



## Beer is the cattle of women: Sorghum beer commercialization and dietary intake of agropastoral families in Karamoja, Uganda

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### ABSTRACT

Karimojong agropastoralists of Uganda have employed a dual subsistence strategy of cattle herding and sorghum cultivation to survive in an unpredictable environment, one afflicted by a severe humanitarian crisis. Armed raiding since the 1970s has led to devastating cattle losses, high male mortality, and increased sedentarization of women and children in densely populated homesteads, where infectious diseases and malnutrition rates are prevalent. Fieldwork in 1998–1999 confirmed the detrimental effects of armed raiding on child growth and development. During this period, however, women maintained largely traditional subsistence patterns. Follow-up fieldwork in 2004 revealed surprising subsistence changes: sorghum beer, an important food and ritual item, was being brewed for sale, which had not been noted in previous literature on the Karimojong. We outline the role of beer in the diet by analyzing the nutritional profile of Karimojong women and children, nutrients supplied by beer, and those supplied by foodstuffs purchased with sales profits. Commercial beer supplied from 3 to 6% of energy intake, and grains leftover from brewing (dregs) supplied from 3 to 12%. Selling beer was women's preferred form of casual labor, with differing patterns of participation in brewing between rural and peri-urban areas. Women who were paid in currency relied on profits to purchase nutrient-rich supplemental foodstuffs important in an otherwise marginal diet, as well as beer. The households of women who worked for other brewers or purchased beer wholesale and sold it retail relied heavily on dregs for daily subsistence. Nutrient intake was highest among women with cattle and sorghum who brewed and sold beer from their homesteads, and lowest among women who lacked sorghum and worked for commercial brewers in urban centers. Because nutritional status remains marginal in Karamoja, beer commercialization as a consequence of subsistence changes could have dramatic health consequences for women and children.

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### Introduction

Karamoja sub-region of northeastern Uganda (Fig. 1) is characterized by intense heat, sporadic rainfall, periodic drought, and environmental unpredictability (Gray, Leslie, & Akol, 2002). Karimojong agropastoralists in southern Karamoja have adapted through a dual subsistence strategy of transhumant pastoralism and sorghum cultivation, described in detail from extensive fieldwork in the 1950s (Dyson-Hudson, 1966; Dyson-Hudson, 1960). At that time men stayed with their herds throughout most of the year, residing in temporary cattle camps and moving to take advantage of the best grazing grounds. Women and children maintained semi-permanent homesteads, where they cultivated sorghum when rainfall allowed. During periods of extended

drought they migrated to the cattle camps, where they had access to milk and meat from the herds (Gray et al., 2002). Thus, a mixed and opportunistic subsistence strategy, combined with population mobility, have long been key features of Karimojong survival.

Although the wealth of men, relationships among families, and the authority of elders are maintained through cattle, in fact sorghum porridge (*etap*) is the staple food of the Karimojong. Sorghum is also used to make beer, which traditionally has been brewed for seasonal rituals; births, weddings, and funerals; to feed work groups; and to offer to elders and ceremonially to ancestors (Dyson-Hudson, 1960). The importance of beer is perhaps best expressed in the Karimojong saying that “beer is the cattle of women” (Dyson-Hudson, 1966: 96), an explanation encompassing at once its ritual, nutritional, social, and economic value.

Aspects of Karimojong life are remarkably different today than in the mid-20th century. Environmental stressors such as drought have increased in frequency and duration, and their effects have

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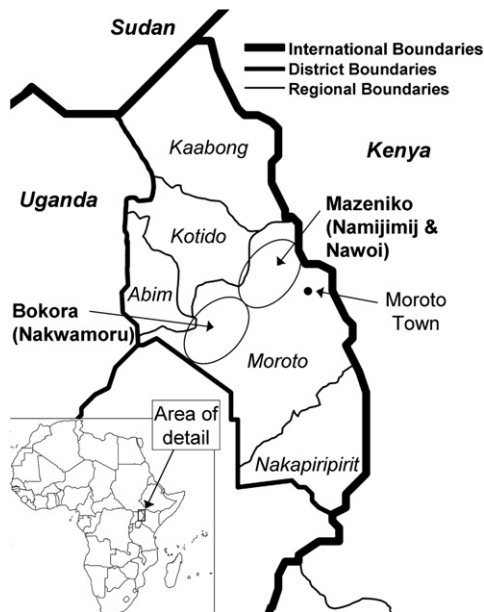


Fig. 1. Map of Karamoja region, Uganda.

been compounded by sociopolitical events and armed raiding of cattle (Gray et al., 2002). Policies during the colonial period (1890–1962) restricted population movement, which resulted in escalated tensions between pastoralists in the region. When these groups gained access to guns brought in with the ivory trade (Barber, 1968) and to automatic weapons looted from barracks in Moroto in 1979 (Lamphear, 1998; Mirzeler & Young, 2000), the resulting armed raids had widespread health effects. AK-47 raiding (Gray, 2000) has resulted not only in high mortality of adult males (Gray, Akol, & Sundal, 2007; Gray et al., 2003) and devastating cattle losses, but interferes with cultivation and makes migration dangerous, thus limiting access to both crops and milk (Gray, 2000). This has exacerbated the effects of environmental stressors, leading to increased sedentarization, recurring famines, and dramatic population losses (Cisternino, 1985; Ocan, 1994). In Akoro, the great famine of 1980, 60% of children under age five reportedly died due to famine in one territorial section (Biellik & Henderson, 1981), and Karamoja has received emergency food relief every year since (Gray et al., 2003; Munghinda, 2009; WFP, 2005).

Fieldwork from 1998 to 1999 in Namijimij and Nawoi homestead clusters in Mazeniko territorial section and in Nakwamoru homestead cluster in Bokora territorial section confirmed the detrimental impacts of armed raiding on child growth and health. Mean height and weight of sampled children under age five fell below National Center for Health Statistics third percentiles (Gray, Wiebusch, & Akol, 2004) and was below that documented among Karimojong pre-schoolers in the 1960s (Jelliffe, Bennett, Jelliffe, & White, 1964). The probability of death before age five was 18.3% from 1990 to 1999, and approached 30% among the Mazeniko families (Gray et al., 2003). During this period, however, women still had some access to herds and maintained traditional subsistence patterns based on cultivation, foraging, and milk (Gray et al., 2003).

Follow-up research in 2004 designed to assess maternal care strategies revealed surprising changes in subsistence patterns. The first was a striking absence of cattle from the homesteads. An estimated 150–200 cattle remained in Nakwamoru, which was insufficient to maintain the population of over 1000 people (see estimates from Allan, 1965). Men from Namijimij and Nawoi still had large herds, but migrated with them to remote grazing areas to

avoid being raided, leaving women and children with no access to milk. Furthermore, the sorghum harvest was poor in Nakwamoru and failed completely in Namijimij and Nawoi. Women thus anticipated famine by the end of the year.

The second surprising observation was the strategy women adopted to cope with the lack of access to cattle, a poor harvest, and subsequent food shortages: beer commercialization. Nearly all women participated in some aspect of brewing sorghum beer for sale. This is not an uncommon strategy in Sub-Saharan Africa – in fact, it might be the most significant economic activity for rural women in Sub-Saharan Africa (McCall, 1996). Selling beer requires less initial capital than many other informal sector activities and, since beer must be drunk within a day or two of brewing to avoid souring, can yield rapid returns – provided customers are able to pay. Furthermore, since brewing has traditionally been women's work, this arena of the informal sector is (at least initially) under women's control (Maula, 1997); whereas since men form the majority of consumers, beer commercialization redistributes wealth from men to women (Colson & Scudder, 1988; McCall, 1996). Women adopt beer sales in response both to the appeal of participating in a business venture ("pull" factors) as well as to social or environmental pressures that necessitate earning extra income ("push" factors) (Maula, 1997). For example, individuals and groups of women in Gwembe, Zambia began selling beer largely in response to relocation after the river near the village was dammed, and women in southern Sudan adopted beer sales during civil war (Jok, 1999). In Karamoja, beer sales had not been noted in any previous records and were not observed even in 1999, but commercialization was increasingly necessary in 2004 for women, who became the sole providers as cattle numbers dwindled. Furthermore, brewing and drinking provide respite from the monotony of daily life and stress, a brief period of sociability and cheer (Colson & Scudder, 1988; De Garine, 2001a). This was no less true or important in Karamoja. Women who were worried about hunger, raids, and illness might forget these – if only for a moment – with a bit of beer.

The beer made for sale in Karamoja differed from beer made for home consumption or ritual use. Traditionally, Karimojong beer is brewed by soaking germinated (malted) sorghum with unmalted roasted sorghum in pots for two days, during which time fermentation occurs (Steinkraus, 1983). The resulting brew is consumed, usually communally, while still actively fermenting with the dregs (grains) left in the liquid. Commercial beer made in 2004 was brewed in large metal drums with maize or cassava flour added to help increase production, and the beer was strained and only the liquid sold to individuals for consumption. The leftover dregs were given away, usually to women who helped with brewing and sale. These were eaten plain, made into porridge, or soaked again at home to produce a weak "second beer" and then eaten.

Many women in 2004 expressed concerns about their children's nutrition, their heavy reliance on beer, and the social implications of increased beer consumption. Nevertheless, daily subsistence was tied to its sale for most families. Evening meals consisted primarily of foods purchased with profits from the day's beer sales, or of beer and dregs paid to women who assisted brewers. This represents a remarkable change from 5 years earlier, and Dyson-Hudson's (1966) description of beer as "the cattle of women" was thus particularly apt in Karimojong society in 2004. Just as men and their cattle had been the primary subsistence resources at the end of the 20th century, so women and their beer were the primary subsistence resources for many Karimojong families at the beginning of the 21st century.

The original focus of the 2004 study was maternal care, and the sample that was appropriate for the original study is small for an analysis of brewing. However, the importance of brewing for

women in the sample and the rapidity of subsistence change warranted analysis of the available data. During 2008 and 2009, skyrocketing food prices, food shortages, and global acute malnutrition rates bordering on emergency levels have culminated in what the World Food Programme identifies as a “severe humanitarian crisis” in Karamoja (WFP, 2009). In this climate, the nutritional implications of beer commercialization, even the most subtle, may have dramatic health consequences.

## Methods

### Study site

From September to December 2004, Gray et al. undertook extensive follow-up to research carried out in 1998–1999 in the Bokora and Mazoniko territorial sections of the Karimojong to investigate maternal strategies and maternal and child health. Three homestead clusters were sampled: Nakwamoru in Lokopo subcounty, Bokora; Namijimij in Nadunget subcounty, Mazoniko; and Nawoi in Rupa subcounty, Mazoniko (Fig. 1).

### Sampling

Data were collected for 15 female-headed households in Nakwamoru, nine in Namijimij, and three in Nawoi. Two women shared a yard in Namijimij, so the Namijimij sample resulted in data for 10 women’s families. Participants were selected from a sample of 300 women who participated in the 1998–1999 study. The 28 participants were purposively chosen as being in their middle-reproductive decade (mean age 31.2 years). Each had experienced two or more pregnancies, and had at least one child currently breastfeeding. While the sample is representative of women of these characteristics, it might not be representative of all women involved in brewing, for the two sampled communities were within less than 2-h walk from a major trading center, and brewing may have been a better option for them. A study in more remote communities in 2006–2009 (Sundal, 2009) indicates they may have had fewer brewing options, but this is currently unconfirmed.

All Nakwamoru households were rural, although they were close to a small local trading center, established after 1998. Namijimij households were peri-urban and within a few kilometers of major trading centers in Moroto Town and Katanga, as well as to Moroto military barracks. The Nawoi households were rural and several kilometers from the closest trading center or urban area. Five households in Namijimij and Nawoi reported having livestock but women had little or no access to them. Four Nakwamoru households still had livestock herds and eight more had a few cattle, goats or sheep. Nakwamoru households had overall greater access to cattle, but herd size had been dramatically reduced.

Households typically included several children, most under the age of 10, and three or four adults: the female head of household, her husband, and one or more other relatives. Mean household size in Nakwamoru was larger than in Namijimij and Nawoi (7.7, 5.8, and 5.0, respectively).

### Field methods

Fieldwork included three major components: behavioral and dietary observations, collection of women’s reproductive histories, and repeated anthropometric measurements of the 28 women and their resident children.

Each household was observed once a month from roughly 8:00 a.m. to 4:00 p.m. for three (Namijimij and Nawoi) or four (Nakwamoru) consecutive months. To ensure that women did not alter their activities as a consequence of the investigators’ presence,

visits were scheduled randomly and without advanced notification. The times of all food procurement and preparation, childcare, social, and casual labor activities were recorded to the nearest minute. The researchers also described and quantified all food consumed during observations and collected dietary recalls, the first detailed dietary data collected in this population. Foods were measured by mass, volume, or both, and the number of individuals eating in each household as well as their age, gender, and contribution to the household economy were recorded. Interviews were conducted in the NgaKarimojong language by Gray with assistance from Akol, who is a native speaker. An open-ended, conversational format was employed.

### Analysis

Nutritional profiles of women and their families were calculated from measured foods and from dietary recalls. Estimates of the amount of beer and milk consumed per person exclude breastfeeding infants but include older children, who consumed beer products – including filtered beer. Estimates of nutritional values were derived from the FAO Food Composition Tables for Use in Africa (Leung, 1968), which to our knowledge are the most complete nutrient composition tables available for East Africa. In the case of foods not listed in the tables, such as sauces, estimates were based on the combined nutritional values of ingredients. These estimates are acknowledged to be rough at best by comparison with actual chemical analysis; nonetheless they provide us with insight into the adequacy of household energy and macronutrient intake and allow us to predict which micronutrients are likely to be lacking in the diet.

Estimates of nutritional values for beer and beer products were derived from these same tables and from accounts of indigenously brewed alcoholic beverages from other studies (Netting, 1964; Odunfa, 1985; Platt, 1955, 1964; Steinkraus, 1983). These tables do not account for reuse of dregs, and the nutritional intake of families who reused dregs for brewing at home before consuming them is thus likely to be slightly overestimated.

Time allocation estimates for brewing and other casual labor activities were calculated from observations and from women’s reports. Estimates for brewing activities include time spent collecting water and supplies for beer, preparing grain for beer, brewing and selling beer, purchasing beer for retail sale, and collecting debts.

Analyses were run in Microsoft Excel and SPSS. Results were compared between the two territorial sections and among the three homestead clusters. Statistical power was low because of the small sizes of each category, so statistical significance was not reached in most analyses of variance.

This study was reviewed and accepted by the Human Subjects Committee at the University of Kansas. In Uganda, research permission was obtained from the Ministry of Science and Technology, the District Officer in Moroto, the Office of the Minister of State for Karamoja Affairs, and the Ministry of Health – Moroto District Medical Officer.

## Results

### Beer consumption

Beer, dregs, or both were consumed on 83 out of 98 days of observation, in all households observed, by both adults and children. In fact, while our estimates of the amount of beer consumed per person per day exclude breastfeeding infants, mothers offered beer to babies and young children, who sometimes drank appreciable amounts. A full mug (500 mL) might be shared

among two or three children, or between a mother and infant. Women who had little else to feed their children reported that beer helped kids sleep and forget about their hunger.

Table 1 summarizes the mean amount of beer products consumed per day in each household and per person. In general, Namijimij households consumed more beer products than households in Nakwamoru and Nawoi, but there was considerable variation within each homestead cluster. For example, household 7 had the most cattle in the sample and higher milk intake than other households, averaging 2.6 L/day. This likely contributes to the household's low beer intake. Household 15 was the largest in the sample, and beer intake per person is low because it was shared among many people. Finally, household 23 had high mean intake owing to one day of heavy consumption, when the female head of household purchased 20 L of beer to sell but it was instead drunk at her homestead.

Eighty-five percent of all beer consumed was strained commercial beer: individual commercial beer intake averaged 190 mL/day in Nakwamoru, 286 mL/day in Namijimij, and 223 mL/day in Nawoi. This accounted for 3.2% of all energy intake in Nakwamoru, 6.2% in Namijimij, and 5.6% in Nawoi. Women in Nakwamoru incorporated more traditional unfiltered beer and "second beer" into the diet (averaging 27 mL and 42 mL per person per day, respectively, compared to 0.6 mL and 1 mL in Nakwamoru and none in Namijimij). Individual dreg consumption averaged 35 mL/day in Nakwamoru, 88 mL/day in Namijimij, and 101 mL/day in Nawoi. Sixty-one percent of dregs in Nakwamoru and 71% in Namijimij and Nawoi were consumed by children under the age of 14.

#### Casual labor and beer production

Women's principal subsistence activities also differed by homestead cluster. More women from Namijimij engaged in "booking": retail sale of beer reserved (or "booked") and purchased wholesale in urban centers from commercial brewers who sold up to 300 L each day. Women bought 20 L jerry cans of beer for 3000 Ugandan shillings (Ush) and sold the beer retail for up to Ush 4000 (In 2004, one U.S. dollar was equivalent to Ush 1725–1742.) Frequently women obtained beer from the wholesaler on credit and, as this was usually an individual activity, a single woman

incurred the full financial risk. Women in Nakwamoru brewed beer in smaller batches (up to 100 L) using sorghum left from their 2003 harvest and sorghum purchased with profits from previous beer sales or money borrowed from their husbands (whom they were expected to repay). They sold the beer directly from their yards or at the nearby local trading center. Brewing in Nakwamoru was more likely to involve multiple women, often relatives and friends. In all three homestead clusters, selling beer was identified as the best way for women to earn money, and even women from the wealthiest households relied on selling beer for their daily subsistence. As one woman observed when asked if life would be easier if her husband were rich: "It's all the same, especially in these hard times: wives of men with or without cattle sell beer."

Twelve (80%) of the women sampled in Nakwamoru participated in brewing and sale. Eight brewed and sold their own beer from their yards or those of friends or relatives, and another four regularly assisted these women. Other sources of income here included gathering and selling firewood, water, sticks for building fences, or grass for thatch, and selling tobacco (grown by Karimojong men). Women carried these items to a major trading center in Matany, approximately 15 km away. All Namijimij women sampled participated in brewing or retail beer sales: five women regularly booked beer and five assisted and sold firewood and water to large-scale commercial brewers. Two of the three Nawoi women assisted commercial brewers. The third woman worked at the army barracks. Other casual labor options for the Mazeniko women included carrying rocks for builders down the steep slopes of Mount Moroto, processing and selling snuff, and collecting and selling grass or sticks for building.

Women who brewed their own beer had currency to purchase foods, including beans, dried fish, greens, nuts and seeds, tomatoes, oil, and when it was available, milk. Those who worked for other brewers were usually paid in beer and dregs rather than in currency, so beer and dregs were the main foods obtained from their labor. Women in Namijimij who carried water and firewood for commercial brewers were paid in beer and infrequently in currency and were more likely to purchase beer with a part of their profits.

While Namijimij and Nawoi women identified booking beer as the best way to earn money, selling beer retail was in fact a risky venture. First, a woman might make plans to sell beer and leave

**Table 1**  
Mean intake of beer products per day for households and individuals (excluding breastfed infants), by homestead cluster.

Nakwamoru (Bokora)				Namijimij (Mazeniko)				Nawoi (Mazeniko)			
ID	Household size	Beer products per day (mL)		ID	Household size	Beer products per day (mL)		ID	Household size	Beer products per day (mL)	
		Per household	Per person			Per household	Per person			Per household	Per person
1	7	1508.8	251.5	16	3	633.3	316.7	26	5	954.2	238.6
2	6	2034.4	406.9	17	5	1333.3	333.3	27	4	1225.0	408.3
3	9	3500.6	437.6	18	6	800.0	160.0	28	6	2175.0	435.0
4	5	2219.8	555.0	19	6	1091.7	218.3				
5	9	1818.8	227.3	20	7	2058.3	343.1				
6	9	2907.5	363.4	21	9	1200.0	150.0				
7	10	448.8	49.9	22	7	2758.3	459.7				
8	7	3371.9	562.0	23	4	4041.7	1347.2				
9	8	3191.3	455.9	24	3	1400.0	700.0				
10	8	1534.4	219.2	25	8	2733.3	390.1				
11	5	2676.1	669.0								
12	5	675.6	168.9								
13	8	1475.0	245.8								
14	7	2468.8	411.5								
15	12	462.5	42.0								
Mean per person per day	337.7	Mean per person per day	441.8	Mean per person per day	360.6						

early in the morning to reserve it only to find that everything was already booked. Second, competition was fierce and potential customers expected a taste before purchasing to determine which beer was of good quality, but a woman who gave away too much risked losing profits. Third, people often bought on credit and a woman might spend an entire day attempting to collect on these debts but still not get enough to repay the wholesaler. Finally, beer would sour overnight and could not be sold the next day, and individuals intentionally avoided purchasing lower-quality beer because sellers were forced to give it away at the end of the evening. Women who sold beer retail thus incurred considerable economic risk, and while they might earn a daily profit of up to Ush 1000 (approximately U.S. \$0.57 in 2004), most earned closer to Ush 500 or 600. Women who were dependent on money from retail beer sales had little to feed their families when profits were low, which was reflected in interview accounts: “With the Ush 600 she gets from carrying beer she usually buys Ush 200 maize, Ush 100 tomatoes, Ush 100 cooking oil, and Ush 200 beer. Today she only got Ush 200 and spent Ush 100 on beer – now she doesn’t know what to feed the children.”

The type of labor in which a woman participated thus influenced her family’s available food options and subsequent nutritional status. Table 2 summarizes mean daily energy and nutrient intake per person by type of labor. The households of women in Nakwamoru who brewed and sold their own beer had greater energy, protein, fat, calcium, and Vitamin A intake than those of women who worked for brewers or did not participate in brewing at all. (However, intake in Nakwamoru is likely slightly over-estimated, because about 7% of dregs consumed there were left-over after brewing second beer, and available nutrient estimates for dregs do not consider reuse.) All women in Nakwamoru who were able to brew and sell their own beer also had access to some cattle, so milk intake accounts for part of the difference in nutrient intake. Table 3 summarizes the mean amount of milk, filtered and unfiltered beer, and dregs consumed per person per day by labor type. Greater milk intake in brewers’ households in Nakwamoru provided about 24% of the extra energy consumed, 25% of the extra protein, 19% of the extra fat, 66% of the extra calcium, and 28% of the extra Vitamin A compared to the other two groups of women combined.

Households of women in Namijimij who sold beer retail had higher average energy and nutrient intake than those of women who did not sell beer. Milk intake was low and accounted for only a small percentage of the differences between these two groups, with the exception of calcium (milk accounted for 34% of the extra calcium in the households of Namijimij retail sellers). Households of Namijimij retail sellers consumed the greatest amount of beer products in the sample (Table 3), and beer products provided about 26% of the extra energy intake among their households, 42% of the extra iron, and 82% of the extra niacin.

**Table 2**

Mean intake of energy and selected nutrients per person per day, by labor type and homestead cluster.

Homestead cluster	Type of labor	n	Mean daily intake per person								
			Kilocalories	Protein (g)	Fat (g)	Carbohydrates (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Vitamin C (mg)	Niacin (mg)
Nakwamoru	Selling own beer	8	1783.0	61.2	27.0	331.8	507.4	36.4	200.7	29.6	16.6
	Labor for brewers	4	1452.0	42.3	17.5	268.2	267.6	28.4	128.9	40.7	10.8
	Non-brewing labor	3	1381.3	41.3	12.8	291.6	268.7	33.3	131.7	30.4	14.2
Namijimij	Retail sale	5	1280.0	42.3	15.0	278.9	470.6	41.4	300.9	34.5	10.8
	Labor for brewers	5	1002.0	40.6	8.0	237.5	362.0	28.6	239.3	20.0	9.7
Nawoi	Labor for brewers	2	1068.4	40.9	9.4	237.9	272.6	32.4	120.9	11.3	10.2
	Non-brewing labor	1	757.4	57.7	9.6	147.8	552.2	17.7	247.9	35.1	6.5

“Beer” includes all beer products. “Milk” includes buttermilk, fresh milk, and butterfat. Nutrient estimates based on Leung, 1968 and Steinkraus, 1983.

**Table 3**

Mean intake of milk and beer products per person per day (excluding breastfed infants), by labor type and homestead cluster. Statistical analyses not shown, due to small sample sizes.

Homestead Cluster	Type of Labor	n	Mean Daily Intake Per Person			
			Milk (ml)	Filtered Beer (ml)	Unfiltered Beer (ml)	Dregs (ml)
Nakwamoru	Selling own beer	8	172.6	201.6	9.6	21.3
	Labor for brewers	4	37.1	226.2	90.1	64.8
	Non-brewing labor	3	30.0	101.0	10.2	40.1
Namijimij	Retail sale	5	72.1	286.3	0	129.1
	Labor for brewers	5	41.9	268.5	1.5	39.8
Nawoi	Labor for brewers	2	36.7	170.3	0	143.6
	Non-brewing labor	1	19.5	409.2	0	11.1

Families in rural Nawoi were the most nutritionally vulnerable in the sample. Energy intake in the household of one Nawoi woman who did not participate in brewing was the lowest in the sample (Table 2). However, consumption of filtered beer was highest in this family, because the female head-of-household was sometimes paid in currency for her work in the barracks and used her income to buy beer. Two women from Nawoi worked for other brewers, and were paid primarily in dregs, which formed the foundation of their daily subsistence.

The time spent in brewing-related labor differed among homestead clusters. Fig. 2 shows the amount of time devoted to beer brewing and sale on days when brewing-related labor was observed. Nakwamoru women spent less time engaged in brewing labor – 120 min, on average – and on 60% of these days, brewing labor occupied less than 120 min. Beer production was more likely to involve multiple women working together at or close to the homesteads, and children were cared for at the brewing site by their mothers, siblings, neighbors, and other relatives. In contrast, the average time engaged in brewing labor was 220 min for women in Namijimij and Nawoi, and on all of these days in Nawoi and half in Namijimij, this work occupied more than 4 h. Children were left at the homestead and were often alone the entire day, with no food but dregs from the night before. This had implications for children’s nutritional intake, discussed below.

## Discussion

The World Health Organization’s 2004 Global Status Report on Alcohol (WHO, 2004) estimated that Uganda had the highest per capita absolute alcohol consumption worldwide, mostly because of heavy consumption of indigenously brewed alcoholic beverages. The modern dependency on beer in Karamoja as a major household

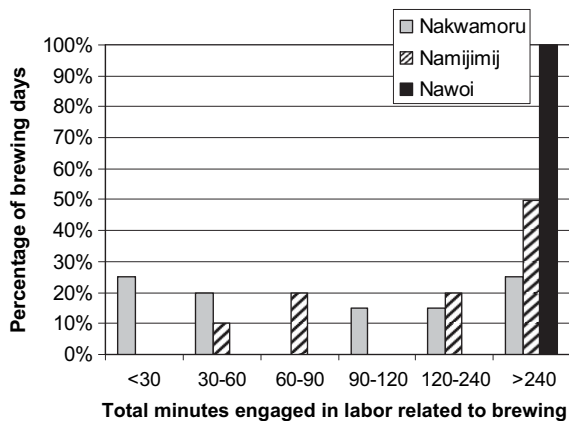


Fig. 2. Percentage of brewing days spent in defined time periods of brewing labor by homestead cluster.

food source and a commercial commodity reflects dramatic differences from the lifestyle observed by researchers both in the 1960s and in 1999, and from accounts of Karimojong women interviewed in 2004. These differences stem ultimately from the effects of armed raiding, which has jeopardized the population's mobility, restricted access to herds and fields, and left women as the primary providers in many families.

The differences in household dietary and nutrient intake reflect differences in livestock resources, sorghum production, and available options for casual labor. In Nakwamoru, all brewers and half of the non-brewers had access to at least some cattle. The sorghum harvest was better there and women were also able to cultivate some cucumbers, watermelons, beans, and leafy greens, which enhanced their energy, protein and micronutrient intake. In Namijimij and Nawoi, by contrast, most households had no livestock at all, whereas the few that did had limited access to the herds. Sorghum stores were depleted and gardens were wastelands of blowing sand; thus women relied completely on casual labor and wild fruits and greens to feed their households. Not surprisingly considering the availability of both sorghum and milk, energy intake was higher in Nakwamoru than in Namijimij and Nawoi.

Nutrient intake was also influenced by the patterns of beer sales observed in the homesteads. In general, Nakwamoru women who had cattle had greater capital to brew their own beer, had higher energy and nutrient intake, and relied less on filtered beer and dregs. Their families' diets included milk from their own cattle as well as nutrient-dense foods they were able to purchase with profits from beer sales. Women who worked for brewers had greater intake of beer products than other women in Nakwamoru, reflecting their payment in beer and dregs. Nakwamoru women who did not participate in brewing had the lowest beer and milk intake in the sample. However, because they still had sorghum stores available, and because they had other casual labor options that afforded them the means to purchase foods, their nutrient intake was comparable to or even better than women who worked for brewers.

As among Nakwamoru brewers, Namijimij women who sold beer retail were able to purchase food with their profits, accounting for part of their greater nutrient intake compared to Namijimij women who did not sell beer. However, the risks of selling beer in the urban center, such as competition between brewers and difficulty collecting debts (risks that are not unique to Karimojong women – see Maula 1997) made this a less reliable form of income than brewing and selling in Nakwamoru. In fact, Karimojong women were already concerned about the sustainability of beer sales in 2004 because so many customers bought on credit and

collecting the money owed was increasingly difficult. Furthermore, the work and social setting at the urban trading center promoted consumption. Most women spent part of their profits on beer and many were inebriated when they returned home, neither motivated nor physically able to prepare a meal for children who had been left alone at the homestead. The danger of lighting cooking fires after dark because of raiding compounded this situation. Thus when a woman was engaged in casual labor for the entire day, her family was dependent upon what she brought home from the trading center, and this was usually dregs and beer. Women in Nakwamoru who sold firewood, water, and grass as casual labor also spent long hours walking to the large trading center (15 km away), but their profits were spent mostly on food, as their commercial beer intake was the lowest in the sample (less than half that of the other Nakwamoru women and less than 40% that of the Namijimij women).

While dregs can be a good source of nutrition, particularly of protein, comparisons of filtered and unfiltered beer (De Garine, 2001b; Leung, 1968; Steinkraus, 1983) and estimates from commercial brewing (Adewusi & Ilori, 1994) suggest that the selected mineral and B-vitamin content of dregs is low. For example, whereas Leung's (1968) tables estimate that 1 kg of unfiltered sorghum and maize beer contains about 50 mg calcium and 45 mg iron, estimates suggest that 1 kg of sorghum and maize dregs leftover from commercial brewing contains only about 4.2 mg calcium and 1.2 mg iron (Perpète, Santos, Bodart, & Collin, 2005). Furthermore, dregs leftover from industrial breweries are reported to have lysine contents approaching zero (Perpète et al., 2005). Finally, the high fiber content of dregs (54%) contributes to reduced intake, protein digestibility, and mineral availability (Adewusi & Ilori, 1994). In the Karamoja context, we expect that dregs contain little calcium, iron, niacin, riboflavin, and lysine. While they still provide important sources of energy and of most amino acids, they must be supplemented with other foods that provide these lacking nutrients.

The foods commonly purchased with profits from beer sales in Karamoja contributed greatly to household nutrient intake. For example, Ush 50 worth of fish sauce, the amount a child might receive after dividing among the family, meets about 30% of protein needs and 50% of fat needs for a child with energy intake of about 1300 kcal (Wardlaw, Hampl, & DiSilvestro, 2004; WHO, 1985). Sauce of tomatoes and greens provides about 28% of the child's recommended daily protein intake, 100% of the calcium and Vitamin A, and about 67% of the Vitamin C. Sauce of beans and sesame seeds provides about 38% of that child's protein needs. These foods also provide the essential amino acid lysine. A child weighing 10 kilograms needs about 640 mg lysine per day (UNU, 1996). Ush 50 worth of sauce made from fish (603 mg lysine), sesame seeds (544 mg lysine), sunflower seeds (396 mg lysine), or pumpkin leaves (689 mg lysine) meets a young child's lysine needs or greatly enhances his or her intake. Finally, although their energy contribution to a child's diet was relatively low, sauces contributed indirectly to energy intake by making sorghum porridge more palatable, so children were able and willing to consume more.

The health implications of beer commercialization are multifaceted, and the social implications no less so. Women who enter beer commercialization are in the difficult position of managing what to do when beer ceases to be an item brewed for rituals and festivals, an item given to show respect to family and elders, and instead becomes a commodity available to anyone with the money to purchase it (Colson & Scudder, 1988; Vargas, 2001). For example, in Karamoja elders would have been preferentially given special traditional beer in the past, but now women are conflicted between social obligations and the risk of losing profits. Furthermore, whereas traditional drinking – in Karamoja and in many other East

African communities – was largely communal, commercial beer is purchased and consumed by individuals, a change often associated with social tensions and perceived to be related to drunkenness (Vargas, 2001; Willis, 2002). Women who sell beer might also risk attaining a bad reputation because of perceived or real links with prostitution (McCall, 1996; Subbo, 2001). Finally, women's brewing is not uncommonly taken over by men or restricted and out-competed by parastatal taverns when it becomes lucrative (Maula, 1997; Willis, 2002). Since Karimojong women are responsible for their children's nutrition, and since beer sales were identified as the best way to earn income to provide for basic daily needs, losing control of this resource could have very real health consequences.

The small sample sizes in the present study limit the conclusions that can be drawn. A larger sample representative of women from more areas is necessary to illuminate the full impact of beer commercialization on dietary intake and nutritional status. A number of other questions arise from the data examined here: the influence of beer consumption, both by pregnant women and children, on infant and child growth and development; the effects of increased alcohol consumption on fertility and mortality, incidence of sexually transmitted diseases, and interpersonal violence; and the short- and long-term sociocultural impacts of beer commercialization, among others. Beer commercialization might also have implications for trade in light weapons and ammunition, as bullets have reportedly become a medium of exchange at markets (women sell beer for bullets and then sell bullets for currency) (Akabwai & Ateyo, 2007). Future research focused exclusively on beer production and consumption would provide a more complete and nuanced perspective of a complex set of intertwined issues.

This is the first observation of beer commercialization among the Karimojong, which was a critical economic subsistence strategy for the women in our sample in 2004. Though medical personnel and government officials frequently criticize brewing (McCall 1996; Willis, 2002), the importance of beer products as a key food source and as the best source of income to purchase other foods point to the need to fully analyze the effects of beer commercialization if maternal and child health are to be improved. While its social and health effects are far from entirely positive, beer commercialization might currently be the best available strategy for Karimojong women who have become primary providers to meet their families' needs, and it reflects their continued resiliency in a stressful environment.

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