependent variable made it necessary to use a binary discrete-choice model in the multivariate analysis. We used a logit and a probit model, but since the results did not vary we only report the results of the probit model. Probit and logit models produce similar results when estimating the effect of explanatory variables at their mean value, as we do in this article (Godoy and Jacobson 1999). In the regression results of Tables 2 and 3 the coefficients represent the probability of reporting illness when an explanatory variable increases by one unit above the mean of the sample used in the regression. For instance, in Table 2 the probability of reporting illness decreases by 0.9 percent for each additional household member beyond the sample mean used in the regression (5.85 people per household).

Table 1. Definition and Summary Statistics of Variables

Variable	Definition	Obs.	Mean	Std. Dev.	Min.	Max.
	Dependent Variable					
Ill	Dummy variable for days ill in 1994; 1=reported days ill; 0=did not report days ill in 1994	169	.5	.5	0	1
	Explanatory Variables					
Hh size	Total # people in household	169	5.8	2.6	1	14
Age	Residence duration in village, years	161	12.7	12.0	0	50
Mojeño	Ethnic membership; dummy Mojeño=1; Yuracaré=0	169	.6	.5	0	1
Education	Maximum education of male household head in years	163	2.6	2.4	0	12
Wealth	Radio ownership; dummy 1=owns radio; 0=does not own radio	169	.5	.5	0	1
Income	*Tareas* of secondary-growth forest cut, 1994;10 *tareas*= 1 ha; entered in logarithmic form in regressions	169	3.1	3.9	0	15
	Integration to Market					
Rice	*Arrobas* (100 lbs) of rice sold, 1994	168	13.8	39.1	0	400
Maize	*Arrobas* (100 lbs) of maize sold, 1994	169	2.3	7.1	0	50
Labor	# days worked for a wage, 1994	167	40.4	78.4	0	320
Credit	*Bolivianos* (Bo) received in credit,1994 ($1=4.87 Bo)	167	53.9	227.0	0	2666
Chemicals	Chemicals used in 1994; dummy 1=used chemicals; 0=did not use chemicals	165	.139	.347	0	1
Seeder	Used rice seeder in 1994; dummy 1=used rice seeder; 0=did not use seeder	163	.3	.5	0	1
Distance	Town-to-village distance, km	159	128	93.5	30	351
Offices	# government and nongovernment offices	158	.59	1.1	0	3
Teacher/ Nurse	# teachers and nurses in village	158	2.4	1.2	1	5

Explanatory Variables Besides Integration to the Market

We used total household size to control for demographic attributes. We tested whether including information for separate demographic groups (e.g., number of adult men, girls) improved the fit—it did not. For this reason, and to conserve degrees of freedom, we opted to include only total household size. Since many people in the study area do not know their date of birth, we decided to use residence duration in the village as a proxy for chronological age. For each person interviewed, we recorded self-perceived ethnic membership and maximum education. We used radios rather than other assets (e.g., cattle) to measure wealth because this variable contained more variance. To measure income (or consumption), we asked about the area of secondary-forest cut

Table 2. Basic Probit Model of Adult Morbidity

Variable	Probability of reporting illness	Std. Err.	z	p>|z|	Mean of explanatory variable
Hh size	-.009	.019	-0.51	.612	.853
Age	.012	.005	2.69	.007	12.859
Education	-.025	.024	-1.05	.294	2.571
Mojeño*	.137	.311	0.43	.666	.654
Wealth	-.153	.101	-1.49	.135	.506
Income	.072	.049	1.46	.146	.935

Number of observations = 156
Pseudo R^2 = 15.33
Dependent variable "Ill" is categorical for whether male household head lost days of work to illness in 1994; 1=reported some ill days, 0=did not report losing any days of work to illness. Regression includes village dummies.
* is for discrete change of dummy variable from 0 to 1.
z and p>|z| are the test of the underlying coefficient being=0.

in 1994. To the extent tribal people cut forest chiefly to plant crops for home consumption and sale, the area of forest cut proxies for consumption or for transitory income. We transformed the variable income into a logarithm to make easier the interpretation of results. In Table 2 a 1 percent increase in the area of secondary-growth forest cut beyond the sample mean of about 0.93 hectares increases the probability of reporting illness by 7 percent. We include, but do not report, village dummies to control for village fixed effects.

Integration to the Market

To ensure robustness in the empirical results we measured integration to the market in nine different ways: 1) share of rice sold, 2) share of maize sold, 3) wage labor, 4) use of credit, 5) use of chemicals in farming, 6) use of a modern rice seeder, 7) village-to-town distance, 8) number of government and nongovernment institutions in the village, and 9) number of teachers and health workers in the village. Definitions 1-6 measure integration to the market at the household level and definitions 7-9 measure integration to the market at the village level.

We tested for heteroskedasticity and accepted the assumption of constant variance of error terms at the 90 percent confidence level. We did not find evidence of strong multicollinearity; most explanatory variables had a partial correlation coefficient with each other of less than 0.2.

The Econometric Approach

We first ran a basic probit model to predict whether the male household head reported having lost workdays to illness in 1994. We ran the basic model with household, with personal attributes, and with village dummies, but without a variable for integration to the market. Table 2 contains the result of that regression. We then ran the basic model nine times, each with a different variable for integration to the market but with the same explanatory variables as in Table 2. Table 3 contains the results of those simulations.

To control for endogeneity or reverse causality when using education or wealth as explanatory variables, we used instrumental variables. We used the total number of teachers and nurses and the number of backpacks for spraying chemicals in the village as instruments. Households do not have a choice over these variables since they represent decisions by the community, not by the subject. The use of a two-stage least square regression did not change the results of the probit model and is therefore not reported.

Results

We split the discussion of the regression results into two sections. In the first (Table 2), we discuss the results of the basic model or the variables held constant to study integration to the market. In the second (Table 3), we discuss the relation between integration to the market and health using different definitions of integration to the market. In Table 3 we only report the sign, size, and level of statistical significance of the variable measuring integration to the market and focus the discussion on that variable rather than on the variables held constant.

The results of the basic model shown in Table 2 suggest that household size, education, and wealth lower morbidity. An additional year of education beyond the sample mean of 2.57 years lowers the probability of reporting morbidity by 2.5 percent, but each additional member of the household beyond the sample mean of 5.85 members reduces self-reported morbidity by 0.9 percent. Age, income, and being a

Table 3. Effects of Integration into the Market on Adult Male Self-Reported Morbidity: Simulations Using Probit Model

Var. for Integ.	Prob. of reporting illness	Std. Err.	z	p>|z|	Mean of x	Pseudo R^2
Rice	-.001	.001	-.27	.785	14.084	15.77
Maize	-.004	.007	-.64	.525	2.596	15.53
Labor	.001	.001	.43	.665	40.375	15.27
Credit	-.001	.001	-.69	.487	57.589	15.15
Chemicals*	.404	.117	2.72	.007	.144	20.34
Seeder*	-.070	.127	-.55	.585	.280	16.02
Distance	.001	.001	1.08	.280	127.055	15.66
Offices	.034	.065	.53	.599	.596	15.66
Teacher/Nurse	-.117	.095	-1.23	.218	2.452	15.66

Dependent variable=Ill; explanatory variables same as in Table 2 plus a variable for integration to the market. Nine regressions run, but Table 3 only contains the statistics on the coefficient for integration to the market.
* is for discrete change of dummy variable from 0 to 1.
z and p>|z| are the test of the underlying coefficient being=0

Mojeño raise the probability of reporting morbidity, but only age is statistically significant (p=0.7%). Of the three variables, ethnicity has the largest physical effect on morbidity; being a Mojeño increases the probability of reporting illness by 13.65 percent (p=0.66).

The simulation results of running the basic model with different definitions of integration to the market show that participation in the market may either raise or lower self-reported morbidity depending on the definition of integration used. Only the use of chemicals in farming affects morbidity in a statistically significant way, and markets and morbidity may be related in a nonlinear way (Table 3).

The results of Table 3 show that wage labor, the use of chemicals for farming, village-to-town distance, and the presence of government and nongovernment offices (besides teachers and nurses) all seem to be associated with more morbidity. But the sale of crops, the use of credit or a modern rice seeder, and the number of teachers and nurses in the village all seem to be associated with less morbidity. Except for the use of chemicals for farming, none of the measures of integration to the market shows a statistically significant relation at the 90 percent confidence level or above. We suspect that the use of chemicals for farming may allow people to take time off when ill since the technology saves labor, a scarce factor of production among indigenous people in the tropical lowlands of Latin America.

We tested whether integration to the market measured by the amount of rice sold, wage labor, or village-to-town distance bore a nonlinear relation to morbidity and discovered the relation between rice sales and morbidity resembled an inverted U, but the relation between morbidity and either wage labor or village-to-town distance resembled a U.

Conclusion

Beyond its empirical contribution to the limited literature on the determinants of adult morbidity in poor countries and in rural populations (Caldwell 1993; Strauss et al. 1993:794), this study makes two methodological contributions to the debate about the effects of markets on the health of indigenous people.

First, we have presented evidence from multivariate analysis to support the position of other researchers (e.g., Brown and Whitaker 1994; Kennedy 1995; Leatherman 1994; Leatherman, Carey, and Thomas 1994) who have also found that the relation between markets and health is nonlinear and complex. Markets do not seem to undermine the health of indigenous populations in a linear way, as some scholars have implied (e.g., Bodley 1988; Kroeger and Barbira-Freedman 1982; Wirsing 1985). In fact, our results suggest that irrespective of how integration to the market is defined, markets seem to have little effect on health, after controlling for a broad range of socioeconomic covariates.

Second, we have presented evidence to suggest that how one defines integration to the nonvillage economy matters. For instance, it appears that integration through the market for crops and wage labor produce opposite effects on health. So far much of the debate in anthropology about the links between morbidity and markets has been ideological and qualitative. We suspect the stalemate will begin to get resolved once researchers start using a multivariate framework on larger samples, developing better theoretical models of adult morbidity, and paying more attention to how they define and measure integration to the market and its close covariates.

References Cited

Behrman, Jere R., and Anil B. Deolalikar
1987 Will Developing Country Nutrition Improve with Income? A Case Study for Rural South India. Journal of Political Economy 95:492-507.

Behrens, Clifford A.
1986 The Cultural Ecology of Dietary Change Accompanying Changing Activity Patterns Among the Shipibo. Human Ecology 14:367-396.

Berry, J. W., Uichol Kim, Thomas Minde, and Doris Mok
1987 Comparative Studies of Acculturative Stress. International Migration Review 21:491-511.

Bodley, John H., ed.
1988 Tribal Peoples and Development Issues: A Global Overview. Mountain View, Calif.: Mayfield.

Brown, Peter J., and Elizabeth D. Whitaker
1994 Health Implications of Modern Agricultural Transformations: Malaria and Pellagra in Italy. Human Organization 53:346-351.

Burkhalter, Brian S., and Robert F. Murphy
1989 Tappers and Sappers: Rubber, Gold, and Money Among the Mundurucú. American Ethnologist 64:100-116.

Caldwell, John C.
1993 Health Transition: The Cultural, Social, and Behavioral Determinants of Health in the Third World. Social Science and Medicine 36:125-135.

Censo Indígena
1994-1995 Censo indígena del oriente, chaco y amazonía. La Paz: Secretaria de Asuntos Etnicos, de Genero y Generacionales, Ministry of Human Development, Government of Bolivia.

Confalonieri, Ulisses, L. F. Ferreira, and A. Araujo
1991 Intestinal Helminths in Lowland South American Indians: Some Evolutionary Interpretations. Human Biology 63:863-873.

Dressler, William W.
1996 Culture, Stress, and Disease. *In* Handbook of Medical Anthropology. Contemporary Theory and Method. Carolyn F. Sargent and Thomas M. Johnson, eds. Pp. 252-271. Westport, Conn.: Greenwood Press.

Equipo Pastoral Rural de Moxos (EPRM)
1989 Historia del pueblo de Moxos. Volume 2. La Paz: Gráficos de Editorial Popular.

Fleming-Morán, Millicent, Ricardo V. Santos, and Carlos E. A. Coimbra
1991 Blood Pressure Levels of the Suruí Indians of the Brazilian Amazon: Group- and Sex-Specific Effects Resulting from Body Composition, Health Status, and Age. Human Biology 63:835-861.

Godoy, Ricardo A.
n.d. Indians, Rain Forests, and Markets: Theory, Method, and Analysis. New York: Columbia University Press. In press.

Godoy, Ricardo A., and Marc Jacobson
1999 The Covariates of Private Time Preference: A Pilot Study Among the Tsimane' Indians of the Bolivian Rain Forest. Evolution and Human Behavior 20:4:249-256.

Johansson, S. Ryan.
1991 The Health Transition: The Cultural Inflation of Morbidity During the Decline of Mortality. Health Transition Review 1:39-68.

Jones, James
1980 Conflict Between Whites and Indians in the Llanos de Moxos, Beni Department: A Case Study in Development from the Cattle Regions of the Bolivian Oriente. Ph.D. dissertation, University of Florida.
1995 Environmental Destruction, Ethnic Discrimination, and International Aid in Bolivia. *In* The Social Causes of Environmental Destruction in Latin America. Michael Painter and William H. Durham, eds. Pp. 169-216. Ann Arbor: University of Michigan Press.

Kennedy, Eileen
1994 Health and Nutrition Effects of Commercialization of Agriculture. *In* Agricultural Commercialization, Economic Development, and Nutrition. Joachim von Braun and Eileen Kennedy, eds. Pp. 79-99. Baltimore: Johns Hopkins University Press.

Kroeger, Axel, and Françoise Barbira-Freedman
1982 Cultural Change and Health: The Case of South American Rain Forest Indians. Volume 12. Frankfurt: Verlag Peter Land.

Lambert, Sylvester M.
1931 Health Survey of Rennell and Bellona Islands. Oceania 2:136-173.

Leatherman, Thomas L.
1994 Health Implications of Changing Agrarian Economies in the Southern Andes. Human Organization 53:371-380.

Leatherman, Thomas L., James W. Carey, and R. Brooke Thomas
1995 Socioeconomic Change and Patterns of Growth in the Andes. American Journal of Physical Anthropology 97:307-321.

Miller, Leo E.
1917 The Yuracaré Indians of Eastern Bolivia. Geographical Review 4:450-464.

Morduch, Jonathan
1995 Income Smoothing and Consumption Smoothing. Journal of Economic Perspectives 9(3):103-114.

Murphy, Robert F.
1956 Credit Versus Cash. Human Organization 14(3):26-30.
1960 Headhunter's Heritage: Social and Economic Change Among the Mundurucú Indians. Berkeley: University of California Press.

Murray, Christopher J.L., and Lincoln C. Chen
1992 Understanding Morbidity Change. Population and Development Review 18:481-503.

Packard, Randall M., and Peter J. Brown
1997 Rethinking Health, Development, and Malaria: Historicizing a Cultural Model in International Health. Medical Anthropology 17:181-194.

Paz Patiño, Sarela
1991 Conflictos interétnicos en la región del habitat tradicional Yuracaré. Cochabamba, Bolivia: Carrera de sociología, facultad de ciencias económicas y sociales, Universidad Mayor de San Simón.

Ribera, René J.
1983 Aima Suñe. Un estudio de la situación actual de la etnia Yuracaré del oriente Boliviano: Bibliografía e investigación de campo. Cochabamba, Bolivia: Facultad de Filosofía y Ciencias Religiosas, Universidad Católica Boliviana.

Rose, Elaina
1994 Consumption Smoothing and Excess Female Mortality in Rural India. Unpublished Manuscript, Department of Economics, University of Washington.

Santos, Ricardo V., and Carlos E. A. Coimbra
1991 Socioeconomic Transition and Physical Growth of Tupí-Mondê Amerindian Children in the Aipuanã Park, Brazilian Amazon. Human Biology 63:795-819.
1996 Social Differentiation and Body Morphology. Current Anthropology 37:851-856.

Strauss, John, and Duncan Thomas
1988 Nutrient Intakes and Income. *In* Handbook of Development Economics. Hollis Chenery and A. Srinivasan, eds. Pp. 1893-1908. Amsterdam: North Holland.

Strauss, John, Paul J. Gertler, Omar Rahman, and Kristin Fox
1993 Gender and Life-Cycle Differentials in the Patterns and Determinants of Adult Health. Journal of Human Resources 28:791-837.

Thiele, Graham, James Johnson, and Jonathan Wadsworth
1995 Bosquejo socioeconómico del norte de Bolivia. Santa Cruz, Bolivia: Centro de Investigación Agrícola Tropical and Misión Británica en Agricultura Tropical. Informe Técnico No. 20.

Von Braun, Joachim, and Eileen Kennedy, eds.
1994 Agricultural Commercialization, Economic Development, and Nutrition. Baltimore: Johns Hopkins University Press.

Wirsing, Rolf L.
1985 The Health of Traditional Societies and the Effects of Acculturation. Current Anthropology 26:303-322.

World Bank
1991 World Development Report. Washington, D.C.: World Bank.
1993 Investing in Health. New York: Oxford University Press.