Social Science & Medicine 69 (2009) 571–578

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Inequality in social rank and adult nutritional status: Evidence from a small-scale society in the Bolivian Amazon☆

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ARTICLE INFO

Article history:
Available online 18 June 2009

Keywords:
Bolivia
Health inequalities
Social rank
Indigenous peoples
Nutritional status

ABSTRACT

Research on the social determinants of health has highlighted (a) the adverse effects of social inequality on individual health and (b) the association between individual social rank and health. In this paper, we contribute to the growing literature on the health consequences of social inequalities by assessing the association between village level inequality in social rank, a form of non-material inequality, and indicators of nutritional status. We use quantitative survey information from 289 men (18+ years of age) from a society of forager-farmers in the Bolivian Amazon (Tsimane'). We construct village level measures of non-material inequality by using individual measures of men's positions in the village hierarchy according to prestige (or freely conferred deference) and dominance (or social rank obtained through power). We find that village inequality in dominance, but not village inequality in prestige, is associated with short-term indices of individual nutritional status. Doubling the coefficient of variation of dominance in a village would be associated to a 6.7% lower BMI, a 7.9% smaller mid-arm circumference, and a 27.1% smaller sum of four skin folds of men in the village. We also find that once we decouple individual social rank based on dominance from individual social rank based on prestige, only prestige-based social rank is associated with nutritional status. Potential explanations for our findings relate to the differential forms of resource access derived from the two forms of social hierarchies and to the social and psychological benefits associated with prestige versus the social costs and psychological stress generated by dominance.

Introduction

Using data from industrial nations, researchers have recently provided quantitative evidence of the effects of two social processes on individual health. First, a growing body of research has documented the adverse effects of income inequality on individual health (Kawachi, 2002; Wilkinson, 1996; Wilkinson, 2000), suggesting that the concentration of income might affect health through the breakdown of social cohesion (Kawachi, 2002) and the creation of psychological stress (Wilkinson, 1997). Non-material social inequalities, such as discrimination based on race or gender, might also affect individual health (Krieger, 1993) (but see also Lynch (2004) for reactions to this work). Second, researchers have also found an association between social rank, or position in dominance hierarchies, and individual health: each step down the socioeconomic ladder is associated with increased morbidity and mortality (Adler, Boyce, Chesney, Folkman, & Syme, 1993; Marmot, 2004; Marmot, Ryff, Bumpass, Shipley, & Marks, 1997).

The scarce research on the effects of income inequality and social rank on individual health in small-scale societies supports the second, but not the first of the findings from industrial nations. In our prior research among the Tsimane', a native Amazonian population of forager-farmers, we found that income inequality within the village is not associated with individual measures of nutritional status (Godoy, Byron et al., 2005), such as indicators of caloric and nutrient reserves. But we found supporting evidence for the social gradient in health among the same indigenous population. Using a measure of social rank that captures the locally

☆ Research was funded by grants from the Cultural Anthropology and Physical Anthropology Programs, NSF (BCS-0134225, BCS-0200767, BCS-0322380).
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doi:10.1016/j.socscimed.2009.05.039

perceived position of an individual in the village hierarchy and controlling for personal income and other correlates, we found a positive association between individual social rank and measures of nutritional status. A higher ranking in the hierarchy was associated with a greater BMI, larger mid-arm circumference, and a greater sum of the four skin fold measurements (Reyes-García, McDade et al., 2008). Our second finding echoes those of previous descriptive research on small-scale societies: high social status typically leads to higher total fertility and survivorship due to preferential access to resources during times of need (Boone, 1998; Patton, 2005; Sugiyama & Chacon, 2000; Wiessner, 2002).

In this paper, we contribute to the growing literature on the social processes that may affect individual health by addressing both findings. Specifically, we ask: does village level inequality in social rank, a form of non-material inequality, have adverse effects on nutritional status in small-scale societies? Researchers have argued that socioeconomic status is a good proxy for social rank among humans (Sapolsky, 2004). Here we suggest that inequality in socioeconomic status measured through income inequality does not adequately capture social hierarchies in small-scale societies. Research shows that social hierarchies are common to all human societies, though not necessarily based on income (Boehm, 1999a; Sahlins, 1958; Wiessner, 1996). For example, researchers have found that social rank in forager societies is linked to physical dominance (Chagnon, 1988; Patton, 2000), hunting ability (Gurven & von Rueden, 2006; Kaplan & Hill, 1985), generosity (Patton, 2005; Stearman, 1989), ability to relate with outsiders (Reyes-García, Molina et al., 2008), or a combination of those traits (von Rueden, Gurven, & Kaplan, 2008). Thus, differentiating between income inequality and other forms of non-material inequality, such as inequality in social rank, might shed light on the effects of social inequality on individual health.

In this article, we estimate the association between village inequality in social rank and individual anthropometric indices of short-run nutritional status among Tsimane' male adults. We follow Henrich and Gil-White (2001) and differentiate between social rank obtained through power (hereafter dominance) and social rank obtained through freely conferred deference (hereafter prestige). For the empirical analysis we use cross-sectional data from the Tsimane', a foraging-farming society in the Bolivian Amazon. Based on research that highlights the adverse effects of inequality on health, we expect to find a negative association between village inequality in social rank, especially when measured through dominance, and individual anthropometric indices of short-run nutritional status.

Methods

Data for this article come from a study (2002-present) of the Tsimane'. The Institutional Review Board for research with human subjects of Northwestern University and Brandeis University and the Great Tsimane' Council approved the study. Before enrolment in the study, we obtained assent from participants. These data were collected by experienced interviewers and translators who had been a part of the panel study from its beginning. Previous publications provide ethnographic information about the Tsimane' (Daillant, 2003; Huanca, 2008). In several articles, we have also described in detail methods used to collect data on anthropometric measures (Godoy, Byron et al., 2005), income (Godoy et al., 2006), and social rank (Reyes-García, McDade et al., 2008; Reyes-García, Molina et al., 2008). Here we provide a brief description of those methods.

The people

The Tsimane' are one of the largest native Amazonian groups in Bolivia, with about 8000 people in approximately 100 villages settled along river banks and logging roads (Censo Indígena, 2001). For their subsistence, Tsimane' rely on slash-and-burn farming supplemented by hunting, gathering, and wage labor in logging camps, cattle ranches, and in the homesteads of highland colonist farmers.

In previous research, we have found that individual-level variables, such as schooling (Brabec, Godoy, Reyes-García, & Leonard 2007; Reyes-García, Vadez et al, 2008), wealth (Godoy, Reyes-García et al., 2005), and social rank (Reyes-García, McDade et al., 2008) are associated in a positive and statistically significant way with adult nutritional status. We have also found that village level variables, such as income inequality and social capital, are not associated with individual nutritional status when considered alone (Godoy, Byron et al., 2005; Godoy, Reyes-García et al., 2005), although social capital and income inequality complement each other in their association with BMI: the rich who refrain from sharing their wealth have lower BMI than the rich who display generosity (Brabec et al., 2007).

Sample

We collected data through a survey that took place from June through September 2005 among nearly all the households ($n = 252$) in 13 Tsimane' villages straddling the Maniqui river. Villages were at different distances from San Borja, the closest market town (population about 19,000). We asked every person over 16 years of age, or younger if s/he headed a household, ($n = 611$) to name all the important people in the village and state why they were important. We selected 16 years of age as the base because this is the age at which Tsimane' establish their own households and are considered adults. Participants include 304 women and 307 men. We found that participants were more likely to name men as important people than women. Eighty-six men, or 28% of the male sample, were nominated at least once, whereas only six women, or 2% of the female sample, received at least one nomination. We also found that men on average received more nominations than women; the average man received 2.7 nominations (SD = 7.80), and an average woman received 0.04 nominations (SD = 0.34). Because women received so few nominations, we limit the analysis to men. The total sample with complete information for multivariate analysis includes 302 adult men.

Dependent variable: anthropometric indices of short-run nutritional status

To enhance comparability with previous work and strengthen robustness in results, we use three anthropometric indices of short-run nutritional status as outcome: (a) body-mass index (BMI: kg/m^2), (b) mid-arm circumference (cm), and (c) the sum of four skin folds biceps, triceps, sub-scapular, and supra-iliac (mm). The three indices reflect different dimensions of short-run nutritional status (Gibson, 1990). BMI is a measure of body composition and the most widely used measure of nutritional status among adults (National Institutes of Health, 1998; Shetty & James, 1994). Mid-arm circumference provides an index of both protein and energy status (Frisancho, 1990). The skin fold measures are sensitive to short-term change in subcutaneous fat stores and are thus good measures of energy reserves (Frisancho, 1990).

To collect the information on short-run nutritional status we trained surveyors to measure physical stature, weight, mid-arm circumference, and skin fold thickness following the protocol of Lohman, Roche, and Martorell (1988). We measured subjects in light clothing without shoes or hats. We measured body weight to the nearest 0.20 kg using a Tanita Digital standing scale. We recorded stature (standing height) to the nearest millimetre using a portable stadiometer or a plastic tape measure. BMI was