# Food Sharing

MICHAEL GURVEN and ADRIAN V. JAEGGI

## Abstract

Food sharing is a human universal trait that forms the centerpiece of economic and social life in hunter-gatherer societies. Human livelihoods require sharing at all life stages: to support infancy, childhood, and adolescence, and to help reduce risk of daily food shortfalls in adulthood. Attempts to understand the evolved human life history require an examination of the conditions that led to the evolution of food sharing. We summarize key findings and recent directions, and raise unexplored questions. Past emphases included testing predictions from several evolutionary models, and the role that sharing may have played in shaping human family formation. The functions of sharing fall into two categories: reducing food shortages that come with relying on a difficult foraging niche, and advertising attractive qualities of the donor. New directions include multivariate analyses of larger samples from a variety of diverse small-scale subsistence populations, greater consideration of the interdependency between producing food and sharing it, incorporation of bargaining theory into exchange models, and greater attention to proximate psychological mechanisms. Future studies need to explain cross-cultural variation in sharing norms and behavior and use a variety of methods to better bridge observed sharing patterns with the study of underlying social preferences and beliefs.

## INTRODUCTION

Cooperation is a core feature of human social life. Among hunter-gatherers, whose lifeways most closely resemble those of ancestral humans, the direct transfer of food items among individuals (hereafter "food sharing") is an important and ubiquitous form of cooperative behavior. A long history of sharing throughout human evolution likely shaped key aspects of our social psychology, social organization, and morality. Understanding the conditions that favored the evolution of human sociality and those that led to different sharing strategies and patterns is therefore an important task for the biological and social sciences. This entry summarizes key findings on food sharing and recent research directions and highlights unresolved questions. Although sharing psychology evolved in a hunter-gatherer context, its relevance is not confined to this domain: Ideas about fairness in

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norms of meat distribution among groups of hunters can reveal insights into norms of profit sharing among business associates starting a new company, or views on wealth redistribution and inequality. To date, observational studies on sharing and cooperation are limited in number relative to experiments under artificial conditions, but new syntheses hope to bridge methodological divides and improve understanding of both proximate and ultimate explanations for sharing.

## FOUNDATIONAL RESEARCH

The most discernible form of food sharing among primates is between females and their offspring. Provisioning by males and other helpers is less common. An ecology defined by more difficult feeding strategies and greater offspring dependency (altriciality) are generally associated with longer and more intensive provisioning (Jaeggi & Gurven, 2013b). For instance, ape or capuchin monkey females occupying a difficult foraging niche may occasionally allow their offspring to take food they cannot yet process independently, while frequent active provisioning by multiple caregivers is required to sustain high fertility and fast growth rates among marmosets and tamarins. Human foragers represent an extreme case: they require provisioning well into their late teenage years (Kaplan, 1994; Kaplan, Hill, Lancaster, & Hurtado, 2000), and parents often provision multiple dependents simultaneously (Gurven & Walker, 2006). Nepotism toward kin due to shared biological ancestry (i.e., kin selection) is a valid evolutionary explanation for vertical food transfers from older to younger generations.

What distinguishes human sharing from that of other primates is extensive resource exchange among adults: mates, kin and unrelated individuals. Foraging is a risky venture, especially when the diet is comprised of large mobile game. For instance, Hadza hunters successfully kill large game on only 4% of excursions, whereas hunters in the neotropics have 35–60% success rates. Sharing food therefore helps substantially reduce the chance of daily food shortfalls (Winterhalder, 1986; Smith, 1988). Six foragers each with a 60% failure rate pooling their catches at the end of the day can reduce the probability of going without food to 4.7%. A difficult foraging niche combined with delayed juvenility favored a sexual division of labor (with sharing), whereby men hunt and women gather in order to produce different macronutrients and jointly provision children (Lancaster, 1978). The evolution of the "nuclear family" has household sharing as a fundamental element, and together with intergenerational transfers from grandparents and other relatives forms the basis of human social organization (Kaplan, Hooper, & Gurven, 2009). Primates may share large fruits or animal prey among adults, but such items typically do not make up a large part of their diets. Furthermore, sharing

among adults mostly seems to reflect an inevitable by-product of individual foraging strategies rather than a desired outcome (Jaeggi & Gurven, 2013b).

A number of evolutionary processes, however, can potentially stabilize sharing patterns and may all be compatible with the functional reduction of risk. Tolerated scrounging occurs when food is transferred in order to avoid potential physical or reputational costs from hoarding (Blurton Jones, 1987). Donors in this model do not gain anything from recipients but are instead viewed as being manipulated by others. Reciprocal altruism occurs when giving food to others is conditional on past receipt, but whose stability requires future interactions (Kaplan & Hill, 1985; Trivers, 1971). *Costly signaling* refers to displays of donor quality that are difficult to fake, including the ability to produce large quantities of food, or to convey altruistic intent (Bliege Bird & Smith, 2005; Zahavi & Zahavi, 1997). Their cost helps ensure the honesty of the signal. A growing body of research has sought to test these competing models using quantitative data on exchanges in subsistence populations (Bliege Bird & Bird, 1997; Bliege Bird, Bird, Smith, & Kushnick, 2002; Gurven, Hill, *et al*., 2000; Gurven, Hill, & Kaplan, 2002; Hames, 2000; Koster, 2011; Nolin, 2011; Ziker & Schnegg, 2005). Key tests include whether food transfers are biased toward those who have shared with the donor in the past (reciprocity), kin (nepotism), or those in need or with greater dominance (scrounging) (see Jaeggi & Gurven, 2013a for a recent meta-analysis).

Debates pitting these hypotheses against each other have rippled throughout anthropology and related disciplines. The validity of viewing sharing as strategic exchange or insurance has been called into question by the argument that game is a "public good" that cannot be defended nor can others be excluded, a view consistent only with tolerated scrounging (Hawkes, 1991). Men's high motivation to hunt despite losing meat to scroungers is thus interpreted as an opportunity to signal the hunter's quality, and to reap personal benefits that may be at odds with family provisioning (Hawkes, 1993). According to this signaling-based view, marriage is not a cooperative enterprise, but rather represents an informal recognition of property rights wherein men can reduce costs of direct competition by laying claim to specific wives (Hawkes, 2004). These views have been influential because they highlight the notions that subsistence strategies are not easily distinguished from mating strategies, and that food is a currency that carries value beyond calories.

## CUTTING-EDGE RESEARCH

One conclusion from multivariate analyses is that sharing is overdetermined; no single explanation accounts for all food transfers, and certain

characteristics may work in concert. For example, kin may receive shares because of nepotism, but may also be trustworthy and reliable sharing partners, thereby promoting reciprocity (Allen-Arave, Gurven, & Hill, 2008). At different life stages, or under varied circumstances, different donor motivations may lead to sharing. An unmarried man with no dependents may have different motivations to share than a married man with multiple dependents, or even an older man with no dependents but with adult offspring. While developing a standardized vocabulary for categorizing sharing behavior may help parse out the variation (e.g., Gurven *et al.*, 2002), current directions recognize that food is a fungible currency that can be used strategically to serve multiple purposes. Similar conclusions have been reached in the study of chimpanzee food sharing (Gomes & Boesch, 2011; Silk, Brosnan, Henrich, Lambeth, & Shapiro, 2013).

The inter-relationship between production and distribution has not been well studied. While the notion that "work transforms material things into property" has long existed (Barnard & Woodburn, 1987), most foundational research and subsequent experiments attempt to explain altruistic sharing only after resources are generated or provided by experimenters. People are much more generous with "windfalls" provided by experimenters than they are with earned income or with endowments that are earned during the course of experiments. In general, we should expect a degree of incentive-compatibility when considering the role that sharing rules or norms have on motivating work effort in group production tasks.

Considering ecological underpinnings and functional design of sharing in the first place leads to distinct expectations of sharing psychology and behavior. The rarity of active sharing among most adult primates in the wild, and limited giving demonstrated in experiments, is consistent with a predictable diet that does not require joint production by multiple individuals, nor pooling in order to reduce risk. Among humans, the necessity for sharing in order to provision infants, juveniles, and adolescents—and abundant inter-household sharing among adults—has led to a relatively high intrinsic propensity to share with others, and a high degree of sensitivity to cues of recipient need (Jaeggi, Burkart, & Van Schaik, 2010). Human societies have been adept at developing sharing norms that reinforce work-related motivations in ways that help promote productivity, and efficient divisions of labor. For example, an initial wave of sharing often occurs among production task group members in hunter-gatherers. More generally, rewarding others who provide critical input (e.g., helping in a monkey hunt), skills and risk (e.g., harpooners among whalers), or capital (e.g., lending arrows and providing canoe) is a common theme in ethnographic accounts of game ownership and share rights [reviewed in Gurven (2004)]. Differential gain in distributions due to "earned" privilege serves to reinforce work motivation, as might

additional attention or benefits obtained from others, as proposed by costly signaling.

Another important area of research addresses limitations of theoretical models of cooperation that employ simple binary behaviors: cooperate or defect. In real-world situations, defection may not be easy to confirm by participants or to measure by researchers. Insights from bargaining theory in economics, and market dynamics affecting supply and demand of resources and partners (Noë & Hammerstein, 1994), suggest that exchange of equal shares may be only one of many possible outcomes of reciprocity. While giving away more than you receive is expected with nepotism toward kin and costly signaling, reciprocity may also be consistent with a range of unequal profit sharing among social partners. Unequal profit sharing may be analogous to a graduated income tax, or may be a compromise associated with group living. Another possibility is that benefits are delivered only during difficult periods of low productivity such as during sickness, injury, or disability (Gurven, Allen-Arave, *et al*., 2000; Sugiyama & Chacon, 2000). Generous donors in hunter-gatherer societies tend also to be high producers. High producers can better afford the "taxes" or insurance premiums to receive support when needed, even if some donors never cash out. If others do not provide support during these high-demand periods, then defection with these "fair weather friends" may be likely. Another possibility in interdependent foraging groups is that food is transferred to others conditional on their productive labor, rather than specific quantities of food produced. Such an approach is more forgiving toward those who may occasionally have nothing to share than more rigid strategies such as tit-for-tat reciprocity (Gurven, 2004). Attention to others' work effort given interdependent production may be a robust aspect of evolved human psychology. For example, the perceived fairness of different income redistribution and welfare schemes in modern nation-states has been linked to beliefs about work effort and deservedness, features of an evolved psychology of reciprocity in the context of a hunting and gathering economy (Fong, 2001).

High status men and women in hunter-gatherer societies are often praised for their generosity, and meat may be used strategically as a means to garner allies and political support (Patton, 2005). Whether higher status is bestowed more because of the high productivity or from the signals of public generosity evidenced by sharing behavior, however, is debatable (Gurven & von Rueden, 2006; Smith, 2004). Greater analysis of the content and interpretation of signals is therefore a productive direction (Smith & Bliege Bird, 2005). Displays of generosity toward specific others may not be informative about future intents toward those who do not receive food. Intent as signaled by food transfer may vary positively with the benefits conferred on a recipient

and the cost incurred by the donor. The latter may be critical for signaling a willingness to sacrifice on behalf of specific others (Tooby & Cosmides, 2008).

The growing study of proximate psychological mechanisms complements the ultimate-level perspective based on adaptive function. Efforts to understand the proximate mechanisms underlying reciprocity have traditionally focused on calculated score-keeping. While moderate correlations between amounts given and received among dyads (or pairs) are significant in human studies, and even after controlling for kinship and proximity relations among those dyads, such correlations may be consistent with a variety of psychological mechanisms (Jaeggi & Gurven, 2013a). Reciprocally sharing dyads may not be literal score-keepers, especially with more involved social partners with whom a longer time horizon of exchange is envisioned (Silk, 2003). These "communal" relationships or "friendships" where deliberate score-keeping may be frowned upon are akin to notions of generalized reciprocity as originally described by Sahlins (1972).

## KEY ISSUES FOR FUTURE RESEARCH

Future progress in understanding the ecology of human food sharing will require new theoretical and empirical studies. For example, several commonly observed sharing norms are not easily explained by simple evolutionary models: pregnant women often reduce work effort yet often receive meat preferentially. Those with small families often give more food away and receive less than those with large families. Many groups have explicit rules about privileged categories of recipients, such as kin, in-laws, and task group members, and these may vary by resource. Rights to property ownership vary by culture and by resource type. Distributions may be carried out by individuals other than the acquirer. While norms often help facilitate coordination and reduce transaction costs, many do not benefit all individuals at all times. How these rules or norms came to exist, how they are maintained and enforced, and how they change over time is a fruitful direction for future research (Kaplan & Gurven, 2005).

Many of the kinds of norms described above are oriented toward helping others in need, shaped in the context of interdependent food production. While contingent sharing, punishment and social exclusion are possible ways to help limit defection and ensure cooperative behavior, the observed high levels of prosociality observed in human foraging groups may require additional explanation beyond the simple evolutionary models of kin selection, costly signaling and dyadic reciprocity. Cooperation may lead to mutual benefit for many individuals once normative pooling systems are in place, thereby making it more costly to defect (i.e., receive benefit without contributing) than cooperate. Without the proverbial temptation to defect,

norms help solve the cooperative dilemma by structuring payoffs in a way that is consistent with mutualism. Several researchers have labeled humans as "cooperative breeders" because of the high degree of helping behavior and higher-than-expected fertility of human hunter-gatherers (Hrdy, 2009). Kinship through blood and marriage additionally binds individuals' welfare together in novel ways (Chapais, 2009). Others have invoked some level of group selection to help favor the evolution of prosocial norms (Bowles & Gintis, 2011). Regardless of the mechanism, it is clear that the human life course could not have evolved without extensive food sharing, and in particular, long-term imbalances in food transfer within and among families. Divisions of labor by gender, age, and ability are manifestations of a general strategy of reaping collective gains from specialization with sharing. How sharing and cooperation helped support a feeding niche oriented more toward difficult-to-acquire foods, linked to the human life history traits of highly dependent juvenile period, a long post-reproductive lifespan and an encephalized brain remains to be untangled. In addition, why do these traits appear so exaggerated only among humans?

Future work also needs to better bridge observed sharing patterns with the study of underlying social preferences and beliefs. Despite high levels of observed sharing among foragers, controlled experiments conducted in both modern industrialized societies and small-scale populations reveal that generosity among foragers and farmers is neither generalized nor indiscriminate, and that punishing direct defections is more common than punishing third-party defections that harm another but that do not directly impact the punisher (Henrich *et al*., 2005; Marlowe *et al*., 2008). How a potentially universal sharing psychology is shaped by local conditions to generate the diverse types of sharing norms and levels of behavior observed in human societies has been well addressed. For example, the Ache of Paraguay share the same game items differently when on foraging treks than when at their more permanent residential settlement (Gurven *et al*., 2002). Group size is much larger in the settlement, a factor that has been shown to lead to less cooperation in a variety of contexts. In larger groups, however, small subgroupings of families may cooperate actively, thereby achieving the benefits of sharing but at reduced risk of defection from relying on too many others who may also be difficult to monitor. The ways in which humans self-organize into residential units and cooperating clusters is another important future area of research, as most theoretical studies of cooperation show that cooperation requires some form of assortment and breaks down with increasing group size or with forced interactions with random members from the population. Group size, extent of interdependency in production, predictability of resource supply, and other factors may help shed light on group differences in sharing patterns.

Our understanding of sharing behavior, norms and psychology will improve with more studies done in diverse populations, including those undergoing socioeconomic transformation (e.g., Franzen & Eaves, 2007). Studies will require methodological pluralism (e.g., experiments, observation, and interview) and sufficient time depth. A wider range of topics should also be covered. We close with two unexplored topics. To date, the trading of food for other goods or services has been widely studied among nonhuman primates, but rarely studied formally in small-scale populations, even though divisions of labor and increasing gains from trade are believed to be critical for the evolution of human societies. Finally, advances in behavioral endocrinology may be fruitful for revealing species and intergroup differences in hormonal correlates of sharing, distress in the presence of others' need, male parental care, risk buffering and caretaking by grandparents and other helpers. Candidate hormones include cortisol, vasopressin, dopamine, oxytocin, and testosterone (Ellison & Gray, 2009).

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