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Haphazard Sharing of Plant Food among the Baka Hunter-Gatherers in Southeast Cameroon

Ayako Sekino[1,*], Ryoma, Otsuka[2] & Hirokazu Yasuoka[3]

[1]*Graduate School of Asian and African Area Studies, Kyoto University*
[2]*Graduate School of Information Science and Technology, Osaka University*
[3]*The Center for African Area Studies, Kyoto University*
*E-mail: sekino.ayako.z66@kyoto-u.jp

Abstract Most studies of food sharing among hunter-gatherers have focused on meat. However, sharing of meat is not the only food sharing practice among hunter-gatherers. Today, the Baka hunter-gatherers live a semi-sedentary lifestyle in southeast Cameroon, spending more than half of the year in semi-permanent settlements near roads. As their lifestyle has changed, their diets have become dependent on agricultural crops. Plant foods, including agricultural crops, show less variation in yield among harvesters than wild meat, and therefore they are not expected to be shared as frequently as meat. However, we observed that the Baka frequently practiced food sharing even in their settlements. Among the Baka, the women who cook decide to whom to give the food. They gave dishes preferentially to close kin, which contributed to increasing their inclusive fitness, and therefore kin selection at least partly explained their food sharing practices. However, they also gave dishes preferentially to their husbands' kin, which did not necessarily increase the women's inclusive fitness. In addition, sharing with distant kin formed a considerable part of the sharing network. Furthermore, visits made to the cooks influenced the subsequent sharing. In summary, the Baka practice food sharing according to plural and complex principles, and because of this hybrid nature, their food sharing practices appear to be haphazard. The results also have implications for the distinction between sharing and reciprocal gift-exchange. Food sharing among the Baka is characterized by imbalances in mutual giving and returning. Although it is much easier to balance mutual giving and returning for agricultural crops than meats, they do not pay attention to this. Unlike reciprocal gift-exchange, which involve a timeline of alternating mutual giving and returning, sharing is practiced of the basis on contingent face-to-face interactions in everyday life.

Keywords: Egalitarian; Food sharing; Reciprocal gift-exchange; Sharing network; Woman.

Introduction

Many studies have examined the origin and functions of food sharing because it forms one of the most basic relationships between people in hunter-gatherer societies. Kishigami (2021) categorized studies of food sharing into three groups:

ecological anthropological studies, evolutionary ecological studies, and social/cultural anthropological studies. Ecological anthropological studies examine the ecological adaptations of food sharing. For example, how is sharing work to equalize the amount of meat accounted for among individuals that differ in their luck and hunting skills? Moreover, how does sharing serve to diversify the risk of fluctuations in the availability of wild foods (Wiessner 1982)? Evolutionary ecological studies often view food sharing as altruistic behavior and focus on the ultimate factors that influence it. For example, kin selection theory predicts that food sharing increases inclusive fitness (Hamilton 1964) by preferentially helping close kin (Kaplan & Hill 1985). Finally, social/cultural anthropological studies argue that sharing reinforces social bonds and builds equitable social relationships in egalitarian societies; such studies have focused on sharing not only in an economic context but also in the context of the whole culture (Kent 1993). Sharing practices vary from society to society. Some studies have focused on the social aspects of sharing, while others see it as a biological survival strategy (Kaplan & Hill 1985; Kent 1993). Kelly (2007) reported that sharing is practiced under a variety of influencing factors and many variables.

Widlok (2017) argued that sharing has often been improperly positioned in the context of cultural anthropology and economic anthropology. Mauss (1923/1924) provided a theoretical explanation for the reciprocal exchange of goods using the concept of the 'gift'. Mauss argued that the concept of a gift involves three obligations (giving, receiving, and returning a gift) and is also accompanied by generosity and power. Although Mauss mentioned the practice of giving in Pygmy groups, he produced no evidence of food sharing in hunter-gatherer societies. Woodburn (1998) stated that "sharing is not a form of exchange". Belk (2010) pointed out that few studies have explicitly compared gift-exchange with sharing and there is a tendency to use gift-giving and sharing interchangeably in consumer research. In addition, Hunt (2000) criticized the use of the gift concept to describe the practice of sharing. Nevertheless, sharing has long been described as a form of reciprocal gift-exchange (Widlok 2017). This paper provides empirical data that contributes to the arguments around the distinction between sharing and gift-giving, or reciprocal gift-exchange.

Most previous studies of food sharing among hunter-gatherers have focused on meat (Testart 1987; Bahuchet 1990; Smith 2004; Yasuoka 2021). This is likely because the process of meat sharing often seems reasonable in terms of a leveling mechanism. Central African hunter-gatherers, or so-called 'Pygmies', share meat in three phases (Bahuchet 1990; Kitanishi 1996). The first is based on explicit rules. Men distribute the butchered meat, usually according to their roles during the hunt. The second is typically carried out between hunters and those who did not participate in the hunt. Generally, there are no explicit rules, and therefore, each incidence of sharing occurs individually, depending on the situation at the time. The third is the sharing of cooked meals by women.

However, sharing of meat is not the only food sharing practice among hunter-gatherers. In the diets of most hunter-gatherers, plant foods (e.g., wild tubers and fruits) are much more important than meat in terms of calorie intake (Lee 1968; Bahuchet et al. 1991; Tanaka 2014). For example, the Baka in the western Congo

Basin receive 68% of their total calories from wild yams in the forest camp (Yasuoka 2006a). Today, the Baka live a semi-sedentary lifestyle in southeast Cameroon, spending more than half of the year in settlements near roads. As their lifestyle has changed, their diets have become dependent on agricultural crops, including those they cultivated and those obtained from neighboring 'Bantu' farmers (Bahuchet & Guillaume 1982; Kitanishi 2003). Normally, plant foods show less variation in yield among harvesters than wild meat. Therefore, sharing as a leveling mechanism would not be as crucial for plant food as it is for wild meat, and therefore plant foods are not expected to be shared as frequently as meat. Nevertheless, in practice, plant foods are frequently shared.

Sharing plant foods is generally practiced after cooking and has no explicit rules. Therefore, its characteristics are difficult to capture. Whatever are the characteristics of plant foods sharing among the Baka, they will contribute to the understanding of food sharing in general. In this paper, we describe the Baka's food sharing in a semi-permanent settlement where they consume mainly agricultural crops and identify the principles behind their sharing practices, and discuss the distinction between sharing and reciprocal gift-exchange.

People and Study Site

The Baka are one of the Congo Basin hunter-gatherers. The total population of the Congo Basin hunter-gatherers is estimated to be 250,000–350,000, which makes it the largest population of hunter-gatherers in the world (Hewlett 2014). The Baka live in southeast Cameroon, northwest of the Republic of the Congo, and in northeast Gabon, which is covered by tropical rainforests. They have an estimated population size of 30,000 to 40,000 (Hewlett 2014).

The first author (AS) conducted fieldwork for 9 months in total (September to November 2014; June to August 2015; November to December 2016; and December 2019 to January 2020) in the village of Lembe, near the town of Messok, Department of Haut-Nyong, East Region of Cameroon (Figure 1). Houses were scattered for 150 m along the road to Messok at the time of the survey. As of August 2015, the population was 148 (168, including those absent from the village at the time of the survey). All were Baka, except for one male Nzime farmer who married a Baka woman. Nzime farmers inhabited the neighboring villages and interacted daily with the Baka of Lembe. Lembe village has a kukuma, a 'chief' who acts as an adviser among the Baka but does not have specific power or privileges. A Baka household is generally composed of a married couple and their children, and they share a hut. All households in Lembe had some kinship through the father of the village chief as of 2015.

Today, the Baka make a living through a combination of farming, hunting, gathering, and working for farmers. The Baka traditionally hunted animals with spears and hunting nets, but since the 1960s, with the availability of steel wire, snare trapping has become the primary hunting method. They hunt medium-size animals such as blue duiker and Peters's duiker (Yasuoka 2006b, 2014; Bobo et al. 2015; Duda et al. 2017). Snares are generally set and maintained by men.

Women sometimes patrol the snare lines and reset snares. Men who hunt animals butcher them, but it is women who cook the meat.

The gathering of plant foods is mainly the work of women, who gather wild fruits, leaves, yams, and mushrooms. In addition to hunting and gathering, the Baka in Lembe engage in shifting cultivation. Most families have their own fields; however, the harvests are insufficient to feed themselves throughout the year due to the small field size. Therefore, they often obtain agricultural produce from farmers. Baka women generally spend about half a day in the farmers' fields to weed, harvest, and transport crops. In exchange for their labor, they receive cassava, other crops, alcohol, or cash (300 to 500 FCFA). Some Baka men cultivate cacao, but few can manage their fields properly. Instead, many work in cacao fields owned by the Nzime farmers in neighboring villages or sometimes in distant villages for several months to earn money.

Baka people usually have a meal two or three times a day if food is available. Women mainly cook meals in the evening. In the morning, they sometimes eat a leftover meal cooked the previous night. For lunch, they often eat light snacks such as grilled plantain or maize. Adult women who cook the food generally give dishes to other households. After cooking, they dish up food on plates, which are immediately delivered to people inside and outside the household. In most cases, the cook passes dishes to children and instructs them who to give the dishes to; therefore, the women who cook decide who receives food.

Methods

I. Recording sharing practices

In this paper, the term 'give' refers to the act of transferring goods from one person to another, regardless of the giver's intent, as envisioned by gift theory. The term 'share' refers to the entire act of a person from cooking, preparing meals, giving dishes to various people, and consuming them. Therefore, 'sharing food' also includes 'giving food,' and one case of sharing typically involves multiple acts of giving.

Baka households in Lembe can be roughly categorized into two groups according to the kin-relatedness and consumer units (Figure 1). AS observed sharing practices in both groups but we focus on Group A because many people in Group B moved to a forest camp during the survey. AS collected data on food sharing, focusing on 16 adult Baka women from all Group A households for 9 days (July 13, 15, 16, 17, 18, 20, 21, 23, and August 6, 2015). A household was defined as a group that share one cooking area or a cooking fire unit. A mother and her married daughter sometimes live in a single house, but if they cook separately we considered them as belonging to different households.

In the evenings, AS visited each of the 16 women's household to record the food that was cooked and the individuals to whom each woman gave dishes. Small portions taken directly from cooking pots and snacking were not recorded. Because AS was also within the sharing network (but as a receiver only), we

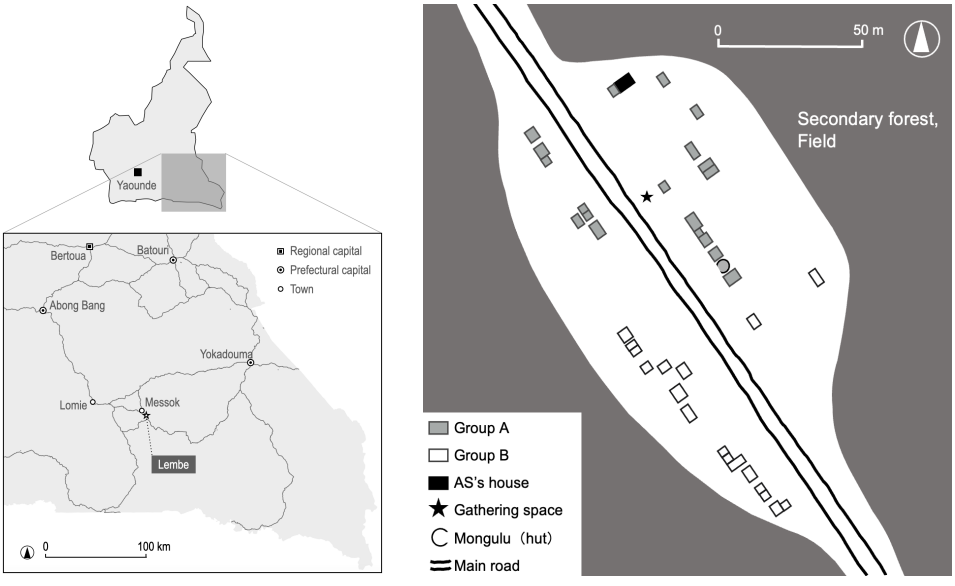

Figure 1 Lembe village. For the food sharing survey, households were divided into Groups A and B based on the location of the houses and their relationships.

included her in the data. When she could not directly observe the delivery of meals, AS soon asked the cook for information and recorded the receivers and contents of the dishes. When food was cooked late in the evening and dishes were given the next day, she recorded the contents and the receivers at the time when the dishes were given.

To compare the frequencies of giving among different food items, the number of dishes given that contained each food item was counted (Kitanishi 1998). A dish containing one staple or one side dish was counted as one. When two different food items were in a single dish, it was counted as 0.5 for each food item. However, to avoid underestimation, meat was always counted as one, even if it was cooked with other foods, because people considered the meat to be a distinct food item in the dish. Ingredients such as Gnetum leaves and cassava leaves served with meat were counted as 0.5 for each food item. Dishes consumed only within each household were not included in the descriptions and analyses.

In addition, AS observed interactions among the women during cooking. For eight sharing cases, she recorded the movements of people outside the household and their behavior around the cooks.

II. Kin relatedness between givers and receivers

We identified a woman who cooked as the giver for each sharing case. On the other hand, the households of the receivers of the dishes were identified as

receivers. Whoever received dishes, we always referred to the name of the woman or wife when mentioning the receiver household.

We quantified the kin-relatedness between the givers and receivers based on genetic distance, identified as follows: 1/2 between siblings, and between a parent and an offspring; 1/4 between a grandparent and a grand offspring, or an aunt and a niece and so forth. For each sharing case, we identified the giver's closest kin in the receiver households and used their kin-relatedness for analysis. Generally, a giver's closest kin in each receiver household was the wife or the husband. In cases where a giver woman had moved in by marriage, the receivers were generally her husband's relatives. In this case, we measured the kin-relatedness between the giver's husband and his closest kin in the receiver households. Then we added 'H', which means husband, to classify their kin-relatedness; for example, 1/2H refers to the relationship between the giver's husband and his sister in a receiver household. If the kin-relatedness could be calculated in two ways, the closer one was taken. In a polygamous household, we set the kin-relatedness of two wives as 0. The kin-relatedness with AS was 0 for all women.

III. Analysis of food sharing networks

We compared the observed sharing network with randomized networks to examine the relationship between kin-relatedness and the frequency of giving dishes. When describing and analyzing the sharing network, one set of dishes given was counted as one giving. Because AS received dishes during the survey period, we included AS in the network analysis.

We performed the following analysis using R version 4.1.1 (R Core Team 2021). First, we visualized the observed food sharing network with 'ggraph' version 2.0.5 (Pedersen 2021), using the force-directed layout algorithm by Fruchterman & Reingold (1991). Then, to identify clusters in the observed network, we used the 'cluster_walktrap' function in 'igraph' package version 1.2.6 (Csárdi & Nepusz 2006), which calculates communities using the random walk process (Pons & Latapy 2006).

To obtain randomized networks, receivers were randomly sampled (sampling without replacement) in each sharing case, while controlling the givers and number of receiver households. Thus, each simulated dataset contained the same number of sharing cases and the same number of receivers per case. We ran this simulation 100,000 times and calculated the proportion of food given to each kin-relatedness category (e.g., 1/2, 1/2H) for each simulated dataset. We compared the proportional distribution from the simulated datasets with the corresponding proportion calculated from the observation data. We calculated Monte Carlo p-values as follows:

$$p = (1 + N\_ds) / (I + 1)$$

where I is the number of iterations (i.e., the total number of simulated datasets) and N_ds is the number of simulated datasets with values greater than or equal to or less than or equal to the observed value (we used the smaller value). We adjusted the p-values using the Bonferroni correction method.

RESULTS

I. General description of sharing

During the survey period, 92 sharing cases (excluding cases in which no dishes were given) were observed, and 348 sets of giving dishes were recorded. The mean number of receiver households was 3.78 per case, the median was 4, and the range was 0–9. Because each giving generally consisted of a couple of dishes, 792 dishes were recorded (Table 1). Of these, agricultural crops accounted for 75%. Staple crops (cassava, plantain, yautia, and maize) accounted for 57%, while agricultural side dishes (cassava leaves and yautia leaves) accounted for 18%. Wild plant side dishes, such as Gnetum leaves, accounted for 9%. Meat, including both hunted and purchased, accounted for 9%.

Cassava was the most frequently cooked and consumed staple crop: it was cooked 69 times. In 97% (67 of 69 cooking events) cassava dishes were given to at least one person outside the household. Plantains were also cooked frequently, on 93% of cooking events. In addition, cassava leaves and Gnetum leaves were frequently cooked and given as side dishes. Cassava and Gnetum leaves were given on 86% and 94% of cooking events, respectively. Maize was given less frequently (62%). Meat was given in all cooking events, regardless of hunting activities or the purchase of meat. Fish were rarely eaten during the survey, although dam fishing became more popular in the dry season (December to February).

For foods that were cooked 15 times or more, the average number of dishes given were given from 3.0 to 4.6. Bushmeat caught in snares was given in 4.6 dishes on average, higher than the number that were given plant foods. However, meat purchased or obtained from farmers were given only in 1.7 dishes on average because it tended to be small portions: a small piece of meat cost 100 FCFA. Yautias were generally given in fewer dishes than cassavas and plantains, likely because the yautia harvest was not large.

Figure 2 shows the distribution of sharing cases by the number of receiver households per cooking event. Dishes were given to 2–6 households in 73% of all cases. Those given to seven or more households accounted for only 8%. This was probably because the unit of harvest (a cassava plant, a bunch of plantains, and so forth) and the size of the cooking pot determined the maximum number of dishes that could be provided.

II. Sharing network

Figure 3 shows a sharing network described based on the number of set of dishes given out. The network was constructed by focusing on women, or the wives, in the 16 households (note that givers are women, but receivers are households). The 33 red arrows indicate giving to the closest kin (1/2 and 1/2H). Thick arrows indicate giving that occurred frequently. The 35 green arrows indicate giving to the second-closest kin (1/4 and 1/4H). The green arrows are generally finer than the red ones, indicating that they occurred less frequently. The red

Table 1 Number of cooking events and number of dishes given to households

Food item	Number of cooking events	Number of cooking events where dish(es) was given to individuals outside the households	Percentage of cooking events where dish(es) was given to individuals outside the households	Number of dishes given to individuals outside the households	Average number of dishes given per cooking events
	(A)	(B)	(B/A)	(C)	(C/A)
Agricultural crop (staple)					
Cassava	69	67	97%	284.0	4.1
Plantain	28	26	93%	104.0	3.7
Yautia	12	10	83%	24.0	2.0
Cassava polige	5	5	100%	18.0	3.6
Maize	13	8	62%	13.0	1.0
Graind corn wrap	2	2	100%	6.0	3.0
Banana	2	1	50%	2.0	1.0
Agricultural crop (side dish)					
Cassava leaf	21	18	86%	81.5	3.9
Yautia leaf	20	19	95%	60.0	3.0
Wild plant side dishs					
Gnetum leaf	16	15	94%	47.5	3.0
Mushroom	11	10	91%	23.0	2.1
Bush mango sauce	4	4	100%	14.0	3.5
Meat					
Bushmeat (self supply)	15	15	100%	69.0	4.6
Bushmeat (Purchased)	3	2	67%	5.0	1.7
Fish	5	5	100%	21.0	4.2
Larva	7	6	86%	20.0	2.9
Total	231	213		792.0	
Average			88%		2.9

arrows are prominent in the cluster on the right, while the green arrows are prominent in the cluster on the left. The 26 gray arrows indicate giving to distant kin (≤1/8, ≤1/8H) or non-kin individuals. Giving dishes to distant kin also contributed to the network formation to some extent, although the arrows were generally finer. Finally, the 12 yellow arrows indicate giving to AS. AS was positioned at the center of the network, likely because she visited all households, to make observations, which affected women who were cooking ineluctably. After she visited some houses where the women were cooking, they usually brought dishes to her. She received dishes from nine individuals during the survey, but this number declined by about half after the survey.

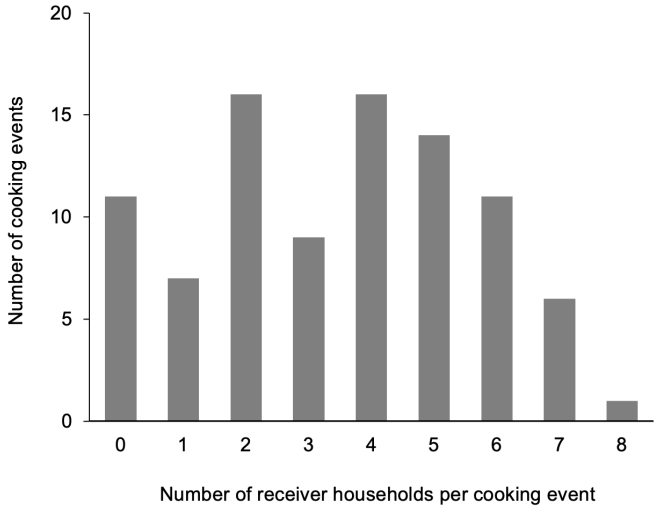

Figure 2 Distribution of cooking events by the number of receiver households. The 16 women that were monitored cooked 92 times.

The network contained two clusters; one surrounded Aya, Anne, and Malenge, and the other was clustered around Mbude. Aya was the wife of Ngubu. He was kukuma, a 'chief' of the settlement. Malenge was Aya's daughter, and Anne was the kukuma's son's wife. Mbude was the kukuma's half-sister (Figure 4). In Baka society, a kukuma has no specific authority to make decisions and has no real power, and therefore he is one of the elders who advise younger people. The kukuma had married three women but only Aya was alive at the time of the survey. The 16 women primarily consisted of Aya's or Mbude's daughters or sons' wives.

In the 9 days of the survey, Aya received 39 times and gave 12 times, while Mbude received 24 times and gave 15 times. These two women were the oldest and did not undertake farming and cooking work as often as the younger women. They often received dishes from their daughters or sons' wives. Sometimes they were given uncooked crops from the younger women. Although Aya and Mbude received much more food than they gave, they always gave dishes to someone when they cooked.

In addition to the two oldest women, Abele also received more than twice as many dishes as she gave to others (received 10 times and gave 4 times). Abele was positioned on the edge of the sharing network because she did not often participate in sharing. She was born in another village, then married and moved to Lembe. However, having a small number of close kin was not necessarily related to the low frequency of sharing. Anne, who was in a similar situation to Abele, gave dishes frequently. Across the clusters, there were only two pairs of mutual sharing (Meka–Yeye and Ntolia–Yeye). Although they were close relatives (Yeye and Ntolia were sisters, and Meka was their mother), they belonged to

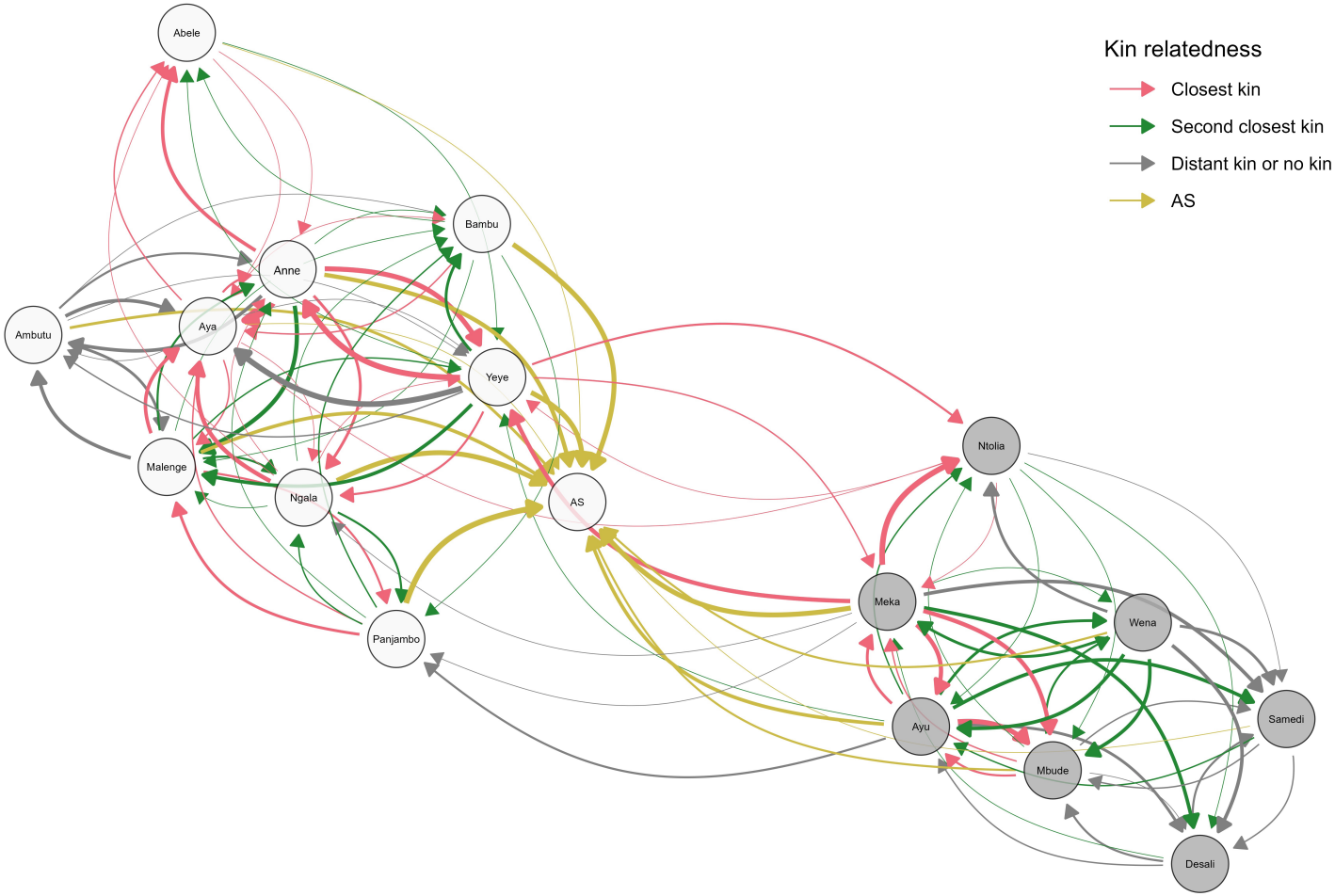

Figure 3 Food sharing network of the 16 women that were monitored. The red, green, gray, and yellow arrows indicate the giving of dishes to the closest kin (1/2 and 1/2H), second closest kin (1/4 and 1/4H), distant and non-kin individuals, and AS, respectively. The thickness of each line corresponds to the number of set of dishes (e.g., staple and side dish) given.

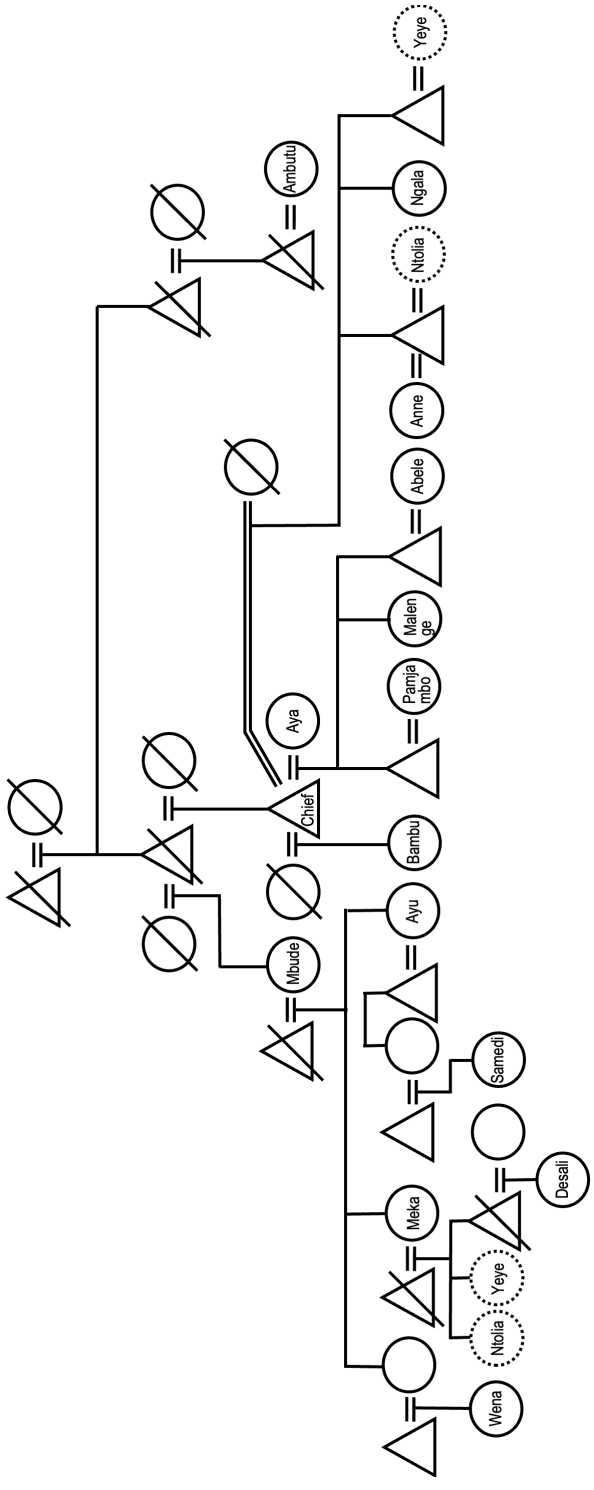

Figure 4 Family tree of Group A including the 16 women that were monitored in 2015. Dotted circles indicate individuals appearing in two places.

different clusters. Meka and Yeye lived close to each other, but Yeye gave more to Aya (her husband's half-mother) and her husband's siblings, including Malenge. Thus, Yeye and Meka belonged to different clusters. Yeye and Ntolia lived relatively far apart. Yeye lived near her maternal relatives, and Ntolia lived near her husband's relatives.

III. Comparison between the observed sharing network and randomized simulations

Women gave dishes to various households in the settlement, including close kin, distant kin, and non-kin households. The number of potential receivers in different kin categories varied from one woman to another. Therefore, to examine how kin-relatedness influenced giving, we constructed randomized simulations to correct for the uneven distributions of kin categories and compared them with the observed sharing network.

Table 2 shows the frequencies of giving by kin-relatedness between givers and receivers. We carried out randomized simulations and compared the observed proportion of giving to households in each kin-relatedness category with the distribution of the simulated proportions. As shown in Figure 5, giving to the closest kin (1/2 and 1/2H) was observed significantly more frequently than in the randomized simulations. Women frequently gave to their husbands' closest kin (1/2H). Giving to the second-closest kin (1/4 and 1/4H) had the same frequency as in the randomized simulations. Giving to distant kin (1/8–1/128 and 1/8H–1/64H) and non-kin household was observed significantly less frequently than in the simulations. Giving to AS was observed significantly more frequently. In summary, the women selectively gave dishes to their closest kin, regardless of the distinction between their own or their husbands' relatives.

Table 2 Number of giving by kin categories

Category	Index	Kin relatedness	Number of giving	Percentage
Closest kin	1	1/2	71	20.4%
	2	1/2H	51	14.7%
Second closest kin	3	1/4	54	15.5%
	4	1/4H	28	8.0%
Distant kin	5	1/8	14	11.2%
		1/16	19	
		1/32	6	
	6	1/8H	0	6.0%
		1/16H	20	
		1/32H	1	
Non kin	7	0	19	5.5%
Non kin (AS)	8	0	65	18.7%
Total			348	100.0%

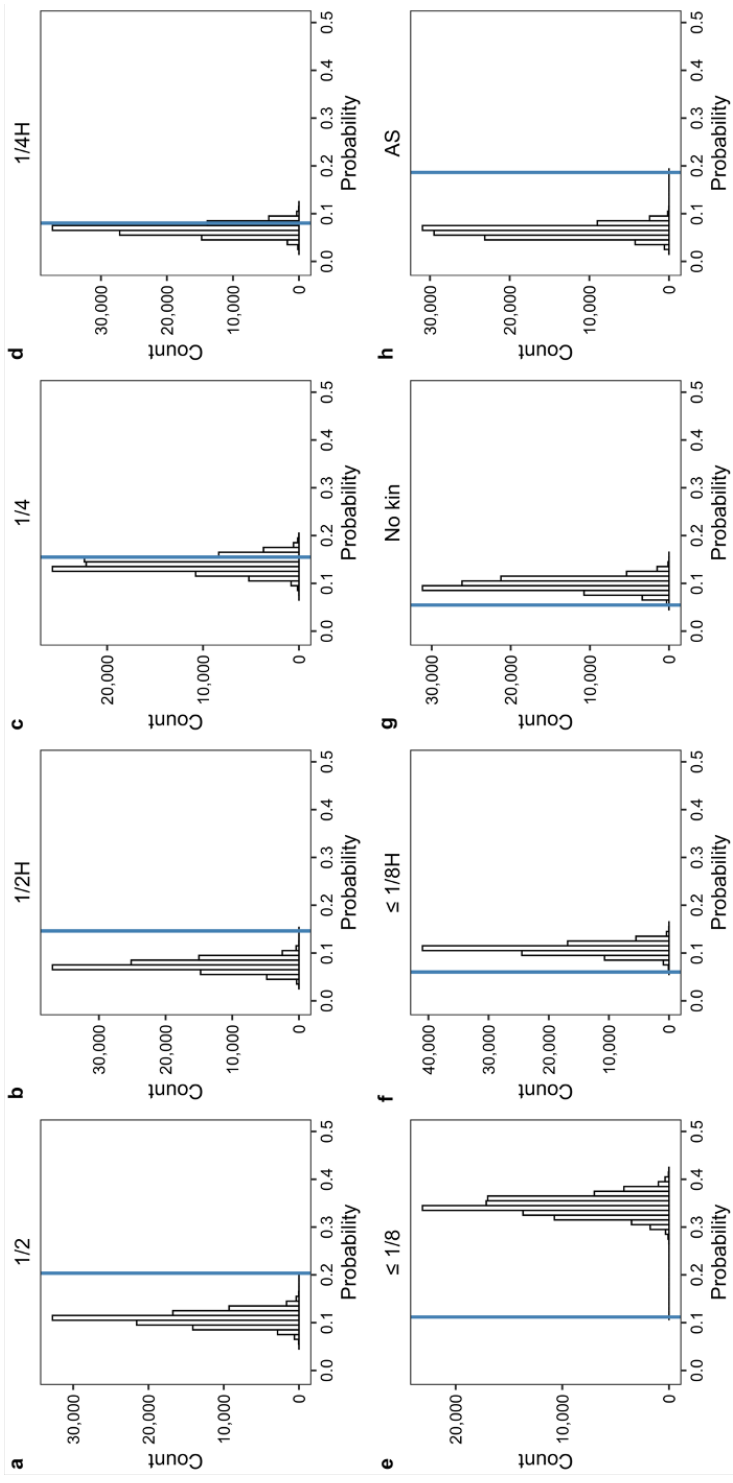

Figure 5 Distributions of the probability of giving in each kin category in randomized simulations of food sharing (100,000 times). Giving of dishes were counted by a set of dishes given to each household (N = 348). Blue lines indicate the observed proportions of dishes given to each kin category. P-values for 1/2, 1/2H, 1/8H≥, and 1/8H≥, were 0.000; P-value for 1/4 was 0.343; P-value for 1/4H was 0.255.

IV. Giving to distant kin and non-kin households

Overall, 41.4% of all of dishes given were to distant kin and non-kin households (including AS) (Table 2). Even excluding AS, 27.9% (79/283) of the dishes were given to distant and non-kin. Because each woman had many distant or non-kin households, giving to them occurred less frequently than predicted by the randomized simulations. From household perspectives, considerable proportions of the dishes they cooked were given to distant or non-kin households.

The proportion of dishes that women gave to distant or non-kin households varied among individuals (Figure 6). Of the 16 women, Desali, Ambutu, and Samedi had few close kin. Desali and Samidi moved to Lembe that year. Desali gave 89% of the dishes she cooked to distant or non-kin, followed by Ambutu (78%) and Samedi (57%). Desali was unmarried and was the great-granddaughter of Mbude. Her father was deceased, and her mother was not in Lembe. Desali lived in Lembe with her paternal relatives, most of whom were her distant kin. She frequently gave dishes to Mbude, her great-grandmother, and Samedi, her great aunt's husband's sister's child. Ambutu also gave more dishes to her distant kin because she had fewer close kin. Ambutu gave dishes most frequently to Aya and Malenge. The fathers of Aya's husband and Ambutu's husband were brothers. Malenge was Aya's daughter. Although Ambutu was not their close kin, they lived next to each other and spent almost all their day together.

Abale, Bambu, Panjamnbo, and Ngala did not give to distant kin. However, they gave more to AS than the other women. If they had not given to AS, they would have likely given dishes to distant kin (e,g., Ambutu). Interestingly, some women gave dishes to distant kin across clusters. For example, Meka gave dishes to Pamjambo and Ngala once, despite them living far from the house and distant kin. Ayu also gave dishes to Pamjambo three times, who also lived away and

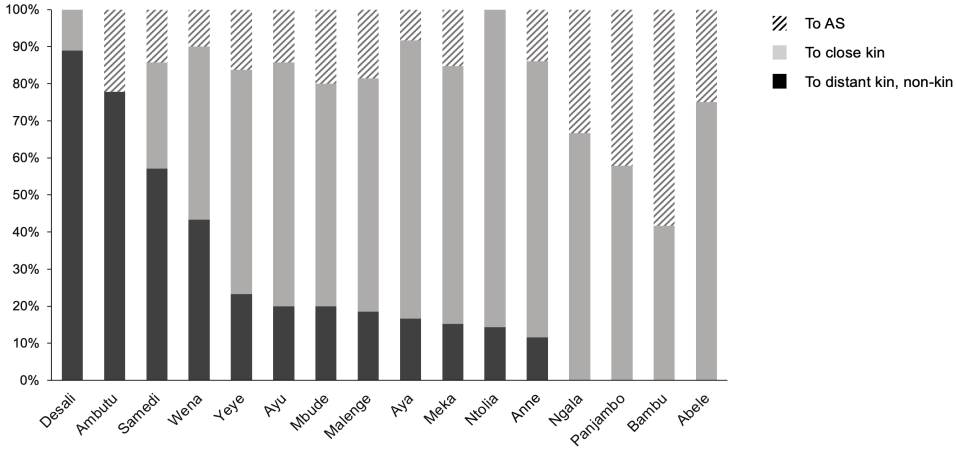

Figure 6 Proportions of the number of dishes given to each kin category by the 16 women that were monitored. Dishes given were counted by a set of dishes given to each household (N = 348).

was not close kin. As we argue later, the reason for these cases may be that there were some interactions between them on that day.

The women gave dishes to different households each day. Of the 16 women, 10 gave to more than seven different households (Figure 7). On average, each woman gave meals to 6.6 different households during the survey. The women gave dishes to an average of 3.78 households per cooking event.

As shown in Figure 3, giving and returning were usually mutual but unbalanced. Figure 8 shows the number of times giving and receiving occurred for each pair among the 16 women, excluding the pair with no interaction or 22 pairs in which one to three sets of dishes were tranfered in total. Out of 36 pairs, in which giving and receiving occurred four times or more, only seven pairs were balanced. Here, 'balanced' refers to the cases where the number of dishes given between from each other were equal or could be equal at the next meal (although they could remain unbalanced). It was notable that giving and returning that occurred in most pairs (29 of 36) were unbalanced. In 26 pairs (pairs 1–20 and 24–29), the number of dishes given was twice as large as in the others.

The most unbalanced pairs were Aya and Yeye (Pair 1). Aya gave Yeye food once, but Yeye gave Aya food eight times. Out of the 15 highly unbalanced pairs, seven were mother-daughter pairs (pairs 1, 2, 3, 4, 8, 9, and 10, including the husband's half-mother, i.e., the Aya and Anne pair). Four pairs included Aya (pairs 1, 3, 4, and 12), and two pairs included Mbude (pairs 8 and 9). These two women were older and did not cook frequently, and therefore they received many more dishes than they gave. However, Meka, who is younger than these two, gave more than she received from her daughter Ntolia (pair 2) and Yeye (pair 10). Five of the remaining eight highly unbalanced pairs were distant kin pairs. For example, Samedi received five times from Meka (pair 6), the sister of her uncle's wife, and four times from Wena (pair 14), the daughter of the sister of her uncle's

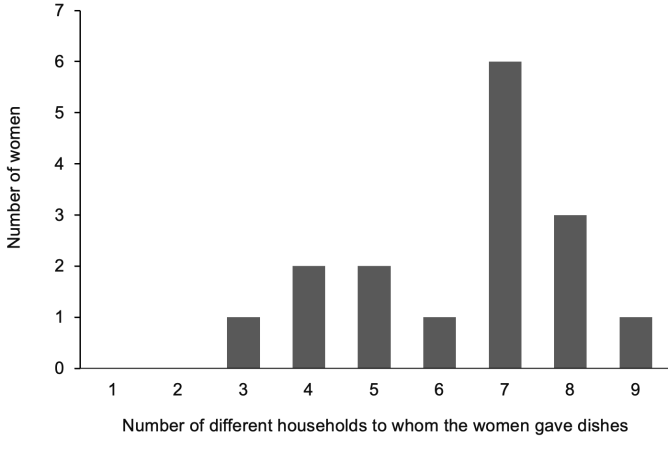

Figure 7 Distribution of the number of giver women (N = 16) by the number of different households to whom they gave dishes during the survey.

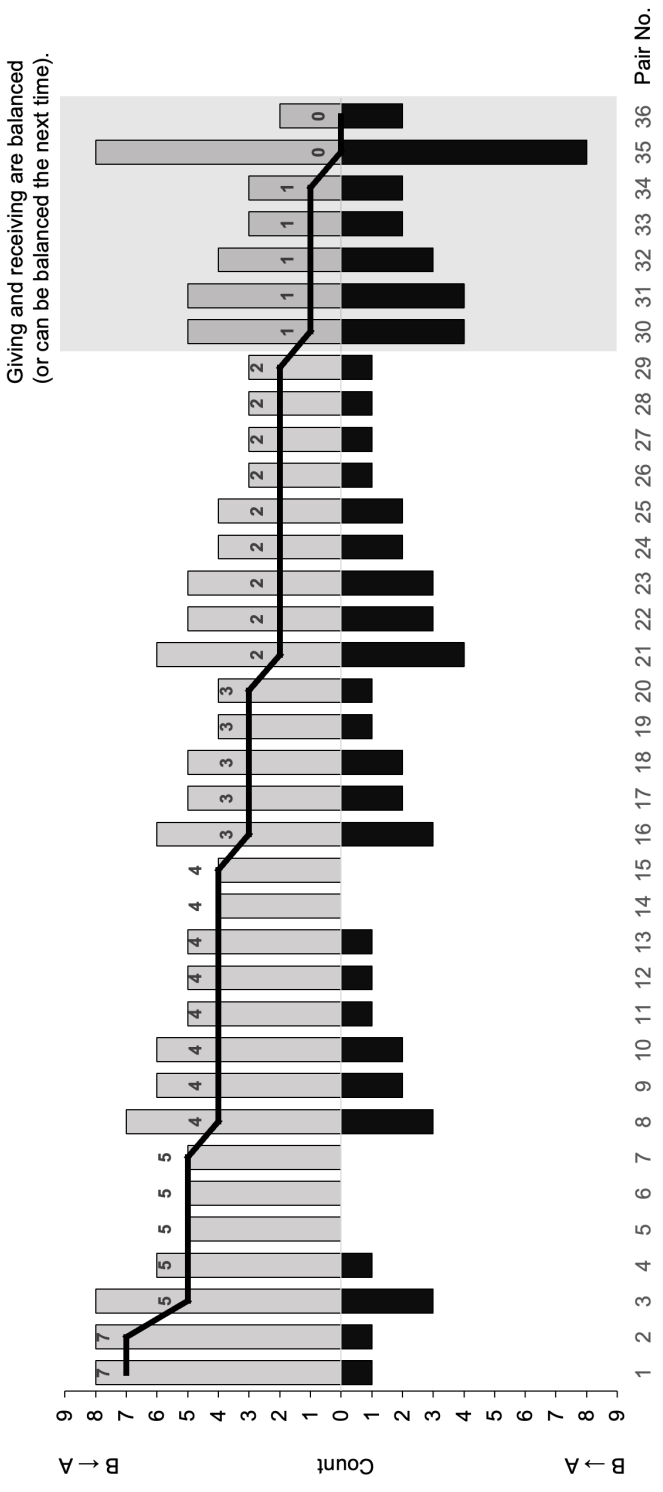

Figure 8 Number of times giving and returning for each pair among the 16 women that were monitored, excluding those between which three or fewer dishes were given. Dishes given were counted by a set of dishes given to each household (N = 348).

wife. However, she did not give anything to these two women. In addition, Wena also gave to her cousin's daughter Desali and her cousin Ntolia, but did not receive from them (pairs 7 and 15). In summary, imbalances occurred in pairs between the closest kin and between distant kin.

If this food sharing were based on gift theory, one person would give something to another, and the receiver should then give back something equivalent, ensuring that a balance between the two is maintained. However, the woman regularly gave additional dishes to the same individuals before receiving anything in return; therefore, the giving and returning between most pairs was unbalanced. We discuss this below.

V. Face-to-face interaction in the sharing process

Peopl in Lembe often visited each other and socialized for short periods. These visits often resulted in food sharing. The following is an example of such sharing by Mesi on November 9, 2016.

16:35 Mesi began peeling a cassava.
16:38 A girl, Aji, brought Mesi's baby to the house. During food preparation, Aji disposed of water from the pot and fetched fresh water.
16:41 Aya entered the house, sat down, and looked at the mushrooms. Aya's grandson, Amendi, arrived later and Aya stayed for a further 10 min before leaving.
16:42 A woman, Ayawe, came and sat outside by the door without speaking. She took care of Mesi's baby, stayed for 12 min, and left.
16:59 Mesi asked Ambese, a young girl living nearby, if there were oil palm nuts. During this time, three boys plucked mushroom stipes.
17:30 A woman, Likombo, arrived and asked Mesi if there were plantains. Mesi just said, "Wait." Likombo stayed for seven min, standing outside the house.
17:34 Two children came from Mbude's house, which was located far from Mesi's house, and whispered very shyly, when asking for cassava. Mesi responded that she had no fresh cassava, and therefore she would give them boiled cassava.
17:45 Mesi had no salt, so she went to Abele's house to get some.
17:53 Mesi placed the boiled cassava and plantains on plates.
17:55 She also finished cooking the mushroom sauce and place it on the otherplates. First, she gave the dishes to her son and told him to take them to the 'big house' (Mbude's house). Mesi asked her son to bring plates from the household to which she would give the food. She told the children to hurry up and bring the plates.
18:01 Amendi, a grandchild of Aya carried the dishes to Ayawe. An old woman, Aya, received the dishes directly from Mesi and went outside to eat with her grandchildren, Amendi and Ambese. Mesi's son, Ibe, delivered the dishes to Abele.

Mesi cooked boiled plantains, cassava, and mushroom sauce and gave it to five households. Four adults, including AS, and two children also visited Mesi. In addition, Mesi's two sons and three children from other households assisted in preparing food or delivering dishes. The three visiting women stayed for about 10 min. Likombo asked for cassava, but Mesi did not give any to her. Ayawe and Aya were close kin of Mesi and interacted with her daily. Mbude was not a regular receiver of dishes from Mesi and had fewer daily interactions, but she gave dishes to Mbude after visiting the children.

AS monitored eight cases of cooking and recorded visitors and individuals to whom the cooker gave dishes. On average, 5.8 visitors were recorded, and in the subsequent sharing the cooks gave dishes to an average of 2.9 of the 5.8 visitors. In total, the cooks gave dishes to an average of 4.3 individuals, 67% (2.9 individuals) of whom visited the cooker in advance. Considering that each woman had a couple of regular receivers (close kin, such as mother and daughter), visiting the cooks significantly influenced the subsequent food sharing. One reason for frequent visits is that tools are frequently lent and borrowed during cooking. AS surveyed the household goods of six women in Lembe. Only three of the six women had a wood mortar, a pestle, a cutting board, and a grinder plate to crush nuts, all of which were essential for cooking. Each woman had only two or three plates and bowls to serve food. Therefore, women often used each other's cooking tools. This way food was cooked involving other people in the process, and this face-to-face interaction was a motivation for sharing food.

Discussion

I. Plural principles of sharing

We described food sharing among the Baka in a semi-permanent settlement where meat accounted for only a small proportion of the food consumed. One of the major factors influencing food sharing among hunter-gatherers is the risk associated with the instability of food acquisition (Wiessner 1982; Kelly 2007; Hames 1990). This factor is important when people depend on wild food, in particular meat. Differences in hunting skills are significant, and success is highly dependent on luck; therefore, sharing contributes to the levelling of meal opportunities among group members (Woodburn 1982). However, most foods that people consumed at the study site were agricultural crops, considerable parts of which they obtained from neighboring farmers. Because opportunities to obtain agricultural crops did not vary much among individuals, there was little need to give food frequently from an ecological or economic perspective. Nevertheless, they enthusiastically practiced food sharing.

The women gave dishes preferentially to their close kin. This tendency would increase their inclusive fitness (Kaplan & Hill 1985). Therefore, kin selection accounted at least partly for the food sharing practices of the women in Lembe. However, they also gave dishes preferentially to their husbands' kin, which would not necessarily increase the women's inclusive fitness. This type of sharing had

the function of coordinating social relationships with in-laws. In addition, sharing with distant kin accounted for a considerable part of the sharing network. This may be accounted for by reciprocal altruism (Trivers 1971), which refers to reducing the risks of hunger and increasing the fitness of each member. However, reciprocal altruism seemed to play only a small role, if it even worked at all, among the Baka in Lembe, who largely depend on agricultural crops. In summary, it was reasonable to conclude that the Baka women practice food sharing according to plural and complex principles, and they do not always decide on whom they will give the food to before they start cooking.

Because of its hybrid nature, the Baka's food sharing practices appeared to be haphazard, as shown by the daily changes in the individuals that the women gave dishes to. Among the Baka, food sharing is rarely provoked by someone's explicit oral request; instead, as far as we could observe as a third party, sharing appears to be based on the voluntariness of those who cook the food. However, Goffman (1963) pointed out that communication is possible without words. Although we stated above that the cook decides who to give dishes, interactions in the harvesting and cooking process likely affect their decision. When she gives dishes to someone, a consensus between the giver and those around her has been tacitly built through their interactions. Therefore, those who do not receive dishes rarely complain. Similarly, Imamura (1993) argued that Bushmen's food sharing is a part of the 'sharing system' that involves various face-to-face interactions during women's daily co-operation, which involves gathering and cooking. Although kin-relatedness affects how the tacit consensus is built to some extent, face-to-face interactions during the harvesting and cooking were also important for the Baka. From the results, two conclusions were reached. First, when the person lives close to or shares the same living space, that person shares food regardless of whether he or she is distant kin or not. Second, in the case of distant kin who are not normally involved in cooking, temporary interactions promote sharing. These results indicate the importance of face-to-face interactions.

II. Sharing rather than a reciprocal gift-exchange

We noted that food sharing in Lembe had the general characteristic of an imbalance between givers and receivers. Although we only observed imbalances in the short term, we think they represent the overall nature of food sharing. The women regularly gave additional dishes to the same individuals before receiving dishes in return, and therefore so imbalances accumulated over time.

This point relates to the distinction between sharing and gift-giving.[1] Gift-giving theory predicts that the imbalance between mutual giving and returning affects social relations between two actors. As Mauss (1923/1924) argued, gift-giving involves a show of prestige by the giver and a debt to the receiver. When people receive something, they feel indebtedness, and elevate the giver to a position of superiority. As a result, the receiver gives back something equivalent to offset the imbalance, or even something more valuable to turn the relationship in their favor. In this way, gift-giving generates reciprocal exchanges. However, among the egalitarian hunter-gatherers (Woodburn 1982), food, and particularly

wild meat, tends to be transferred in fixed directions. Therefore, giving and returning are generally unbalanced because considerable disparities exist between individuals in their ability to procure meat. According to the gift-giving theory, numerous individuals can therefore become indebted to a skilled hunter. Should this occur, social equality would become unsustainable. Nevertheless, egalitarian hunter-gatherers, including the Baka, maintain social and economic equality among all members through the prevention of power and authority being bestowed on specific individuals. This is the paradox of egalitarians: the impossibility of resolving economic and social equality (Yasuoka 2021).

It is important to note that although it is much easier for agricultural crops to be balanced between giving and returning, the Baka do not pay attention to this. When they give or receive dishes, they maintain an unconcerned and casual attitude, without expressing gratitude or making a greeting. Moreover, they do not remember each sharing case precisely, nor do they talk about it later. The Baka's behavior suggests that food sharing among the women is a substantially different practice from gift-giving. If the gift-giving theory is not applied to their food sharing practice, the paradox of economic and social equality does not exist. Unlike gift-exchange, which involve a timeline of alternating giving and returning, sharing is practiced on the basis of contingent face-to-face interactions in everyday life.

Many studies have posed the question, "why do people share?" This question assumes that food is to be consumed within a household. However, this question does not seem to be relevant to the Baka's sharing practices. For them, sharing food is as natural as cooking food. We must therefore ask the question "how do they choose the individuals with whom they share food?" Sharing does not consist only of the transfer of goods. To understand sharing, it is necessary to also understand not only the act of giving itself but also the interactions among the people surrounding it, the atmosphere of the location, and the relevant situations and contexts. Individuals are choosing whom to give to by responding to various situations through repeated face-to-face interactions.

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Note

(1) Food sharing is sometimes discussed in the framework of reciprocity, in particular generalized reciprocity. Sahlins (1972) proposed three types of reciprocity according to social distance. Generalized reciprocity refers to a generous one-way transfer to close relatives. The opposite is negative reciprocity, which refers to attempts to gain something without giving anything from those with the least familiarity. Between the two, there is balanced reciprocity. However, it should be noted that Sahlins claims that acts based on generalized reciprocity, i.e., giving something without expecting anything in return, are usually performed as gift-giving from the rich to the poor to show, and to maintain adequate sociability. However, as Widlok (2017) mentioned, the concept of reciprocity is too rough to distinguish between sharing, gift-giving and exchange. individuals, and AS, respectively. The thickness of each line corresponds to the number of dishes given.

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