GDS Working Paper 2015-7

April 16, 2015`

Health, inequality, and conspicuous consumption: Longitudinal evidence from native Amazonians in Bolivia

Veronica Nica[1], Eduardo A. Undurraga[1, 2], Rebecca Zhang[3], Irene C. Mensah[4], and Ricardo A. Godoy[1,]*

Center for Global Development and Sustainability

Brandeis University
The Heller School for Social Policy and Management

Health, inequality, and conspicuous consumption:

Longitudinal evidence from native Amazonians in Bolivia

Veronica Nica[1], Eduardo A. Undurraga[1, 2], Rebecca Zhang[3], Irene C. Mensah[4], and Ricardo A. Godoy[1,*]

Abstract

Studies from industrial nations suggest that community or country income inequality harms individual health either by eroding institutions that provide public goods or by encouraging social comparisons with others. We test the hypothesis that community inequality in resources with greater cultural visibility will show a stronger association with health than inequality in less conspicuous resources. To test the hypothesis we use: ***(i)*** a survey to gauge the cultural visibility of goods and behavior and ***(ii)*** a nine-year annual panel (2002-2010), both from a horticultural-foraging society of native Amazonians in Bolivia. We find partial confirmation for the hypothesis, but, more intriguingly, we find that greater village economic inequality is associated with better health after controlling for many covariates, including resources that protect health (e.g., education). We conclude with a discussion of why economic inequalities might be associated with better health in pre-literate, small-scale, endogamous rural societies.

Keywords: Social epidemiology, income inequality, Tsimane', conspicuous consumption

---

[1]Heller School for Social Policy and Management, Brandeis University, Waltham, MA 02453, USA.

[2] Interdisciplinary Center for Intercultural and Indigenous Studies, Pontificia Universidad Católica de Chile

[3] Federal Reserve Board, 20th Street and Constitution Avenue NW, Washington, DC 20551, USA

[4] UNDP, 01 BP506 lot 111, Zone Residentielle, Cotonou, Republique du Benin

*Corresponding author: rgodoy@brandeis.edu. Tel. 1-781-736-2784

Acknowledgements. The views expressed in this article do not necessarily represent the views of the Federal Reserve Board or the United States. We thank the Anthropology Program of the National Science Foundation and the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) for grant support, and Vicky Liu for research assistance. The studies received IRB approval from Brandeis University, Northwestern University, and the Consejo Tsimane

Introduction. In this article we link two lines of research that have yet to meet but which show promise of yielding new insights when joined: ***(a)*** the effects of community economic inequality on health and ***(b)*** the use of conspicuous consumption to signal status. When combined, the two lines of research yield an intriguing hypothesis: community inequality in resources with high cultural visibility should bear a stronger association with individual health than community inequality in resources with less cultural visibility. The effect of community economic inequality should be in line with its cultural visibility. The insight is novel because studies of the effects of economic inequality on individual health focus on colorless economic indicators, such as income or wealth, but ignore whether the cultural salience of the economic indicator matters. We are saying that what matters for individual health is not just how unequal resources are distributed in a community, but also how visible the inequality in those resources is to the people in the community.

The effects of community economic inequality on individual health. A raft of observational studies across the industrial world suggests that – after controlling for resources that protect health, such as income or education – greater economic inequality in communities or nations is associated with worse individual health (Deaton, 2013; Lynch et al., 2000; E. A. Undurraga et al., 2010; Wilkinson & Pickett, 2009b). We focus on two paths most germane to our study: material deprivation and social comparisons.

[a] Material deprivation or the absolute income hypothesis. One line of research suggests that economic inequalities affect individual health because economic inequalities abrade social institutions that protect health. By making some people better off than others, economic inequalities make it harder for people to cooperate in the provision of public goods and services. As economic inequality grows, the haves might usurp political power (Piketty, 2014), and when

this happens governments, neighborhood organizations, and village councils are more likely to disagree, for example, on how many health workers to hire, where to place clinics, and what types of medicines to buy. If institutions reach a stalemate in how to move forward, the supply and quality of public goods plummets and with it health (Smith, 1996).

[b] Social comparisons or psychosocial paths. By lengthening the economic ladder separating those at the top from those at the bottom, economic inequalities fuel psychosocial stress from social comparisons. The better-off feel guilty and insecure; the ruck feels envy, anger, and resentment. These emotions increase stress, which, in turn, harm health through many biological mechanisms (Brunner, 1997; Dickerson & Kemeny, 2004; McEwen, 2012).

The use of conspicuous consumption to signal status. The second research line of interest goes back to Veblen (1899), and suggests that people invest in positional goods to enhance their status, and do so while ignoring that their gains in status might distress their neighbors. To test Veblen's idea that people invest to enhance status, Heffetz (2011; 2012) developed the concept of cultural visibility, which he defined as the time it would take to find out about the expenditure or the consumption of a neighbor. He distinguished between socio-cultural and physical visibility: physical visibility refers to the size of goods whereas cultural visibility refers to how fast people learn about the consumption or expenditure of others. Cultural and physical visibility need not overlap; some goods might be physically visible but might be ignorable because they carry little cultural meaning. Culture trains us to spot the observable. As Bourdieu (1984) taught, people in different social groups are socialized into different values and preferences which guides their actions. As a result of differential socialization, he argues, the cultural radar of the middle and upper crust in France was finely attuned to notice a neighbor's collection of

legitimate works of *avant-garde* art, whereas the cultural radar of the lower class was conditioned to quickly eye utilitarian objects.

For the empirical analysis, Heffetz used the Consumer Expenditure Survey of the USA and split household expenditures into 31 categories. He then conducted a telephone survey with 480 adults >18 years of age and asked them how long it would take them before they noticed a neighbor's expenditure in each of the 31 categories. From their answers he developed a cultural visibility index. He used data from the Consumer Expenditure Survey to regress the amount of expenditure in a category as a share of total expenditures against the visibility index. He found that the visibility index explained ~30% of the variation in total expenditures. Since then, studies in Germany, South Africa, Indonesia, and the USA have supported his findings (Charles, Hurst, & Roussanov, 2009; Friehe & Mechtel, 2014; Kaus, 2013; Roth, 2015): people spend resources to acquire goods that others notice because getting noticed enhances one's social status.

The need to signal status through positional goods happens because in daily interactions with anonymous strangers others cannot see or verity one's income or wealth unless one takes steps to make them noticeable (Bagwell & Bernheim, 1996; Glazer & Konrad, 1996). And displaying status matters because status may improve one's economic well-being (Frank, 1985), is associated with better health (Sapolsky, 2005), and enhances reproductive success (Hudders, De Backer, Fisher, & Vyncke, 2014; Miller, 2000; Newson, 2009).

Here we report the results of a study to test the idea that economic inequality in resources with greater cultural visibility will show a stronger association with individual health than economic inequality in resources with lower cultural visibility. To test the idea we use data from a horticultural-foraging society of native Amazonians in Bolivia, the Tsimane'. Drawing on

ethnographic work spanning almost two decades and on observational annual panel (longitudinal) data over nine consecutive years (2002-2010), we estimate the association between the ***(i)*** Gini coefficient of village inequality in goods and behaviors that vary in their cultural visibility and ***(ii)*** the health of adults >16 years of age. The results provide some evidence that village inequality in resources with high cultural visibility bore a stronger association with a person's health than village inequality in resources with low cultural visibility. That said, the relation between village economic inequality and individual health was not what one would have expected based on findings from industrial nations. We found that greater village inequality in resources with more cultural visibility went along with better – not with worse – health.

The people. The Tsimane' are an endogamous society of foragers-horticulturalists in the tropical rain forest of the department of Beni, Bolivia (Figure 1). They live mostly along the rivers Maniqui and Apere and still follow a preferential system of cross-cousin marriage, meaning that a man marries his mother's brother's daughter or his father's sister's daughter (Daillant, 1994). Recent population estimates by the Tsimane' Council, their governing body, suggest that the Tsimane' number ~14,200 people, living in ~95 villages of at least eight households (Undurraga et al.2015). A Tsimane' village has ~20 households (standard deviation, SD=24), with an average of six people per household.

[Insert Figure 1]

In a village, houses lie scattered, with related families living around an open courtyard. Made of palms, poles, and planks, houses have four sides and, in remote villages, lack walls. In villages closer to towns, people have put locks on doors, and walls to enclose their homes; in these villages people outside a house cannot see those inside. During the 2002 survey of all

households in the 13 Tsimane' villages of the 2002-2010 panel, we counted the number of outside walls of each house. We found that in remote villages houses had an average of 2.5 walls (SD=1.6), but a quarter of houses had no walls. In villages closer to towns, houses had an average of 3.3 walls (SD=1.2), and only 9% of houses had no walls. Seeing what people have or consume in other households is easier than these figures suggest because Tsimane' keep many durable goods in lean-to kitchens, and 71% of these sheds had no walls. Furthermore, Tsimane' have a lax attitude about asset ownership; they leave physical assets thrown about in their open courtyards so those who pass by can easily see what their neighbors own (Godoy & Jacobson, 1999).

In 2004 we did a survey of monetary expenditures among 161 adult Tsimane' women and 257 men in the same 13 villages described in the previous paragraph (Godoy et al.2007). We grouped purchases into the following categories: animals, clothing, kitchen, health and hygiene, luxuries, school supplies, tools, and transport. We defined the categories based on our understanding of what the categories stood for. The categories were not based on socio-cultural visibility, ubiquity, or prices. Except for luxuries, the definition of a category was unambiguous. We equated luxuries with goods such as jewelry, battery-operated radios, and watches; these goods were neither more expensive nor more visible than goods in other categories – they simply conformed to our definition of luxury. We found that a higher share of expenditures went to the purchase of luxuries than to the purchase of durable goods (e.g., toothbrushes). The study shows that Tsimane' spend in luxuries, but leaves unexplored the links between inequality, cultural salience, and individual health.

In 2009, mean daily monetary income per person among the Tsimane' reached only US$0.90 (SD=2.1), slightly above the threshold of extreme poverty used by the Bolivian

Government (US$0.62)(World Bank, 2005). Between 2002 and 2010, the mean annual village Gini coefficient of total asset wealth inequality in the 13 villages of the panel study was 0.31 (SD=0.07) if estimated from assets owned by the entire household, and 0.49 (SD=0.06) if estimated from assets owned by individual adults >16 years of age. We equated asset wealth with the monetary value of a basket of industrial products (e.g., metal knives), goods made from local materials (e.g., canoes), and domesticated animals (e.g., chickens). The mean annual Gini coefficient of village monetary income inequality computed from the earnings of adults was 0.73 (SD=0.08). We found more village inequality in monetary earnings than in durable-asset wealth because only adults (and mostly men) have access to wage earnings in logging camps or in cattle ranches, whereas all adults (and even children) have access to some physical assets (e.g., ducks, chickens)(E.A. Undurraga & Godoy, 2015).

Although Tsimane' have clear concepts of private ownership over physical assets and monetary earnings, they borrow, share, and exchange goods and labor with others inside and outside their villages (Godoy et al. 2007a). Several environmental and socio-economic constraints make it hard for households to accumulate savings. Instead of relying on material accumulation to buffer risks, Tsimane' buffer risk through sharing and reciprocity (Undurraga et al. 2013). However, they also have a stingy side. In experimental games across small-scale cultures worldwide, Tsimane' ranked among the least pro-social (Henrich et al. 2010).

In several studies we have estimated the association between ***(a)*** village inequalities in monetary income or total monetary expenditures and ***(b)*** markers of individual well-being, such as perceived morbidity and musculature (Godoy et al., 2006; Godoy et al., 2010; Reyes-Garcia et al., 2007; Reyes-Garcia et al., 2009; Undurraga et al., 2010). In one study we found weak evidence of an association between an individual's wealth rank in a village and health, no

association between community income inequality and health, and little change in the wealth hierarchy of a village (Undurraga et al. 2010).

Methods

Data. For the main analysis we use two sources of data. The first body of data comes from a study to measure and rank goods by their cultural visibility. The second data set consists of an annual panel study of nine years (2002-20010) in 13 villages. We assess the robustness of our results and extend the analysis by drawing on another panel of two years (2008-2009) in 40 different villages[1].

Visibility module. In 2006 Heffetz adapted his index of cultural visibility from the USA to the Tsimane'. He asked a sample of 676 adults the following question: "If someone in the village was to buy/consume/do [….*name of good or behavior*….], how long would it take before you found out?" He posed the question for many goods and behaviors, with questions about different goods and behaviors asked in random order to avoid response bias from the order in which subjects heard the questions (Kahneman et al. 2006). Following Heffetz (2011; 2012), we assumed that people would take less time to notice expenditures, consumption, or behaviors with greater cultural visibility.

Based on the results from Heffetz's survey we chose six behaviors that spanned the continuum of cultural visibility. Consumption of wildlife and consumption of meat from domesticated animals were ranked as most visible, followed by monetary expenditures (not ownership) in luxuries (e.g., jewelry) and durable assets (e.g., metal tools). The least visible

[1] The two panel data sets are available to the public at http: http://heller.brandeis.edu/sustainable-international-development/tsimane/index.html. The nine-year panel contains 14 villages, but

behaviors included the area of forest cleared for horticulture and the area planted with four staples: manioc, rice, maize, and plantains. For simplicity we use the word *behavior* to capture behaviors proper (e.g., consumption) and goods or items (e.g., area planted).

Long panel (2002-2010) for main analysis. During 2002-2010 we collected annual panel data from 1036 adults>16 years of age in 401 households in 13 villages. Elsewhere we describe the methods of data collection for the panel (Undurraga et al. Leonard & Godoy, 2008; 2013).

Short panel (2008-2009) for robustness analysis. During 2008-2009 we carried out a randomized-controlled trial with two treatments in 40 villages beyond the ones described in the previous paragraph. The methods of data collection for the trial have been described elsewhere (Saidi et al. 2013; Undurraga et al., 2013; Undurraga et al., 2014).

Outcomes. Health outcomes fell into three categories: *(a)* perceived health (stress and morbidity), *(b)* behavioral health (addiction), and *(c)* objective health (anthropometric indicators of short-run nutritional status. Perceived stress, perceived morbidity, and addiction proxy for psychological health; research suggests that in the short run these indicators respond to changes in community economic inequality (Kawachi & Kennedy, 2002; Wilkinson & Pickett, 2009a).

[Tables 1-2]

Perceived stress and perceived morbidity. We asked adults how often they had experienced anger, un-happiness, sadness, and fear during the seven days before the interview. We used the mean of the total episodes of negative emotions as an outcome[2]. To measure perceived morbidity we created two binary dummy variables: Bed and Ill. The variable Bed took

[2] Using the total number of episodes of negative emotions as a dependent variable produced similar results.

the value of one if the adult reported having been bed-ridden during the 14 days before the interview and zero otherwise. The variable Ill took the value of one if the adult reported having felt ill (though not necessarily bed ridden) during the previous two weeks. The two variables capture different points in the continuum of perceived morbidity, with Bed capturing morbidity that is perceived as so severe that it confines the person to bed and limits ordinary activities.

Addiction. To measure addiction we used principal component factor analysis to combine responses about the consumption of cigarettes and commercial alcoholic beverages during the seven days before the interview. The five variables loaded into a single factor with an eigenvalue greater than one (2.44; Chronbach's alpha=0.70).

Anthropometric indicators of nutritional status. We followed Lohman's (1988) protocol to measure standing height and body weight. From measures of height and weight we computed the body-mass index (BMI=weight in kg/standing height in m^2). For the analysis with BMI as an outcome we exclude pregnant and lactating women (Zeng et al., 2013). We also used calipers to measure mid-arm muscle area following the norms of Frisancho (Frisancho, 2008).

Identification strategy. We estimate the parameters of the following equation:

$$[1]\ H_{ihvtj} = \alpha + \phi Inequality_{vtk} + \beta Resource_{ihvkt} + \theta Control_{ihvt} + \varepsilon$$

H stands for the health of individual *i* of household *h* in village *v* at time *t*; *j* indexes for the health outcome. *Inequality* stands for the Gini index of inequality of resource *k* in village *v* at time *t*. *Resource* stands for the level of resource *k* (e.g., expenditure in luxuries) of individual *i* at time *t*. *Controls* include age, gender, education, village-to-town travel time, median annual value of *k* for the village, annual village population size, and number of times the person was surveyed. We used OLS with robust standard errors, clustering by village, and year fixed effects.

We follow the practice of using at least two measures of community economic inequality to ensure robustness in results (De Maio, 2007; Kawachi & Kennedy, 1997; Wagstaff, Paci, & Vandoorslaer, 1991). Appendix A contains an explanation of how we estimated the Gini coefficient and how we imputed values for missing observations[3]. Doing the analysis with or without imputed values did not change results. We use the Gini coefficient of village inequality as a starting point because it is widely used and therefore facilitates comparison with other studies. The Gini coefficient has also been used in anthropology (Borgerhoff Mulder et al., 2009; Godoy et al., 2006; Undurraga et al., 2010). But the Gini index is problematic because it does not differentiate between kinds of inequalities. To ensure results do not hinge on how we measured inequality, we also do the analysis measuring inequality with the coefficient of variation (standard deviation/mean of the village wealth distribution) due to its simplicity and ease of interpretation.

Results

Table 3 contains two noteworthy results. First, we found some evidence that village inequality in behaviors with more cultural visibility bore a stronger association with a person's health than village inequality in behaviors with less cultural visibility. Second, we found that greater village inequality was generally associated with better health.

[Table 3]

The gradient of cultural visibility. In section III of Table 3 we see that the Gini coefficients of village inequality in the two behaviors with the least cultural visibility (area

[3] In the main regressions we use the Gini coefficients with imputed values. Doing the analysis with or without imputed values did not change results.

planted or area deforested) bore no statistically significant association with individual health. However, village economic inequality in resources with medium visibility (expenditure in durable assets, luxuries) were significantly associated with less perceived stress, illness, and addiction, and village inequality in meat consumption, a resource with the most cultural visibility, was significantly associated with lower anthropometric indicators of short-run nutritional status. We say that the results provide partial support for the hypothesis because the variables that bore the strongest association with individual health were not the most visible ones (consumption of meat from domesticated animals or wildlife) but the ones with intermediate visibility. A one-point increase in the Gini coefficient of village inequality in meat consumption was associated with a 0.56 SD decrease in age and sex-standardized arm muscle area and a 1.70 point decrease in BMI. Among resources with medium visibility we find that a one-point increase in the Gini coefficient of village inequality in expenditure in durable goods was associated with 0.24 fewer episodes of stress and a six percentage-point lower probability of reporting illness, and an increase in the Gini coefficient of village inequality in expenditure in luxuries was also associated with lower stress and illness, and with a 1.14 SD decrease in addiction.

Greater village economic inequality associated with better health. The second noteworthy finding from Table 3 is that as village economic inequality increases, a person's perceived and behavioral health improves. For example an increase in the Gini coefficient of village inequality in expenditure in durable assets or in expenditures in luxuries was associated with lower perceived stress, lower perceived morbidity, and lower addiction. Only with objective anthropometric indicators did we find the expected relations of increased inequality associated with worse health. An increase in the Gini coefficient of village inequality in the consumption of meat from domesticated animals was associated with lower mid-arm muscle area

and lower body-mass index. A decline in BMI is an adverse result because the Tsimane' are physically fit, with low rates of overweight (~22%) or obesity (2-3%) compared with the USA, where overweight and obesity rates reach 69% and 35% (Gurven et al., 2013; Rosinger et al., 2013), and unlike other native Amazonian populations, the Tsimane' show little evidence of experiencing increased obesity (Zeng et al., 2013).

In sum, we found some evidence that village economic inequality in behaviors with prominent cultural visibility bore stronger associations with a person's health than village inequality in behaviors with less cultural visibility. We also found that irrespective of the visibility of a behavior, greater village economic inequality was generally associated with better perceived and behavioral health.

Robustness and extensions

In Table 4 we use the coefficient of variation instead of the Gini coefficient of village economic inequality. We find that the results of Table 4 largely confirm the results of Table 3, but we also found statistically significant results for inequality of resources with less cultural visibility. Greater village economic inequality was associated with improved perceived morbidity and less addiction, and also with lower anthropometric indicators of short-run nutritional status. Most of the coefficients that were statistically significant in Table 3 were also statistically significant in Table 4, and retained the same sign. What we find in Table 4 that we did not find in Table 3 is that one of the least culturally visible resources – forest area cleared for farming – bore a significant negative association with perceived illness, addiction, and anthropometric indicators of short-run nutritional status. Thus, the hypothesis that village economic inequality in resources with more cultural visibility should bear a stronger association

with individual health than village inequality in less conspicuous resources depends on the measure of inequality, with the coefficient of variation providing more evidence than the Gini coefficient.

[Table 4]

To assess whether our results were robust and to extend the analysis in new directions, we repeated the same regressions of Table 3-4 using a larger dataset, with 40 different villages instead of 13 villages measured over two consecutive years (2008-2009). The short panel allowed us to use an improved measure of stress, cardiovascular health, a different measure of short-run nutritional status (body-mass index; BMI), and addiction. We include cardiovascular health because it is one of the few objective indicators of short-run health we have. To measure perceived stress, we used our ethnographic work with the Tsimane' to adapt Cohen et al.'s (1983) Perceived Stress Scale. We asked adults how often they had experience nine negative emotions during the seven days before the interview. Negative emotions included having problems with sleep, feeling angry, worried, sad, ashamed, envious, harried, feeling that one did not have enough time to do all one needed to do, and feeling things were not going well. To measure cardiovascular health we took the average of three consecutive measures of systolic blood pressure, diastolic blood pressure, and pulse rate, and used each of the three means as a separate outcome.

[Table 5]

Although some of the details differ, the results of Table 5 largely support the previous findings. First, inequalities in resources with high or with low cultural visibility did not show as much evidence of being associated with individual health as resources with medium levels of

cultural visibility. In Table 5 we find that of the seven Gini coefficients of village inequality with statistically significant associations with health, five came from resources with medium levels of cultural visibility. Second, except for one case, we again found that village inequality in resources was associated with improved individual health. A one-point increase in the Gini coefficient of village inequality in expenditure in durable assets was associated with a 5.37 point (4.7%) increase in systolic blood pressure. Unlike the nine-year panel, the two-year panel shows a statistically significant association between more village inequality in expenditure in durable-asset wealth or more inequality in expenditure in luxuries and BMI.

In Table 6 we replicate Table 5, but use the coefficient of variation instead of the Gini coefficient. Again, we find that most of the significant results are concentrated among resources with intermediate levels of cultural visibility. Irrespective of whether we use the Gini coefficient or the coefficient of variation, a comparison of Tables 5 and 6 suggests that more village inequality in wildlife consumption was associated with less stress, more inequality in expenditure in durable-asset wealth or in luxuries, and more expenditure in durable-asset wealth was also associated with higher systolic blood pressure.

[Table 6]

Discussion

We found partial support for the hypothesis that inequality in resources with greater cultural visibility bore a stronger association with individual health than inequality in resources with less cultural visibility. Most of the evidence linking village inequality with individual health came from inequality in resources with intermediate levels of cultural visibility: inequality in purchases of durable assets or luxuries. We next try to explain the finding.

Durable assets and luxuries differ from the other resources considered because they are not usually shared, or at least not shared as widely as some of the other resources. Tsimane' will borrow each other's durable assets such as a canoe to cross a river, and will often do so without asking the owner, but they don't usually borrow freely assets acquired in the market. Unlike the other resources considered, durable assets and luxuries purchased in the market have clear individual property rights. Not so with the other resources considered, such as the harvest of wildlife, meat from domesticated animals, area planted, or area of forest cleared. People are expected to share in the success of a hunting or a fishing expedition (E. Undurraga, Zycherman, et al., 2013), or to share meat from domesticated animals, though in practice Tsimane' might hide their consumption when eating wildlife or meat from domesticated animals (Ellis, 1996). The same logic applies to area planted or to area of forest cleared, the resources with least cultural visibility. People without enough food can surreptitiously take some of the crops from the fields of others. Fields being so scattered and unguarded, it is hard to monitor who takes what planted crop from where. Thus, it might not be simply the cultural visibility of a resource that matters when assessing whether community inequality in that resource affects individual health, but – in addition – it might also matter whether other villagers have formal or informal access to one's resource, either through tolerated theft, sharing, or reciprocity. If a resource with high (or low) cultural visibility is very unevenly distributed in a community, its inequality might not affect individual health provided people feel they have claims on the resource held by others. In sum, inequality in market goods might bear a stronger association with individual health than inequality in other goods and behaviors because it might be harder to access a neighbor's goods purchased in the market than goods produced with local materials or procured from the village commons.

This then raises a second question: Why might village economic inequality be associated with good health? Perhaps the most intriguing finding of our research is the consistent negative association between village economic inequality and poor health. Why might this be so?

Recall from the introduction that inequality presumably affects health through two paths: social comparisons and the erosion of institutions that protect health. As the economic ladder separating the haves from the have-nots widens, all people feel worse: those at the bottom feel envy and resentment, while those at the top feel guilty, remorse, and insecurity. True, but this story holds up mostly in large conglomerates of industrial societies marked by a great deal of anonymity (Wilkinson & Pickett, 2009b). The effects of economic inequality take on a different hue when it unfolds in a very different cultural tapestry. When economic inequalities expand in a small-scale village where all people are related by blood and marriage, as they are among the Tsimane', then someone else's gain might not be perceived as threatening. In fact, if one has de facto access to the resources of a neighbor, most likely a kin, then someone else's gain makes one better off.

Short of cash stacked away, resources among the Tsimane' are not exactly open for anyone to take, as noted earlier, but they are certainly accessible to others through multiple channels. The channels include borrowing goods, receiving goods through gifts from family, and petty theft, a practice made easier by lax security of houses and lax attitude toward physical assets. The prevalence of gift-giving, reciprocity, sharing, and, to a lesser extent, tolerated theft, among native Amazonians, including the Tsimane', have been widely documented by anthropologists (Godoy et al., 2007; Overing & Passes, 2007; Undurraga et al., 2013). What have not been as well documented are the implications of these norms and practices when estimating the effects of village economic inequalities on personal well-being. In fact, we might

argue that the concept of economic inequality is a solecism in a kin-based society; except in rare cases, we do not speak of economic inequalities within a family even though parents earn more than children. As long as ties of mutuality tie people in a nuclear or in an extended family -- or in an in-bred village -- there is no reason to think the economic inequalities will harm health. Put more positively, growing economic inequalities in a tight, inward-looking small group will improve well-being if those at the bottom have access to the mammon of those at the top. While there is some experimental, ethnographic, and historical evidence suggesting that the Tsimane' have a stingy side, particularly with food (Ellis, 1996; Heinrich et al., 2004; Wegner, 1929), studies among the Tsimane' have documented several informal institutional arrangements to deal with uncertainty in future consumption (Undurraga et al., 2013).

This brings us to the second reason why we do not see greater village economic inequalities associated with worse health. In industrial nations, a rise in income inequality moves in lockstep with concentration of power in the upper crust, with more ethnic heterogeneity, and with the enfeeblement of formal institutions that protect health. Small-scale horticultural-foraging societies lack such confounders; no ethnic heterogeneity in an in-breeding society, no concentration of power in an acephalous society where people can quickly pack up and move downriver if they dislike village life, and no formal institutions to speak off in lands far removed from the reach of the government. For example, among Tsimane' adults in the villages of the 2002-2010 panel study, only 29% knew the name of the municipality to which their village belonged, and only 21% could name the mayor (Reyes-García et al., 2010). Thus, in these societies the path linking community economic inequality with health has to be explained mainly through norms and practices of reciprocity, sharing, and redistribution rather than through the breakdown of institutions that provide public services.

Conclusions. We take away a simple message from the empirical analysis: One should be chary about joining the growing salvo condemning income inequality. In industrial nations, income inequality matters because income buys almost all, including subjective evaluations of life, so it is reasonable to feel aggrieved by extreme income inequality, particularly if one perceives the distribution of income as unfair. We feel what we see, and we see the many forms that income takes. Furthermore, besides being visible, income and its symbols are highly exclusionary. My income is not yours. Little wonder that income inequality in industrial nations might be associated with so many undesirable outcomes.

But this need not be so across societies of very different ilk. In the ragged corners of the world, people see other resources and behaviors, and it is likely that inequalities in those exotic resources play the dominant role that income plays in our society. But not necessarily in the way we might expect. When economic inequalities intertwine with a thick cultural tapestry of norms, behaviors, and kinship ties, then their effects on well-being become less predictable. As we found somewhat heretically, in stone-age societies economic inequality might be good for your health.

Figures

Figure 1. Map of 13 Tsimane' villages of annual panel study (2002-2010)

Note: The colors of the territory denote elevation (mamsl=meters above sea level). The square symbols and letters in each town are approximately proportional in size to town population. Tsimane' villages include the 13 villages of the annual (2002-2010) Tsimane' Amazonian Panel Study (TAPS). The Tsimane' territory is an administrative division that does not necessarily reflect the lands inhabited by the Tsimane'.

Tables

Table 1. Name and definition of variables in regressions

Name	Definition
[A]. Outcome variables:	
[i] Perceived stress and perceived morbidity:	
Stress	"During the last 7 days how often did you feel……?" Negative emotions included: sad, fear, angry, and unhappy. Mean of total episodes of negative emotions used.
Bed	Person reported being bed-ridden in last 2 weeks; zero otherwise
Ill	Person reported having had an illness or symptom of illness in last 2 weeks; zero otherwise
[ii] Addiction:	
Addiction	Principal component factor analysis used to create a Z score for consumption in last seven days of commercial cigarettes and alcoholic beverages
[iii] Anthropometric indicators of nutritional status:	
Arm	Age and sex-Z score of arm muscle area based on Frisancho (2008) norms
BMI	Body-mass index (weight [kg]/height [m^2]); pregnant and lactating women excluded
[B]. Gini coefficients of per capita village inequality (H, M, and L = high, medium and low visibility):	
Wildlife	Kg of wildlife (wild meat, fish, and birds) eaten by person in last seven days/# of household residents. Per capita indices computed from household data/household size **(H)**
Meat	Kg of meat from chickens, pigs, cattle, and ducks eaten by person in last seven days/# of household residents. Per capita indices computed from household data/household size **(H)**
Durables	Monetary expenditures in physical durable assets in last 7 days (e.g., metal tools, plastic buckets). Per capita indices computed from individual data **(M)**
Luxuries	Monetary expenditures in luxuries in last seven days (e.g., watches, perfume, shoe polish). Per capita indices computed from individual data **(M)**
Plantings	Ha planted with main crops last year: manioc, rice, maize, plantains. Per capita indices computed from household data **(L)**
Forest	Ha of old-growth and fallow forest cleared for farming last year. Per capita indices computed from household data **(L)**
[C]. Control variables:	
Male	Subject's sex (male=1; female=0)
Education	Maximum school grade attained by subject
Age	Subject's age in years
Year	Survey year
Count	# of times person was surveyed
Resource	Subject's level of resource *k* in section [B]; e.g., if regression includes Gini of luxuries, resource=person's expenditure in luxuries
Median k	Annual village median value of resource *k*

Table 2. Summary statistics of variables for last survey (2010)

Name of variable	N	Mean	SD
[A]. Outcome variables for people > 16 years of age:			
Stress	607	4.35	1.33
Bed	612	0.21	0.41
Ill	612	0.51	0.50
BMI	454	23.86	2.93
Arm (muscle)	611	-0.62	0.87
[B]. Gini coefficients of inequality in village:			
Wildlife	13	0.43	0.09
Meat	13	0.57	0.14
Durables	13	0.88	0.27
Luxuries	13	0.83	0.06
Plantings	13	0.36	0.06
Forest	13	0.38	0.07
[C]. Control variables of people > 16 years of age:			
Male	612	0.49	0.5
Education	612	3.01	2.94
Count	612	7.17	2.55
Age	612	36.32	16.15

Notes: Summary statistics for addiction are not shown in section [A] since, by construction, they have mean=0 and SD=1. Statistics for BMI include all people with non-missing values for schooling and exclude pregnant and lactating women. Controls also include village-to-town travel time, annual village median of the resources whose inequality we measure, and total number of households in the village each year.

Table 3. Regression results: Effects of ***Gini*** coefficient of village economic inequality on individual health using the nine-year panel (2002-2010) of 13 villages

Village Gini of:	Health outcomes: *Perceived*				Anthropometrics	
	Stress	*Ill*	*Bed*	*Addiction*	*Arm*	*BMI*
[I]. High visibility – Gini coefficient of:						
Wildlife	0.29	-0.09	0.02	0.25	-0.43	-0.14
	(0.32)	(0.19)	(0.13)	(0.30)	(0.34)	(0.79)
N	3850	5007	5167	2888	4884	3562
R^2	0.08	0.17	0.05	0.25	0.42	0.05
Meat	-0.63	-0.14	-0.13	-0.30	-0.56	-1.70
	(0.53)	(0.17)	(0.11)	(0.27)	(0.18)***	(0.81)*
N	3850	5007	5167	2888	4884	3562
R^2	0.09	0.17	0.05	0.25	0.42	0.04
[II]. Medium visibility – Gini coefficient of:						
Durables	-0.24	-0.06	-0.05	-0.0005	-0.12	-0.24
	(0.13)*	(0.02)**	(0.06)	(0.06)	(0.08)	(0.22)
N	2861	3956	3956	2888	3934	2902
R^2	0.08	0.21	0.06	0.25	0.43	0.04
Luxuries	-2.46	-0.22	-0.01	-1.14	0.22	-0.28
	(0.77)***	(0.09)**	(0.07)	(0.25)***	(0.20)	(0.55)
N	2861	3956	3956	2888	3934	2902
R^2	0.09	0.21	0.06	0.25	0.43	0.04
[III]. Low visibility – Gini coefficient of:						
Plantings	-0.60	-0.28	-0.02	-0.22	-0.44	-0.78
	(0.66)	(0.23)	(0.23)	(0.40)	(0.39)	(1.77)
N	2848	3925	3932	2836	3903	2895
R^2	0.08	0.21	0.07	0.25	0.43	0.05
Forest	-0.01	-0.37	-0.12	-0.30	-0.68	-1.95
	(0.71)	(0.26)	(0.19)	(0.31)	(0.45)	(2.09)

Notes: Regressions are OLS with robust standard errors (in parenthesis) and clustering by village. *, **, and *** significant at ≤ 10%, 5%, and 1%. Regressions include year fixed effect, and control for attributes of individuals (age, sex, education, and level of economic resource) and villages (village-to-town travel time, village median of the resource, and total number of households in village).

Table 4. Regression results: Effects of ***coefficient of variation (CV)*** of community economic inequality on individual health using the nine-year panel (2002-2010) panel of 13 villages

Village CV of:	Health outcomes: *Perceived* *Stress*	*Ill*	*Bed*	*Addiction*	Anthropometrics *Arm*	*BMI*
[I]. High visibility – Coefficient of variation:						
Wildlife	0.05	-0.01	0.01	0.05	-0.18	-0.06
	(0.10)	(0.05)	(0.02)	(0.10)	(0.08)**	(0.21)
N	3850	5007	5167	2888	4884	3562
R^2	0.08	0.17	0.05	0.25	0.42	0.05
Meat	-0.14	-0.04	-0.03	-0.03	-0.05	-0.11
	(0.11)	(0.02)**	(0.01)**	(0.03)	(0.02)**	(0.09)
N	3850	5007	5167	2888	4884	3562
R^2	0.09	0.18	0.05	0.25	0.42	0.04
[II]. Medium visibility – Coefficient of variation:						
Durables	-0.04	-0.01	-0.01	-0.01	-0.01	-0.02
	(0.02)**	(0.01)**	(0.01)	(0.01)	(0.01)	(0.03)
N	2861	3956	3956	2888	3934	2902
R^2	0.08	0.21	0.06	0.25	0.43	0.04
Luxuries	-0.17	0.002	-0.02	-0.07	-0.02	-0.09
	(0.04)***	(0.01)	(0.01)	(0.03)*	(0.03)	(0.11)
N	2861	3956	3956	2888	3934	2902
R^2	0.09	0.21	0.06	0.26	0.43	0.04
[III]. Low visibility – Coefficient of variation:						
Plantings	-0.29	-0.13	-0.03	-0.13	-0.18	-0.81
	(0.32)	(0.09)	(0.09)	(0.15)	(0.14)	(0.71)
N	2848	3925	3932	2836	3903	2895
R^2	0.08	0.21	0.07	0.25	0.43	0.05
Forest	-0.21	-0.14	-0.04	-0.24	-0.28	-1.16
	(0.23)	(0.07)*	(0.07)	(0.13)*	(0.09)**	(0.39)**
N	3838	4943	5098	2839	4817	3523
R^2	0.09	0.17	0.05	0.25	0.43	0.06

Notes: Same as in Table 3.

Table 5. Regression results – effects of ***Gini*** coefficient of village economic inequality on individual health using the 2008-2009 panel of 40 villages

Village Gini of:	Health outcomes:					
	Stress	*Cardiovascular*			*Addiction*	*Nutrition (BMI)*
		Systolic	*Diastolic*	*Pulse rate*		
[I]. High visibility – Gini coefficient of:						
Wildlife	-1.07	6.90	1.21	-4.48	-0.02	0.35
	(0.54)*	(5.91)	(5.88)	(5.28)	(0.60)	(1.14)
N	972	906	906	906	956	1584
R^2	0.09	0.21	0.07	0.11	0.24	0.51
Meat	-0.25	-5.27	-2.8	1.65	0.34	0.76
	(0.42)	(5.89)	(4.69)	(3.49)	(0.38)	(1.04)
N	972	906	906	906	956	1584
R^2	0.08	0.22	0.07	0.11	0.26	0.51
[II]. Medium visibility – Gini coefficient of:						
Durables	0.02	5.37	-1.02	-2.63	-0.12	1.01
	(0.17)	(3.02)*	(2.23)	(1.21)**	(0.17)	(0.47)**
N	972	902	902	902	956	673
R^2	0.07	0.22	0.07	0.11	0.23	0.03
Luxuries	-0.51	13.16	3.27	3.05	-0.15	3.97
	(0.61)	(10.66)	(8.20)	(6.25)	(0.83)	(2.21)*
N	972	902	924	902	956	673
R^2	0.09	0.21	0.07	0.11	0.26	0.03
[III]. Low visibility – Gini coefficient of:						
Plantings	0.50	0.24	2.15	7.29	-0.83	1.10
	(0.35)	(7.18)	(6.46)	(5.59)	(0.73)	(1.46)
N	971	905	905	905	955	1581
R^2	0.10	0.21	0.07	0.11	0.25	0.51
Forest	0.77	-2.39	-0.81	11.53	-1.68	0.65
	(0.68)	(10.52)	(10.86)	(7.31)	(0.83)**	(1.56)
N	971	905	905	905	955	1581
R^2	0.10	0.21	0.07	0.11	0.25	0.50

Notes: Regressions are OLS with robust standard errors (in parenthesis) and clustering by village. *, **, and *** significant at ≤ 10%, 5%, and 1%. Regressions include year fixed effect, and control for age, sex, education, level of economic resource of the subject, village-to-town travel time, total number of households in village, attriter, and village median of the resource, and two dummy variables, one for each of the two treatments.

Table 6. Regression results: Effects of ***coefficient of variation (CV)*** of community economic inequality on individual health using the two-year panel (2008-2009) panel of 40 villages

Village CV of:	Health outcomes:					
	Perceived Stress	*Cardiovascular*			*Addiction*	*Nutrition (BMI)*
		Systolic	*Diastolic*	*Pulse rate*		
[I]. High visibility – Coefficient of variation:						
Wildlife	-0.47	3.90	1.21	-2.68	-0.12	0.003
	(0.16)***	(2.56)	(1.81)	(1.51)*	(0.22)	(0.46)
N	972	906	906	906	956	1584
R^2	0.10	0.22	0.07	0.11	0.24	0.51
Meat	-0.10	0.45	0.30	-0.05	0.11	0.02
	(0.10)	(1.57)	(1.62)	(0.94)	(0.06)*	(0.17)
N	972	906	906	906	956	1584
R^2	0.09	0.22	0.07	0.11	0.26	0.51
[II]. Medium visibility – Coefficient of variation:						
Durables	-0.03	0.98	-0.14	-0.38	-0.05	0.21
	(0.03)	(0.50)*	(0.40)	(0.27)	(0.02)	(0.09)**
N	972	902	902	902	956	673
R^2	0.08	0.22	0.07	0.11	0.24	0.03
Luxuries	-0.07	1.22	0.31	0.04	-0.01	0.37
	(0.04)*	(0.61)*	(0.47)	(0.35)	(0.04)	(0.14)**
N	972	902	924	902	956	673
R^2	0.10	0.22	0.07	0.11	0.27	0.04
[III]. Low visibility – Coefficient of variation:						
Plantings	0.28	0.30	1.49	1.86	-0.19	-0.20
	(0.11)**	(2.60)	(1.80)	(1.65)	(0.24)	(0.39)
N	971	905	905	905	955	1581
R^2	0.10	0.21	0.08	0.11	0.25	0.51
Forest	0.26	-2.45	-0.62	4.12	-0.31	-0.52
	(0.16)	(2.93)	(3.17)	(2.30)*	(0.24)	(0.50)
N	971	905	905	905	955	1581
R^2	0.10	0.21	0.07	0.11	0.24	0.51

Notes: Same as in Table 5.

Appendix A: Estimate and imputation of the Gini coefficient

To compute the Gini coefficient of village inequality in an economic resource, we used the command inequal7 developed by Philippe Van Kerm for STATA. This command will produce missing values for the Gini coefficient if observations contain only missing values or a mix of zeroes and missing values. In the latter case, we assumed the village had complete equality, and we imputed zero for the missing Gini coefficient.

For example, to compute the Gini coefficient of consumption of domesticated animal per capita (dommeat_cap) for village 3 in year 2011, we use the following command:

```
generate gini_dommeat_cap = .
inequal7 dommeat_cap if village == 3 & year == 2011
replace gini_dommeat_cap = `r(gini)' if village == 3 & year == 2011
```

If inequal7 produced a missing value for the Gini coefficient and there were zeroes for some observations, we replaced gini_dommeat_cap to be 0. The table below shows the number of raw observations of the Gini coefficient and the number of observations with imputed values.

Summary of total number of observations before and after imputation

Gini coefficient	***Before***	***After***
Wildlife	13281	13281
Meat	13281	13281
Durables	9270	10445
Luxuries	10307	10445
Plantings	10445	10445
Forest	13281	13281
Individual wealth	13281	13281
Household wealth	13281	13281
Income	13281	13281

As noted in the text, we did the analysis with and without imputation and found essentially the same results.

Reference List

Bagwell, L. S., & Bernheim, B. D. (1996). Veblen effects in a theory of conspicuous consumption. *American Economic Review, 86*, 349-373.

Borgerhoff Mulder, M., Bowles, S., Hertz, T., Bell, A., Beise, J., Clark, G., . . . Wiessner, P. (2009). Intergenerational Wealth Transmission and the Dynamics of Inequality in Small-Scale Societies. *Science, 326*(5953), 682-688.

Bourdieu, P. (1984). *Distinction: A social critique of the judgement of taste*. Cambridge, MA: Harvard University Press.

Brunner, E. (1997). Socioeconomic determinants of health - Stress and the biology of inequality. *British Medical Journal, 314*, 1472-1476.

Charles, K. K., Hurst, E., & Roussanov, N. (2009). Conspicuous consumption and race. *Quarterly Journal of Economics, 124*(2), 425-467.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A Global Measure of Perceived Stress. *Journal of Health and Social Behavior, 24*(4), 385-396.

Daillant, I. (1994). *Sens dessus-dissous. Organisation sociale et spacial des Chimanes d'Amazonie Boliviene.* (PhD), Université de Paris, Paris.

De Maio, F. G. (2007). Income inequality measures. *Journal Epidemiology Community Health, 61*, 849-852.

Deaton, A. (2013). *The great escape: Health, wealth, and the origins of inequality*. Princeton, New Jersey: Princeton University Press.

Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortison responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin, 130*(3), 355-391.

Ellis, R. (1996). *A Taste for Movement. An Exploration of the Social Ethics of the Tsimane' of Lowland Bolivia.* (PhD PhD dissertation), St. Andrews University, St. Andrews, Scotland.

Frank, R. H. (1985). *Choosing the right pond: Human behavior and the quest for status*. New York: Oxford University Press.

Friehe, T., & Mechtel, M. (2014). Conspicuous consumption and political regimes: Evidence from East and West Germany. *European Economic Review, 67*, 62-81.

Frisancho, A. R. (2008). *Anthropometric Standards: An Interactive Nutritional Reference of Body Size and Body Composition for Children and Adults*. Ann Arbor, Michigan: University of Michigan Press.

Glazer, A., & Konrad, K. (1996). A signaling explanatioin for private charity. *American Economic Review, 86*, 1019-1028.

Godoy, R., & Jacobson, M. (1999). 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.

Godoy, R., Reyes-García, V., McDade, T., Huanca, T., Leonard, W. R., Tanner, S., & Vadez, V. (2006). Does Village inequality in modern income harm the psyche? Anger, fear, sadness and alcohol consumption in a pre-industrial society. *Social Science & Medicine, 63*, 359-372.

Godoy, R. A., Reyes-Garcia, V., Huanca, T., Leonard, W. R., McDade, T., Tanner, S., . . . Team, T. B. S. (2007). On the measure of income and the economic unimportance of social capital - Evidence from a native Amazonian society of farmers and foragers. *Journal of Anthropological Research, 63*(2), 239-260.

Godoy, R. A., Reyes-Garcia, V., Huanca, T., Leonard, W. R., McDade, T., Tanner, S., . . . Seyfried, C. (2007). Signaling by consumption in a native Amazonian society. *Evolution and Human Behavior, 28*(2), 124-134. doi: 10.1016/j.evolhumbehav.2006.08.005

Godoy, R. A., Reyes-Garcia, V., Huanca, T., Leonard, W. R., Olvera, R. G., Bauchet, J., . . . Seyfreid, C. (2007). The role of community and individuals in the formation of social capital. *Human Ecology, 35*(6), 709-721. doi: 10.1007/s10745-006-9106-1

Godoy, R. A., Reyes-Garcia, V., McDade, T., Huanca, T., Leonard, W. R., Tanner, S., & Vadez, V. (2006). Does village inequality in modern income harm the psyche? Anger, fear, sadness, and alcohol consumption in a pre-industrial society. *Social Science & Medicine, 63*(2), 359-372. doi: 10.1016/j.socscimed.2006.01.021

Godoy, R. A., Zeinalova, E., Reyes-Garcia, V., Huanca, T., Kosiewicz, H., Leonard, W. R., . . . Team, T. B. S. (2010). Does civilization cause discontentment among indigenous Amazonians? Test of empirical data from the Tsimane' of Bolivia. *Journal of Economic Psychology, 31*(4), 587-598. doi: 10.1016/j.joep.2010.04.001

Gurven, M., Jaeggi, A. V., Kaplan, H., & Cummings, D. (2013). Physical activity and modernization among Bolivian Amerindians. *Plos One, 8*, e55679.

Heffetz, O. (2011). A test of conspicuous consumption: Visibility and income elasticities. *The Review of Economics and Statistics, XCIII*(4), 1101-1117.

Heffetz, O. (2012). Who sees what? Demographics and the visibility of consumer expenditures. *Journal of Economic Psychology, 33*(4), 801-818.

Heinrich, J., Boyd, R., Bowles, S., Camerer, C., Fehr, E., Gintis, H., & McElreath, R. (2004). *Foundations of Human Sociality: Economic Experiments and Ethnographic Evidence from Fifteen Small-Scale Societies*. New York: Oxford University Press.

Henrich, J., Ensminger, J., & McElreath, R. (2010). Markets, religion, community size, and the evolution of fairness and punishment. *Science, 327*, 1480-1484.

Hudders, L., De Backer, C. J. S., Fisher, M., & Vyncke, P. (2014). The rival wears Prada: Luxury consumption as a female competition strategy. *Evolutionary Biology, 12*(3), 570-587.

Kahneman, D., Krueger, A. B., Schkade, D., Schwarz, N., & Stone, A. A. (2006). Would you be happier if you were richer? A focusing illusion. *Science, 312*, 1908-1910.

Kaus, W. (2013). Conspicuous consumption and 'race" Evidence from South Africa. *Journal of Development Economics, 100*(1), 63-73.

Kawachi, I., & Kennedy, B. P. (1997). The relationship of income inequality to mortality: Does the choice of indicator matter? *Social Science & Medicine, 45*(7), 1121-1127.

Kawachi, I., & Kennedy, B. P. (2002). *The Health of Nations. Why Inequality is Harmful to Your Health.* . New York: The Free Press.

Leonard, W. R., & Godoy, R. A. (2008). Tsimane' Amazonian Panel Study (TAPS): The first 5 years (2002-2006) of socioeconomic, demographic, and anthropometric data available to the public. *Economics & Human Biology, 6*(2), 299-301. doi: 10.1016/j.ehb.2008.04.001

Lohman, T. G., Roche, A. F., & Martorell, R. (1988). *Anthropometric Standardization Reference Manual* (Vol. 10). Champaign, Illinois: Human Kinetics Publishers.

Lynch, J. W., Smith, G. D., Kaplan, G. A., & House, J. S. (2000). Income inequality and mortality: importance to health of individual income, psychosocial environment, or material conditions. *British Medical Journal, 320*(7243), 1200-1204.

McEwen, B. S. (2012). Brain on stress: How the social environment gets under the skins. *Proceedings of National Academy of Sciences, 109*(2), 17180-17185.

Miller, G. F. (2000). *The mating mind: How sexual choice shaped the evolution of human nature*. New York: Doubleday.

Newson, L. (2009). Cultural versus reproductive success: Why does economic development bring new tradeoffs? *American Journal of Human Biology, 21*(4), 464-471.

Overing, J., & Passes, A. (2007). *The anthropology of love and anger. The aesthetics of conviviality in native Amazonia*. London: Routledge.

Piketty, T. (2014). *Capital in the twenty-first century*. Cambridge, Massachusets: Harvard University Press.

Reyes-Garcia, V., Godoy, R. A., Huanca, T., Leonard, W. R., McDade, T., Tanner, S., & Vadez, V. (2007). The origins of monetary income inequality - Patience, human capital, and division of labor. *Evolution and Human Behavior, 28*(1), 37-47. doi: 10.1016/j.evolhumbehav.2006.07.001

Reyes-Garcia, V., Molina, J. L., McDade, T. W., Tanner, S. N., Huanca, T., & Leonard, W. R. (2009). Inequality in social rank and adult nutritional status: Evidence from a small-scale society in the Bolivian Amazon. *Social Science & Medicine, 69*(4), 571-578. doi: 10.1016/j.socscimed.2009.05.039

Reyes-García, V., Vadez, V., Aragon, J., Huanca, T., & Jagger, P. (2010). The uneven reach of decentralization: A case study among indigenous peoples in the Bolivian Amazon *International Political Science Review, 31*, 229-243.

Rosinger, A., Tanner, S., Leonard, W., & TAPS. (2013). Precursos to overnutrition: The effects of household market food expenditures on measures of body composition among Tsimane' adults in lowland Bolivia. *Social Science & Medicine, 92*, 53-60.

Roth, C. P. (2015). *Conspicuous consumption and peer effects: Evidence from a randomized field experiment*. Oxford, UK.

Saidi, F., Behrman, J. R., Undurraga, E. A., & Godoy, R. A. (2013). *Inequality, relative income, and development: Field-experimental evidence from the Bolivian Amazon*. TAPS Working Paper Series 78.

Sapolsky, R. M. (2005). The influence of social hierarchy on primate health. *Science, 308*(5722), 648-652. doi: 10.1126/science.1106477

Smith, G. D. (1996). Income inequality and mortality: Why are they related? Income inequality goes hand in hand with underinvestment in human resources. *British Medical Journal, 312*(7037), 987-988.

Undurraga, E., Behrman, J., Grigorenko, E. L., Schultz, A., Yiu, J., TAPS, & Godoy, R. (2013). Math skills and market and non-market outcomes: Evidence from an Amazonian society of forager-farmers. *Economics of Education Review, 37*, 138-147.

Undurraga, E., Zycherman, A., Yiu, J., Behrman, J., Leonard, W., & Godoy, R. (2014). Gender targeting of unconditional income transfers and child nutritional status: Experimental evidence from the Bolivian Amazon *GCC Working Paper Series 14-03*. Philadelphia: University of Pennsylvania.

Undurraga, E., Zycherman, A., Yiu, J., & Godoy, R. (2013). Savings at the periphery of markets: Evidence from forager-farmers in the Bolivian Amazon. *Journal of Development Studies, 50*, 288-301.

Undurraga, E. A., Cruz, C., & Godoy, R. A. (2015). Demografía y territorialidad de la población Tsimane' actual. In V. Reyes-García & T. L. Huanca (Eds.), *Cambio global, cambio local. La sociedad Tsimane' ante la globalización* (pp. 91-120). Barcelona, Spain: Icaria, Institut Catala d'Antropologia.

Undurraga, E. A., & Godoy, R. A. (2015). Actividades generadoras de ingresos y distribución de la riqueza material. In V. Reyes-García & T. L. Huanca (Eds.), *Cambio global, cambio local. La sociedad Tsimane' ante la globalización* (pp. 177-202). Barcelona, Spain: Icaria, Institut Catala d' Antropologia.

Undurraga, E. A., Nyberg, C., Eisenberg, D. T. A., Magvanjav, O., Reyes-Garcia, V., Huanca, T., . . . Taps Bolivia Study Team. (2010). Individual Wealth Rank, Community Wealth Inequality, and Self-Reported Adult Poor Health: A Test of Hypotheses with Panel Data (2002-2006) from Native

Amazonians, Bolivia. *Medical Anthropology Quarterly, 24*(4), 522-548. doi: 10.1111/j.1548-1387.2010.01121.x

Veblen, T. (1899). *The theory of the leisure class*. New York: MacMillan.

Wagstaff, A., Paci, P., & Vandoorslaer, E. (1991). On the measurement of inequalities in health. *Social Science & Medicine, 33*, 545-557.

Wegner, R. N. v. (1929). Canoafarhrten zu den Chimanen (Bolivien). *Die Umschau, 32*, 937-944.

Wilkinson, R. G., & Pickett, K. E. (2009a). Income Inequality and Social Dysfunction. *Annual Review of Sociology, 35*, 493-511. doi: 10.1146/annurev-soc-070308-115926

Wilkinson, R. G., & Pickett, K. E. (2009b). *The Spirit Level: Why Greater Equality Makes Societies Stronger*. New York: Bloomsbury Press

World Bank. (2005). Bolivia Poverty Assessment: Establishing the Basis for Pro-Poor Growth (pp. 142). Washington, D.C.: Poverty Reduction and Economic Management Sector Unit. Latin America and the Caribbean Region.

Zeng, W., Eisenberg, D. T. A., Rubio-Jovel, K., Undurraga, E., Nyberg, C., Tanner, S., . . . Godoy, R. (2013). Adult obesity: Panel study from native Amazonians. *Economics and Human Biology, 11*(2), 227-235.