A Space of Vulnerability in Poverty and Health: Political-Ecology and Biocultural Analysis

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ABSTRACT *In this article I present a political-ecological approach for biocultural analyses that attempts to synthesize perspectives from anthropological political economy and those from ecological anthropology and human adaptability approaches. The approach is used to examine contexts and consequences of vulnerability among Andean peoples in southern Peru, and specifically the ongoing and dialectical relationships between poverty, illness, and household production. Household demographic composition, class position, economic status, and interpersonal relations are all important in shaping their experience with illness, and coping capacity in dealing with the consequences of illness on household livelihood. I suggest that the contexts and consequences of vulnerability among rural producers in southern Peru contributed in part to the spread of the* Sendero Luminoso *revolutionary movement into the region in the late 1980s and early 1990s.* [vulnerability, health, Peruvian Andes, biocultural approaches, political-ecology]

INTRODUCTION

A biocultural approach is a defining feature of a holistic anthropology. Most biological anthropologists, some cultural anthropologists, and many of those working at the boundaries of the two subfields (e.g., medical and nutritional anthropology) adopt a "biocultural perspective" as the guiding paradigm of their research. One might think, then, that biocultural theory would reflect a rich history of contributions from across the

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discipline. One might also expect that the theoretical intersection of biology and culture would occupy a somewhat privileged space for the sort of theoretical boundary-crossings that would bring together anthropologists of various persuasions. Yet, as is now well known (e.g., Brown and Joffe 1992; Holden 1993; Peacock 1995), the intersection of biological and cultural anthropology is often more a point of contention than cooperation, and more a site for theoretical segregation than synthesis. For those of us working at these boundaries of the biological and the social–cultural, and who believe in the value of synthesis, increased efforts to bridge the "biocultural chasm" (Goodman and Leatherman 1998b) are needed and overdue.

The contributions to this collection, and the Emory Symposium on which it is based, show that there are multiple possibilities for building a biocultural synthesis. In this article I will discuss a direction for biocultural anthropology that is concerned with the links between social inequalities and human biology, and that attempts to draw perspectives from anthropological political-economy into synthesis with perspectives from ecological anthropology and human adaptability. Efforts to illustrate how local level human–environment interactions are linked to broader political–economic forces have appeared under several labels such as a "Biology of Poverty" (Thomas 1998), "Critical and Humanistic Biology" (Blakey 1998), "Critical Biocultural Medical Anthropology" (Singer 1998; see also Leatherman 1996 and Leatherman et al. 1993), and a "Political-Ecology of Human Biology" (Leatherman and Thomas 2001). In this article I suggest framing biocultural relationships within a political-ecology approach that explicitly connects issues of power and inequality (from political-economy) with human–environment interactions (the concern of ecological anthropology), and addresses these relationships at the intersection of the global and the local (Bryant and Bailey 1997; Peet and Watts 1996). This approach is as relevant to questions concerned with meaning and behavior found in psychological anthropology, as to questions of poverty and health found in critical biocultural medical anthropology.

The article is divided into three parts. First, is a brief discussion of various assumptions and shortcomings of earlier biocultural models found in ecological, biological, and psychological anthropologies. The review specifically highlights the importance of establishing broader global–local contexts and a greater emphasis on human agency in biocultural approaches. Second, I note basic themes in a political-ecology of biology and health (global–local contexts, relations of power, and agency)—focusing particularly on an analysis of vulnerability. The focus on vulnerability resonates with the articles in this special issue, and is a broader concern of psychological anthropology (e.g., Dole and Csordas 2003; Handwerker 2003) as well political-ecology. Third, I provide a case study drawn from

earlier research on the political-ecology of health and household economy in the Peruvian Andes. This example pays particular attention to coping in contexts of vulnerability and illness, highlighting how decision making must be understood within the material conditions, broader economic strategies, and systems of meaning in local contexts–contexts shaped by broader regional and global histories.

INEQUALITY AND HUMAN BIOLOGY: FRAMING THE QUESTIONS OF A BIOCULTURAL PERSPECTIVE

There are many converging reasons for trying to build new biocultural perspectives, and specifically to attempt to frame a political-economic or political-ecological perspective for studying human biology and health. These have been discussed in detail elsewhere (Goodman and Leatherman 1998b; Leatherman and Thomas 2001), but three of the key issues include: 1) a general dissatisfaction with the state of biocultural theory, especially in biological anthropology, for its dearth of social content and context, and inattentiveness to many new theoretical directions in anthropology; 2) a need to respond to the salient features of critiques of ecology and adaptation theory from multiple corners (e.g., evolutionary biology, critical medical anthropology, anthropological political economy); and, 3) a need to develop new frameworks that can explicitly address problems that impact human society and biology, especially in the developing world and in contexts of globalization—growing levels of poverty and inequality, environmental degradation, armed conflicts, population displacement, and loss of biodiversity as well as systems of indigenous knowledge (Leatherman and Thomas 2001). These same problems are also salient to psychological anthropology, with a focus on psychoanalytic and cognitive approaches.

Many biocultural anthropologists in the 1970s felt that the discipline had achieved a theoretically coherent bridge between the scientific and the humanistic. There was much optimism that ecological anthropology could draw the threads of different subfields into a single overarching theoretical approach envisioned in a holistic, four-field anthropology. Adaptation was adopted as a core concept to describe and evaluate the relative benefits of genetic, physiological, behavioral, and social responses to the multiple stresses produced by physical, biotic, and social environments. Yet, critiques of the "adaptationist program" and of a closed-systems, homeostatic, functionalist ecological anthropology from within evolutionary biology (e.g., Levins and Lewontin 1985; Lewontin 1978) and anthropology (e.g., Singer 1989, 1998; see Orlove 1980 for overview), brought to the forefront many of the limitations of ecological

and evolutionary approaches for dealing with human–environment interaction in a dynamically changing (and social) world. Missing from most ecological and biocultural approaches were efforts to show how large scale processes (e.g., global capitalism) shaped local environments, how local-level structural inequalities shaped both exposure to stress and adaptive response, or how individual and collective agents played a role in constructing the environments in which they operated. Rather, the environment, whether social or physical, was often treated as autonomous and natural; external and alienated from humans. As Smith and Thomas put it, "This is an analysis where the natural environment and organism assume an independent and dependent variable relationship . . . the organism is seen mostly as a passive adjuster to environmental conditions it cannot really control" (1998:461).

For example, although biological anthropologists and nutritionists studied the physiological adaptations of malnourished individuals to chronically low food intakes, they rarely explored why intakes were low and, rather, took them as a given feature of marginal environments and economic conditions. In this sense, they "naturalized" a socially produced scarcity. Moreover, to call physiological responses (e.g., stunted growth) to conditions of scarcity "adaptations" fails to take a broader view of the meaning of adaptation and the consequences of adaptive process (see Pelto and Pelto 1989, on the "Small but Healthy Debate"). Studies of psychosocial stress that fail to explore the social and structural roots of the oppression and discrimination that lead to frustration, hopelessness, or despair (and physiological stress) in marginalized groups, similarly take such social contexts as a given, and fail to address the experiential and humanistic side of lived realities (see Blakey 1994, 1998). Likewise, more recent studies of the biological and health correlates of modernization that rely on a comparison of "traditional" and "modern" peoples without clarifying what traditional, modern, and everything in between might mean, or how people end up in one category or the other, "naturalize" complex processes of social, economic, and political change, and undercut the importance of their contributions.

These examples highlight the need to devote the same attention to the broad contexts of human environments and experiences as to micro-level analyses of human behavior and its biological correlates. They direct us to look beyond the immediate efficacy of coping responses, to how these responses help construct the very conditions and contexts within which humans act. Thus, many biocultural researchers have found that to make sense of biology and behavior in environmental contexts, they needed to better understand how local-level realities were shaped by processes beyond the community and region, and how local social and economic differentiation (e.g., class, ethnicity, gender) shapes how people experience and

negotiate these realities (see contributions to Goodman and Leatherman 1998a). Moreover, processes of globalization frequently increase levels of inequality and poverty, environmental degradation, and disparities in nutrition and health, as well as the deterritorialization of culture, space, and place (Anderson-Fye 2003; Robbins 2002). Local and global contexts are unfixed and changing rapidly, and we need approaches capable of tracking these biocultural dimensions of globalization.

Biocultural anthropologists should need no urging. Even mainstream analyzes of environment, health, and development in a global economy point to problems of poverty and inequality as among the most salient for understanding variation in health. The World Health Organization (WHO) chose a theme issue on inequalities in health as the first issue for a new century and millennium. In an editorial for this issue, Richard Feachem states that the problem of poverty and poor health, and "the gap in health between rich and poor . . . constitutes one of the greatest challenges of the new century" (2000:1). A focus on poverty and inequality as it relates to human biology is a logical and important focus for biocultural anthropology, now and in the future. Biocultural anthropology has much to offer studies of inequalities in health. Most studies measure inequalities though country comparisons, or broad in-country comparisons, using macro-level economic measures (e.g., GINI coefficient of inequality) or health measures (life expectancies; mortality rates; expenditures on health care, etc.). The focus usually does not reach down to subregions or social groups within a country, much less to more fine grained pictures of how poverty and poor health affect people in local contexts. Biocultural field studies can do precisely what regional analyses and aggregate statistics cannot: demonstrate what these broad measures of inequality mean for real people living in conditions of poverty and inequality at the local level.

A SPACE OF VULNERABILITY IN A POLITICAL-ECOLOGY OF HEALTH

Over the past two decades, biological and biocultural anthropologists have moved their research into the social arena. It is common that nutrition, health, and growth are correlated with measures of economic status, educational attainment, and the like. But, we need to move the question from how people's socio-economic status is related to health status, to ask why are some people poor in the first place, why do some get sick when others do not, and why are some able to cope with problems when others cannot. We need to ask how conditions of poverty and poor health are mutually causative and constituted; how each serves to (re)produce the other. To borrow a concept from Watts and Bohle (1993), we need to

identify "a space of vulnerability" within which to examine the intersection of poverty, hunger, nutrition, and health, and how individuals, households, and other collective agents operate within, and thus help construct, this space. Following Chambers (1989:1), they outline three basic coordinates to vulnerability as the locally and historically specific conjunction of: 1) the risk of exposure to stress; 2) risk of inadequate capacities to cope; and 3) risk of severe consequences from stress, crisis and shocks. The most vulnerable individuals and groups "... are those most exposed to perturbations, who possess the most limited coping capability, who suffer the most from crisis impact, and who are endowed with the most circumscribed capacity for recovery" (Watts and Bohle 1993:45). Although the poor are usually among the most vulnerable to hunger and illness, there are a host of factors that contribute to vulnerability beyond income or other conventional measures of poverty. Sen (1992), for example, notes that the way poverty limits capabilities to engage in various activities to secure livelihood, food, etc. (i.e., acquire basic resources) lies at the heart of hunger. Thus it is important not only to specify the local meaning of poverty, but also the conditions that make individuals more or less vulnerable to the hunger, malnutrition, disease, and psychosocial stress, that can accompany poverty. This entails an examination of structured inequalities and social relations that underlie poverty, and how they affect not only levels of illness, but also coping capacities and hence the outcomes of poor health on the economic and social functioning of the household. It also entails an examination of how lived vulnerabilities affect perceptions of environment, poverty, and health, and also the differing sense of control, opportunity, and hope, which orient people's actions and shape their complicity, resistance, and resilience within these contexts of inequality.

This framework for a space of vulnerability resonates well with adaptability approaches that focus on exposure to stress, coping responses to stress, and consequences of stress and coping (see Thomas 1998, for the historical development of adaptability models). Both, however, need to be located within broader political-economic (Roseberry 1998; Wolf 1982) or political-ecological perspectives (Bryant and Bailey 1997; Peet and Watts 1996). Bryant and Bailey (1997) have noted that within a Third World political-ecology framework, neo-Marxian political-economic perspectives that emphasize First World–Third World asymmetries of power, unequal distribution of resources, and structural inequalities—all of which are critical to understanding environmental change and its impacts—are paired with a focus on human agents and their motives and actions. Thus, like much anthropological political-economy, political-ecological approaches focus on the "unity of structure and agency" (Roseberry 1988) in studying human–environment interactions within broad global histories. This same unity of structure and agency is a concern with practice-based approaches

in anthropology, recently presented at length as an important way to develop psychological anthropology (Holland et al. 1998).

One theme within the political-ecology approach developed here is the interplay between the global and the local. Thus, we study specific sorts of human–environment relationships in specific local contexts, but understand that they exist in relation to broader regional and historic processes. These broader processes and networks of interconnections are not universal or homogeneous, but are socially and historically configured in space and time. "The local is global, in this view, but the global can only be understood as always and necessarily local" (Roseberry 1998:81). Thus, environments and people can be described by any number of attributes, but cannot be fully understood without also locating their weblike links to other specific local and broader forces, processes, and institutions. Local institutions of community, family, kin, and much larger institutions of church and state, the IMF and World Bank, NGOs, local lending institutions, and cooperatives, affect how human–environment relations are played out at the local level (Kalipeni and Oppong 1998).

A second theme is to go beyond static assessments of wealth and poverty, and focus on the social relations of production that structure class processes and related factors such as poverty, inequality and exploitation, which importantly shape the material conditions, experiences, and perceptions of conditions for individuals and groups at the local level. In the context of rural producers, for example, the different relations through which land is obtained (e.g., rents, sharecropping, communal rights, and private ownership) and the ways they articulate with the capitalist market, affect relative levels of poverty, real and perceived vulnerability, and decisions about whether to seek treatment for an illness, or engage in farming production in the face of sickness.

A third theme is a greater attention to human agency in constructing environments, coping with problems and uncertainties, and contributing to the very contexts of their own realities (and adaptive problems and contexts). These social actors operate under multiple constraints and with limited options based on their personal reading of specific circumstances; what Levins and Lewontin (1985) call a conditional rationality. This calls for a closer identification of the environmental, social, cultural, and ideological contexts that frame their actions; contexts that are shared, but only in part. All actors do not perceive or experience conditions of vulnerability the same, nor have the same goals, capabilities, or coping capacities. What is beneficial to one individual or group often conflicts with the goals and actions of another. It is always appropriate to ask adaptive for whom and in what context. In understanding "conditional rationalities" of actors, it is also important to assess how personal experience, interpersonal relations, and identity (e.g., ethnicity, class, and gender), affect perceived

uncertainty, predictability, and control which, in turn, importantly shape what might be seen as appropriate and possible options for coping.

A space of vulnerability then configures a specific set of conditions in which people live, and sets constraints on how these conditions are perceived, how goals are prioritized, what sorts of actions or responses might seem appropriate, and which ones are possible. The goal is to examine how people operate within this space—at times in unpredictable ways and with remarkable creativity, improvisation, and resilience—and the consequences of their actions in (re)producing the contexts of vulnerability. This final point is crucial. We need to always follow responses through to their effects on the contexts within which they emerge, and see them as transient points (not adaptive end products) in a continuous and ongoing process of cultural practice. In cases of high vulnerability—where risk to exposure is high and coping capacities are limited—it is likely that any response will carry negative costs and might further increase vulnerability. In such cases, it might be quite rational to seek to change the system, not adjust to it. Social resistance or even revolution might seem appropriate, although such actions were never considered within the realm of rational behavior in homeostatic models of adaptation and ecology—a point made by Starn (1994) in his critique of cultural ecologists "missing the revolution" of *Sendero Luminoso* in Peru.

The idea, then, is to take the global–local historical perspectives and the unity of structure and agency that have been central to political-economy and political-ecology, and make these central to the way we study human biology, health, and lived experience. These are not new ideas, just not well integrated into biocultural models. In the remainder of this article I will outline a space of vulnerability in Nuñoa (Melgar, Puno) Peru, in the southern Peruvian Andes, and summarize findings from a research project on consequences and responses to illness among rural producers. Many of the basic findings have been detailed elsewhere, but the emphasis here is on illustrating how local populations in different class positions operate within conditions of vulnerability, and the meaning of vulnerability in their lives. In the final instance, the people of Nuñoa did not miss the revolution of *Sendero Luminoso*, and the discussion also highlights the conditions that made the region vulnerable to revolt.

A SPACE OF VULNERABILITY: POVERTY AND POOR HEALTH IN NUÑOA

Many of ideas discussed here were developed and tested in research in Nuñoa Peru conducted from 1983–85 (Leatherman 1996; Thomas et al. 1988). The objectives of the research were to analyze patterns of nutrition and illness, and the consequences of and responses to illness among

households living in different social and economic contexts. A key question was how pervasive problems of malnutrition and illness might impact small-scale farmers and herders' ability to carry out the work necessary for successful production, and what sorts of coping strategies were employed to minimize these impacts. Ultimately we were interested in how the consequences of illness, as well as coping responses to illness, affected household production and economy, and what this meant in terms of ongoing levels of health and nutrition. In a sense, then we were examining the reproduction of poverty and poor health among small-scale producers.

The framing of our problem and procedures for examining these relationships was akin to the analysis of a "space of vulnerability" within a broader political-ecology perspective. First we documented patterns of health, and asked *who was at risk* to problems of nutrition and illness, what types of problems were prevalent, and how socially and behaviorally disruptive they were to work and other aspects of everyday life. Second, we identified *coping responses to illness*, both in terms of negotiating the identification and treatment of health problems, and in dealing with disruption to the work associated with daily activities and critical production tasks. Third, we assessed the *consequences of illness on household production* and other income generating activities, and what this meant for the daily, and longer-term, reproduction of the household. Here we were also concerned with features that accentuated the vulnerability and resilience of households to the consequences of illness. In our view, malnutrition and illness were not just symptoms of poverty but also catalysts, contributing to the social and economic conditions that increased risk to hunger and illness in the first place. Coping capacities were constrained in conditions of poverty, and responses to illness and threats on household livelihood played a major role in shaping the reproduction of poverty and poor health in the region.

Contexts of Marginality

To analyze a space of vulnerability for the reproduction of poverty and poor health, it was first important to set the contexts of local environments and social relations that structure levels of poverty and marginality, and to frame these local-level realities in broader histories and processes. Andean environments have long been described as harsh, unproductive, multistress, and marginal—in themselves a source of vulnerability. Earlier biocultural work highlighted problems of cold and, especially, high altitude (hypobaric hypoxia) as major constraints on population biology, and how these factors along with rough terrain, shallow soils, frosts, irregular rain, and frequent droughts, posed a problem for production systems and energy flows (Baker and Little 1976).

Yet this same "marginal" environment had provided ample resources for earlier Andean peoples and cultures, but operating in a different historical context with a different set of economic and social relations. Historically, Andean cultures dealt with environmental extremes by exploiting vertical ecozones with different production systems (e.g., herding and farming), and by exploiting micro-environmental differences within the same zone (Murra 1984; Thomas 1973). Communities accessed lands at different altitudes and ecosystems, and redistributed products through systems of exchange. Andean societies and cultures also were well known for formalized systems of labor exchange (Alberti and Mayer 1974), through which labor could be organized and distributed among varied production activities and households. Following the conquest, the Spanish systematically dismantled these social and economic structures, and reorganized indigenous relations that structured access to land and labor according to colonial needs for extracting resources and labor tribute (e.g., *encomienda* and *repartemiento*; Alberti 1981). Hence, much of the marginality of local environments and populations was historical and political-economic in nature. We began our research cognizant of the problems posed by the physical environment as contributing to vulnerability, but not as a determinative force of nutrition and health. Rather, social relations of production and relative degrees of poverty and unequal access to means of production were given priority in explaining local-level realities.

Poverty, by almost any definition or measure, is critical to defining vulnerability, and the vast majority of households in this region are impoverished. However, we identified different sorts and sources of poverty, and saw differing levels of vulnerability for those who were land poor, labor poor, and/or cash poor. Access to land and labor was essential, and we found that land tenure arrangements (e.g., privately owned, usufruct/communal rights, sharecropping, and rents) were particularly important because they provided the farmer with different degrees of control and predictability in the production process. Family labor was important not only for meeting production tasks, but for many households (e.g., with usufruct/communal rights or in sharecropping) labor rents were the means to access land on which to produce. Extra-family labor was frequently needed to carry out production tasks in a timely manner, requiring either money to hire labor, or networks of kin and interpersonal social relations through which one entered into systems of labor exchange. These aspects of access and control were psychological and cultural as well as material and economic. Having land to farm, especially land privately owned or obtained as a community entitlement, and engaging in reciprocal exchanges of labor, were central to Andean cultural identity. They also provided a sense of social connectedness as well as some degree of individual and household security.

To grasp the importance of access to land and labor in illness, consider a comparison of a household with privately owned lands, a large family labor pool, and sure access to extra-family labor versus another household where land is rented in cash or labor, where the family labor pool is small, and access to extra-family labor is uncertain. These two households are in very different positions in terms of production possibilities, in terms of work or cash commitments incurred in each production season, and in terms of options for coping with illness when it threatens to impact the production process.

Thus, individuals and households are embedded in different webs of social relations through which they gain access to land and labor, and engage in other economic activities to secure household livelihood. These social relations have been shaped by a long history of colonization, and a more recent history of shifting land rights through agrarian reform and penetration of capitalist relations into the rural economy. This region had been the site of many of the largest wool-producing haciendas in Peru. An agrarian reform in the early 1970s expropriated hacienda land, but created even larger cooperatives (3 cooperatives controlled 61 percent of productive land in the district). Very little land was reallocated to peasant communities. The cooperatives employed some of the workers from the original haciendas, but left many in the rural countryside without access to land. Thus, many rural households became landless, and as a result, towns grew rather rapidly with an influx of peasants looking for opportunities on the wage market or in petty commodity production.

Penetration of capitalist relations into rural zones and the consequent rise in markets and commoditization of goods and labor drew rural producers further into a cash economy and significantly altered local social relations of production and reproduction. Households experienced a greater need for cash to purchase items formerly produced in the household. One strategy was to sell items like meat and eggs in order to buy larger quantities of cheaper, subsidized foods of lower nutritional quality, like pastas, rice, and sugar (Leonard and Thomas 1988). Indeed, this region was one of the largest meat producing regions in Peru, but household dietary surveys showed relatively little meat was consumed (Leatherman 1994; Leonard and Thomas 1988). Another strategy was seasonal migration for wage work in other zones. But, because the wages received were usually insufficient to meet basic needs (i.e., not a living wage), household food production was essential to meet the food needs in the family. Thus a large class of semi-proletarian workers and households emerged within this region, and in much of rural Peru. All households to some extent relied on a mix of farming/herding and cash-generating activities (some up to five separate cash-generating activities). This led to conflicts over allocating household labor to wage work versus farming tasks. As more adults and

older children migrated out of the community for work, the labor power of the household tended to be limited and fixed; for many there was no real increase in labor available over the course of the family life cycle (a normal expectation of farming families). Also, as labor became a commodity, historically important systems of reciprocal labor exchanges diminished (Brown 1987; Erasmus 1956). In town-based households, we even saw parents and their children pay each other for work. This was in direct contradiction to ethnographic depictions of the practice of labor reciprocity in Andean communities where kin-based exchanges were more certain and never paid in cash (Alberti and Mayer 1974). This demise of a moral economy for a more individual economy (Aramburu and Ponce Alegre 1983) constrained access to extra-household labor for many cash poor families.

Taken together, the changes brought on by reform and rural capitalism importantly reworked relations of production, and shaped local social and economic differentiation and capabilities of dealing with health and production problems when they arose. In other words, these changes shaped the space of vulnerability framing levels of illness, coping capacities, and consequences of illness on production and household economy. They also prompted feelings of frustration and disenfranchisement over an agrarian reform that failed to provide land to the majority, of uncertainty over availability of wage work and whether food production would meet more than a few months' basic needs, and of the loss of predictability and control over access to land and labor. Thus, changing relations of production altered people's perceptions of their own vulnerability, as well as their ability to operate within conditions of economic marginality.

Vulnerability to Undernutrition and Illness

Set against this backdrop, we investigated patterns of nutrition and illness, and consequences and responses to illness among rural producers. Research methods have been presented in previous publications (Leatherman 1994, 1996), but, in short, we combined participant observation and informant recall with three seasonal household surveys that collected information on demographic, economic, and social characteristics of households, along with diet, nutrition, health, work activities, and inputs (e.g., land, labor, and seed) and outputs (yields) of farming production.

We carried out the research in three communities that differed in land base, economic structure, and range of production activities, and that were differentially affected by the agrarian reform and spread of capitalist relations. These sites also provided a useful comparison with the past, because each was represented in earlier research in the region (Baker and Little 1976). One site was an alpaca-herding cooperative of 25 families

who received a wage for tending cooperative herds, as well as usufruct rights to land for pasturing private herds and potato production. A second was a small *ayllu* (traditional kin-based community) of 25 families that received no lands as part of the reform, and found themselves hemmed in on three sides by cooperatives that refused them access to pastures. The third was a semi-urban town with a relatively diverse population of farmers, herders, shop owners, petty commodity producers, and landless unskilled laborers. Whereas secure access to land for farming and herding benefited members of the alpaca-herding cooperative, access to land and resources for town and *ayllu* households remained the same or decreased following the reform. The *ayllu* particularly suffered because cooperatives discontinued informal rent-for-work or sharecropping arrangements that had existed with haciendas, and through which *ayllu* households had accessed additional land for pasturing private herds and gathering resources like dung for fuel and *ichu* grass for roofs. Indeed, when asked about the impacts of the agrarian reform on their community and household, 63 percent of cooperative families felt that conditions had improved whereas only 5 percent of the *ayllu* saw improvements, and 79 percent felt that conditions had worsened. Almost 90 percent of the *ayllu* households reported owning less land and fewer animals than their parents. About half of the town-based households felt conditions had improved or stayed the same, and half thought they had worsened; especially the landless unskilled laborers.

Levels of infant mortality, undernutrition, and illness illustrated the overall poor health in the region. Infant mortality in the District of Nuñoa was 128/1,000, one of the highest for Andean regions. About 60 percent of the children were sufficiently stunted to indicate chronic undernutrition. On the average, 37 percent of all individuals surveyed reported experiencing an illness event or other health problem during any of the three seasonal health surveys. At least 60 percent of households reported work disruption because of illness for at least one adult in the family for any given survey, amounting to a loss of four to five workdays per two-week period.

Dietary diversity was roughly similar in the cooperative and town, but lower in the *ayllu* (Leatherman 1994). Seventy-three percent of children from the *ayllu* were considered chronically undernourished (stunted) and 32 percent severely stunted, compared to 54 percent stunted and 16–19 percent severely stunted in the cooperative and town. Interestingly, this marked a reversal of diet and growth status reported in earlier research in the *ayllu* and cooperative (Frisancho and Baker 1970; Gursky 1969). Because the cooperative is at a higher altitude (500 meters higher) than the town or *ayllu*, earlier work concluded that a higher degree of stunting there could be attributed to hypobaric hypoxia. The reversal of conditions

clearly showed that economic relations, and not high altitude, had the larger effect on growth for these groups. It also showed how the effects of political-economic processes such as an agrarian reform were felt quite differently within the district.

Similar to information on diet and growth, households in the *ayllu* reported higher levels of illness (more cases and symptoms), and more work disruption because of illness. Annual estimates of work lost, suggest that households from the *ayllu* lost about 75 days of adult labor each year because of illness; almost twice that of town households and three times that of the cooperative. Within the town, there was marked variation in access to land, reliable wage work, and relative wealth. Those households who were landless or near-landless, and relying on unskilled temporary wage work for the majority of their incomes, suffered levels of illness, work disruption, and undernutrition equal to or worse than the *ayllu*. In every community, adult women and the elderly were particularly vulnerable to illness and its impact on work. Women reported more illness cases, symptoms, and work lost than men. Like men, respiratory problems and skeletal muscular complaints were leading categories of complaint, but women also reported a relatively high number of generalized symptoms (headaches, weakness, general malaise, abdominal pains) that they associated with reproductive illness, specifically a local illness named *sobreparto* (Larme and Leatherman 2003). Levels of illness symptoms and work lost also increased with age, because the elderly had longer to accumulate a life of hard work and debilitating conditions, and less resilience to work through daily health problems.

Levels of diet, nutrition, and health were lowest in the poorest communities and poorest households within communities. Yet, what constituted poverty or wealth differed in each community. In the *ayllu* and cooperative it was largely based on herd size and land for farming, and secondarily on sources of cash income. Town households were much more economically differentiated, and more thoroughly integrated into commodity markets for goods and labor. For them, access to land for farming and herding was important, but access to steady sources of income was the stronger predictor of nutrition and health (Leatherman 1998). For all sites, food production was primarily for household consumption, and levels of food production had important impacts on diet.

Coping with Illness in Contexts of Household Production

Whether, and to what degree, illness affected household production and other economic activities depended, in part, on coping responses to illness and its potential impacts. Coping responses to illness were understood within the context of overall household economic strategies and

social relations, and focused on the negotiation of illness and its treatment, and responses to a diminished household labor force. In examining the impacts of illness on work and production, the underlying disease process mattered (e.g., respiratory problems were most prevalent, followed by skeletal-muscular ailments) but appraisal of and behavioral response to the disease or illness mattered even more. It is the behavioral response to illness that determines the impact of illness on work. Responses were based on the identification and labeling of illness, and were negotiated based on a host of interrelated concerns, including family, social, economic, and cultural identity issues, not just restoration of health.

None of these steps were a given. First, accepting a sick role, and subsequent diagnosis and treatment, was partly an individual decision, but also a negotiation with the family and others. During critical production periods (e.g., planting and harvest), individuals might ignore symptoms of illness and keep working. In our seasonal surveys of illness we found the highest levels of illness immediately following the planting season and the lowest levels during the harvest. These patterns likely reflected differential prevalence of signs and symptoms of illness, *and* the recognition and acceptance of signs and symptoms of illness *as illness*. In other words, "being sick" was postponed during planting and harvest until after the work was done, sometimes leading to extended periods of bed rest.

Factors such as the cost of treatment and physical access to different treatment options (e.g., a clinic), understandings and trust of different explanatory models and treatment regimes, and social position were all important in decision making about illness. Diagnosis and treatment can have as much to do with class, ethnicity, and gender relations as with an objective reading of symptoms (see Crandon-Malamud 1991). For example, rural households less integrated into a capitalist economy were often less receptive to Western disease classification, and were more likely to define a problem in terms of local cultural categories often based on a spiritual etiology. Conversely, many shop owners and teachers who sought to promote a *mestizo* image denied belief in spiritual causality. Chronic illness in Nuñoa was often seen as incurable and out of the control of the patient and biomedical health specialist. Such problems were often defined and labeled as *desgracias* (a term with multiple meanings, e.g., disgrace, misfortune, sadness, fatality) rather than *enfermedades* (disease/sickness) or *dolores* (aches and pains). The idea of illness as *desgracia* speaks to social aspects and connotations of health problems (e.g., social transgressions, social stigma, interpersonal problems in the family or extended relations, failure to meet obligations to spirits). In other words, *desgracias* were often associated with profound loss of control over one's health and well-being.

A diagnosis sometimes also shifted over the course of an illness, reflecting a change in the symptomatology, severity, and duration of the problem, and also changes in coping capabilities (i.e., the social and economic conditions and relations that shape coping capacity). This might mean reclassifying an *enfermedad* as a *desgracia*. For example, we saw initial instances of acute illness classified as *gripe* (flu), which when it persisted, was reclassified as *machuhuayru* (literally old winds)—a serious and chronic problem with a spiritual etiology and therefore not amenable to treatment within a biomedical regime. This shift in health status was consonant with a shift in social status toward a greater perceived vulnerability and fatalism, and entailed consequent adjustments in work, production strategies, and reduced levels of consumption. Individuals and households more vulnerable to illness, with fewer material resources for coping, and with a stronger indigenous ethnic identity (or need to reaffirm this identity), were perhaps more likely to make such a shift in diagnosis. In this sense, poverty, class and ethnic identity, diagnosis and treatment of illness, and levels of production and consumption were interwoven threads of the same webs of social relations.

Gender roles were also reflected in the diagnosis of *sobreparto*, a Spanish term used by Quechua-speakers, which literally means "illness following childbirth" (Larme and Leatherman 2003). In a number of cases this term referred to a postpartum infection, associated with pain localized in the lower abdomen, and, at times, a fever. However, *sobreparto* was often used in a more general sense, to refer to a group of symptoms (e.g., weakness, general malaise, headaches, and body aches) that persisted years after the last birth. Childbirth was perceived to have long-lasting and deleterious effects on a woman's body and health. As one woman explained, "After giving birth, a woman's body is completely *malogrado* [Sp., ruined], just like after a truck accident." Thus, *sobreparto* reflected the real and perceived physical toll of multiple births (average of 7–8 births during reproductive years) under conditions of high workloads and marginal nutrition. Cultural beliefs and practices held that women were especially vulnerable during and after childbirth, as there were multiple orifices through which cold and winds could enter the body causing illness (Larme and Leatherman 2003). Hence, care was taken to rest, refrain from work, avoid the sun and exposure to environmental extremes, and practice dietary restrictions. The realities of daily life often prevented full adherence to this post-partum regime, and thus exposed women to immediate and long-term health problems. In discussions with Nuñoa women, it also became clear that *sobreparto* was an accepted reason for reducing one's workload and for abstaining from sexual relations with husbands. Thus, because it was an illness within the knowledge domain and experience

of women, the diagnosis of *sobreparto* allowed women to negotiate some limited control over their productive and reproductive roles.

Second, when an individual accepted a sick role that removed them from the work force, household responses ranged from intra-familial adjustments in work tasks, to seeking help from outside the family, to selling off assets for money to hire labor and seek more expensive treatments. Because illness reflects a state of vulnerability, the initial response of many families was to avoid exposing their vulnerability in broader social contexts (and hence risk disadvantageous situations or interpersonal relations), to forgo the added expense and/or commitment of seeking outside help, and rather, to reallocate work tasks among healthy household members. This often meant pulling children out of school to take over some of the work of a sick parent. Over the short run such adjustments helped diminish the full impacts of lost labor, but over the long run, by denying schooling to the child, they could serve to reproduce vulnerability in the family.

Andean societies have a long history of formalized system of labor exchanges (e.g., *ayni* and *minka*), that for some ethnohistorians and cultural anthropologists were seen as one of the defining aspects of Andean culture (Alberti and Mayer 1974; Murra 1984). Thus, we expected that these might constitute a critical line of response when people became sick. Calling on extended kin and/or engaging in labor reciprocity limits cash and resource commitments in times of illness, and makes social and economic sense in the context of vulnerability. Also, given that the cultural meaning of illness is often linked to spiritual or social imbalance and/or digression, engaging in culturally meaningful social reciprocity might be seen as a step toward restoring social balance and health. Indeed, when posed with a hypothetical illness event, there was a general consensus that if key family members (and workers) became ill and extra-household help was needed, one would first call on extended kin and then reciprocal labor (*ayni*) partners. But reports and observations of what actually happened in cases of illness during important production periods were different. In the *ayllu*, where a stronger moral economy was evident, family members did aid sick relatives (albeit reluctantly), while in the town, where capitalist relations were stronger, labor more strongly commoditized, and economic relations individualized (Aramburu and Ponce Alegre 1983), extended family support and *ayni* labor were not readily available. This was played out in several ways. In some cases, very poor individuals with unpredictable access to land and a weak sense of economic and social security, did not seek outside help because they saw all such interchanges as potentially asymmetrical (see Orlove 1977, on asymmetrical exchange). Sick individuals also knew they were making a commitment they might not be able to repay, and that could carry a larger social cost in the long

run. In other cases, individuals were reluctant to enter into reciprocal exchanges with someone who was sick, because they had little assurance that the labor would be returned in kind when needed. Hence, many sick individuals and households were unwilling or unable to seek or obtain help. This often meant that those with cash to hire extra-workers were able to meet labor needs and production tasks, and those without were forced to work longer and accomplish what they could with available labor. Cash-poor and labor-poor households were disproportionately impacted, suffering greater losses in production than middle-income households.

When illness persisted and households were unable or unwilling to obtain sufficient labor to maintain production activities at pre-illness levels, the only option was to retrench, or to plant less with whatever level of labor and resources was available. Households with chronic health problems (and/or severe illness of moderate duration), planted fewer fields, spent more days per field carrying out work tasks, and had reduced yields. But the impact of chronic illness on production varied by differential access to land. Households with predictable and permanent access to land in the *ayllu* and cooperative planted roughly the same number of fields as healthy families, but had lowered productivity. For these households whose livelihood was so strongly tied to food production, and for whom access to land did not require further labor or monetary investments, there was no rationale to plant fewer fields, and there was the important reason of food security to maintain normal production. Households in the town that accessed land through rents and sharecropping, and hence incurred a monetary and/or labor cost simply to access land for planting, often planted only half the fields as healthy counterparts, but had roughly equal levels of productivity. For them it perhaps made more sense to invest money and labor in acquiring only as much land as they felt they could productively farm. Some also decided that it made little sense to invest in land they might not be able to farm, because of illness, and to reallocate healthy labor time to wage-earning activities.

Meaning of Vulnerability in Poverty and Illness

Reduced productivity and production over time can lead to a heightened vulnerability, what Carmen Deere (1987) called a process of household disintegration—where households were unable to produce at levels where they could reproduce land, seed, tools, and other productive inputs (including a healthy labor force) necessary to maintain themselves as farming unit. At this point herders or farmers might sell their animals and land, or lose communal rights to land, and move to the town or migrate out of the area. Yet, often poor, landless, and unskilled laborers in the town experienced even greater extremes of poverty and poor health.

In some instances, impoverished households unable to care for their children would send them to live with middle-class townspeople as *criadas*, working as servants in exchange for food, clothing, and education. Susan Luerssen (1994) found that when she asked what would happen if someone in the family became seriously ill, the response for 89 percent of poor, landless, nonfarming households in the town was that they would die.

Marginalized individuals also express a feeling of vulnerability within their social relations, with comments such as "all my *compadres* just want to exploit me, they want me to work for them all the time," or, "when you are sick your relatives are the last people you can count on (especially in the town)." For recent arrivals in the town without a local means of livelihood or networks of family and friends, their social and economic marginality make them particularly vulnerable. An example can be seen in the case of a mother of three children who moved into the town while her husband and son migrated in search of work. She had little cash to see the family through their absence, and weak social networks because she was relatively new to the town. She supported her three younger children in the interim by doing piecework, washing clothes and selling others' goods in the town square. First one, then another, of the children became ill and she was unable to leave them to work outside of the home. She rapidly depleted her meager cash and food reserves and exhausted her credit at local stores. With few friends or relatives she was unsure where to turn and reluctant to beg for help and thus communicate the dire position of the family. She had little confidence that help would be available even if she asked. By the time her husband and son returned, she and her three children were malnourished, and two of the three children were seriously ill. With the money brought by her husband and son, all the children returned to health and adequate nutrition. However, reluctant to migrate again, her husband began to rely on temporary wage work in the town, and thus limited the options for maintaining or improving household economic and food security.

The loss of agro-pastoral livelihood can signify a loss of social and cultural identity, and represents another set of meanings and implications of vulnerability. One elderly man in the town who persisted in farming a small plot despite his advanced age commented that even though he produced little and had little to eat, if he could go to his fields and work, he did not feel the hunger, but, without fields to plant and work to do, the hunger was constant. Particularly for older generations, self-identification as a farmer or herder was central to one's ethnic and social identity as a member of an Andean community. As long as he was working and maintaining that identity, multiple levels of vulnerability, including hunger, were more manageable. Without land, or a sense of purpose, all problems became more acute.

Finally, vulnerability can contribute to broader social process. The reproduction of poverty and poor health sent those most vulnerable into a spiral of household disintegration. The situation for some was desperate with little hope for improvement. The agrarian reform and subsequent promises of further reallocation of land benefited a few and frustrated many. Cynthia McClintock (1984) has argued that just this sort of perpetual poverty among Andean rural producers led to the spread and success of *Sendero Luminoso* that came to dominate the political landscape of Peru in the late 1980s and early 1990s. By 1986 in this region, the threat of *Sendero Luminoso* was acutely felt. First, a raid on cooperatives and larger land owners (*saqueo)* took place over several days, during which many herds were stolen, and the homes of wealthy landowners were vandalized and looted. These raids were not carried out by *Sendero*, but by others who used their presence (and perhaps inspiration) as a context for redressing inequalities, and/or simply to take advantage of a volatile social and political landscape. When *Sendero* did make their presence felt, it was first through a public assassination of a supposed director (later realized as a case of mistaken identity) of the largest cooperative in the area. In three to four subsequent events, the town hall was demolished, police and other officials killed, and the town declared a "liberated zone." Retaliation by government forces put the area under siege by a second force, leaving most of the population caught in the middle.

It is not surprising that the targets of attack during the *saqueos* and public assassinations were the cooperatives and wealthy landowners. Anger over profits gained by cooperatives and the failure of the agrarian reform to benefit local communities was common discourse in the early 1980s. It is also not surprising that several of our key informants from the poorest and most marginalized communities were suspected to be involved in the *saqueo*, and as supporters of *Sendero*. This possibility makes sense given the levels of vulnerability in their lives, and little hope for change. Indeed, some of these suspected sympathizers have now moved to a new community and expanded their holdings.

The larger costs (or perhaps benefits) of the revolution are yet to be established for this region. Landholdings have shifted, the town has almost doubled in size, and more small shops and a few government enterprises are evident. Yet, during a recent visit to Nuñoa in 2003, townspeople remarked that recent changes also included greater levels of poverty, hunger, and alcoholism in the town and rural communities. For many townspeople, the period of *Sendero's* dominance (1989–92) established a kind of fear and uncertainty (another sense of vulnerability), which is still felt and manifested in a heightened aura of wariness and distrust of other townspeople. Informants spoke of the "1,000 eyes and ears" of *Sendero*, that disciplined their speech and activities then, and, to a lesser degree, now.

During this time it was common practice was to lock the doors and turn off the lights in one's home as soon a night fell; and hope for no knocks or other disturbances. Many fled the area and have not returned, whereas others returned to lost holdings and are attempting to rebuild. Some of the new entrepreneurs in the town are suspected of having acquired the capital for new businesses by profits they made in the *saqueo* and other subsequent raids.

It is impossible to say who might have been a *Sendero* sympathizer and who was not, who suffered most and who benefited most, or the extent of the costs (including health costs) and long-term vulnerability connected to the anxiety and stress provoked by being caught in the middle of a brutal revolutionary movement and equally brutal government response. The point is that the conditions that give rise to such events are tied to structures of poverty and inequality, and an analysis of a local and historically specific vulnerability, can have something to say about these conditions. Biocultural analyses, in turn, have something to say about the vulnerability of those most affected.

DISCUSSION

The goal of this case study has been to illuminate a piece of the broader processes that play a role in the reproduction of poverty and poor health in the region. The most vulnerable to negative impacts of illness on production—and the extreme case of household disintegration—were the poor: labor poor, cash poor, and land poor. They were prone to greater food insecurity and higher levels of illness, were less able to cope with the negative impacts of illness on production, and were the most prone to chronic poverty and poor health. These households occupied a historically specific space of vulnerability, which is not adequately described by "socio-economic status," but requires knowledge of the social relations through which they accessed land and labor, and participated in the capitalist market. These relations are shaped by an extensive global history of exploitation and more recent social and economic transformations. Levels of illness, coping strategies and capacities, and consequences of illness and responses to illness on production and household economies, could only be understood through the way they are linked to the culture, social relations, and economic strategies of individuals and households. Finally, because the interaction between poverty, poor health, and production is an ongoing process, one factor cannot be understood as causative of another, but each can be seen as mutually causative in an ongoing process. Indeed, most relationships in analyses of human–environment interaction are best seen in this light—as a part of a mutually constitutive dialectic.

In our current era of global economies, growing inequalities and poverty, and unacceptably high levels of hunger and illness, we need approaches that are capable of linking human biology to social inequalities in contexts of globalization. Although approaches to these issues can develop from several directions, starting point matters. Within the political-ecology of biology and health approach proposed here, the starting point is political-economy, particularly the global–local interactions and unity of structure and agency that provide a way into understanding the reproduction of poverty and poor health in specific environmental and ethnographic contexts. The approach also highlights the role of human agents in responding to conditions of vulnerability, such as poverty and illness, and thus dialectically creating, in part, the conditions of their own vulnerability. Whatever the approach we adopt in biocultural analyses, however, we must place the study of human biology in both broad and specific social contexts, or we miss the chance of making our results relevant to the rest of anthropology and especially the people with whom we are working.

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