

Studies in Human Ecology and Adaptation

Ludomir R. Lozny
Thomas H. McGovern *Editors*

Global Perspectives on Long Term Community Resource Management

With a Foreword by
Carole L. Crumley

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Managing Risk Through Cooperation: Need-Based Transfers and Risk Pooling Among the Societies of the Human Generosity Project



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Padmini Iyer, Brighid McCarthy, Dennis Sonkoi, Cathryn Townsend,
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Introduction

Making a living often involves risks. Whether you are a Hadza hunter who often comes home empty-handed; a Maasai herder facing the prospect of losses due to drought, disease, and theft; or a modern-day cowboy in the American Southwest using potentially dangerous heavy machinery on a day-to-day basis, risk is an integral and inevitable part of life. Given risk's inevitability, managing it is an important component of both individual and community strategies to adapt to local conditions. Social risk management strategies are diverse. They include, for example, Hadza sharing food with camp members who do not have enough to eat, Maasai herders agreeing to help each other when disaster strikes, and American ranchers coming to the aid of their injured neighbors. The Human Generosity Project, a transdisciplinary effort to examine both biological and cultural influences on human cooperation, has documented and analyzed these and many other examples of social risk management.

What do these three examples of social risk management have in common? In every case they are characterized by people who have the capacity to help giving aid to others who are in need as a result of risk and uncertainty. Because these instances

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of sharing and helping are based on recipient need, we refer to them as *need-based transfers* (Aktipis et al. 2016; Cronk and Aktipis 2016a, b). As shown in Table 1, the societies included in the Human Generosity Project (<http://humangenerosity.org>) provide abundant evidence that need-based transfers are a common strategy for the social management of risk. Our field sites span three continents (Fig. 1; Table 1) and

Table 1 Summary of major characteristics of the eight Human Generosity Project field sites and the individual and social risk management strategies used at each site

Name (location)	Subsistence	Major risks and hazards	Individual risk management strategies	Social risk management strategies
Maasai (Kenya/Tanzania)	Pastoralism	Drought, disease, theft	Livelihood diversification, veterinary care, herd accumulation	<i>Osotua</i> stock friend relationships for risk pooling and risk retention ^a Group defense
Yasawa Island (Fiji)	Fishing and horticulture	Cyclones, droughts, illness, injury	Livelihood diversification, relocation, lifestyle changes	Demand sharing within households, <i>kerekere</i> need-based sharing norm, ritual exchange between clans and villages ^a
Hadza (Tanzania)	Hunting and gathering	Variable hunting returns, wild animals, diseases, droughts, floods, and witchcraft	Consumption of a wide range of wild foods, development of foraging skills over lifetime	Central place food sharing with those in need ^a
Darhad (Mongolia)	Pastoralism	Severe winter storms	Cutting and storing hay, repairing livestock shelters, short-term migrations	Providing assistance to reduce risk including building shelters and other preparations ^b
American ranchers (Cochise County, AZ and Hidalgo County, NM)	Commercial ranching augmented by small businesses and wage employment	Droughts, floods, injuries, and illness	Livelihood diversification, herd accumulation, veterinary care, wells and stock tanks	<i>Neighboring</i> ethic, help given freely to those experiencing unexpected needs, chiefly from injuries and illnesses ^a
Ik (Uganda)	Horticulture, hunting, gathering, and beekeeping	Drought, variable hunting returns, resource raiding by outsiders	Livelihood diversification	Widespread sharing (<i>tomor</i>) norm, with supernatural enforcement of sharing norm ^a Group defense

(continued)

Table 1 (continued)

Name (location)	Subsistence	Major risks and hazards	Individual risk management strategies	Social risk management strategies
Karamoja (Uganda)	Pastoralism and agriculture	Drought, disease, theft	Livelihood diversification, livestock movement, herd accumulation, agricultural intensification, food storage	<i>Akoneo</i> stock friend relationships; aid given to relatives, neighbors, acquaintances, and friends ^a
Kijenge (Tanzania)	Casual labor	Chronic unemployment	Livelihood diversification	<i>Kushirikiana</i> sharing ethic ^a

Across societies, need-based transfer systems are key components of social risk management (indicated by ^a). Among Mongolian herders, providing need-based assistance in real time (for the purpose of pooling risk) is often impossible due to ecological constraints, yet they assist one another with risk-reduction activities (indicated by ^b)

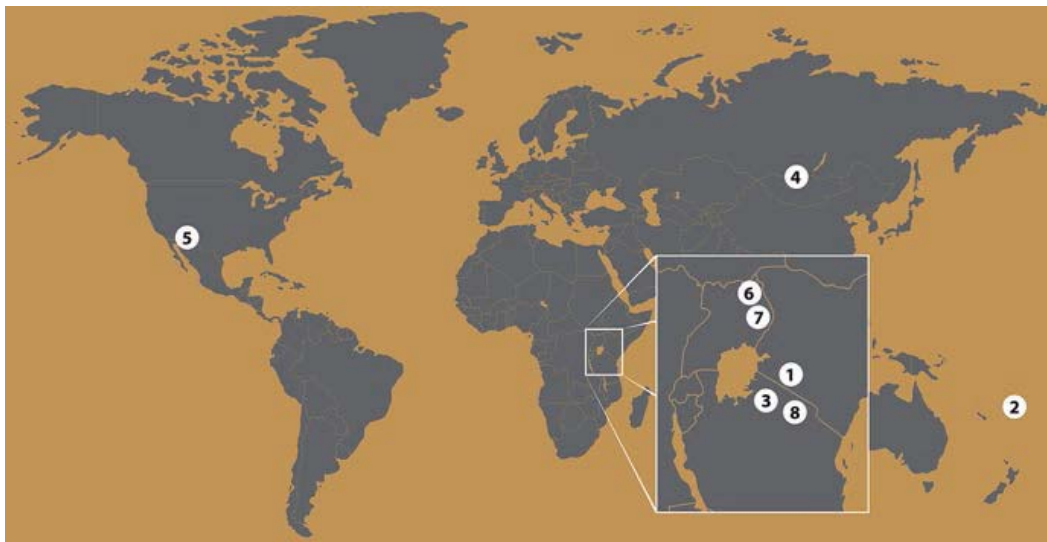


Fig. 1 A map of the world with a detailed inset for East Africa showing the approximate locations of our eight field sites: (1) Maasai, Kenya, and Tanzania; (2) Yasawa Island, Fiji; (3) Hadza, Tanzania; (4) Darhad Depression, Mongolia; (5) Cochise County, Arizona, and Hidalgo County, New Mexico; (6) Ik, Uganda; (7) Karamoja, Uganda; and (8) Kijenge, Arusha, Tanzania. Map image courtesy of Wikicommons

include many different subsistence strategies, from hunter-gatherers to fisher-horticulturalists to pastoralists to market-integrated societies. In this chapter we will provide an overview of the risk management framework we are using and describe how each society manages risk socially, focusing especially on the use of need-based transfers to buffer the effects of disasters and ecological uncertainty.

Risk Management as a Social Enterprise

From the very beginning of life, organisms who effectively managed risk were the most evolutionarily successful, surviving better and leaving more descendants than their competitors. This includes all life forms from simple such as early bacteria to biologically complex modern-day humans. If we look across life, we see that it is rife with risk management strategies. Everything from the accumulation of body fat for buffering against starvation to the building of structures such as dens and nests is a biological example of risk management. Many of these risk management strategies can be employed by individuals. They do not require cooperation or coordination to achieve the risk management benefits. Others, however, do require social action—for example, the creation of complex hives and honey storage in some bees or the biofilm structures created by bacteria that help them survive exposure to toxins. Humans, of course, engage in many risk management practices that are fundamentally social. And compared to other species, humans have a (perhaps unique) capacity to flexibly respond to challenges, incorporate new information, and share information with one another to solve problems including the management of risk.

Humans have colonized diverse environments throughout the globe, each one characterized by unique challenges and hazards. Dealing effectively with these risks requires the application of risk management practices that are well suited to the risks that individuals and communities face. In our work, we adopt the risk management framework proposed by Dorfman (2007). In his scheme, risk management practices fall into four main categories: risk retention, risk avoidance, risk reduction, and risk transfer (Dorfman 2007). *Risk retention* consists of accepting risk and absorbing any resulting losses and includes storing resources (either individually or as a group) and institutional self-insurance. Risk retention may be most appropriate when losses occur frequently but are not very severe (Rejda 2011). *Risk avoidance* involves the reduction of dependence on high variability outcomes. For example, pastoralists sometimes avoid risk by reducing their reliance upon herds and practicing other forms of subsistence, such as farming (e.g., Little et al. 2001). Risk avoidance can either be an individual strategy or a coordinated group strategy, as with social and institutional restrictions on risky practices (e.g., gambling). Risk avoidance can be a hard strategy to commit to and/or enforce socially because avoiding risks can also mean giving up on potentially high rewards. *Risk reduction* refers to efforts to lower the probability of loss or to reduce the size of losses. For example, investors may buy bonds as well as stocks, and pastoralists often diversify their livestock holdings among different species and divide their herds among different ecological areas (Dahl and Hjort 1976, p. 114; King et al. 1984; Mace and Houston 1989; Mace 1990, 1993). Building of shelters for oneself or for livestock is another example of risk reduction. Across the societies we study in the Human Generosity Project, we see many examples of shelter building as both an individual and social risk management strategy (e.g., see the description of our Mongolian field site). *Risk transfer* is the exchange of risk from one individual or group to another. Although all four risk management strategies may involve social

interactions, only risk transfer *requires* sociality: risk transfer simply cannot occur unless there is someone to whom to transfer the risk. One common way to transfer risk is to pool it, i.e., to agree to take on some of another party's risk in exchange for their willingness to take on some of one's own, as occurs in formal and informal insurance systems (Wiessner 1982; Cashdan 1985; Levy 2012; Aktipis et al. 2011). Risk pooling decreases the size and severity of losses, though it is accompanied by a higher likelihood of those losses. Need-based transfer relationships, where individuals agree to help one another during times of need if they are able to do so, result in a form of limited risk pooling.

The focus of our work is on need-based transfers as a strategy for limited risk pooling. As with many social strategies, there is a potential for individuals to cheat and take advantage of each other's generosity. In the case of need-based transfer systems, there are two primary ways to cheat: the first is to ask when one is not in need, and the second is to refuse to give even if one has sufficient resources. If cheating is frequent, a system of risk pooling through need-based transfers—like any cooperative system—will collapse. Thus, solving the problem of risk management socially can introduce new problems that must then get solved, such as monitoring, enforcing, and coordinating around the rules of engagement in need-based transfer systems. Our goal with the Human Generosity Project is to better understand the implicit and explicit rules that are used in need-based transfer systems across societies and identify mechanisms that stabilize, maintain, and enhance the effectiveness of these need-based transfer systems for risk management.

In the Human Generosity Project, we use a combination of fieldwork, computational modeling, and laboratory experiments to understand the nature and evolution of human generosity. Each of these approaches is complementary to the others, and our goal is to create constructive, creative synergies among the three methods. The focus of this article is on the fieldwork that Human Generosity Project team members have conducted, or are currently conducting, at eight field sites around the world. When appropriate we will also refer to our modeling and laboratory work. The members of the Human Generosity Project are by no means the first scholars to study community risk management. We build upon a large body of existing scholarship, most notably work by economists on systems of risk sharing (e.g., Fafchamps and Lund 2003; Barr and Genicot 2008; Fafchamps 2011) and by human behavioral ecologists and economic anthropologists on risk management strategies in small-scale communities (e.g., Wiessner 1982; Cashdan 1985; Winterhalder 1986; Cashdan 1990; Bird and Bird 1997; Gurven et al. 2000; Bliege Bird et al. 2002; Gurven and Hill 2009, 2010).

Our Field Sites

Our eight field sites are ecologically, culturally, and economically diverse. They include pastoralists, horticulturalists, hunter-gatherers, fisher/farmers, urban poor, and commercial ranchers. Although five are clustered near each other in East Africa, they are quite different from one another, ranging from very isolated groups such as

the Hadza and Ik to the urban dwellers of Kijenge. We apply the same theoretical framework to all our sites, but we adjust our methods to suit local conditions. Beyond such standard and universal methods as participant observation and ethnographic interviews, each field site supervisor tailors his or her approach to the specific local circumstances. Other methods we employ include experimental economic games, focus group interviews, risk preference surveys, social network analysis, wealth inventories, cultural domain analysis, and mail surveys.

At each of these sites, we are investigating the resource sharing and helping systems that are used among members of each community. We are particularly interested in documenting how these sharing systems help individuals and communities manage risk. In every society that we have examined to date, we see evidence of need-based transfer systems: sharing that is characterized by helping based on the need of the recipient. Below we provide brief overviews of each of our field sites and the resource sharing systems we have documented at them.

Maasai (Dennis Sonkoi and Lee Cronk)

Maasai and other Maa-speaking pastoralists live in a swath running from Lake Turkana in northern Kenya south through the Great Rift Valley to central Tanzania. An important precursor to the Human Generosity Project was Cronk's fieldwork among the Mukogodo Maasai (Cronk 2004) on the Maasai system of risk pooling based on need-based transfers (Cronk 2007). Maasai refer to this system as *osotua*, which literally means a human umbilical cord. *Osotua* relationships usually begin with a request for a gift or a favor. Such requests arise from genuine need and are limited to the amount actually needed or less if that is all that the donor can afford to give. Gifts given in response to such requests are given freely (*pesho*) and from the heart (*ol-tau*) but, like the requests, are limited to what is actually needed (see also Perlov 1987, p. 169). Because the economy is based on livestock, many *osotua* gifts take that form, but virtually any good or service may serve as an *osotua* gift. Once *osotua* is established, it is pervasive and eternal. It cannot be destroyed, even if the individuals who established the relationship die. In that case, it is passed on to their children (see also Spencer 1965, p. 59). *Osotua* does not follow a schedule. It will not go away even if much time passes between gifts. Although *osotua* involves a reciprocal obligation to help if asked to do so, actual *osotua* gifts are not necessarily reciprocal or even roughly equal over long periods of time. The flow of goods and services in a particular relationship might be mostly or entirely one way, if that is where the need is greatest. Not all gift-giving involves or results in *osotua*. For example, some gift-giving results instead in debt (*esile*). *Osotua* and debt are not at all the same. While *osotua* partners have an obligation to help each other in time of need, this is not at all the same as the debt one has when one has been lent something and must pay it back (see also Spencer 1965, p. 27; Perlov 1987, p. 169). Going along with the idea that *osotua* gifts do not repay debt, *osotua* gifts are not payments at all, and it is inappropriate to use the verb "to pay" (*alak*) when referring to them. *Osotua* is imbued with respect (*enkanyit*), restraint, and a sense of responsibility in

a way that non-*osotua* economic relationships are not. In the words of one interviewee, “*keiroshi*”: It is heavy.

To learn more about *osotua*, Cronk used it to frame trust games played by Maasai. In the trust game, two players, who are anonymous to each other, are given an initial endowment. The first player can then give none, some, or all of his endowment to the second player. The experimenter triples that amount and then passes it on to the second player. The second player can then give some, none, or all of the funds in his control to the first player. A total of 50 games were played. All players were given standard instructions, in Maa, on how to play the trust game. Half of the games were played with no framing beyond the instructions themselves. The other half were played with a single additional framing sentence: “This is an *osotua* game.” That minimal framing resulted in several contrasts between *osotua*-framed games and unframed games. In keeping with the emphasis in *osotua* relationships on restraint, respect, and responsibility, amounts given by both players as well as the amounts that first players expected to receive in return were all lower in the framed than in the unframed games. In games played without *osotua* framing, a positive correlation was found between amounts given and amounts expected in return, suggesting that players were invoking such common principles of exchange as trust, investment, and tit-for-tat reciprocity. In the *osotua*-framed games, in contrast, no relationship was found between amounts given and amounts expected in return. In *osotua*-framed games, but not in unframed games, amounts given by the first player and proportional amounts returned by the second player were *negatively* correlated, suggesting that the *osotua* framing shifts game play away from the logic of investment and toward the mutual obligation of *osotua* partners to respond to one another’s genuine needs but only with what is genuinely needed.

Osotua differs greatly from *esile* (debt). In *esile*, repayment is expected in the form of an animal at least as valuable if not more so than the one given. The repayment is referred to as *elaata*, which means to set free or untie a knot (Perlov 1987, p. 184). If a debtor fails to repay, his creditor has the option of forgiving the debt but then referring to him henceforth as “*Pasile*”: One whose debt I have forgiven. This type of construction, in which the prefix “*pa*” is used to indicate what a person has given or received, is common in Maa, but it is normally used in a positive way. For example, a man refers to his father-in-law as “*Pakiteng*,” meaning “cow receiver,” in recognition of the bridewealth that was paid. The use of the term “*Pasile*” essentially serves as a mild public reproach to those who fail to repay their debts.

Our current work on the *osotua* system is being conducted by Dennis Sonkoi, who is focusing his efforts not on the impoverished Mukogodo but rather among the relatively wealthy Loita Maasai, whose territory straddles the Kenya-Tanzania border. His attention is focused primarily on how *osotua* partners are chosen and how *osotua* relationships develop over time. The process of instilling *osotua* values begins in childhood. Children are encouraged to form childhood friendships known as *isiriti* (singular: *esiriti*). These are developed mainly within neighborhood settlement clusters. Children share food and exchange small gifts. Friendships formed during childhood eventually lead to adulthood exchanges of much more valuable gifts, which may lead to the formation of *osotua* partnerships. The overall process is somewhat similar to courtship, with prospective *osotua* partners getting

to know each other and giving small gifts over a period of years. When a degree of trust has been established, the relationship may then be recognized as *osotua*. People often make some effort to establish *osotua* relationships with people in different ecological zones and, thus, complementary risk profiles. For example, people living in the drought-prone lowlands seek *osotua* partners in the wetter highlands, and vice versa, which then provides both parties with access not only to food but also to pasture when their own is either too dry or too wet. A similar pattern has also been observed among both Maasai in north central Kenya and the Turkana of northern Kenya (Gulliver 1955; Dixit et al. 2013).

One interesting contrast between the Mukogodo and Loita Maasai stems from the large differences between the two areas in average livestock wealth. While the Loita Maasai have long had livestock and maintain large herds of cattle supplemented by some sheep and goats, most Maasai in the Mukogodo area obtained livestock relatively recently and have herds dominated by sheep and goats with only a few cattle. The wealth of the Loita Maasai enables them to use their *osotua* relationships not only as sources of support after disasters occur but also to help each other build up herds during good times so that they can engage in risk retention. The relative poverty of people in the Mukogodo area, in contrast, means that they have little opportunity to engage in risk retention and must use their *osotua* ties solely for risk pooling.

In addition to fieldwork, our team has also developed three computer simulations based on the *osotua* system (Aktipis et al. 2011; Hao et al. 2015a, b; Aktipis et al. 2016). We have found that *osotua*-style need-based transfers increase survivorship and decrease wealth inequalities compared to no transfers and to transfers that follow the rules of *esile* (debt). Another research team (Hao et al. 2015a, b) independently developed a computer simulation to examine the effects of spatial and temporal correlations of disasters on survival in an *osotua* network. Their main finding that synchronous disasters reduce survivorship is in line with our model described above.

Yasawa Island, Fiji (Matthew Gervais)

Yasawa Island is the northwestern-most island in the Republic of Fiji in the South Pacific (Figs. 2 and 3). Twenty kilometers long and rarely more than 1 kilometer wide, Yasawa Island is home to six villages averaging around 200 people each. Transport between villages is primarily by foot, horse, or motorboat. Travel between Yasawa and the port of Lautoka on Fiji's largest island (Viti Levu) takes from 5 to 15 h. Among the least economically developed islands in Fiji, subsistence is based primarily on marine foraging and slash-and-burn horticulture, with approximately 25% of calories coming from purchased foodstuffs such as flour, sugar, and cooking oil. Yasawans face a number of hazards for which there are few management options beyond risk transfer through mutual aid. These include injuries, illnesses, droughts, and cyclones. While Yasawans believe that some risks can be avoided or reduced by

Fig. 2 The *matanivanua* (“mouth of the chief”) from a nearby village presents a *tabua* during the funeral of the Tui Yasawa or regional chief of the Yasawa Islands. The *tabua*, a polished sperm whale tooth on a braided cord, symbolizes and reaffirms the heavy weight of the social ties connecting clans across villages. Photo credit: Matthew Gervais



relocation to town or by lifestyle choices related to diet, exercise, and piety, limited economic resources and deep attachments to place and tradition mean that much risk is retained (see also Nolet 2012). Social relationships are explicitly viewed as essential to survival among interdependent Yasawan villagers, with extensive time and energy devoted to building and preserving social capital. As one villager succinctly stated, *keda leqa kece*, “we all have problems” such that no one can survive on their own. In open-ended queries about the problems, risks, or fears of villagers, the topic nominated most often is “village responsibilities”—underscoring social relationships as the most proximate concern of villagers and ecological risks as almost-taken-for-granted facts of life.

Yasawan villages are normatively patrilocal, with patrilineal descent groups organized hierarchically from extended households (*itokatoka*) to ranked land-owning clans (*mataqali*) composing village-level *yavusa*. Universal kinship ties are the backbone of Yasawan village life. Four types of resource transfers are noteworthy in Yasawa. The first is a system of demand sharing among members of extended households, in which property is shared and can be used or taken with little more than a notification. The second is a system of ad hoc need-based requests known as *kerekere* (Sahlins 1962). Villagers respectfully use *kerekere* among extended kin when in need of a resource, and the target of the request is expected to give the



Fig. 3 In the foreground sit roofs of thatched houses (*bure*) that collapsed during a tropical storm in 2010; behind them sit several new *bure* built to replace them. All such houses on Yasawa Island fell during Cyclone Evan in 2012, but the central government replaced them with wooden houses, undercutting the practice-based knowledge of traditional house building in these villages. Photo credit: Matthew Gervais

resource if able. Clans and villages as corporate units also use *kerekere* to acquire resources such as land for gardens or labor help on large projects or on special occasions. A *kerekere* request creates no expectation of short-term repayment, but it does engender expectations of reciprocal help if fortunes reverse. Gossip against those who are “stingy” or “bad-hearted” is the principal means of sanctioning violations of *kerekere* etiquette, while falling into bad standing compromises one’s ability to use *kerekere* when in need. Third, there is a system of ritual exchanges (*veiqaravi vakavanua*) that attend numerous life-course ceremonies in Yasawa such as births, marriages, and funerals, as well as special occasions such as visitations of chiefs, first visits from matrilineal kin, completed house construction, or formal apologies (Ravuvu 1987). These exchanges are showings of respect among clans and villages and involve the reciprocal presentation of valued goods (*iyau*) such as kava roots, woven mats, yams, pigs, and kerosene. While the initiators usually present a greater quantity of goods, the receivers reciprocally present not-insubstantial “appreciations” that clear them of debt and strengthen the relationship. The “lead” objects in these reciprocal exchanges are *tabua*, whale’s teeth with large woven cords braided from end to end. *Tabua* carry explicit symbolism: the braided cord is the tie among the exchanging parties, while the weight of the tooth is the “heaviness” or visceral significance of the relationship (unpublished data; also Ravuvu 1987). Such ritual exchanges across clans and villages may help to scale up

kinship networks in the service of mutual aid during shocks that affect a large portion of the village or island population. The fourth type of resource transfer is a system of collective fund raising (*solu*) for clans, churches, schools, and sometimes the *vanua* (village). These usually involve a feast, kava drinking, and turn-taking donations with public announcements of the amount given.

Yasawans do not consider all types of resources as being appropriate for *kerekere* requests. Data from a card-sorting task conducted in 2015 indicate that Yasawans distinguish between two kinds of resources. The first group consists of subsistence foodstuffs, tools, land, and labor, all of which are often *kerekere*'d, given without question, and which do not create debt. The second group consists of ritual exchange goods and monetized resources (e.g., fuel, cash itself) that are not often *kerekere*'d and that create debt and are expected to be reciprocated in kind based on an informal agreement. Violating the terms of this agreement puts the relationship into bad standing, compromising future sharing within it. One villager clearly summarized the distinction in exchange types: "Debt and *kerekere* are different."

Interviews with randomly selected informants indicate that Yasawans do routinely provide aid to one another in response to the unpredictable hazards that they all face. For each of the four often-mentioned hazards (debilitating injuries and illnesses, droughts, and cyclones), ten villagers were interviewed, and each answered questions about two or three hazards. All ten interviewees reported that villagers help one another in dealing with injuries. Nine reported having given help to an injured person, while eight reported having received such help recently. Similarly, nine reported that villagers do help one another in dealing with illnesses, with eight reporting having given help recently to the sick and eight reporting having received such help while recently sick. Eight out of ten interviewees reported that villagers do help one another in dealing with drought, with seven reporting having helped someone recently and the same number reporting having been helped recently. Yasawans also reported extensive helping among villagers, and even among villages on the island, before and after a cyclone hit. Eight out of ten interviewees said that villagers help one another in dealing with cyclones, with seven reporting having given help in a recent cyclone and seven of ten reporting having received help. This help included food sharing, equipment sharing, and sharing of supplies such as kerosene and, more so than for any other shock, collective house building and collective farming directed at those most in need (cf. Takasaki 2011).

The hazards that Yasawans face—injury, illness, drought, and cyclones—differ considerably from one another in terms of the synchronicity with which they strike their victims. While Yasawans tend to report that injuries and illnesses only affect one or a few villagers at a time, droughts and cyclones are thought to influence everyone at once. During synchronous shocks such as droughts and cyclones, Yasawans appear to scale up and out of their social networks by seeking help from and giving help to a more far-flung network of social ties. This is qualitatively the case in our data, in that Yasawans mention other villages and relatives in town and abroad more often as helping partners during droughts and cyclones than during injuries and illnesses. It is also the case quantitatively. Looking at the relative frequencies of close kin (nuclear families + $r \geq 0.25$) vs. distant kin (e.g.,

classificatory fathers or mothers, classificatory cousins) among people nominated as having helped or having been helped by interviewees during low-synchrony (injuries + illnesses) vs. high-synchrony (droughts + cyclones) shocks, we find that close kin are overrepresented in low-synchrony helping (16/44) compared to high-synchrony helping (7/47) ($\chi^2 = 5.55$, $p = 0.019$). Although this result is tentative because it is derived from a small sample (ten interviewees for each type of shock), the pattern is encouraging. This result supports the thesis that ritual exchanges (*veiqaravi vakavanua*) across clans and villages help scale up kinship networks in the service of mutual aid during shocks that affect a large portion of the village or island population. Currently we are collecting comprehensive helping network data for these four risks across multiple Yasawan villages.

Experimental economic game data collected in 2012 (Gervais 2016) reinforce that need-based transfers are important determinants of Yasawan generosity. In an allocation game similar to an N -recipient dictator game, a subject was presented with a grid of photographs of 53 people in their community alongside a picture of himself and the opportunity to distribute money among the photographs. Only one of 51 subjects kept all the money for himself. Twenty-two subjects (43%) kept nothing for themselves, while 39 (76%) kept 10% or less. Perceived need was by far the most important reason that subjects gave for their allocation decisions, with 47 subjects (92%) citing the recipients' weakness (*malumalumu*), old age, lack of income, financial troubles, many dependents, widower status, general problems, or desire to help them. Similarly, a lack of need was the overwhelming reason given for not allocating to particular individuals, with 37 subjects (72.5%) mentioning a potential recipient's strength (*kaukauwa*), sources of income, or support from a large family. Compassion (*kauwai*), love (*loloma*), and thinking of others (*veinanumi*) are central tenets of Yasawan village life.

Hadza (Colette Berbesque)

The Hadza are a group of hunter-gatherers who live in savannah/woodland areas in northern Tanzania. They live in mobile camps, which average 30 individuals (Marlowe 2010) (Figs. 4 and 5). Camp membership often changes as people move in and out of camps (Jones et al. 2005). These camps move about every six weeks on average. Hadza men usually go foraging alone. They hunt birds and mammals using bow and arrows. While on walkabout they often feed themselves (Berbesque et al. 2016), but routinely bring meat, honey, and baobab fruit back to camp to share with others. Hadza women go foraging in groups of three to eight adults plus nurslings and often some older children. They mainly collect baobab fruit, berries, and tubers of several species.

Unpredictability shapes Hadza life in many ways, including positive ones. Hadza acquire large game approximately 1.4 days per hunter per month (Berbesque et al. 2016). These kills are fairly infrequent and unpredictable, and certainly months can go in a given camp without any large game kills. However, a large game kill can



Fig. 4 Hadza men carrying a dead antelope to be butchered and shared. Photo credit: Frank Marlowe

easily yield 50 kg of meat and fat or more, which is a very large number of calories for a camp of 30 adults on average. Because a hunter must get help from others to process the carcass and carry it back to camp, he must also share it. Large game carcasses are shared widely in camp with both kin and nonkin. There are occasionally disputes over parts of large game carcasses and their distribution in camp. These disputes can involve shouting and may be resolved by changing the distribution. However, if the distribution is not changed, anger often remains. In such cases it is common for the offended family to move out of that camp and avoid the person they feel has shortchanged them for a period of time.

When asked about the risks and hazards they face, Hadza produce a long list, most of which they see as being very rare. For example, although most Hadza listed animal attacks as the foremost danger they face, they also said that although such attacks can be lethal, they are also quite rare. Among most commonly listed diseases were malaria and AIDS, but both were agreed to be rare. Also feared are droughts, floods, and witchcraft, which they think is sometimes used by other ethnic groups against them. Droughts and floods are associated not only with food shortages but also with increased numbers of snakes in the case of droughts and increased numbers of mosquitoes in the case of floods. Despite all of these hazards, most Hadza agree that deaths from starvation are extremely rare or nonexistent. A few said that these food shortages only seriously affected people that were very old or very ill.



Fig. 5 Hadza women roasting and sharing//ekwa (*Vigna frutescens*) roots that they had just dug up. Photo credit: Athena Aktipis

Most of these risks are both asynchronous and unpredictable, making them good candidates for risk pooling, an outcome the Hadza achieve routinely through food sharing. Droughts and floods, which affect large swaths of the Hadza population simultaneously, are notable exceptions to this pattern. Like many other warm-climate hunter-gatherers, the Hadza do not store food or attempt to buffer themselves with other contingency measures against food shortages caused by floods and droughts. This is likely because of the unpredictable nature of these risks in warmer climates. Hunter-gatherer groups with predictable and frequent food shortages, in contrast, very often do have contingency measures (Berbesque et al. 2014). Other risk management strategies available to the Hadza include risk avoidance through the acquisition of foods with predictable, reliable yields such as tubers, fruits, and other plant foods. In keeping with the sex-based division of foraging labor found in almost all documented hunter-gatherer societies, these reliable foods are primarily targeted by Hadza women, while Hadza men tend to focus on foods with more variable return rates. Another way Hadza reduce their exposure to risks is through the refinement of their foraging skills. Because Hadza do not accumulate wealth, risk retention is not a viable strategy for them.

Mongolian Pastoralists (Thomas Conte)

Roughly one third of the Republic of Mongolia's population of slightly fewer than three million is employed in nomadic or seminomadic animal husbandry (Endicott 2012). These herders make use of Mongolia's diverse steppe, desert, forest, and mountain ecosystems to sustain herds of horses, sheep, goats, cattle, and camels (Humphrey and Sneath 1999). Because the Inner Asian steppes are subject to an extreme continental climate with periodic temperature and precipitation fluctuations, Mongolian herders have developed flexible nomadic land use strategies based on livestock's seasonal nutritional and hydrological needs (Fernandez-Gimenez 2000; Pederson et al. 2014; Conte 2015).

Over the last two decades, the Mongolian Plateau has experienced a rise in unpredictable severe weather conditions known as *zud*. In the winter, *zud* occur when snowstorms are followed by severely cold temperatures that cause a thick layer of ice to form over the ground (Begzsuren et al. 2004). When these conditions occur, livestock cannot access the forage beneath the ice, and many die of starvation or exposure (Fernandez-Gimenez et al. 2012). As climate change affects the Mongolian steppes, *zud* conditions are becoming both increasingly severe and more unpredictable. Current estimates indicate that the Mongolian pastoral economy suffered the loss of over 21 million livestock as a result of *zud* between 1990 and 2010 (UNDP 2010). *Zud* have been identified as a major driver of rural poverty in Mongolia and have forced many of the nation's pastoral nomads to abandon herding and seek alternative sources of income (Vernooy 2011; Endicott 2012).

Previous ethnographic research on Mongolian pastoralists indicates that herders often rely on cooperative networks with other families to effectively manage daily herding tasks and seasonal migrations (Cooper 1993; Bold 1996; Conte and Tilt 2014). However, *zud* conditions present herders with seasonal risks that are both unpredictable and affect entire communities simultaneously. The synchronous nature of winter *zud* often renders herders unable to engage in patterns of mutual assistance and labor sharing with other families (Templer et al. 1993; Thrift and Byambabaatar 2015). To effectively manage *zud*, herders often rely on cooperative risk-reduction strategies that aim to both prepare families for *zud* and reduce the severity of the effects of severe winter weather conditions when they occur (Swift and Siurua 2002). These strategies include pooling labor to build and repair winter livestock shelters, cutting and storing supplementary forage for times of scarcity, and making short-term migrations to reserve pastures where herders can fatten livestock in preparation for winter (Humphrey and Sneath 1996). Thus, while the unpredictable and synchronous nature of winter *zud* make herders unable to use cooperation to overcome *zud* when they occur, many herders rely on cooperative networks of extended kin and neighbors to reduce the severity of *zud* through preparatory risk management strategies.

In order to assess the effects of *zud* on Mongolian herders' willingness to cooperate with one another, in June 2015, Human Generosity Project team member

Thomas Conte ran a series of common-pool-resource games in Mongolia's Bulgan province. In common-pool-resource games, two anonymous players are each given access to a hypothetical envelope containing a sum of money. Each is then allowed to remove from the envelope whatever sum of money he or she wishes (Sosis and Ruffle 2003; Gelcich et al. 2013). If anything remains in the envelope after each of the two players has made his or her decision, then it is multiplied by a factor greater than one and divided evenly between the two players. However, if the two players collectively choose to extract an amount of money greater than the total amount in the envelope, then neither player gets anything. These games aim to simulate the problem of subtractability that is inherent in common-pool-resource management systems (Messick et al. 1988; Gardner et al. 1990).

Conte ran three versions of the game with a sample of 60 pastoralists (20 per version). The first version was a standard common-pool-resource game with a certain, unchanging amount of money in the hypothetical common envelope. The second version introduced uncertainty and stochasticity into the game in which participants were unsure if the total sum of money in the hypothetical envelope would be reduced by 20% after they made their decisions on how much money to remove. The third version of the game presented participants with the exact same uncertainty as the second version, but the reduction was framed as a *zud*. Participants were asked both how much money they would like to remove from the common envelope and how much they expected their partners to remove from the envelope. A comparison of mean taking for each of the three scenarios revealed no significant difference in average taking among the three versions. However, a comparison of mean expected taking revealed a statistically significant difference between the stochastic and *zud*-framed game versions: participants expected their partners to take significantly more from the common envelope in the *zud*-framed version. When interviewed regarding this difference, participants cited the needs of their partners as the reason why they expected greater taking in the *zud*-framed games.

Conte is currently establishing a site for his dissertation research in the Darhad Depression in northern Mongolia. Conte will again play common-pool-resource games, with one added wrinkle: He will run them both during a season of abundance and during a season of scarcity. This was inspired by a study in Afghanistan that found lower rates of enforcement of sharing norms in a third-party punishment game during lean times than immediately following a harvest (Bartos 2015), which suggests that people become more sensitive to one another's needs during times of scarcity. In addition, Conte will use social network analysis to better understand patterns of mutual support and run allocation games like those played by Gervais at his site in Fiji (see above) to find out whether Mongolians, like Fijians, donate more to people that they perceive as needy.

Ranchers in the American Southwest (Lee Cronk and Athena Aktipis)

Cochise and Hidalgo counties are located adjacent to each other along the US-Mexico border in southeastern Arizona and southwestern New Mexico, respectively (Fig. 6). Although the two counties together cover an area larger than six of the United States, they are home to only about 130,000 people. We were initially drawn to this region by the notoriety of the Malpai Borderlands Group, an organization of ranchers who work with each other, the Nature Conservancy, and federal and state authorities to sustainably manage the region's rangelands (Sayre 2005). They have also engaged in international exchanges, including one with Maasai that included Human Generosity Project team member Dennis Sonkoi (Curtin and Western 2008). Because the Malpai Borderlands Group has too few members to provide statistically valid results, our focus in this project is not on the Malpai group itself but on the region and the ranchers that live in the general area, all of whom face roughly similar environmental, economic, and political challenges.

Most ranches in the area are family operations, but few families find that they can make a living solely from ranching. To make ends meet, people do a wide variety of things including horse breeding, commercial hunting, renting out land to quail and deer hunters, owning small businesses, and a wide variety of jobs in nearby towns. Ranches vary in terms of the degree of control they have over the land on which they run livestock. A few have deeds to all the land they use, but more often a ranch is a



Fig. 6 Cowboys roping steers in Hidalgo County, New Mexico. Photo credit: Lee Cronk

combination of deeded land and land owned by the federal and state governments to which the rancher has limited access. Some ranches are on contiguous tracts of land, but many of them are broken up into multiple physically separated holdings.

When asked about the risks and hazards they face, almost all ranchers in this area first mention the weather. They are particularly wary of droughts, but heavy rains can also cause a variety of problems including washed out roads and drowned cattle. After the weather, interviewees brought up a variety of different problems including unpredictable market forces, government regulation, estate taxes, predators, and the scarcity of people who really know how to work with cattle. Injuries were also frequently mentioned. Many injuries occur while people are working with livestock and arise from the inherent unpredictability of cattle and horses. Others involve various pieces of heavy equipment that are often used on modern ranches. One retired rancher described it this way: “There are a lot of opportunities to injure yourself.” Another put it even more succinctly: “It is a very dangerous business.”

Because most ranches are family-run, few of them have enough skilled people on hand to deal with such large chores as branding and shipping cattle. Although some do hire cowboys, many complain about the difficulty of finding people who still have the skills necessary to do the work efficiently and safely. Having an unskilled person around, rather than being helpful, is actually a detriment, an idea colorfully expressed in this common saying: “A person that don’t know cattle is like two good cowboys gone.” However, one source of skilled labor is readily available: neighbors. Not only do neighbors have the skills, they also have the same need. This creates a perfect situation for a regular, steady exchange of labor. Ranchers refer to this as “trading out work” or “neighboring,” as in this quote from one rancher: “I’ve been neighboring with the Millers since I don’t know when.” Neighbors, who may live as much as 2h drive apart from each other, negotiate with each other regarding the dates certain types of work will be done, and then they show up and help out. In such situations, there are two unstated expectations: first, that they will be fed and, second, that they will receive similar help when they need it on their ranch.

When needs are not so predictable—say, when a rancher is injured or when equipment suddenly and unexpectedly fails—all interviewees agreed that neighbors would come to that person’s aid with no questions asked and no expectation of any return apart from a similar generosity should they ever be in a similar bind. This kind of behavior is simply seen as being neighborly, and no accounts are kept or debts created. A few quotes capture the spirit of this kind of neighborliness:

If there’s any major occurrence that happens these little communities all come together to take care of those left behind, clean their houses, feed them, really amazing.

I don’t think anybody keeps track. If you kept track it would become a headache If somebody needs help, you help them My family’s never worked that way and we never will It all comes out in the wash.

It’s a solidarity-type world out here.

The next step for the Human Generosity Project at this site is to administer a mail survey regarding patterns of risk, need, and generosity among the ranchers in

Cochise and Hidalgo counties. The data we gain from the survey will enable us to test our ideas about the role that the predictability of need plays in determining patterns of cooperation as well as a variety of other ideas.

Karamoja (Padmini Iyer)

The Karamoja region in northeastern Uganda is home to over one million pastoralists who subsist on a mixed economy of livestock production and opportunistic agriculture. Our study population includes members of two similar but distinct ethnic groups, the Matheniko Karimojong and the Tepeth. For simplicity, we will refer to everyone in our study population as residents of Karamoja. The greatest risk in Karamoja is drought, which typically occurs in 4-year cycles and which creates chronic food insecurity. Other major risks in the environment include unchecked livestock disease, small-scale animal theft, human illness, and variable cash incomes from alternative livelihoods. Further compounding these risks is the overall low livestock base of the majority of households in Karamoja, which is the result of decades of violent intercommunity livestock raiding and subsequent state-imposed interventions (Mamdani et al. 1992; Gray et al. 2003; Stites et al. 2007). To sustain livestock and crop production under these circumstances, residents of Karamoja use a variety of strategies. These include the movement of livestock and people for the exploitation of key productive patches, herd accumulation, agricultural intensification and storage, livelihood diversification, and the use of informal systems of mutual insurance.

One particularly important risk management strategy is the formation of livestock sharing relationships among men known as stock friendships or associations (*akoneo*) (Dyson-Hudson 1966; see also Gulliver 1955 and Bollig 2006). These relationships are formed between an individual and others from his extensive kin and nonkin networks through the exchange of gifts ranging from small favors to cattle. In founding a network of stock friends (sing., *ekone*; pl., *ngikonei*), an individual herder establishes a network of mutual insurance unique to him. The networks can range in size from three to thirty individuals, with an average of eight *ngikonei*. During a time of need, *ngikonei* are expected to assist each other under an assumption of mutual obligation created through livestock transfers. However, *ngikonei* are chosen not on the basis of their asset wealth, which would be sound from a purely economic perspective, but rather on account of their peace-loving and genial personalities as well as the chemistry between the two potential friends.

Ngikonei share livestock with each other for a number of reasons. These include animals given to assist in bridewealth accumulation, for dispute resolution, during rituals such as initiation, during periods of food insecurity or urgent cash needs, and simply as gifts. Once an animal is transferred to a friend, the giver ceases to have property rights over it, and such transfers also do not create debt. A few categories of livestock transfers, such as animals given for fertilization and milking, create symbolic debt in that the giver continues to retain property rights over the transferred

animal but never actually reclaims his property. By placing livestock in each other's herds, *ngikonei* establish, maintain, and strengthen ties of mutual obligation that stretch over generations.

Women herders in Karamoja also maintain similar risk-pooling relationships with other women and men who constitute the category of “close friends” (*ngikonei ke etau*—“friends of the heart”; see also Pollard et al. (2015) for a description of risk-pooling friendships among Marakwet and Pokot women). While the circle of close friends tends to be small (between two and three friends per individual) and there is less ceremony associated with friendship formation, women's friendships serve some of the same purposes as men's stock associations. For example, in a time of food insecurity, women approach their friends for help with fulfilling the household's nutritional needs. Women with extra money or those who receive food aid may circulate the surplus in their friendship and kinship networks not only to help those in need but also to reinforce pre-existing relationships. Contrary to established beliefs about gendered sharing within the Karamoja economy (Quam 1976), women also transfer livestock to their male and female friends as gifts, for bridewealth accumulation, and for survival.

As important as *akoneo* relationships may be, *ngikonei* constitute only one part of a herder's multifaceted, wide-ranging need-based transfer network. This is illustrated by data on mutual aid during a prolonged drought in 2015. Help flowed in various networks including agnatic and affinal relatives, neighbors, acquaintances, and friends. Whereas nearly half of all exchanges were between “friends” (45%), less than 15% of the individuals listed as “friends” were *ngikonei*. Thus, the flow of help in Karamoja communities during crises may be influenced as much or more by people's immediate need and ability to help as by profound and long-lasting contractual relationships such as those between *ngikonei*. This exchange system based on need is necessary in an environment where a herder's luck may change overnight due to devastating raids or livestock disease that can render those who were previously sufficient suddenly destitute.

Ik (Cathryn Townsend)

The Ik people of northeastern Uganda are former hunter-gatherers who speak a peripheral isolate Nilo-Saharan language, which distinguishes them from neighboring pastoralist peoples such as the Karimojong and the Turkana. The Ik people became notorious in anthropology following Colin Turnbull's ethnography *The Mountain People*, in which he described them as “unfriendly, uncharitable, inhospitable and generally mean as any people can be” (Turnbull 1972, p. 32). We included them in the Human Generosity Project precisely because of that controversial description, and our interest in including a society purported to be ungenerous.

Today the Ik practice a mixed subsistence strategy involving the seasonal cultivation of maize, sorghum, and millet alongside year-round gathering and hunting

within a semiarid environment subject to intermittent droughts and fluctuating wet seasons and beekeeping. Contrary to Turnbull's account, sharing between Ik people is both rigorous and extensive, as is typical for hunter-gatherer peoples. Beneficiaries are typically close relatives, friends, and those in need. Both foraging and the small-scale cultivation that Ik people engage in have unpredictable, stochastic outcomes at the individual level but are adequate in providing for the group so long as food is shared. Another factor that adds to the asynchronous nature of the risks that Ik people face is that individuals may become the victims of sporadic violence and resource raiding from neighboring groups.

The risk-pooling networks of Ik people are maintained by cultural norms. Ik people have extensive kinship practices and terminology of the empirically universal kind (Barnard 1978). Nurturing circles of sharing and trust beyond close relatives create important social obligations. If it is noticed that an Ik person is not sharing, they will quickly gain the reputation of being stingy, which will jeopardize their chances of getting help from others in the future. Ik conventional wisdom says that even if a household stores all its farm produce for itself, it will still finish it all before the dry season is through. By the time the dry season comes, when the Ik must survive from wild foods alone, a household must rely on others for help in the event that their own hunting or gathering luck is poor. This wisdom is summed up in the Ik saying *maranga tomora* ("it's good to share"). Moreover, those who do not share incur the wrath of others. The Ik also believe that nature spirits of the earth (*kijawikâ*, literally "children of the earth") will pick up these negative emotions and bring misfortune to those who do not share. Also, one should give freely and with good will. *Kijawikâ* can sense antisocial feelings of annoyance or resentment on the part of a donor, and so such emotions are suppressed lest the *kijawikâ* react badly to them. Conversely, the more one shares, the luckier one will be, as the *kijawikâ* feed off the positive emotions of both the donor and the receiver.

Given the widespread sharing norms of the Ik, how, then, did Turnbull (1972) come to form such a negative impression of Ik generosity? The answer no doubt lies in that his fieldwork with Ik people fell within the years of 1965–1966, a period of drought and famine during which many people starved to death and raids from Kenyan pastoralists increased. Today the year of 1966 is remembered in northeastern Uganda by the Karimojong name *lopei kopo*, the utterance of which is inevitably accompanied by a chuckle of characteristically dark humor. It means "year of one cup," which refers to the fact that the government aid for the entire year amounted to one cup of ground maize per person. For the Ik, that was also a time when they were adapting to life on top of Mount Morungole after having been pushed out of their previously large and transnational foraging area. Two factors led to sedentarization. Firstly, the creation of the Kidepo Valley National Park by the British colonial authorities in 1958 excluded the Ik from one of their prime hunting grounds. Secondly, they retreated to the highlands to escape an upsurge in interethnic violence. This combination of drought and an enforced shift of subsistence strategy from mobile foraging to sedentary cultivation created a synchronous shock. Ik were all suffering such severe caloric restriction that nobody was in a position to help anybody else, even if they had had the desire to do so. It is perhaps no wonder, then,

that traditional social ties and practices broke down to the point of societal collapse during *lopei kopo*. The fact that the Ik, though still poor, have rebounded and recovered their strong ethic of sharing is a testament to the importance of need-based sharing systems in subsistence economies.

Kijenge, Tanzania (Brigid McCarthy)

Kijenge is a diverse and densely populated slum in the city of Arusha, Tanzania. Most of its residents live in chronic economic precarity, with unpredictable and intermittent employment, high food insecurity, and little money for long-term investments in property or human capital. The most common source of wage income for men is temporary day labor, such as construction, seasonal agricultural labor, or transporting goods on foot. Some people, particularly women, have small businesses such as selling vegetables, street vending, or brewing banana beer. Some families also keep small livestock such as chickens, ducks, and rabbits. Nearly all income comes from the informal sector, and purchased staples typically make up the large majority of calories. Household composition is variable and flexible. For example, it is common for children to change residence or caretakers, and men may move if they are unable to support their families. Adults in a household may or may not be employed, for short or long periods, with no job security or income predictability. As a result, household income is subject to large unpredictable variations over time. Most of the shocks that affect household income are asynchronous, even between close neighbors. Shocks may be positive or negative, and the prevailing condition of precarity makes it difficult to define any baseline for income. These conditions are well suited to risk pooling through need-based transfers, and the people of Kijenge do indeed engage in such transfers extensively. They refer to this practice as *kushirikiana*, a multivalent Swahili word that may be translated as “cooperation,” “collaboration,” “participation,” “partnership,” or “sharing.” *Kushirikiana* creates social networks based on mutual interdependence that are the backbone of the community.

According to preliminary fieldwork based on focus group discussions and participant observation, the people of Kijenge have three categories of cooperative giving, each with a different social script for asking and receiving and different expectations about repayment. The first category includes predictable needs that require labor sharing or financial contributions. Examples mentioned included weddings, other life cycle ceremonies, and building new houses. The family requesting help is expected to host a gathering, inviting neighbors and paying for a communal meal. After the guests have eaten, the head of household will discuss the project and ask for help. This sequence explicitly frames this kind of cooperation as reciprocal, and large contributions create a debt obligation. The second category of helping governs public goods provisioning, including contributions to community development and maintaining common spaces. Public goods provisioning improves one’s reputation but is not explicitly repaid.

The final category of helping corresponds to need-based transfers and involves urgent needs that result from misfortune, especially sickness and acute hunger. In this case, the affected family will selectively make calls to close friends, who contribute according to their ability. Helping in these circumstances does not create debt, but it results in a special kind of relationship in which both the donor and recipient can call on each other in times of future need. At the first such need-based request, donors are not under an obligation to give, and they go through a complex decision-making process evaluating the potential recipient's history. If the requester has demonstrated generosity in the past to others, even with very small financial contributions, she will likely receive help without debt. Interviewees viewed this kind of helping as a prudent investment for this reason: "Even if you give a hundred shillings when they have a problem, they can give you much more if you need it." Notably, this statement explicitly frames participation in need-based transfers as a choice involving time and risk and specifically risk for which an expected value cannot be easily calculated. If the recipient has not helped others in need in the past, donors look for a history of signals of empathy. They report that they are more likely to give to those who "feel pain at the pain of others." They believe this kind of generosity is proximately motivated by sorrow (*uchungu*), and donors may help recipients who have never helped others in the past if they have displayed visible signs of empathy.

Not all need-based transfers in Kijenge begin with a request. In many instances, respected community members in need are offered assistance before they ask, when others suspect they might be in need. Similarly, not all need leads immediately to requests for help. Several people said they had severely reduced their own food consumption for several days before making a serious and formal request for a need-based transfer. Such delays in making requests for help serve as honest signals of need. Another way to cheat is to hide resources in order to avoid requests from others. While livestock and large game animals are difficult to hide, cash is easy to conceal. Yet, with remarkable reliability and speed, others do find out and gossip about who has recently come into money. As one interviewee put it, "Everyone knows who has money—how he walks, what clothes he wears."

Discussion

Need-Based vs. Debt-Based Transfers

As we have seen, Maasai make a distinction between *osotua* relationships, in which transfers are made to partners in need with no expectation of repayment and *esile* transactions, which do create debt and which must be repaid. Similarly, Yasawans distinguish between resources that are appropriate for *kerekere* requests and whose transfer does not create debt and others that are inappropriate for *kerekere* requests and that do create debt. The same distinction can be found in labor-sharing

arrangements among ranchers in the American Southwest: If a need arises unexpectedly, as in the case of an injury or a sudden equipment failure, aid is given with no expectation of repayment other than a similar kindness should the donor ever be in similar straits. But if a need is one that arises predictably, as when it is time to brand cattle or ship them off to market, then the ranchers make arrangements for a balanced exchange of favors.

These three examples demonstrate a distinction that may be useful to generalize. On the one hand, we have need-based transfers, which do not create debt and which may lead to long-lasting relationships even when the flow of resources is solely or predominantly one way. On the other, we have situations in which debt is a crucial element and gifts must be repaid or the relationship will end. We refer to gifts that create debt as “debt-based transfers.” Our agent-based models have shown that, when environmental conditions are volatile, need-based transfers lead to more risk pooling and longer survival than do debt-based transfers (Aktipis et al. 2016). The reason is that the unpredictability of need applies not only to the party that happens to be in need at the moment but to everyone. Given that the future is unpredictable, it makes sense to exchange the low probability of a catastrophic loss for a high probability of small, manageable losses. But when needs occur regularly and predictably, as in the case of branding time for our ranchers, debt-based transfers may work better to maintain cooperative networks over time (Fig. 7).

We use the terms “need-based transfers” and “debt-based transfers” rather than other existing terms because no current terms used in the literature capture the underlying logic of need-based transfers (Cronk and Aktipis 2016a, b). “Sharing,” for example, is a broad concept that does not by itself capture the idea that the giving is to those in need. One can, after all, share with someone who is wealthy as easily as with someone who is poor. Similarly, while Fiske’s (1991) “communal

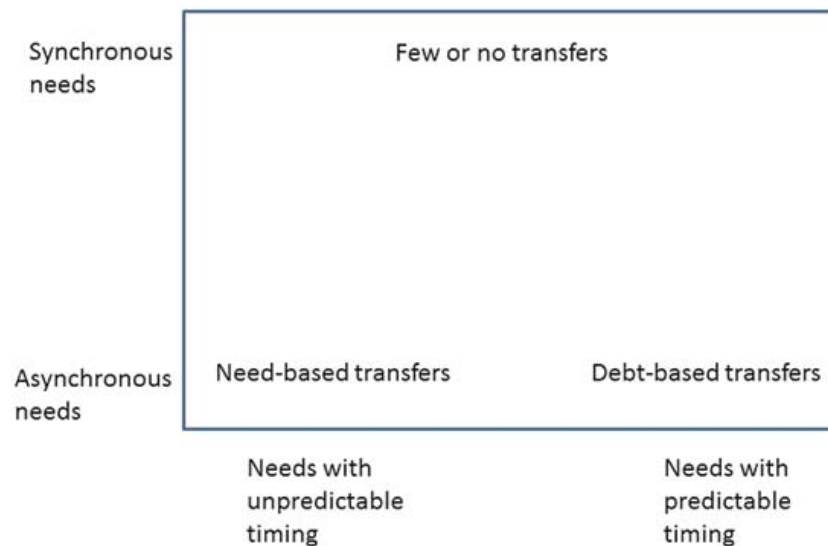


Fig. 7 Risk pooling through need-based transfers is most appropriate and feasible when needs occur unpredictably and asynchronously

sharing” and Sahlins’ (1965) “generalized reciprocity” overlap with some cases of need-based transfers, they do not describe the kinds of formal, contractual risk-pooling arrangements found at some of our field sites. Why not “risk-reduction reciprocity,” a term used by some human behavioral ecologists (e.g., Bliege Bird et al. 2002)? In this instance, our objection is logical. The risk pooling that results from need-based transfers does not actually *reduce* risk but simply redistributes it; hence “risk-reduction reciprocity” is a misnomer. It is also tempting to refer to need-based transfers simply as “risk pooling.” However, our computer simulations have shown that some limited risk pooling can be achieved even when agents are limited to debt-based transfers (Aktipis et al. 2016). Risk pooling is best seen as an outcome of certain kinds of transfers rather than as a particular kind of transfer. As for “debt-based transfers,” we could instead say “balanced reciprocity” (Sahlins 1965) or “tit-for-tat reciprocity” (Axelrod 1984), both of which capture the same basic idea. We choose instead to avoid the word “reciprocity” because of the way that it has come to mean so many different things, including many things that are not reciprocity at all (e.g., negative reciprocity, indirect reciprocity, and strong reciprocity; Cronk and Leech 2013).

One thing that need-based and debt-based transfers do have in common is that neither will work unless the people involved have a high likelihood of future interactions with each other (Axelrod 1984). Although this is usually the case in the kinds of small-scale societies where anthropologists often work, it may not be in large-scale societies. Large-scale systems may be made stable by a variety of mechanisms including institutional frameworks, impersonal ways of assessing the qualities of potential cooperative partners (e.g., background checks and credit scores), and actuarial databases, which make it possible to remain ignorant about the likelihood of any particular individual suffering a loss while being quite confident about the likelihood that a category of people will suffer one (Levy 2012).

A comparison of debt-based and need-based transfers, respectively, to the analogous systems of lending by banks and insurance markets found in modern, large-scale societies may be enlightening. Debt-based transfers are like bank loans: If you don’t repay your current loan, you will not receive any more loans. Just as debt-based transfers work well if the two parties to the agreement can set up a tit-for-tat exchange of favors, bank loans work well if lenders have good reasons to believe that borrowers will have the means to repay. Need-based transfer systems, in contrast, are similar to insurance policies purchased on the market. When you pay your insurance premiums, you are not giving a loan to the insurance company and hoping that they will one day repay you. On the contrary, you hope that you are so fortunate as to never have to file a claim and that, as a result of your good fortune, all of your premiums end up being a complete waste of money. But the future is unpredictable and you are prudent, so you buy an insurance policy and pay your premiums, anyway. Similarly, when fortunate people give to those in need in a risk-pooling system, they are hoping that their good fortune will continue and that they themselves will never be in need. But they, too, are prudent, and so they enter into risk-pooling relationships even as they hope that they will never need to call upon them.

However, market insurance differs from social risk pooling in interesting and important ways. For example, insurance products are very specific, insuring against a single risk or a narrowly defined set of risks (e.g., flood, legal liability, medical expenses) and cover a single asset or a narrowly defined set of assets (e.g., home, business property, health). In contrast, social risk pooling is typically much more flexible. A single relationship can cover a wide range of risks and a wide range of assets. Instead of having separate insurance products for each source of risk, the same social networks can insure against shocks resulting from many different causes. Furthermore, in systems of risk pooling based on need-based transfers, the risks covered do not always need to be fully specified in advance. If unforeseen risks emerge, the same social networks are often able to absorb them.

Synchronous Needs, Asynchronous Needs, and the Question of Scale

When everyone in a community experiences the same need simultaneously, neither need-based nor debt-based transfers may be feasible, and resource transfers and other forms of helping may occur only for other reasons, such as parenting and kinship (Fig. 7). The Mongolian herders provide a good example of a group that relies mainly on means of risk management other than risk pooling for precisely this reason: When disaster strikes, no one is in a position to help anyone else. They still cooperate and provide assistance to each other to manage risks, but before the disaster strikes rather than during the disaster. Turnbull's fieldwork during the Ik's disastrous *lopei kopo* famine shows how completely social support networks can fall apart when disasters are both severe and simultaneous. On the other hand, Cathryn Townsend's current work shows that even in a group that has undergone such extraordinary stress, sharing norms and the beliefs that support them can re-emerge when conditions improve.

Despite the dramatic examples of simultaneous needs provided by our Mongolian and Ik field sites, the simultaneity of needs may need to be quite extreme before systems of risk pooling become nonviable. This is because when a community is hit by a disaster, its impact may not be felt equally by everyone in the community. For example, when drought and disease struck livestock herds owned by Pokot in western Kenya in 1991 and 1992, some herders lost about 50% of their cattle, while others lost only a few head. Losses among goat herds were similarly variable, with some herds dropping by as much as 30%, while one actually grew by 11% (Bollig 1998, p. 145). To take an example closer to home, when Superstorm Sandy hit New Jersey and New York in October, 2012, its impact on communities was quite uneven. Some were devastated, while others suffered only minor damage and power outages. Even within hard-hit communities, the extent of damage varied from block to block and house to house. As a result, people were able to help each other even in very hard-hit communities.

The example of Superstorm Sandy highlights another important issue regarding synchronicity of needs: Whether people experience needs simultaneously is really a matter of spatial scale. While parts of New Jersey and New York were hit hard by the storm, most of the rest of the United States was untouched by it. Thus, one way to change the nature of the risk management game is to find ways to scale up, which decreases the odds that everyone in the risk-pooling system will suffer a loss simultaneously. In the United States, this is made possible by large institutions (the government, churches, Red Cross, etc.) and by high-quality and large-scale infrastructures for communication and transportation. However, our Yasawa Island field site, where aid comes mainly from close kin in the event of very local events such as illnesses and injuries but from distant kin when widespread disasters such as droughts and cyclones strike, shows that some limited scaling up may be both possible and helpful even in small-scale communities.

Cheating, Cooperative Partner Choice, and Moral Hazard

Whenever people cooperate at some cost to themselves, there is the potential for cheating. Risk-pooling arrangements are no exception to this rule. At some of our sites, cheating may be difficult for a simple, practical reason: The resource in question is highly visible. Large dead animals and livestock are difficult things to hide. Despite the visibility of livestock, it would in principle be possible to hide one's wealth by taking advantage of practices such as *enkitaaroto*, a Maasai system in which animals are put in someone else's herd but without a transfer of ownership. We have livestock census data from both Mukogodo Maasai (Cronk 1989, 2004) and Karamoja. In both cases, the correlation between herders' apparent wealth, defined as the numbers of animals in their herds regardless of who really owns them, and actual wealth, defined as the number of animals that they actually own regardless of whose herd they happen to be in, is too high for this kind of cheating to be a real problem (Mukogodo Maasai, Pearson's $r = 0.984$, $p < 0.01$, $N = 183$; Karamoja, Pearson's $r = 0.968$, $p < 0.01$, $N = 44$). In need-based transfer systems where resources can be hidden or individuals are otherwise unable to evaluate the resource holdings of others, cheating is likely to be a larger problem.

Maasai also discourage cheating by imbuing their *osotua* relationships with a deep sense of sacredness and responsibility that is captured by the very term the use to describe such relationships: umbilical cord. Given how tempting and, at least in some circumstances, how easy it might be to cheat in need-based transfer systems, it makes sense that cheating may be guarded against by a threat of supernatural punishment. In the Maasai case, that threat is rather vague. However, among the Ik, the threat of supernatural punishment and the complementary possibility of supernatural reward are quite explicit, with the *kijawikā* earth spirits monitoring everyone's generosity and stinginess and rewarding or punishing them accordingly.

It may also not be coincidental that the kinds of situations that give rise to systems of risk pooling based on need-based transfers are also the kinds of situations

where one is most likely to find extreme religiosity, superstition, and magical thinking. When events are out of one's control, it is common for people to imagine that they are in the control of forces that can be influenced through such means as prayer and magic. This "uncertainty hypothesis" was first inspired by Malinowski's (1922) observation that, in the Trobriand Islands, magic was more often associated with dangerous activities such as open ocean fishing than with safe activities such as lagoon fishing. Gmelch (1971, 1992; see also Burger and Lynn 2005) provided an entertaining example of this phenomenon among professional baseball players: Superstitions regarding rituals, routines, and magical charms are frequently related to activities that have high rates of failure, such as pitching and hitting, and are rarely associated with activities with high rates of success, such as fielding. Somewhat similarly, people who feel that they are in danger are more likely to engage in religious rituals (Sosis 2007). Perhaps the sacredness with which need-based transfers are often imbued is enhanced by their association with high-risk situations and thus with religion, superstition, and magical thinking (Cronk and Aktipis 2016a, b).

Another way of suppressing cheating is for individuals to carefully choose partners with whom they enter into need-based transfer relationships. Partner choice is one way of enhancing assortment of cooperators with one another, and it can be realized through both simple and complex rules for choosing and maintaining relationships (Noë and Hammerstein 1994; Aktipis 2004, 2006, 2011; Barclay and Willer 2007; Nesse 2009; Barclay 2013). Careful partner choice may be particularly important in societies like the Maasai and in Karamoja where such relationships are formal, clear, and long-lasting obligations. As we have seen, in both societies stock friends are chosen carefully and with great attention to trust, congeniality, and compatibility. Among the Maasai and in Karamoja, this process is somewhat like courtship and involves the exchange of small gifts and favors over time. Such gifts serve as signals of each party's commitment to the relationship. This is reminiscent of the *hxaro* gift-giving system found among the Ju/'hoansi hunter-gatherers of the Kalahari. In the *hxaro* system, partners exchange small gifts, most of which are of little economic consequence, in order to maintain relationships that become vital when one partner has a serious need, such as an unexpected shortage of food or water (Wiessner 1977, 1982). In this way, reciprocal gift-giving serves as a signal of commitment to a system that is ultimately about the management of unpredictable risks through need-based transfers. These systems of signaling commitment may serve to help solve the problem of cheating by requiring ongoing mutual investment and engagement in order to maintain relationships that can then be called on during times of need. In Yasawa, Fiji, such exchanges among households, clans, and villages may enable the scaling up of social support networks to be drawn on in times of locally synchronous need.

We are also exploring the issue of cheating through laboratory experiments. Our preliminary findings indicate that, in a standard test of cheater detection ability called the Wason selection task (Cosmides 1989), people are quite good at identifying cheaters in need-based transfers, particularly those who ask when they are not actually in need (Chang et al. 2015; Muñoz et al. 2016). We are currently adapting

this method for use at some of our field sites, as well. Vigilance about need-based transfer cheating may help explain a recent finding in political science that people in both the United States and Denmark support welfare payments to people who find themselves in need through no fault of their own while opposing such payments to people perceived as lazy (Petersen 2012). In short, those who receive help without actually being in need are perceived as cheaters regardless of whether the help is provided by the government or a friend.

In addition to outright cheating, need-based transfer systems may be undermined by another deleterious outcome: the “moral hazard.” This refers to the possibility that people who know that they will be taken care of if they suffer a loss may then take on additional risk. When all of the risks people face are negative, this can be a serious problem. But what if risks can also be positive? In that case, people should encourage their risk-pooling partners to take risks because they might receive part of the resulting windfall. At some of our field sites, this simply is not possible. Apart from possibly high yields from livestock raiding (which obviously come with their own set of risks), pastoralists do not experience sudden windfalls. Livestock reproduce at particular rates, and that is that. But at two of our sites, both coincidentally in Tanzania but worlds apart in most other ways, people do experience occasional windfalls. Among the Hadza, big game are seldom obtained, but when they are they are shared widely. Similarly, residents of Kijenge occasionally get lucky, perhaps by finding a job. When that happens, the proceeds are often shared within networks of *kushirikiana*. Thus, the system of risk pooling simultaneously provides support in the event of loss and encourages people to take positive risks, which in the long run increases the health, wealth, and well-being of the community as a whole. These observations fit well with findings from experiments and computer simulations that strong sharing norms are most likely to emerge when resource acquisition is uncertain (Kameda et al. 2002, 2003).

Social vs. Individual Risk Management

The vulnerability of need-based transfer systems to cheating highlights the fact that the social management of risk can, in itself, be a risky prospect. Relying purely on risk pooling or other social forms of risk management may be unwise. If risks can be avoided, reduced, or absorbed, then people may be able to reduce their dependence on their social networks for help and, thus, their exposure to the problems of cheating and the moral hazard. Thus, individual-based risk management strategies are important across the societies that we study as well. Pastoralists guard their livestock, have them vaccinated, engage in other forms of subsistence, and maintain large herds. Foragers develop their hunting and gathering skills and rely not only on unreliable large game but reliable foods such as plants, small game, and honey. Ranchers vaccinate their livestock, kill predators, get jobs as teachers, open bed-and-breakfasts, and so on. Sometimes, one risk management strategy may do double duty. This is exemplified by the way that Loita Maasai use *osotua* relationships not

only to help each other after losses have occurred but also to build up herds before disaster strikes so that losses can simply be absorbed. In other situations, need-based transfers at the moment of need are simply not feasible. In Mongolia's Darhad Depression, for example, when a disaster strikes, it strikes everyone. Rather than pooling risk after the fact, Mongolian herders cooperate with each other to reduce their exposure to risks by gathering hay and building livestock shelters.

Across the societies of the Human Generosity Project, we see a diversity of individual and social risk management strategies that are well suited to the particular challenges and opportunities of each local ecology and subsistence practice. Across all our sites, we find social risk management systems, most notably systems of risk pooling via need-based transfers. However, this social risk management comes with risks including the possibility of cheating and moral hazard. Interestingly, many need-based transfer systems encourage individual-level risk management practices to reduce the reliance on need-based transfer systems. For example, among the Maasai, *osotua* partners are expected to manage their own risk through being responsible and restrained in their herding practices. Cowboys in the Malpai borderlands of the southwestern United States expect themselves and their neighbors to be self-reliant, managing their own risks effectively and not taking unnecessary ones. Yasawan horticulturalists expect one another to work hard in their own gardens throughout the year to reduce seasonal shortfalls. Similar patterns are emerging at our other field sites as well: We find that norms of self-reliance coexist with a strong ethic of helping others in need. This suggests that norms of self-reliance and responsibility about managing risk as an individual can actually be an important part of a larger social risk management system by reducing the risk of cheating and moral hazard. Norms of self-reliance may also help limit the reverberation of negative events in a network, increasing the resilience of the system to catastrophic events. The interplay between individual and social risk management strategies and the norms underlying them is an important topic that we are continuing to explore at our field sites and in The Human Generosity Project more generally.

Conclusion

Risk management is an evolutionarily ancient and widespread problem that all humans face. Members of the Human Generosity Project are working together in a highly interdisciplinary team to understand both individual and social risk management strategies employed by societies around the world. Every society we have studied to date utilizes social forms of risk management, most notably systems of risk pooling through need-based transfers. Need-based transfers are often characterized by giving "from the heart" to individuals who are in need. These need-based transfer systems differ in important ways from society to society, with some based on dyadic relationships and others based on group membership, and some based on small transfers, while others are based on large gifts. These differences across need-based transfer systems appear to be suited to the spatial and temporal

patterning of local risks. We suggest that risk pooling through need-based transfers is an important and flexible strategy that communities can and do use to manage risk and maintain a sustainable way of life across diverse ecologies.

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