

Why Wage Earners Hunt

Food Sharing, Social Structure, and Influence in an Arctic Mixed Economy

by Elspeth Ready and Eleanor A. Power

Food sharing has been a central focus of research in human behavioral ecology and anthropology more broadly. Studies of food sharing have typically focused on either the individual's motivations to share or the social formations and value systems that sharing produces. Here, we employ social network analysis to do both, investigating how strategic economic decisions, such as decisions about sharing, are embedded in and feed back onto social structure. This research is based on a questionnaire conducted with 110 Inuit households during 12 months of ethnographic fieldwork in Kangiqsujuaq, Nunavik, Canada. In Kangiqsujuaq, traditional Inuit resource harvesting and sharing practices coexist with and depend on opportunities and constraints in the cash economy. Food sharing in Kangiqsujuaq emerges as a complex social, political, and economic phenomenon that accomplishes different objectives for actors based on their social position. The network approach adopted in this research highlights the conjugate role of individual decisions and structural constraints in broader processes of social and cultural change. In the mixed economy of Kangiqsujuaq, food sharing, social structure, and political influence are intimately connected. The results suggest that economic and political inequality in the settlement are reinforced by the social structures produced through sharing.

In Kangiqsujuaq, a small Inuit village in the eastern Canadian Arctic, harvesting and sharing of traditional country foods, such as seal, arctic char, and beluga, are a major part of everyday life. Food sharing occurs both as communal meals and as gifts of country foods exchanged between family, friends, and neighbors. However, harvesting country foods is a costly endeavor in terms of time, energy, and money (Smith 1991). In the contemporary mixed cash/subsistence economies of Canadian Arctic settlements, harvesting requires snowmobiles, guns, gasoline, and a wide range of other equipment, whose purchase and maintenance depend on money earned through wage labor. Given these costs, why do wage-earning Inuit continue to spend their hard-earned money on harvesting and sharing of country foods? Why do Inuit not simply eat cheaper purchased foods or focus only on filling their own freezers with country food? And as is often the case for productive harvesters when their freezers are already full, why do they acquire surpluses of country food and give them away instead of setting the money used for hunting aside for the future?

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This question of why people should expend time and energy to acquire resources only to give them away to others has been a longtime focus of study in anthropology. Within the subfield of human behavioral ecology (HBE), researchers have identified a number of mechanisms that can motivate individuals to share with others, such as kin selection, tolerated theft, reciprocal altruism, and costly signaling (Gurven 2004; Jaeggi and Gurven 2013a; Winterhalder 1997). Some sharing can be explained by inclusive fitness (Hamilton 1964, 1970), when individuals provision their kin (Gurven 2004; Hooper et al. 2015; Koster and Leckie 2014). In some cases, allowing others access to a resource may be less costly than trying to prevent needy individuals from taking it (Blurton Jones 1984). Often, sharing may foster long-term relationships of mutual aid and assistance (Hill and Kaplan 1993; Jaeggi and Gurven 2013b; Jaeggi et al. 2016). Some studies have suggested that sharing food with others could be driven by the potential reputational benefits of provisioning others, as a person may acquire a reputation for hunting skill, generosity, or commitment to the group (Bliege Bird and Bird 2008; Bliege Bird, Smith, and Bird 2001; Gurven et al. 2000). In many cases, these various mechanisms appear to be operating in concert, although their relative importance may change between cultures, resources, and even individuals within a group (Gurven 2004).

What this body of work fundamentally demonstrates is that while sharing food is certainly an economic transaction, it is also a social interaction. The close association of exchange and social relationships is of course a foundational observation

within anthropology: exchange relationships—whether of ceremonial goods, livestock, or foodstuffs—reveal how individuals orient themselves to one another, situating them in the larger social structure of their community (Mauss 1923). Economic anthropologists have often focused not on the individual returns to sharing, but on how forms of exchange are related to the operation of broader systems of social and political relationships (Kent 1993; Peterson 1993; Price 1975; Testart 1987) and on the production of value and meaning (Appadurai 1986; Bourdieu 1980; Graeber 2001). As any particular exchange is simultaneously the product of an individual's motivations (which will often be based on economic need) and the social formations and value systems in which they operate, a full explanation of any exchange system requires a clear understanding of both (Coleman 1986; Irons 1979). How are individual transactions shaped by the larger structure in which they are situated? And how does that exchange in turn influence the evolution of the social system? Are the benefits of food sharing equally shared, or do some stand to gain more (or less) from these exchange relationships? In the case of food sharing in Kangiqsujuaq, what is the role of traditional food exchange when economic life in the settlement depends on cash? While questions such as these may have been implicitly asked within the literature on food sharing, they have not yet been rigorously addressed, in part because the methods needed to answer them have only recently been developed. Advances in social network analysis, however, now make such questions empirically answerable.

Social network analysis refers to a set of methods designed for the analysis of relational data. Relational data represent connections between agents and are inherently different from most social science data because relations cannot be reduced to an attribute of any one agent (Wasserman and Faust 1994). As such, social network analysis is the set of methods most appropriate for the study of social structure (Scott 2000). Borgatti et al. (2009) argue that the fundamental insight of social network analysis is the idea that explanations for an individual's behaviors and personal outcomes may be found by examining his or her position in the network structure. For large, complex data sets, quantitative graph theoretic tools provide precise methods of comparing the properties of a graph and the individuals represented in it (Wasserman and Faust 1994). Such tools and the relational perspective that they imply allow social scientists to study the individual as both shaped by social structural forces and also agentfully shaping those same structural realities (Coleman 1986). Network ideas have long been implicitly part of HBE research on food sharing specifically (e.g., Hames 2000; Kaplan and Hill 1985) and support relationships and exchange more generally (e.g., Macfarlan, Quinlan, and Remiker 2013; Wiessner 1982). Recently, human behavioral ecologists have begun to apply network analysis techniques to explore and explain relational data (e.g., Alvard 2003; Kasper and Borgerhoff Mulder 2015; Koster 2011; Lyle and Smith 2014; Nolin 2010, 2012; Ziker and Schnegg 2005). Nevertheless, these studies have largely focused on the individual and

the dyad rather than the overall structure and feedbacks therein.

Here, we employ network analysis to investigate the relationship between food sharing and socioeconomic status in Kangiqsujuaq. We first examine the question of why Inuit share country food, situating household sharing strategies in the broader context of the mixed cash/subsistence economy (cf. Gurven et al. 2015; Kasper and Borgerhoff Mulder 2015; Scelza et al. 2014; Ziker et al. 2016). As we will show, country food sharing in Kangiqsujuaq serves multiple purposes for different households, based in large part on their relative socioeconomic status. We then explore the collective consequences of these sharing strategies for patterns of inequality in the settlement. Those who are able to afford the high cost of harvest production are able to embed themselves in the sharing network and reap not only material but also social and political benefits. Perhaps counterintuitively, we suggest that the dynamics of sharing may actually be contributing to inequality within Kangiqsujuaq, a conclusion that is consistent with historical evidence of social differentiation among Inuit (e.g., Hervé 2015; Pryor and Graburn 1980; Stevenson 1997; Woollett 2007). These results demonstrate that a network approach allows us to identify not only the factors that shape household involvement in country food sharing in Kangiqsujuaq but also the aggregate social results of those actions.

Study Area

Kangiqsujuaq is a settlement of roughly 800 people located on a large bay on the west coast of Hudson Strait in Nunavik, Canada. All but a half dozen of the village's permanent residents are Inuit. The village is nestled in a valley between steep hills, near excellent hunting territories for a wide range of animals. The village is generally accessible only by plane, although it is possible to drive snowmobiles or boats to neighboring villages (roughly 175 km away) depending on the season. Most imported goods are brought to the settlement by sealift during the summer months. Small quantities of perishable goods, mainly fruits and vegetables, arrive by plane on a roughly weekly basis.

Nunavik is a region unique in Canada for having its own regional government within a province (Quebec): the Kativik Regional Government (KRG), which was created as a part of the James Bay and Northern Quebec Agreement (JBNQA) in 1975. Nearly all Nunavimmiut live in KRG social housing, paying a monthly rent that includes water, sewage, electricity, and heating for the use of a home (mostly duplex units) owned by the housing board. Nunavik also has a land claims organization, Makivik Corporation, which is responsible for administration of the lands covered by the land claims agreement. Many Kangiqsujuarmit hold local elected positions with KRG or Makivik.

Throughout Nunavik, Inuit began to settle around trading posts and missions in the early part of the twentieth century. Inuit settlement in the Canadian Arctic was a complex process

that involved both the active manipulation of social and economic opportunities by Inuit and the policies of the Canadian federal government, which discouraged settlement until after the Second World War (Damas 2002; Duhaime 1983). In Nunavik, nearly all families had moved to settlements by the early 1960s. Over the past few decades, the importance of formalized education, wage labor, and new forms of recreation have steadily increased throughout the Canadian North. Today, the most common form of employment in Kangiqsujuaq is public sector wage work, which includes jobs at the school, daycare, and nursing station; administrative positions at the local KRG and Makivik offices; and maintenance work. Private sector employment is limited and includes jobs at the general stores as well as fly-in/fly-out jobs at a nickel mine in the region; however, few Inuit find work at the mine to be an attractive option. Unemployment rates are very high, but few individuals qualify for welfare payments. Seniors qualify for various support payments, as do women supporting minors. Inuit households also receive occasional payments from mining royalties. Even with subsidies on housing and many food items and commodities, the need to import foods and other goods means that the cost of living in Nunavik is extremely high relative to southern parts of Canada (Kativik Regional Government 2016). The combination of the high cost of food and high unemployment means that poverty and food insecurity are serious problems in the region, as they are elsewhere in the Canadian Arctic (Council of Canadian Academies 2014). In 2013–2014, 20% of Kangiqsujuarmit had low food security, and 21% had very low food security (Ready 2016; cf. Lawn and Harvey 2004).

Traditional or “country” foods, such as seal, beluga, arctic char, caribou, and ptarmigan, continue to constitute an important part of the diet in Kangiqsujuaq. Duhaime, Chabot, and Gaudreault (2002) reported that 12.3% of all calories consumed by Nunavimmiut came from country foods, representing 58% of total meat intake. Lawn and Harvey (2004) obtained a similar figure for women in Kangiqsujuaq (11.1%) based on a 24-h recall study. Harvesting of country foods (hunting, fishing, and gathering) remains an important economic activity for many households in Kangiqsujuaq; the livelihoods of most households involve negotiating their participation in wage labor and traditional harvesting activities.

Relying on country food is not a simple alternative to wage labor, however. Modern Inuit harvesting relies on a wide array of purchased goods, including major investments such as snowmobiles, all-terrain vehicles (ATVs), and watercraft, as well as recurring expenses for supplies such as gasoline and ammunition. Inuit harvest participation is therefore mediated by access to cash and other materials (both personally held resources and those accessed through social networks) as well as by the harvester’s knowledge and ability (Collings 2011; Langdon 1991; Wenzel 2000). Harvesting country foods consequently entails sizable investments of time, money, and energy. Hunting is therefore not a solitary endeavor; households coordinate their resources and effort to support their harvest production.

Country food continues to be shared widely in Kangiqsujuaq as well as in other Inuit settlements (Bodenhorn 2000; Collings 2011; Collings, Wendell, and Condon 1998; Harder and Wenzel 2012; Hovelsrud-Broda 2000; Kishigami 2000). Country and purchased foods are not substitutable in this respect: although purchased foods may be included in shared meals and are occasionally given to needy households, usually on demand, they are not shared in the way that country foods are, that is, given deliberately as gifts and distributed widely. Although there is a small black-market trade in country food, selling country food to individuals is prohibited by the JBNQA. Although the prohibition is not strictly enforced, many Nunavimmiut strongly disapprove of the practice of selling country food precisely because it undermines sharing, believing that traditional foods should be free to all despite the costs of modern harvest production (Gombay 2010). Nunavimmiut are allowed to sell harvested foods to the local Hunter Support Program, a government program that purchases food from hunters and makes the food freely available to the community. However, the program’s budget is relatively limited, and its operation can be sporadic and unpredictable. Consequently, access to country food continues to be primarily mediated by harvesting participation and social relations, rather than by markets or formal institutions. In addition to shares given (or asked for) directly between households, country food is also occasionally shared over the local FM radio. This most often occurs when a household has had an unusually large harvest, generally of arctic char. In this case, a household member will call the radio to announce that anyone who wishes can stop by to collect a share; dozens of people often respond.

Given the costs associated with modern harvest production (Smith 1991), why do Inuit continue to pursue and share country foods? Food transfers may involve the creation of social and symbolic value as well as the fulfillment of economic needs (Bourdieu 1980; Graeber 2001). Numerous scholars have suggested that the persistence of traditional subsistence activities in Inuit communities despite their integration into broader industrialized economies, a pattern now commonly referred to as a mixed economy (Wolfe and Walker 1987), is related to the social importance of sharing country food for Inuit (Bodenhorn 2000; Collings 2011; Hovelsrud-Broda 2000). Wenzel (1995, 2000) has argued that the mixed cash/subsistence economic system that characterizes modern Inuit settlements is fundamentally a social economy, not a market economy, because Inuit economic decisions are often driven by investments in social relationships rather than by the accumulation of material wealth or cash. Through our modeling of the flows of food, we are able to investigate not only the economic but also the social value of these resources. We study the economic and social benefits that Inuit households derive from their investment in sharing country food, specifically through a network approach that allows us to extend dyadic exchange to the broader social structure of the community. In particular, we link information on the sharing of country food with information on social status to explore the political economy of country food sharing in Kangiqsujuaq.

Methods

Fieldwork

The fieldwork for this research was conducted between September 2013 and July 2014 by the first author. This article focuses on a household questionnaire, which gathered data on household demographics, employment, income, hunting participation, food sharing, and food security from a large representative sample of households in the settlement. Portions of the survey were adapted from instruments used in a previous study of food security in Kangiqsujuaq (Lawn and Harvey 2004) and in harvest studies by the Alaska Department of Fish and Game (e.g., Kukkonen and Zimpelman 2012), with the help of Kangiqsujuarmit who pretested the survey. In total, 110 of 146 Inuit households in the settlement (75.3%) were surveyed. The population sampled in the household survey shows the same age (Kolmogorov-Smirnov test: $D = 0.04$, $P = .72$) and sex ($\chi^2 = 0.05$, $P = .82$) distributions as the 2011 census data for Kangiqsujuaq (Statistics Canada 2012). Households are defined as people living together in a single dwelling, but household composition is highly variable, from multigenerational families (in one case, four generations), to single women with children (representing 33% of households), to men living alone. In general, interviews were conducted with the head of the household by the first author and a local translator or research assistant. Thirty-five percent of interviews were conducted in Inuktitut and the rest in English. Fifty-five percent (60/110) of respondents were women. Respondents were asked to provide information covering the previous 12 months. The study was approved by the Kangiqsujuaq Northern Village and the Stanford Institutional Review Board.

Data

In the analyses reported in this article, we draw on the following data sources.

Country Food-Sharing Network. As part of the household survey, household heads were asked to free-list their most important country food sharing partners, both who they gave to and who they received from. From these reports, we create a network representing the sharing of country food among households. For every pair of households, if either one reported in the survey that they shared food with the other (giving or receiving), we record a tie representing that flow of food, following Nolin (2008, 2010). Although households that did not participate in the study were named, only households who completed the survey are included in the analysis, because of the need for complete data in the network analyses. This network consists of 110 households (nodes) and captures 57% of all theoretically possible ties within the village and 75% of all theoretically possible ties within the survey sample. In this in-sample network, households give and receive food from 4.55 other households; however, there is substantial variation be-

tween households in how much they give and receive (out-degree $SD = 4.57$; in-degree $SD = 3.10$). Of all possible ties between households in the sample, 4.2% are realized, of which 37.6% are reciprocated.

Household Food Security Assessment. Households also answered a set of questions evaluating their food security, the results of which are reduced here to a binary variable categorizing households as food secure or food insecure. Households designated as food insecure experienced at least one episode of food shortage that resulted in a reduction in food intake by adults in the household (cutting or skipping meals) in the 12 months preceding the assessment. Thirty-eight percent of households in the sample are food insecure according to this metric. The indicator of food security used here is a measure of poverty not directly associated with harvest production or country food shares received (Ready 2016).

Household Socioeconomic Attributes. The household survey also included questions on household demographics, recent employment history, harvest production (including harvests of beluga, ringed seal, caribou, and geese), income, and other socioeconomic indicators. The monthly incomes of household heads over the 12 months preceding the interview are summed to obtain a total 1-year income for the household, including any reported pensions or government benefits. For most analyses, harvest production is tallied in kilocalories using data from Smith (1991) and then categorized into three groups: low producers (households that did not harvest any of four species mentioned in the survey), mid-producers (those who did some harvesting), and super producers. Super producers are defined as households in the top 30% of harvests (BurnSilver et al. 2016; Wolfe 1987) and harvested approximately 80% of all calories represented in the harvest data. Households also indicated whether they gave away country food over the local FM radio in the past year, a variable we refer to as "FM giving." A separate variable also indicates households headed by single females. These are usually young single-parent households, but the category also includes some mature households headed by elderly women. Variables representing workplace affiliation (e.g., the school, the co-op) were also created using the employment data. Workplaces are referred to by letter (A, B, etc.) to protect the anonymity of respondents.

Kinship Data. Kinship relationships were gathered along with the sharing network data and supplemented by interviews with informants and genealogical data obtained from the Avataq Cultural Institute. Ties between parents/children and siblings are used here to define whether households are close kin, including both biological and adoptive relations. A second, broader kinship term is also included, dividing the population into 16 kinship groups, each primarily associated with one or two common local family names, ranging in size from four to 20 households (mean = 10.7, $SD = 4.8$), with some overlap between groups because households may belong to more than

one cluster. One household was an isolate. This household-by-group matrix was then used to create a kinship group network.¹

Political Appointments. Records of the composition of a local elected council from 1980 to 2014 were gathered from publicly available sources. Membership on this council is determined by the popular vote obtained by candidates who present themselves for election. Living individuals who have been elected to the council have been linked to households represented in the survey sample to create a variable indicating whether a household includes someone who was ever on the council. We call this “historic council membership.” Household membership in several elected community positions during fieldwork in 2013–2014 is also considered, which we call “2013 council membership.”

Data Analysis

To describe the sharing network structure, we develop an exponential random graph model (ERGM) of the network using a range of household-level and relationship attributes. The aim of using an ERGM is to identify the individual (node-level) and group structural (network-level) forces that best predict the overall structure of the observed network, represented in figure 1. The model coefficients in an ERGM are analogous to the coefficients in a logistic regression, where the response is the probability of a tie between two nodes.² All network analyses were conducted in R (R Development Core Team 2012) using the *statnet* suite of packages (Handcock et al. 2003). We also present regressions to further investigate some of the patterns identified in the ERGM. Regression analyses use the *MASS* package (Venables and Ripley 2002) in R.³

1. To create a variable representing kinship ties extending beyond parent/child and sibling relationships, a secondary kinship network was created by, first of all, creating suprahousehold-level kinship clusters based on the parent-sibling ties represented in the close kin network. These sibling groups were then linked to the sibling groups of their parents and, where possible, the parents of their parents. The resulting kinship groups should include, minimally, relationships to cousins, aunts/uncles, and grandparents/grandchildren. Some households with only more distant kin ties in the community were assigned to kinship groups based on their last names.

2. In exponential random graph modeling, simulated networks are created in a manner analogous to flipping a coin with different weights, based on the predictors in the model, for all the possible edges in the network. The distribution of simulated network properties are then compared to the empirical network to assess whether the predictors in the model are able to replicate the observed network structures. Unlike traditional statistical methods, ERGMs can account for nonindependence of social relations. Harris (2014) and articles in Handcock et al. (2008) provide good overviews of the logic of ERG modeling and model-fitting procedures.

3. The magnitude, standard errors, significance, and confidence intervals of regression coefficients were considered as well as the model

Results

ERGM Results

The results of the ERGM are shown in table 1. The model presented here includes measures of household kinship and proximity, harvest production, economic status and food security, employment status, demographic characteristics, and a number of structural control variables.⁴

The ERGM shows that households with greater resource availability are more likely to give country food than households with fewer resources. The model also shows that households tend to share with kin and neighbors. The effect of close kinship on the probability of a tie is the strongest effect in the model (odds ratio = 21.16). The effect of belonging to the same kin group, while also significant, is much less but still considerable (odds ratio = 3.56). Close kin ties were subtracted from the kin group network, so these are exclusive categories in the ERGM. The probability of a sharing tie between households decreases with increasing distance between them. As some houses are as far as 1 km apart, while the coefficient for distance is small, it has a large impact on the probability of a sharing tie between households in different parts of the settlement. For example, immediate neighbors are 1.63 times more likely to exchange food than households that are 500 m apart. We considered that

Akaike information criterion (AIC; using the function *stepAIC*) to determine which variables to include in the final models presented here. Regression diagnostics were examined for all models presented; adjustments to the models, such as removing outliers and transformation of the variables, are noted wherever they were required.

4. The ERGM presented here is the model with (a) the minimum number of control parameters needed to generate random networks with comparable structure (i.e., number of edges, degree distribution, and shared partnerships) and (b) the lowest AIC obtained for a model with those control parameters and the set of predictor variables considered. Variables considered in the model-building process include kinship, the physical distance between households, harvest production, ownership of hunting vehicles, household annual income, giving of food over the radio, household food security, age of the oldest household member, whether the household was headed by a single female, the size of the household, the workplaces of people in the household, whether a household member had ever been elected to the municipal council, and whether a member of the household was currently a member of an elected village council. The effect of each of these terms on both giving and receiving for households was considered in the model-fitting procedure, as well as the effect of shared group membership (homophily) where relevant. For example, homophily was examined among super households to assess whether generalized reciprocity might operate within this subgroup of households. In addition, a variable representing the combination of a household’s harvest production level (low, middle, or super) and food security status (secure/insecure) is used to represent different strategies of engagement in the cash and subsistence economies. Three terms (edges, in-degree(0), and geometrically weighted edgewise shared partnerships [GWESP]) are included in the model as control parameters. The GWESP model term is included to control for transitivity in the network (Hunter 2008; Hunter and Handcock 2006). The reciprocity terms model the likelihood of a tie in one direction, given that a tie already exists in the other direction.

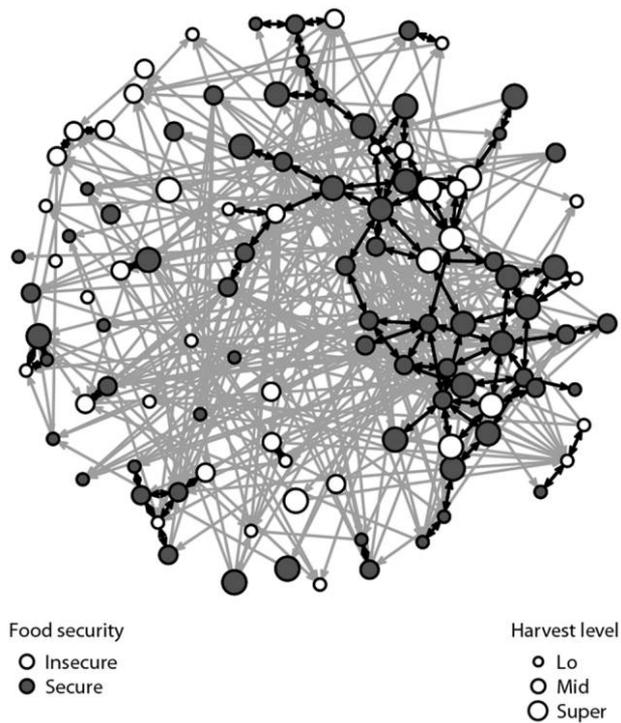


Figure 1. Kangiqsujuaq country food-sharing network. Households are color coded by food security status, and nodes are sized by harvest production level (low/mid/super). One-way ties are shown in gray, and reciprocal ties are shown in black.

individuals working together might also be more likely to share with each other, but workplace homophily was not significant; instead, households with individuals working at two particular institutions are associated with significantly greater out-degree. Not surprisingly, these are workplaces associated with desirable jobs with good pay, good benefits, and good working hours.

Single female-headed households and elders are preferred targets of giving. However, more direct measures of household need, whether food insecurity, low harvest production, or household size, are not significant predictors of incoming ties. Owning more hunting vehicles also has a small negative effect on in-degree. Because owning more hunting vehicles is associated with higher income and harvest production, households with more vehicles tend to have higher out-degree to begin with, so this covariate simply reflects that these households are more likely than others to support one-way outgoing ties.

Although neither food security nor harvest production alone was found to be a significant predictor of incoming ties, the model does find different probabilities of sharing ties between households with certain socioeconomic profiles, as measured by the interaction of household food security and harvest production. Food-insecure super households (I-Super) have a strong tendency for sharing with food-secure nonhunters (S-Low). In other words, these cash-poor hunters prefer to give to cash-rich nonhunters. Although we do not have complete exchange network data for other currencies, this pattern likely

reflects exchanges across currencies between these types of households. Unemployed hunters, especially young men, often share with more affluent nonhunting households (usually relatives) and receive cash, gas, or other goods in exchange. Food-insecure super households are the least common household type ($n = 9$ or 8.2% of households), which is not surprising given the high cost of harvesting.

Food-secure super households (S-Super) have a higher probability of sharing with other food-secure households or super households than with households that are food insecure and have lower harvest. In fact, food-secure super households have the strongest affiliation with other food-secure super households, which may represent generalized reciprocity among this relatively restricted group ($n = 20$ households). This pattern is also suggested in figure 1 and confirms the importance of ties between cooperators (cf. Apicella et al. 2012; Lyle and Smith 2014). The second group that food-secure super households are most likely to share with is nonharvesting food-secure households. This may also represent trade, as suggested for food-insecure super households; however, this is less certain, because food-secure super households tend to finance their own hunting efforts. Finally, low- and mid-production food-insecure households (I-Low and I-Mid) tend to have sharing ties with each other. Mid-production food-insecure households give to fewer food-secure nonhunters (I-Mid to S-Low), who, as mentioned above, are frequently the targets of super households.

Reciprocity has a sizable effect in the model, second only to the effect of close kinship. A household is nearly five times more likely to share with another household if they receive food from that household. The strength of this term suggests that contingent reciprocity is an important determinant of the structure of the sharing network, because the model also includes several terms that control for homophilous behaviors (e.g., sharing among kin and super households), which could induce generalized reciprocity among subgroups within the network.⁵

Several examples of the ERGM predictions are worked through in figure 2, which shows the probability of ties between households with different socioeconomic characteristics. These examples clearly show the strong effects of kinship and reciprocity, but also highlight the relative disadvantage of low-production, food-insecure households, particularly if they are not female-headed. Although the effects of several variables

5. To assess whether contingency might occur only within certain groups, terms for reciprocity for kin groups and harvest production groups were also examined. However, this analysis revealed that a global model term for reciprocity was a more parsimonious explanation of network structures. Although the model therefore suggests that contingency is important for all sharing ties, this conclusion is affected by the limitations of current implementations of ERG modeling. The mutual model term in the package *ergm* (Handcock et al. 2003) can calculate reciprocity within groups based on node-level covariates, but terms for reciprocity based on network covariates cannot be included independently.

Table 1. Summary of ERGM of country food sharing

Model parameter	Term type	Coefficient	SE	Odds ratio	<i>p</i>
Edges (intercept)	Control term	-7.202	.328	.001	<.001
In-degree(0)	Control term	-1.690	.725	.184	.020
Close kinship	Edge covariate	3.052	.146	21.165	<.001
Kin groups	Edge covariate	1.269	.130	3.557	<.001
Distance (m)	Edge covariate	-.001	.000	.999	<.001
Harvest production (mid)	Node out-factor	.511	.164	1.666	.002
Harvest production (super)	Node out-factor	.858	.208	2.359	<.001
Hunting vehicles	Node out-covariate	.051	.028	1.052	.070
Annual income (per CAN\$10,000)	Node out-covariate	.057	.021	1.059	.006
FM giving	Node out-factor	.228	.114	1.256	.045
Food security	Node out-factor	-.347	.154	.707	.025
Workplace A	Node out-factor	.476	.151	1.610	.002
Workplace B	Node out-factor	.340	.110	1.405	.002
Hunting vehicles	Node in-covariate	-.100	.029	.905	<.001
Age of oldest HH member	Node in-covariate	.037	.004	1.038	<.001
Single female headed	Node in-factor	.536	.119	1.709	<.001
I-Low to I-Mid	Node attribute mixing	.777	.442	2.174	.079
I-Mid to I-Low	Node attribute mixing	.969	.355	2.635	.006
I-Mid to S-Low	Node attribute mixing	-2.454	.030	.086	<.001
I-Super to S-Low	Node attribute mixing	.999	.370	2.716	.007
S-Super to I-Super	Node attribute mixing	.675	.360	1.965	.061
S-Super to S-Low	Node attribute mixing	.805	.248	2.237	.001
S-Super to S-Mid	Node attribute mixing	.663	.236	1.940	.005
S-Super to S-Super	Node attribute mixing	.988	.252	2.686	<.001
Reciprocity	Dyadic dependence	1.577	.217	4.841	<.001
GWESP ($\alpha = .1$)	Dyadic dependence	.571	.089	1.770	<.001

Null deviance = 16622, df = 11990
 Residual deviance = 2613, df = 11964
 Log-likelihood = -1306.268
 AIC = 2664.537

Note. Low/mid/super refers to household harvest production levels. Edge covariates are terms describing the nature of the relationship between two households, for example, the distance in meters between two households. Node in-/out- terms reflect the impact of household-level attributes on tie formation. Out/in refer to terms that affect outgoing ties (giving) vs. incoming ties (receiving). Covariates are numeric predictors while factors are categorical. Node attribute mixing terms model the probability of ties between households with specific combinations of attributes. Dyadic dependence terms model the effect of ties on other ties. Reciprocity refers to the increased probability of a mutual tie. GWESP models the increased likelihood of two households having a tie if they have a partner in common. AIC = Akaike information criterion; ERGM = exponential random graph model; GWESP = geometrically weighted edgewise shared partnership; HH = household; I = food insecure; S = food secure.

(such as income and giving food over the FM) are not illustrated in figure 2, the effect of these variables exaggerate the basic patterns shown because of the positive correlations between high income, high harvest productivity, and food security. In summary, the ERGM results provide evidence for contingent reciprocity along with suggestive evidence of trade. Nevertheless, 62% of ties are unreciprocated, and high-income, high-harvest households maintain a large number of one-way ties toward low-income, low-harvest households that are unlikely to be able to reciprocate in kind or otherwise. These patterns suggest that while sharing widely is clearly associated with high socioeconomic status, there might be other pathways between these traits that motivate wealthy households to share.

Sharing and Political Influence

To further unpack the positive associations between country food sharing and affluence in Kangiqsujuaq, we investigate

whether food sharing may operate as a signal of commitment to the community (cf. Bird and Bliege Bird 2010; Bliege Bird and Power 2015). In particular, we hypothesize that sharing country food widely is linked to people’s ability to access positions of community leadership. To examine this hypothesis, we perform logistic regressions on two variables that are indicators of individual prominence and leadership in Kangiqsujuaq: (1) 2013–2014 elected council memberships and (2) historical council membership (1980–2012). The left panel of table 2 shows the regression results for the 2013 council memberships. Sharing network out-degree was not retained in the model; however, giving country food nevertheless emerges as an important correlate of recent election: the strongest predictor in the model of whether a household includes someone who was a member of an elected local council in 2013–2014 was whether that household had given away food over the FM radio in the past 12 months (odds ratio = 24.34). The number of hunting vehicles owned by a household is also correlated

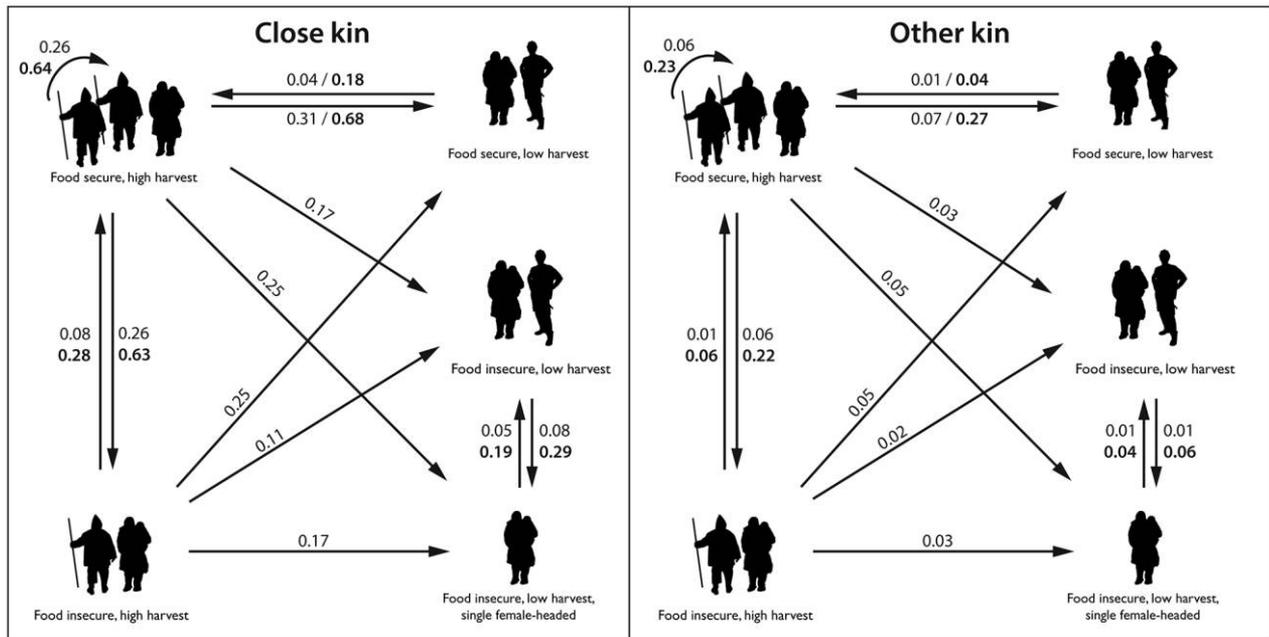


Figure 2. Examples of ERGM tie probabilities between different household types. Distance between households, household income, age of the eldest household member, FM giving, and workplace are held constant in these examples, which show only the effects of close versus distant kinship, food security, harvest production, hunting vehicle ownership, and single female household heads. Households were assigned the median number of hunting vehicles for their demographic (five for food-secure super households, two for food-insecure super households, and one for the other groups shown). Boldface numbers indicate the effects of reciprocity on the probability of a tie: if $a \rightarrow b$ is completed, then $b \rightarrow a$ has an enhanced probability.

with recent election. Importantly, ownership of hunting vehicles is not only a reflection of household income over a longer term than 12-month income, but also a visible signal of a commitment to using disposable income to support country food harvesting. Finally, membership on the historic council is also an important predictor of the 2013 councils, which reflects continuity in tenure of elected positions for households, even across different local councils. Figure 3 visually summarizes some of the patterns observed in the regression for 2013 council membership and clearly shows the increased involvement of council members' households in sharing, as well as their increased economic status. Although council membership is clearly correlated with numerous indicators of sharing participation and socioeconomic status, not all of these were retained in the stepwise regression analysis because of strong collinearity between many of these variables.

The right panel of table 2 shows the regression results for the historical council data. Interpreting this regression requires caution because the temporality of the data is collapsed in the binary variable representing election, and characteristics of households may have changed substantially if the individuals were on the council 20–30 years ago rather than within the past few years. Therefore, it is not clear whether the predictors in the model reflect the reasons why individuals get elected or effects that occur after election. Nevertheless, the regression provides

suggestive results regarding the types of households that have participated in local political life over the past 30 years. As in the model for current councils, ownership of hunting vehicles is a strong correlate of historic council membership. The importance of this factor in both the historical and current council models suggests that high income combined with a commitment to harvesting are characteristics of local council members both before and after election. Further, sharing network out-degree has a significant effect in the model, suggesting that individuals who have been members of the council tend to come from households that are heavily invested in the sharing economy. Mean household age is also significant, although this is essentially a control variable that accounts for the fact that older persons have a greater chance of ever having been on the council.

These results provide strong evidence for why affluent households in Kangiqsujuaq support one-way sharing ties to low-resource households in addition to engaging in supportive reciprocal sharing relationships. Households that are more heavily invested in the sharing economy—and households that engage in food distributions over the FM radio—are more likely to have members who have been elected to local council(s). Holding a council position has both direct and indirect social and economic benefits, including monetary compensation (roughly CAN\$700/month for the municipal council) as well

Table 2. Logistic regression results for 2013 council membership and historic council membership

Model parameter	2013 councils					Historical council				
	Retained?	Odds ratio	Coefficient	SE	<i>p</i>	Retained?	Odds ratio	Coefficient	SE	<i>p</i>
Intercept	Yes	<.001	-7.708	1.915	<.001	Yes	<.001	-16.747	4.171	<.001
Sharing network out-degree ^a	No	...	...	...	...	Yes	4.970	1.604	.684	.019
Super-HH (0/1)	No	...	...	...	...	No	...	...	...	...
Harvesting HH (0/1)	No	...	...	...	...	No	...	...	...	...
Food secure (0/1)	No	...	...	...	...	No	...	...	...	...
HH income per CAN\$10,000 ^a	No	...	...	...	...	No	...	...	...	...
No. hunt vehicles ^a	Yes	11.355	2.430	.983	.013	Yes	4.893	1.588	.753	.035
Mean HH age ^a	No	...	...	...	...	Yes	20.346	3.013	1.003	.003
Single female headed (0/1)	No	...	...	...	...	No	...	...	...	...
HH size ^a	No	...	...	...	...	No	...	...	...	...
FM giving (0/1)	Yes	24.336	3.192	.978	.001	No	...	...	...	...
Historic council member (0/1)	Yes	8.209	2.105	.922	.022	NA	...	...	...	...
No. other HH with close kin	No	...	...	...	...	No	...	...	...	...
Kinship group size	No	...	...	...	...	No	...	...	...	...

Null deviance = 87.333, df = 108 Null deviance = 103.907, df = 108
 Residual deviance = 43.129, df = 105 Residual deviance = 62.113, df = 105
 Model vs. null deviance: $\chi^2 = 44.204, p < .001$ Model vs. null deviance: $\chi^2 = 41.369, p < .001$

Note. HH = household; NA = not applicable.
^a Variables that were log-transformed ($\log(x + 1)$) in the model.

as influence in important community affairs, such as major construction projects and community programs.

Discussion

The ERGM and regression analyses suggest that while sharing of country food is driven by reciprocity, trade, and wealth, sharing is itself a predictor of the political success and influence of wealthy households. In the discussion, we delve into the connections between generosity, influence, and affluence in the settlement and consider how these patterns might articulate with processes of cultural, social, and economic change. Namely, we explore how traditional food sharing may contribute to economic and political inequality in the contemporary mixed economy. Finally, we discuss the implications of these results for how, as anthropologists, we can better negotiate the gap between models of individual economic decision-making and the real constraints imposed by social structure.

Sharing and Economic Strategies

In late September 2013, Jaani, a hunter in his late forties, went on an overnight ATV hunt with his two young adult sons and a couple of their friends. They returned home with over 130 Arctic char and two small caribou. One of the friends took six fish from the catch, and Jaani brought the rest home. He kept the caribou, but he called the FM radio to give away the fish, inviting anyone who wanted some to come to the shack behind the house and take it. Jaani did not pay attention to who came to get fish that weekend. Too many people dropped by, and he

could not be there to observe everyone who came by to collect a share. He was not concerned with the details of the distribution beyond that it had been widely shared. Jaani's wife, however, had paid closer attention. Besides the close family members who dropped by regularly and were always given shares, more distant relatives and some unrelated men and women also showed up to claim a share on this occasion. Most of these distant relatives and others were from households with demonstrable food need, who did not hunt much themselves and were unlikely to be able to reciprocate the shares they received. Another hunter or two, friends of the family, also stopped by for a social visit and grabbed a fish or two on their way out because they did not have any fresh fish at home.

About a week or so after this event, another hunter, Naalak, an Inuk in his late thirties, caught a harp seal while out on his canoe looking for caribou. Because most Kangiqsujarmiut do not consider harp seals to be good to eat, Naalak skinned the animal for its pelt and gave all the meat to a friend of his, Pitsiulaq, who owns a dog team. A week or so later, Pitsiulaq caught seven caribou. On his return, Pitsiulaq gave Naalak a generous share of fresh caribou meat, which was a welcome surprise to Naalak, who had been caribou hunting several times in the past few weeks but had not encountered any. Around the same time, Lizzie, a married woman in her fifties, was asked to collect some mussels by a friend in exchange for CAN\$40. She collected mussels for this same woman a few more times before freeze-up in early December; each time, she received cash payments.

This small glimpse of day-to-day country food exchange in Kangiqsujuaq illustrates the main findings reported above:

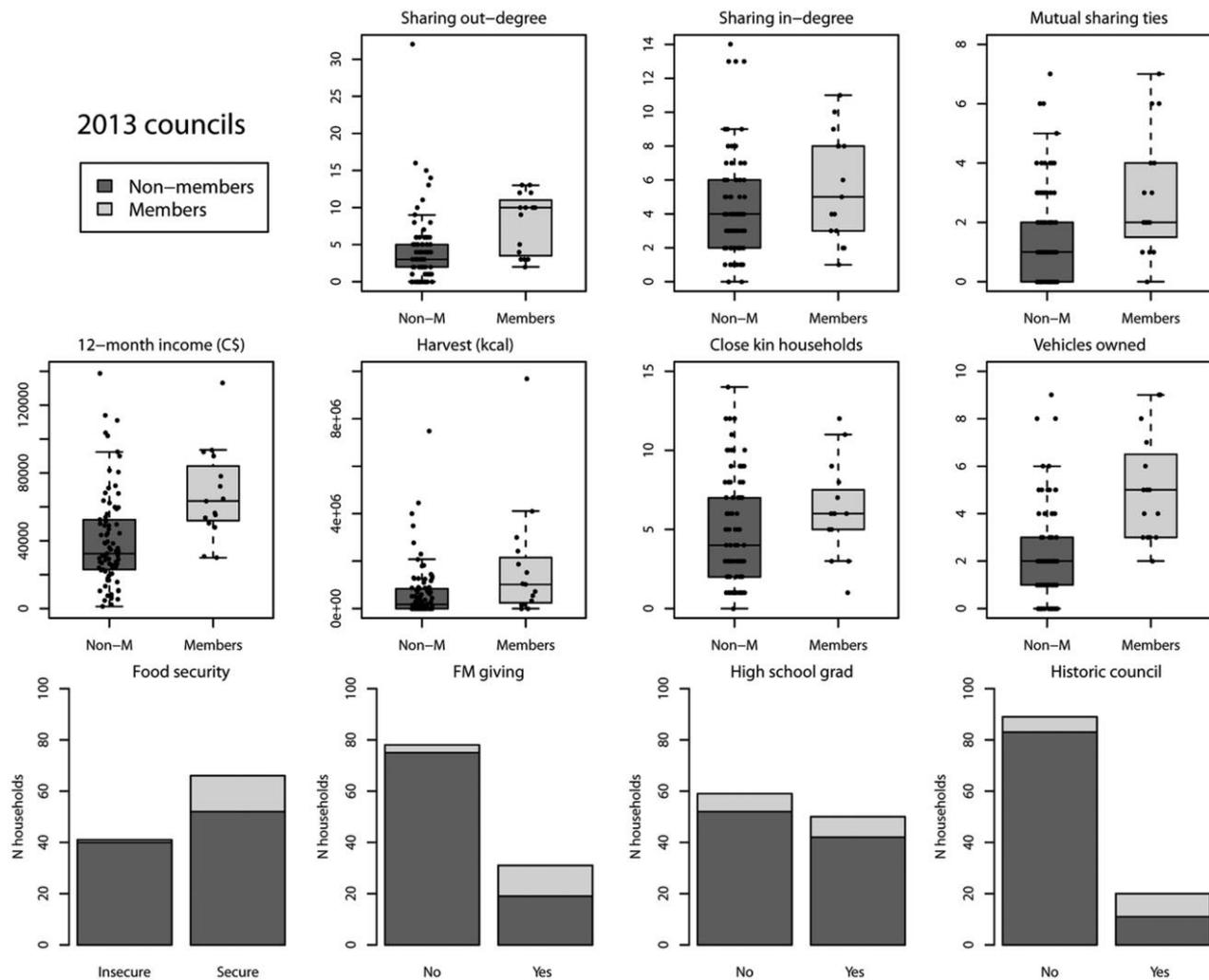


Figure 3. Characteristics of Kangiqsujaq 2013–2014 council members and nonmembers.

country food sharing has multiple social and economic functions in the mixed economy. Households that give away their harvests can benefit from reciprocity, trade, or enhanced reputations, not to mention the contribution of sharing to Inuit social well-being (Condon, Collings, and Wenzel 1995; Nuttall 1992; Searles 2002). Moreover, the analyses suggest that both the extent of engagement in sharing and the particular rewards derived from it differ between households. As the examples above show, super households, such as those to which Jaani, Naalak, and Pitsiulaq belong, engage in directed reciprocity, especially with each other, but also sometimes participate in broadcast sharing of large food surpluses. These broadcast sharing events are linked to social status, as measured by local election results. Not coincidentally, both Jaani and his wife—as well as Naalak and Pitsiulaq—hold white collar public service positions in the community, which allows them to afford substantial outlays for equipment and hunting supplies, even

though the food they harvest is often given away without expectation of return.

In contrast, Lizzie is also a member of a super household, but her husband is unemployed, and both she and her adult children who live at home have only low-paid, part-time work. Thus, her family regularly attempts to parlay their harvesting activities into additional income. They have mixed success in doing so for a number of reasons, including the high cost and uncertainty of harvesting; the unreliability of the Hunter Support Program, which only sometimes has money to purchase food from hunters; and the unwillingness of many Kangiqsujaarmiut to pay for country food outright (cf. Gombay 2010). Lizzie's household experienced shortages of store food at times when Lizzie was not able to work enough hours at her job. Undoubtedly, however, their harvesting gives them a considerable economic advantage over nonhunting households with similar employment patterns: not only do they produce a lot

of food themselves, but other super households share with Lizzie's family quite often. Together, Lizzie and her husband have at least 21 adult siblings (biological and adopted) living in the settlement, which also greatly contributes to their advantageous position in the sharing network.

In Kangiqsujuaq, we find that there are multiple motivations and strategies that may lead households to pursue and share country food. As others have recognized (e.g., Gurven 2004; Nolin 2010, 2012), it is not a question of one mechanism (for example, kin selection or reciprocity) explaining food sharing to the exclusion of others, but rather a question of the relative importance of multiple mechanisms, all of which are likely acting to some extent. Here, we further stress that particular mechanisms may be more or less relevant in explaining the sharing behavior of households in different socioeconomic positions, as well as in different cultural and ecological settings (e.g., Koster 2011; Ziker and Schnegg 2005). For example, high-harvest but food-insecure households focus on attempting to convert country food into other material resources, such as cash. In contrast, for high-income, high-harvest households, increased participation in sharing and giving away food in particular ways (e.g., over the FM radio) is associated with political success in the settlement. Country food sharing serves multiple purposes for households, both economic and social.

Sharing, Inequality, and the Persistence of the Mixed Economy

Contrary to other mixed economies where wealthy households have been observed to divest from sharing networks (e.g., Kasper and Borgerhoff Mulder 2015), our analyses demonstrate that the benefits of giving away food are concentrated among high-income and high-harvest households, because these house-

holds are able to give the most (cf. Gurven et al. 2015). Households that give more also have more reciprocal ties. We stress, though, that this is a mixed economy that has developed over more than a century of trade and increasing market integration, not a recent transition, and that country food today is a small—although nutritionally important—component of Inuit diets. The question we ask is, why does sharing persist at all? And why are wealthy households more, rather than less, invested in sharing than poorer households? We find that generosity with country food provides important reputational benefits that have consequences in the political arena and that are also likely to be important in securing employment, favors, and other forms of social and economic assistance.

This distribution of the benefits of sharing has important social and economic ramifications thanks to the links between affluence, influence, and generosity (fig. 3). Given the dependence of harvesting on the cash economy, these linkages could produce positive feedbacks (generosity leads to access to influential positions, which improves access to resources, which enables generosity) and create lasting differences in economic and relational wealth between households and between kin groups. The existence of such trends is suggested in figure 4, which shows the kinship network positions of living individuals in both council data sets. Many of the council members come from dense clusters within the kinship graph. Many are also closely related: of the 25 individuals in the historical council sample, there are four parent-child pairs, five husband-wife pairs, and three groups of siblings, not to mention relationships between cousins and in-laws.

Just as these connections between generosity, influence, and affluence can lead to a compounding of the benefits for better-situated households, they can similarly lead to a compounding

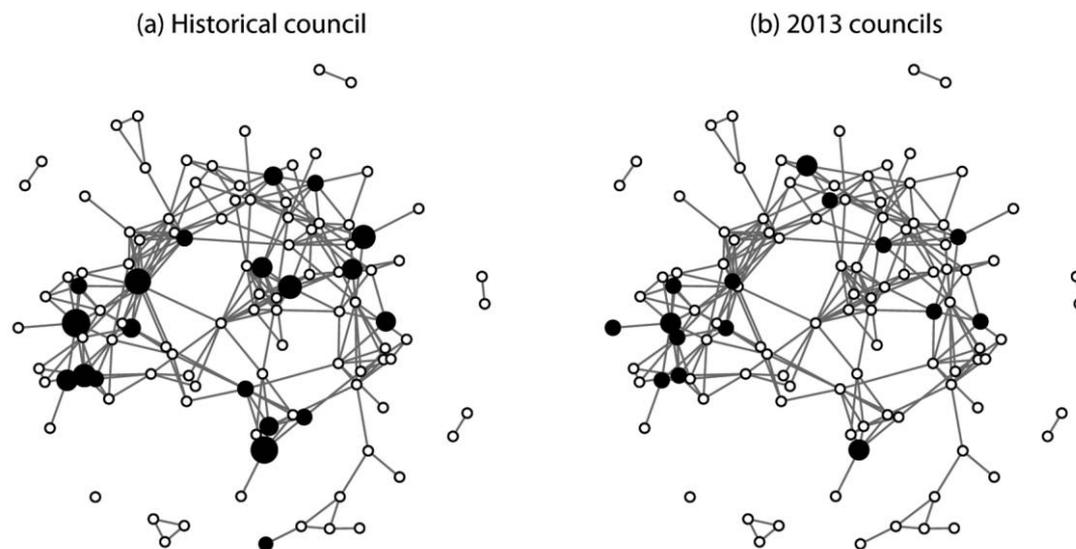


Figure 4. Kinship network positions of past and present local council members. Black nodes represent council members. Nodes in *a* are sized by the total length of tenure of household members on the council; nodes in *b* are sized by the number of 2013 council positions held by household members.

of the economic and social disadvantage of households without these traits. Low-income, low-harvest households in Kangiqsujuaq have few means to build reciprocal sharing ties and even less to engage in signaling through wide distributions of food. Many employed persons in Kangiqsujuaq readily express how much they value their jobs. These sentiments reflect the importance of employment for living a full life in the settlement, which means being able to give country food away as well as receive it. Low-income, low-harvest households in general are unable to participate fully in the traditional economy because they are unable to give (in kind or otherwise).

These data suggest that Kangiqsujuaq is characterized by relatively high levels of inequality (fig. 5), particularly when it comes to harvesting. Sharing does redistribute resources in the settlement, but not sufficiently to create equal opportunities for all. On the contrary, giving food creates obligations (e.g., to reciprocate in kind, to pay for gas next week) that benefit those with the resources required to be generous. These results resonate with studies of the relationship between group leadership and cooperation (Glowacki and von Rueden 2015; Hooper et al. 2010; Powers and Lehmann 2014) and provide support for recent anthropological research on the evolution of inequality (Borgerhoff Mulder et al. 2009; Bowles, Smith, and Borgerhoff Mulder 2010; Mattison et al. 2016).

In possibly the only major work on socioeconomic inequality among Inuit, Mitchell (1996) argues that Canadian Inuit today are characterized by two social classes: “the native corporate elite” and others whom she characterizes as “simple commodity producers.” Using extensive historical evidence, Mitchell argues

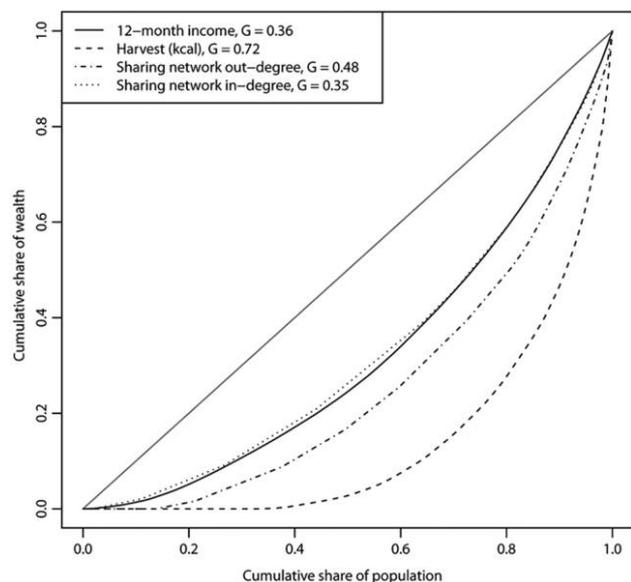


Figure 5. Lorenz curves showing the distribution of several forms of wealth in Kangiqsujuaq. Although almost all households participate in some harvesting, the harvest curves refer to the household's take of four important food species (ringed seal, geese, beluga, and caribou). The diagonal line shows perfectly equal wealth distribution. G = Gini coefficient.

that the process of contact, sedentarization, community organization, and land claims settlements led to the gradual emergence of Inuit leaders among those who interfaced with whalers, traders, and eventually Canadian government officials. These corporate elite enjoy economic and political advantages as a result of their collaboration with outside capitalists. This model provides an interesting perspective on the role of capitalist and colonial influences in shaping Inuit nationalism and in providing the substrate for an emergent class structure. However, although the results presented here also suggest that Inuit settlements are characterized by substantial social and economic inequality, the corporate elite model cannot explain the persistence of the mixed economy in its current form, in which local affluent households—not the most marginalized households—are the most engaged in subsistence production (see also BurnSilver et al. 2016). In other words, an analysis that focuses exclusively on top-down structures (i.e., the role of the Canadian state) in influencing economic and political development in Arctic settlements does not make sufficient room for bottom-up structures resulting from interactions between Inuit themselves.

Hervé (2015) provides key insight into these bottom-up structures by identifying the interactional nature of power and influence among Inuit. She argues that persons who accumulate material resources, social relations, and knowledge are obligated to assist others but are also listened to, and thus, power among Inuit is produced by wealth (Hervé 2015:365). This conclusion is supported by the analysis presented here, which links traditional food sharing (specifically, giving away food) with political success and socioeconomic status. However, the influence of individuals depends on the cooperation of others, and Inuit leaders are recognized as such only when they take into account the needs of others (Hervé 2015:332; Oosten 1986). Differences in wealth and power come with substantial obligations and responsibilities.

Despite the omnipresent rhetoric of equality, Inuit are decidedly nonegalitarian, and this is not simply a result of settlement and colonial influence (Hervé 2015). Early explorers and ethnographers (e.g., Hawkes 1916; Stefansson 1913) may have had difficulty detecting Inuit sociopolitical organization because of its informal nature. Later ethnographers, historians, and archaeologists paid more attention to variability in Inuit social structures and suggested status differentials or incipient social inequality among several groups, driven by differences in hunting skill and the need for leaders in cooperative hunting (Damas 1969; Friesen 1999; Morrison 1994; Savelle and Wenzel 2003; Spencer 1959; Stevenson 1997). Prior to settlement, material and social inequality may have been kept in check among Nunavimmiut and other eastern Arctic Inuit by resource limitation, mobility, and the need for cooperation over the long-term. The results presented here provide quantitative evidence of inequality among Inuit and show that in the settlement context, inequality is (perhaps surprisingly) driven in part by the redistribution of country food. The strong effect of reciprocity, particularly among food-secure super households, means that much country food sharing is often among those

who are already relatively well situated. However, the strong obligation to share with kin means that those individuals with the resources to share beyond their kin groups (particularly over the radio) are uniquely able to signal a commitment to the entire community, not just their own relatives. Through such acts, affluent households are able to justify their privileged access to a much broader range of resources (e.g., gas subsidies for hunters, political and public service positions). Acts of generosity by politically connected individuals extend to other spheres as well, in major gift distributions that take place during community events sponsored by local organizations. These distributions include prizes for games, raffles, and “candy drops” in which organizers literally shower attendees with free candy, toiletries, and household supplies ranging from feather dusters to rifle cases. These candy drops are reminiscent of historical harvest celebration events reported in Alaska (Fienup-Riordan 1983). Tellingly, the forms of broadcast giving that take place in Nunavik today are tied up with political office and wealth. While these patterns linking generosity and leadership reflect long-term continuities in Inuit social relations, transformations brought about by Euro-Canadian institutions, population growth, and settlement have dramatically altered the social and economic consequences of country food sharing.

This model of Inuit food sharing simultaneously explains the persistence of the mixed economy among Inuit and relatively high levels of socioeconomic inequality. Harvesting persists in Inuit settlements because Inuit economic life is inseparable from complex obligations that integrate kinship, politics, economics, and sociality. Similar arguments have been made about Inuit sharing in Nunavut, the Inuvialuit Settlement Region, Alaska, and Greenland (Bodenhorn 2000; Collings 2011; Hovelsrud-Broda 2000; Wenzel 2000); however, we expand our argument to show how the intertwining of economic and social life has consequences for socioeconomic inequality at the settlement level. The mixed economy persists because food sharing is a strategy by which privilege is expressed and maintained by those who give. In sum, Inuit food sharing is nothing less than Inuit social structure.

Store and country food are clearly not substitutable for Inuit, because the currency of foraging (and sharing) among Inuit is not simply calories. Although the dietary contributions of harvested and shared food are important for most Inuit households, country food also represents a fundamental means by which Inuit negotiate relationships with one another, and Inuit today reap economic, political, and social rewards from harvesting and sharing. The fact that food exchanges have dietary benefits to receivers in addition to the sociopolitical benefits to givers means that although the returns are variable, households on both ends of the spectrum have an incentive to participate in the system. Inuit society thus continues to be characterized not just by a foraging ideology but by a social structure that is reinforced by foraging and sharing. Consequently, this research supports other work identifying the behavioral basis of ideology, beliefs, and values (Bourdieu 1977; Dahl 2000; Wenzel 2009). Although Inuit society has

transformed dramatically over the past decades, the changes that have occurred have not eliminated the social structural contexts that allow a subsistence economy to be reproduced.

Sharing and Levels of Analysis

Multiple mechanisms foster country food sharing in Kangiqsujaq, and these patterns (notably, the linkage of generosity and political influence) help explain the continuation of the mixed economy in the settlement, despite the substantial investments necessary for contemporary hunting and harvesting. In conclusion, we suggest that the theoretical and analytic perspective adopted in this study (the merging of human behavioral ecological models with a network approach to analyzing behavior) offers a means to reconcile the roles of structure and agency in the study of socioeconomic decision-making, by providing a connection between individual decisions and group-level patterning. The network analyses demonstrate how the ability of households to participate in different sharing strategies is affected by their economic status and also shows that the benefits to their actions are shaped by structural factors such as kinship. Of particular significance is that the network framework reveals variability in the socioeconomic strategies available to households in Kangiqsujaq. Food sharing among Inuit does not have a single function; rather, it emerges as a complex social, political, and economic phenomenon that accomplishes different goals for actors based on their social position.

By incorporating social structure into the analysis of cooperative behavior, this approach addresses theoretical and methodological gaps between sociocultural anthropology and human behavioral ecology. A major distinction between human behavioral ecology and much of the rest of contemporary anthropology is HBE's microlevel focus on individual trade-offs and decisions, rather than a top-down interest in macrostructures such as state institutions (Smith 1991). Scaling up from individual behaviors to population-level patterns is one of the largest challenges in biology (Krause et al. 2007; Levins and Lewontin 1980; Sutherland 1996) and is perhaps one of the major challenges in the behavioral sciences generally (e.g., Coleman 1986). Although human behavioral ecologists recognize the existence of a feedback loop between micro- and macroscales of analysis (Irons 1979; Mace 2014; Nettle et al. 2013), behavioral decision models in HBE have not been thoroughly integrated with structural approaches (Gray 2000; Winterhalder and Smith 2000). Our results indicate the promise of network analysis tools to assist with such integration. However, while our analyses help us illuminate how broader socioeconomic patterns are linked to household decisions, the cross-sectional nature of our data means that we are unable to fully disentangle the chains of causality. We believe that the causal arrow in this case likely goes both ways: wealth enables greater harvesting and greater sharing, but sharing in turn may help sustain wealth due to the links to political influence. In the future, longitudinal network analyses will have the potential to

help anthropologists more clearly unravel the complex dynamics of sharing and inequality.

Despite the limitations of our cross-sectional approach, this study provides suggestive results regarding the conjugate role of individual decisions and social structure in broader processes of social and cultural change. Food sharing among Inuit redistributes wealth, but the act of redistribution is in itself a way to create and legitimate inequality because it reinforces patterns of social distinction in the settlement. A network approach, which treats interactions as the basis for social structure and allows the analysis of economic decisions to be situated within that social structure, thus offers particularly useful tools for challenging the “fruitless assumption that culture comes from culture” (Steward 1955:36). Specifically, this research supports classic anthropological arguments about exchange as a “total social fact” (Mauss 1923) that permeates cultural institutions and transcends economic, political, and social spheres (Malinowski 1920; Sahlins 1963; Weiner 1992; Wiessner 2002) while simultaneously being compatible with evolutionary ecological approaches that give primacy to micro-economic trade-offs as drivers of human behavior.

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Comments

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This article represents a significant step forward in the behavioral ecology paradigm. It also employs novel methods of discovery and argument in advancing this new approach. The crux of the argument is that food sharers make decisions about sharing practices based on a number of contingent and variable factors, which can include elements of local political history and the economic conditions of both sending and receiving individuals/households. As important, however, is the conclusion reached by Ready and Power: patterned systems of

exchange in Kangiqsujuaq contribute to inequality within the community. This represents a significant departure from prior anthropological approaches to exchange in mixed economies. Having argued that anthropologists need to pay more attention to the ways that cultural practices contribute to both gross and subtle differences in power and economic well-being, I welcome these conclusions (Dombrowski 2007). My comment focuses on this aspect, as the particular elements of this inequality deserve some attention.

It is not surprising that “households with greater resource availability” are more likely to give food than those with fewer resources; those who have something to give are more able to do so. However, the pattern of that giving is not simple. While need might be suspected to guide the targets of sharing, in Kangiqsujuaq, food insecurity does not predict incoming sharing ties. In fact, food insecurity prompts sharing mainly from other food-insecure households, while food-secure households mainly share with one another. This may sound puzzling, but it is similar to what colleagues and I found in the eastern Arctic among Labrador Inuit (Dombrowski et al. 2013). In that community, resource-rich households mainly share with one another, while occasionally sharing down to resource-insecure households. We identified this as a “trickle down” structure.

In Ready and Power’s case, something similar is at work. Abstracting from table 1, there seems to be two quasi-independent sharing circles in the community based on food insecurity and food production, with food-insecure super producers participating in the same circle of exchange as the food-secure households, while the mid- and low-producing food-insecure households share mainly (only?) with each other (see fig. 6). To the extent that family/kin ties coincide with these divisions, the result would seem to be two communities co-inhabiting the same social space but interacting in distinct social spheres. The exchange likelihoods for close versus distant kin shown in figure 2 would seem to reinforce this conclusion.

Elsewhere, colleagues and I have discussed the way in which historical events can produce such a situation, one where two seemingly nonoverlapping groups live together as a single social space, differentially endowed with resources and opportunity (Dombrowski et al. 2014). In that case, the roots of the social formation lay in community relocations that took place in the late 1950s where separate communities were thrust together in a single location. We were able to show that the unequal effects of the relocation persisted in the form of social divisions that endured through at least one subsequent generation.

Ready and Power tie food sharing to political power rather than historical disruption. In Kangiqsujuaq, past village council membership both predicts current council membership and is in turn strongly associated with the number of other households to whom someone has given country food. Indeed, along with age and number of hunting vehicles, food sharing out-degree is one of the few reliable predictors of past council membership. However, the interpretation of these relationships is messy. Current food sharing out-degree predicts past council

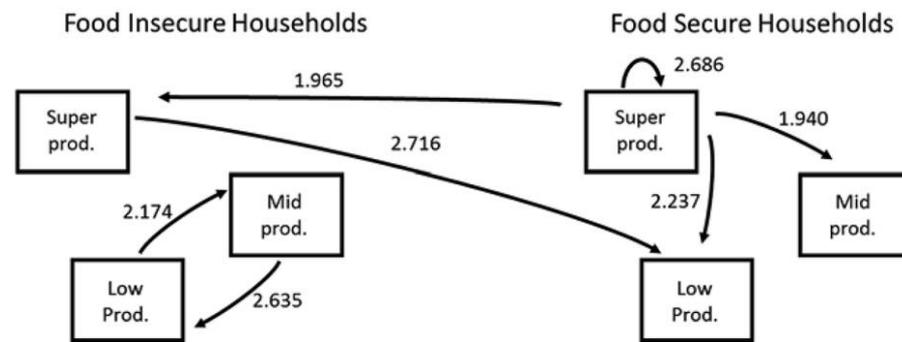


Figure 6. Exchange odds for food-insecure versus food-secure households on the basis of country food productivity (from table 1).

membership; past membership predicts current council membership; but current food sharing out-degree does not predict recent council membership (FM sharing does). Clearly, something is going on that ends in statistically meaningful associations, even as income, kin group size, or number of households with close kin act fail to predict recent or past council membership.

Ready and Power interpret this as evidence of a range of instrumentalisms and social investments, coupled with a kinship system where “generosity, influence, and affluence can lead to a compounding of the benefits for better-situated households” while it can also “lead to a compounding of the economic and social disadvantage of households without these traits.” I don’t doubt that this is true, but I wonder to what extent those disparate strategies are individual or momentary and whether the effects are restricted to single households rather than communities within communities. Given what we found in the eastern Arctic, it is possible that the two distinct circles of exchange reflect a deeper social division/separation that is masked by the occupation of the same social space. This question goes beyond the current analysis, but suggestions in the article make it worth asking. Underneath such a question is the larger issue of whether and to what extent individual strategies are what is at stake, or whether instead the exchanges we see are evidence of a social topology that is much more hidden and where individual choices are constrained in ways that are not easily visible to those involved. In such cases, we might ask whether such structures are also hidden in part by our own our ethnographic tendencies to see holism where it may not be (Dombrowski et al. 2016).

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Human behavioral ecology (HBE) succeeds where its theoretical and empirical toolkit permits modeling optimal decision-

making given available options and constraints; its weakness is ignoring history and the embedded social and power structures within which individuals operate (i.e., the model “constraints”). However, explicit modeling of these constraints might be unnecessary for some questions and difficult to integrate empirically. Embeddedness of behavior in a larger political, economic, or social context also tells a more complete but less generalizable story. With these caveats in mind, Ready and Power should be commended for bridging the microeconomic approach of HBE with higher-level social processes in their study of country food sharing in a mixed Inuit economy. Their use of ERGMs includes nodal and dyadic covariates and endogenous network variables all in the same empirical framework—an important advance that others will surely imitate. We focus our comment on two issues: (1) the utility of network analysis and how it might help connect societal-level structure with individual-level behavior and (2) how to situate the current study in the larger context of socioeconomic change.

The network of food transfers among 110 households is used to represent the social structure within which individual behavior is embedded. Two problems arise from this approach. First, given that the considered network derives from food-sharing behavior, there is circularity in thinking about how network structure might influence food sharing and vice versa. How to assess aspects of social structure independent of sharing? The structure of social interactions spans beyond country food exchanges, especially if 88% of the diet is comprised of other foods. Are other foods not shared? To what extent is there interdependence in food production, economic specialization combined with trade, or social relationships within the community? Information about these activities would help contextualize or constrain patterns of country food sharing. Second, without a way of establishing causality, it will be impossible to disentangle the causal role of sharing in affecting and being affected by changes in social structure. For example, how to assess the effects of exogenous or endogenous changes in social structure on production and sharing decisions? Do sharing activities exhibit temporal patterns in association with the election of local leaders? As noted by the authors, the ordered nature of events coupled with longitudinal data may permit better causal inference in future studies.

Despite these concerns, some findings are quite familiar: people share avidly with close kin, neighbors, and reciprocators, and families experience varied gains and losses from participation in sharing networks. Those findings are robust across ecological settings and subsistence modes. Unlike other populations, however, Kangiqsujuaq subsistence activities are limited to the wealthy who can afford the high cost of vehicles, gasoline, rifles, and other technology. These wealthier households are more likely to hold political office, actively hunt, donate country food, and share with close kin who possess similar characteristics. Country food sharing may strategically help keep these relationships embedded, but it's hard to tell. Certainly, excluding others from receiving shares is more often the rule than the exception. Only 4% of potential household dyads witnessed any exchange over a 1-year duration, suggesting that country food sharing is very limited.

If the country food-sharing network does represent the larger social web of interactions, we would have expected to see more analyses that incorporated specific aspects of network structure. Only the GWESP variable, which assesses transitivity, appears to be a network-specific measure, and in this case, GWESP is treated as a control variable rather than an interpretable representation of clustering patterns within the network.

Other tools from network analysis may prove useful in addressing the role of network topology. One's position in the sharing and kinship network (e.g., eigenvector or betweenness centrality) might be useful to explore relationships with political influence, economic wealth, and reputational enhancement that would not otherwise be visible using more traditional regression approaches (e.g., generalized linear mixed model). Ties to well-connected individuals are unlikely to be equal to those of less embedded partners. Strategies of peripheral versus more centrally positioned actors in the network might provide insight into how families navigate multiple needs. Peripheral households may indeed be poorer, but they may also have independent means of obtaining country foods (e.g., buying and selling).

This leads to our second point. Sharing is often a primary means of reducing the risk of shortfalls in nonmarket economies. If other ways of managing risk become available (e.g., with increasing market integration), traditional sharing networks sometimes collapse, in other cases they remain unchanged, and sometimes wealth is used to help expand sharing networks, as we found among Tsimane forager-farmers of Bolivia. Long-standing questions in anthropology consider how and when cooperation, monetized exchanges, private property norms, restricted sharing, wealth accumulation, and incipient inequality go hand in hand as traditional populations experience socioeconomic change. As hinted in the paper, historical intergenerational inequality due to some families living mostly on the trapline during the fur trade may have already established some components of a restricted production and sharing ecology. Given recent changes in Nunavik, perhaps wealth can be leveraged more reliably and effectively to manage some risks

better than social indebtedness; under such conditions, food transfers may be increasingly used as a prestige signal to garner political support. If indeed "the influence of individuals [still] depends on the cooperation of others" despite the lack of strong economic or social interdependence among households, then generosity may help generate political support. Generosity could also act as an insurance premium to cover other risks, paid by wealthy households that can afford it. The fact that wealthier households engage in more traditional economic pursuits suggests that hunting and fishing has transitioned from a staple subsistence strategy to a luxury sport—now profitable only with expensive technology given the alternative economic options available in the Nunavik environment. As is usually the case with interesting research, we are pleased that Ready and Power raise many exciting questions that move discussion beyond the simple case study of the biology of altruism—and direct our attention to pertinent questions that have long been neglected.

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This study is innovative because the authors quantitatively tested the relationships of Inuit food sharing with kinship, physical proximity, reciprocity, or political status using social network analyses. I completely agree with their argument that contemporary Inuit food sharing has multiple functions and that it can be regarded as an example of Mauss' "total social phenomenon" (Kishigami 2012, 2013). Indeed, I think that this paper, with its new approach, contributes greatly to the theoretical development of food sharing research, not only of the Inuit but also of hunter-gatherers in general. Keeping that in mind, here I offer several critical comments on the paper.

First, the authors do not define "sharing." They questioned Inuit household heads about sharing, which seems to mean "giving or receiving of country food." They state that the heads "were asked to free-list their most important country food sharing partners, both who they gave to and who they received from." Based on my ethnographic research in Akulivik, since 1984, I have found that much of food sharing among the Akulivimuit was done not through giving and receiving of meat or communal meals in the village but through the sharing of daily meals within the village or sharing of game meat in hunting/butchering sites located away from the village. I wonder whether the authors' interviews covered those practices.

My second comment concerns the authors' explanation of economic and political inequality among Inuit in a village under the contemporary mixed economy. Their argument that sharing contributes to economic and political inequality in Kangiqsujuaq is provocative. I agree that such inequality exists in Inuit villages in Nunavik. However, I disagree with their explanation regarding its cause. Each extended or local family

(Burch 1975:273; Wenzel 1991:101–102) tends to keep and share its food and monetary resources within the family. Because different extended families have differential access to cash and other resources, there are disparities in hunting/fishing activities and sharing practices, which results in economic and political inequality among the extended families in the settlement. On the other hand, economic leveling is attained through food sharing within each extended family. I argue that extended family relationships across the related households still have a powerful socioeconomic organizational function among the Inuit in a mixed economy. Socioeconomic stratification or inequality occurs not among households or individuals but through extended families in an Inuit settlement.

My third comment concerns the relationship between sharing and the mixed economy in Inuit society. The authors insist that “the mixed economy persists because food sharing is a strategy by which privilege is expressed and maintained by those who give.” I agree only partly with this statement. Obtaining sociopolitical reputation through giving food to others can be a motivation for Inuit to continue sharing their food (Kishigami 2012, 2014). However, I do think that sharing is not a major factor sustaining a mixed economy. Rather, I believe that Nunavik Inuit hunt and share animals primarily to obtain the “real food” (*niqituinnaq*) associated with their cultural value and identity to live in mixed economy. Thus, they engage in both wage labor and subsistence activities to live in a culturally meaningful way, leading to persistence of the mixed economy.

My fourth comment is related to the relationship between sharing and reciprocity. The authors write that “sharing of country food is driven by reciprocity.” Although I observed many cases of both direct and indirect reciprocal exchange in Akulivik, I argue that the principle of Inuit sharing is characterized by an obligation to give (Riches 1981) or giving (Kishigami 2004). Based on my participant observations, I doubt the usefulness of the concept of reciprocity for understanding Inuit sharing practices.

Last, the authors do not consider Christianity and traditional Inuit worldviews when exploring contemporary sharing (Kishigami 2012, 2013, 2014). Also, they should have paid greater attention to changes in the frequency and forms of Inuit sharing in Nunavik over the last several decades. I expect the authors will include these factors as major components of Inuit sharing when developing their study further.

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Some Methodological Challenges of Working with Social Network Data

As is frequently the case with social network analyses, much of what interested me in this paper I found in the methods

and footnotes. This is where the methodological challenges of working with network data are revealed. Being familiar with the specific methods employed here, I will focus my questions and comments on these aspects.

Households in this study were asked both whom they gave to and from whom they received, meaning ties in this study were double sampled. This creates the potential for discrepant reports between households. The authors deal with this problem (as have I and others; Nolin 2010; Kasper and Borgerhoff Mulder 2015) by treating a report by either party as evidence of a tie. There are sound reasons to believe that in most cases people are honest but forgetful and that this practice will minimize type II error (Nolin 2008). However, this is an assumption that should be empirically assessed for each study, not assumed. In this regard, it would be interesting to know what proportion of reports were concordant and discordant.

A second challenge faced by the authors is how to deal with incomplete network data. They chose to consider ties only among the 110 households because of the limitations of the analysis method. However, the limitation is not so much the lack of data on ties as it is the data on households. While the statnet implementation of ergm can handle missing ties (at least those missing at random), it cannot impute the node attributes for the 36 unsurveyed households. Still, it would be interesting to know how many additional ties were omitted when the sample was constrained to only those ties reported among the 110 surveyed households. The number of ties in the final network is not presented but can be inferred from the mean in- and out-degree of 4.55 to be about 501. How many ties were dropped, and how does their inclusion change the degree distribution?

The extent to which missing network data affects inference depends on whether the data is missing at random (Smith and Moody 2013; Smith, Moody, and Morgan 2017), with inference (unsurprisingly) more biased when data is missing nonrandomly. The sample of households presented here is described as representative but not random. The authors demonstrate that the age-sex structure of the sample matches the demography of the community as a whole. It would be reassuring if we knew the surveyed households were representative on other household attributes included in the analysis, such as food security, productivity, and political offices. Of course, if we knew these things about the excluded households, the data wouldn't be missing, so perhaps the authors can add nothing further on this point.

In footnote 5, the authors highlight one of the chronic problems with social network analysis: both theoretical developments and empiricists' needs often outpace current software implementations. In this case, it would have been desirable to interact reciprocity with edge covariates such as kinship or distance, but unfortunately that capacity is not implemented in the statnet package. I'm reminded of Mark Handcock's regular response when a student would ask why a particular feature wasn't available in statnet: “Because *you* haven't written it yet.” Of course, expecting every researcher to also be a statistician and programmer isn't very realistic, so perhaps we should resign

ourselves to living with some implementation lag in this rapidly developing field.

The authors' method of model selection is somewhat opaque to me. Note 4 explains that AIC selection was performed on the set of models including "the minimum number of control parameters needed to generate random networks with comparable structure." One test of a good-fitting ERGM model is that it can be used post hoc to simulate networks that match structural aspects of the observed data, such as the density and degree distribution (Goodreau et al. 2008; Hunter et al. 2008). I assume this is what was done here, but perhaps the authors would like to clarify further in their response.

As a final note, I would like to compliment the authors on the graphical presentation of their data. The results of ERGM models can be difficult to interpret (who thinks in log-odds?). Figure 2 is an innovative and intuitive method of presenting predicted probabilities of example cases. Additionally, the use of Lorenz curves in figure 5 to plot the distribution of giving and receiving (out-degree and in-degree) is a particularly novel and clever way of demonstrating the redistributive effects of sharing.

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Network analysis has become a popular tool in anthropological studies. However, its power to increase our understanding of relationships within and between communities, as well as the interaction between structure and agency, depends heavily on whether the data merely map network ties (Apicella et al. 2012) or include variables that elucidate the nature and content of relationships in a network. Ready and Power's use of network analysis is outstanding in that it not only maps connections between people but also includes several measures of the nature and content of relationships: sharing of country foods, kinship relations, household types, economic status, reciprocity, spacial distance, and position in the political hierarchy. The result is a clear and deep understanding of the Kangiqsujuaq community with visually appealing diagrams.

The results are not surprising to hunter-gatherer researchers: sharing is a central value; kin have priority; reciprocity matters though returns need not be in the same currency; the more able are willing to help support the less able; and when surplus production is possible on a sustained basis, political inequalities emerge (Hayden 2014). However, this paper raises a number of questions in response to the authors' question, "Given these costs, why do wage-earning Inuit continue to spend their hard-earned money on harvesting and sharing of country foods?" My queries come from curiosity, not critique, for the terrain covered is already substantial for a single paper.

First, in a community of 800 that can be reached only by plane and where people rent government housing, what other options do people have to spend their money? In mixed economies that are not as isolated, would the more productive households choose different options? For example, today Ju/'hoansi bushmen of Nyae Nyae with well-paying jobs join churches of other ethnic groups and contribute generously to become integrated into mainstream populations of Namibia. These individuals keep up some traditional obligations with kin but also spend their incomes for their own interests: to purchase vehicles, build modern houses, and network with people from other ethnic groups to start small-business enterprises. They do not share widely with others but still achieve strong political standing in their communities.

Second, what does actual participation in a hunt do for bonding participants and for social dynamics in general? Does the act of hunting provide an outlet for competition, add excitement to life, and generate stories to entertain during long, dark nights? The hunt itself may have an important role in community dynamics. Finally, food is a widely used marker of identity in human societies. Aside from preferences for traditional country foods, what role does procuring country foods play in expressing Inuit pride and identity in the nation state? Does continuing to hunt or fish traditional prey help maintain legal rights to Arctic resources? Incentives to continue hunting may go beyond what can be achieved by the distribution of the returns.

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Why Hunters Earn Wages

"Why Wage Earners Hunt" addresses a larger perennial question in anthropology striking to the heart of human nature and with broad relevance to the contemporary human condition: Is human decision-making largely geared to rational cost-benefit outcomes, or is our economic behavior conditioned largely by the social environment and learned factors? The answer to this question has long-term implications for promoting sustainable livelihoods on our planet. Solving collective action problems and environmental dilemmas in particular requires a better understanding of the relationship between individual decision-making and social structure and values informing our decisions (Ziker 2015). "Why Wage Earners Hunt" examines the interrelationship of decisions surrounding production and distribution of procured food and economic resources along with factors representing social structure and the political economy.

The study community, Kangiqsujuaq, has provided us a glimpse into the inner workings and sustainability of a mixed economy through Ready and Power's analysis. Ready and Power present a state-of-the-art predictive social network anal-

ysis of food sharing in this indigenous community embedded in the mixed economy of the eastern Canadian Arctic. To the extent that all economies are to some extent mixed, this research has far-reaching implications. The methodology follows a number of other studies done by human behavioral ecologists examining food sharing and also includes political structural variables, such as council membership, that are highly relevant to understanding the causes of sharing in a mixed economy. The network analyses show that households participate in a variety of sharing strategies (generalized, mutualistic, trade, sale) depending on their economic status. The benefits to hunting and sharing the spoils are shaped by structural factors such as kinship and inequality. The article also addresses an issue of broad interest, in particular, the reproduction of structures and values underpinning economic behavior and inequality.

“Why Wage Earners Hunt” demonstrates a way forward to address the complex methodological issues surrounding questions about relationships between individual decision-making and macrolevel systems. This way is culturally meaningful to the research community and provides quantitative, empirical analysis of behavioral patterns that anthropologists more commonly study using qualitative methods. An important finding from this article that supports qualitative findings is the fact that acts of redistribution create and legitimate structural inequality in the community by reinforcing existing patterns of social distinction.

Cross-cultural comparison is a cornerstone of anthropology, and providing some additional comparisons may help to contextualize Ready and Power’s results. Working in the Siberian Arctic in a community of hunter-fisher-trappers called Ust’-Avam (Ziker 1999, 2002*b*), I see many parallels and one major divergence between “Why Wage Earners Hunt” and my own work on food sharing in the Siberian mixed economy. The first parallel is the importance of kinship in explaining food sharing patterns. In two published (Ziker, Rasmussen, and Nolin 2016; Ziker and Schnegg 2005) and one unpublished paper utilizing the social network analysis approach to food sharing in Ust’-Avam, my colleagues and I found that kinship is consistently the strongest explanatory variable. My measures of kinship are based on extensive genealogies and coefficients of relatedness rather than the close kinship and group membership categories utilized by Ready and Power, but the gist is the same. Ready and Power identify reciprocal food sharing as the second-most predictive variable, as we found that was a strong explanatory factor in the Siberian food-sharing networks as well. Ziker, Rasmussen, and Nolin (2016) found that kinship and reciprocity interact statistically. Some sharing with kin occurs irrespective of reciprocal sharing, but another proportion of the sharing increases as both kin relatedness and reciprocal sharing increases. Ready and Power did not investigate interaction effects in this manner, so we cannot make this comparison at this time. Physical distance between households is relevant in both communities.

Ready and Power state that food-secure super households have a high probability of sharing with other food-secure house-

holds. They interpret this finding in terms of generalized reciprocity among a restricted group. In the Siberian sharing network, Ziker, Rasmussen, and Nolin (2016) find an interaction between reciprocal sharing and the similarity of hunting skill of households. Hunting skill is measured for hunting households with a simple scale derived from interviews with key consultants in the community (Ziker, Rasmussen, and Nolin 2016). Hunting skill is similar to Ready and Power’s measure of household hunting productivity. What this means is that in Ust’-Avam, reciprocal sharing increases along with the similarity of production means. Rather than generalized reciprocity, this relationship fulfills the predictions of risk-buffering reciprocity as delineated in Kaplan and Hill (1985), and this is how we have interpreted it for Ust’-Avam.

Direct measures of household need, food insecurity, or household size are not good predictors in the Canadian and Siberian data. However, households in Ust’-Avam, as in Kangiqsujuaq, state that their preferred targets of giving often include single female-headed households and the elderly (Ziker 2002*a*). In Ust’-Avam, once we control for kinship, reciprocity, the interaction between kinship and reciprocity, and the interaction between reciprocity and similarity of hunter skill, food sharing in Ust’-Avam increases as reciprocal sharing decreases (Ziker, Rasmussen, and Nolin 2016). This likely parallels Ready and Power’s finding that food-secure super households give to single female-headed households and the elderly, who would obviously have a harder time reciprocating.

Finally, some comparison should be made regarding the political economy where there are some obvious differences between North America and Siberia, along with particular differences in the learned behaviors of the different tribes. Olga Ulturgasheva, who has worked with Siberian Eveny and Yup’ik in Alaska, has observed that the Eveny economic system features egalitarian principles of distribution, while Yup’ik politics inclines to manifest elements of hierarchical distribution (personal communication). I think we may see similar differences comparing Ust’-Avam with the Kangiqsujuaq community. In Alaska and Canada, there are elected leadership positions, which we do not see in Siberia. Food sharing in Ust’-Avam explicitly supports egalitarian social norms (Ziker, Rasmussen, and Nolin 2016) rather than structural inequality.

Why do hunters earn wages? In Ust’-Avam, they work at jobs and sell the products of hunting to maintain their hunting so they can support their families and community. This general finding parallels Ready and Power and points to the sustainability of mixed economies in the Arctic.

Reply

While human behavioral ecology has long noted the feedbacks between individual action and social structure (e.g., Irons 1979), the socioecological context has often been treated as a static

entity within which individuals must operate. This has largely been due to the difficulty of empirically capturing the complexities of dynamical systems. We feel that network analysis holds particular promise in helping with this task, and as noted by some of the commentators, its strength is most evident when combined with detailed ethnographic knowledge. We are well aware that much remains to be done, but we appreciate that the commentators were sympathetic to the broader goals of our analysis.

Network Analysis: Possibilities and Challenges

Network analysis is a rapidly growing area of study, with methodological advances happening apace. While noting the expanding possibilities of network analysis, some of the commentators also addressed the challenges associated with the approach. First, there is the issue of data collection and sampling: if some nodes and edges are not collected or analyzed, the network may not be an accurate representation of the underlying “actual” network. Nolin, Kishigami, and Gurven and Kraft all raised concerns to this effect about the food-sharing network, so we begin by offering a few summary statistics about the coverage and construction of the network. We note that the sharing network encompasses exchanges of country food both within the village and between hunters while out on the land but does not include meal sharing, for which network data were collected separately (and will be a focus of future work). There are 500 total unique ties in the sampled country food-sharing network. If we include ties that involved non-participant Inuit households in the village, there were 633 unique ties, so 133 or 21% of ties were dropped. If we compare the degree distributions of the network before and after dropping these ties, they are statistically indistinguishable (Kolmogorov-Smirnov tests: $D = 0.058$, $P = .983$ for in-degree distribution; $D = 0.117$, $P = .352$ for out-degree distribution). Consequently, we feel that the network accurately reflects the broad patterns of country food sharing in Kangiqsujaq.

Second, focusing on the sampled network, Gurven and Kraft worry that sharing seems to be relatively limited in scope, noting that only 4.2% of all possible sharing ties are reported. However, we disagree that overall network density is an appropriate measure of the extent of food sharing. Larger social networks are necessarily less dense than smaller networks (Krivitsky, Hancock, and Morris 2011). A density of 4.2% in a 100-vertex network means 416 ties, but the same density in a 10-vertex network means only four ties. Furthermore, our data represent regular sharing partners, not an exhaustive record of all food exchanges. When Inuit harvest country food, they almost always share, sometimes very widely, and requests for country food are almost never denied. While documenting quantities exchanged is informative in some contexts (Koster and Leckie 2014), amounts of food exchanged have limited salience for Kangiqsujuarmiut respondents. In this setting, then, we argue that perceptions of ties are more important in shaping future interactions than absolute amounts exchanged (Krackhardt 1987). We plan to take up this issue in future research by examining the difference between reported ties in this network and actual food exchanges

of a small subsample of households. These differences in actual and perceived social ties are a broader issue that will have increasing relevance as the use and collection of network data expands and is especially important in studies of social support (a growing field) where support given can be difficult to quantify.

Third, Nolin raises the issue of tie concordance, meaning the extent to which reports of giving food are corroborated by reports of receiving food. This provides another assessment of the completeness of households’ reports of their sharing relationships. For our network, 598 ties were reported among in-sample households, meaning that 98 (196) were reported by both giver and receiver, while 402 were reported only in one direction, giving a concordance of 32%. Of these discordant ties, 147 were reported by the receiver (but not the giver), and 255 were reported by the giver (but not the receiver). We believe that the latter type of discordance (possible overinflation of own generosity) is more likely than reporting incoming ties that do not exist. Interestingly, we note that the proportion of giver-reported discordant ties correlates with harvest production level: a smaller proportion of the out-going ties from high producers were self-nominations. This is consistent with the idea that high-production households give to more people than they can keep track of (or have a higher threshold for perceiving a sharing tie as important), and so they are more likely to be on the giving end of a discordant tie reported by a receiver. Thus, if we attempted to correct the network by removing self-reported discordant giving ties, the out-degree of low-production households would decrease more than that of high-production households, accentuating the difference between low- and high-production households.

Finally, once the network itself is determined, there are still many decisions to be made regarding the analysis of the network. In this paper, we tried to understand what determined the likelihood of a food-sharing tie between households using an exponential random graph model. Nolin asked for further clarification of our model selection process; as he correctly surmised, we used post hoc simulation to assess whether the models provided an adequate representation of the network, as well as AIC (i.e., some variables could be included in models that provided adequate goodness of fit but did not lower model AIC). It was largely for this reason that we did not consider adding additional structural terms, as Gurven and Kraft suggest. ERGMs are particularly useful tools, we feel, but they are certainly not the only way to analyze network data, nor are they without limitations (e.g., Ziker and Nolin both noted the inability of our ERGM to determine whether the imperative to reciprocate differs based on kinship). As Gurven and Kraft stress, there are other potential analyses yet to be done with these network data, for example, asking how a household’s position in the food-sharing network influences its strategies of country food harvesting.

Nested Social Structures

Both Kishigami and Dombrowski emphasize the dynamics of sharing at intermediate scales within the village. While we have

focused on the sharing strategies of households within the settlement-wide network, we agree with their suggestions that extended families and socioeconomic groups constitute important subcommunities within the village. These comments highlight the fact that it is important to recognize that geographic communities do not necessarily coincide with social communities, and this is an issue that needs to be carefully considered in any network analysis (see also Collings 2011). However, as Dombrowski illustrates, the existence of subcommunities within the network is upheld by our own analysis—and, we think, suggested in figure 1 (in the component of the graph connected by reciprocal ties). We think that the fact that our model captures these dynamics (through the terms for kinship and attribute-based matching terms) illustrates the power of network analysis to elucidate nested social structures. For example, our suggestion of trade between food-secure, low-production households and food-insecure, high-production households likely represents one of the forms of organization within extended families mentioned by Kishigami. Nevertheless, we chose to focus on households rather than mesolevel communities in our analysis for several reasons. While sharing within families does produce some economic leveling, there is considerable variation in the economic status of households within extended family groups, as well as conflict over these resource differentials. Furthermore, many households not only have large kin networks but also often have ties to multiple extended family groups (due to adoption practices and endogamous marriages) and therefore have to make active choices about how to distribute resources between them. As such, households build their extended families through their social and economic activities, such as sharing, just as much as kinship relations may constitute an organizational basis for collective action.

Additionally, Kishigami doubts the usefulness of the concept of reciprocity for conceptualizing Inuit food sharing. Despite the overarching obligation to share, hunters also explicitly recognize the benefits of reciprocal sharing ties and even state that sharing with other hunters represents a different kind of interaction (perhaps reflecting a community within the village) than sharing with nonhunters. Hunters who encounter each other out on the land often exchange both food and information when they cross paths, even if they are not hunting together. One hunter spoke about the importance of frequent exchange among active hunters as a means of accessing fresh rather than frozen country foods, in the context of explaining why highly productive hunters often exchange among themselves rather than storing food or always prioritizing more needy households. We think that reciprocity is the appropriate concept for understanding these interactions.

The Shifting Social and Cultural Value of Sharing

The importance of situating current patterns of exchange within the larger historical context of socioeconomic change was also mentioned by several of the commentators. Some relevant contextual detail for our study was discussed in Kishigami and Dombrowski's recent exchange in *Current Anthro-*

pology (Dombrowski et al. 2016). We emphasize that market integration is not a recent development for Inuit, as compared with groups such as the Tsimane, Ju/'hoansi, or Pimbwe. Inuit subsistence strategies have been transformed considerably through both active choices about residence near trading posts and missions in the early part of the twentieth century and, later, through the coercive actions of the Canadian government and changes in the economic viability of the seal fur trade (Wenzel 1991). As such, there is a long history of Inuit making decisions in view of different economic options and different sources of risk, and so we agree with Gurven and Kraft that the role of sharing as a risk-management strategy is likely limited for some households. However, we emphasize the economic importance of the redistribution of country food for households that are food insecure. We agree with Kishigami that the interaction of traditional Inuit worldviews and Christianity (including the emergence of Pentecostalism) in shaping how values about subsistence and sharing are expressed is important, but we see it as beyond the scope of this research.

Despite the isolation of the village, today there are many options other than subsistence activities for individuals to spend their time. These include sewing, carving soapstone sculptures, carpentry, going to church, attending Bible conferences, playing sports such as hockey, or consuming marijuana and alcohol. Yet, hunting, fishing, and camping remain preferred activities for Inuit, and many alternative pursuits remain infused with the importance of subsistence: women sew parkas for hunting, sculptures depict animals and hunters, and craft activities focus on the manufacture of hunting-related items, such as harpoons and *kakivak* (fishing spears). In addition to its obvious caloric and economic value, country food clearly holds substantial social and cultural value, and both Kishigami and Wiessner emphasize this point. It is this value that we attempted to articulate with the analyses in this paper, demonstrating how traditional Inuit practices and values have been incorporated into modern institutions.

Kishigami suggests that the mixed economy persists not because of the importance of sharing but because of the cultural value and identity associated with obtaining and sharing “real food.” We do not doubt the importance of subsistence ideology, but following Bourdieu (1977), we argue that if external social structures are radically different from those of the past, both cultural practices and eventually value systems will not be reproduced unchanged. This perspective is affirmed in Kishigami's own research on the identity of urban Inuit (Kishigami 2001). While many researchers have focused on the importance of subsistence ideology (e.g., Bodenhorn 2000; Nuttall 1992), we have focused on the role of external structures in the persistence of the mixed economy and suggest that the manifold social and economic benefits of sharing serve to validate the continued relevance of subsistence ideology.

Future Directions

As a number of the commentators noted, social dynamics are not perfectly distilled in the network of country food sharing. While we certainly feel that Inuit food sharing both reflects and

contributes to social structure, it also interacts with other important domains of exchange and support and other arenas of distinction, as many of the commentators note. For example, Kishigami is right to emphasize the importance of meal sharing. Gurven and Kraft suggest a study of other forms of exchange beyond country food, and Wiessner astutely asks about the salience of the hunt itself and other forms of association. By drawing out the relationships between such things as food sharing and political office, we aim to highlight the interdependency of these various forms of social interaction. Given the particular cultural value of country food, the social significance of its distribution, and its long history of study, we chose to take this as our starting point into our own research on these issues and what we hope will be a larger effort within HBE (and beyond) to a more thorough articulation of these interdependencies.

Clearly, there are both empirical and methodological limitations to what we were able to accomplish with this study, and we plan to address some of these in future work. Yet, we believe—and are gratified by the general agreement of the commentators—that we have demonstrated some of the possibilities that network analysis holds for understanding fine-grained variability in socioeconomic trade-offs and how these interact with broader social and economic forces. However, we wish to emphasize that this theoretical objective of integration of economic, social, and cultural factors across scales is not tied to any particular analytical technique or data type (e.g., Lawson et al. 2015). In this research, we have drawn on decades of anthropological research on why people work to share (Bliege Bird and Bird 2008; Gurven and Hill 2009; Hawkes 1993; Kaplan and Hill 1985), and indeed, the commentators note that some of our conclusions (e.g., sharing is sustained by multiple mechanisms) are familiar. We agree and so see a new set of questions for human behavioral ecologists to tackle, which expand the social, temporal, and spatial scales of analysis to investigate the systems of feedbacks in which decisions about sharing occur. This paper represents an initial foray into such an investigation.

—Elspeth Ready and Eleanor A. Power

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