Journal of Eastern African Studies

ISSN: 1753-1055 (Print) 1753-1063 (Online) Journal homepage: http://www.tandfonline.com/loi/rjea20

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To cite this article: Ivy L. Pike, Bilinda Straight, Charles Hilton & Matthias Österle (2016) Comparative nutritional indicators as markers for resilience: the impacts of low-intensity violence among three pastoralist communities of northern Kenya, Journal of Eastern African Studies, 10:1, 150-167, DOI: 10.1080/17531055.2016.1138657

To link to this article: http://dx.doi.org/10.1080/17531055.2016.1138657

Published online: 08 Mar 2016.

JOURNAL OF EASTERN AFRICAN STUDIES, 2016
VOL. 10, NO. 1, 150–167
http://dx.doi.org/10.1080/17531055.2016.1138657

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Comparative nutritional indicators as markers for resilience: the impacts of low-intensity violence among three pastoralist communities of northern Kenya

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ABSTRACT

We present results from a collaborative project on the consequences of endemic violence in the pastoralist zone of Northern Kenya. Drawing on our ethnographically driven epidemiological approach, we examine the differential cost of violence by examining household nutrition. The case/control approach we employ draws data from six sites that are culturally similar but differ in the degree of exposure to, or relative insulation from, violence. As one of many lenses through which to examine the consequences of endemic violence, nutritional status offers a different story than assessing livestock holdings or access to land. Our data suggest that despite the different strategies that the pastoralist communities employ to contend with the violence, each one comes with nutritional consequences. Measuring the direct and indirect effects of violence in communities already compromised by poverty and episodic drought challenges researchers, policy-makers, and humanitarian organizations. Our goal is to offer insights into reasonable pathways for understanding these intersections of insecurity for policy and humanitarian organizations.

ARTICLE HISTORY
Received 2 April 2015
Accepted 7 December 2015

KEYWORDS
Conflict settings; food security; nutrition; low-intensity violence; pastoralist resilience

Pastoralist communities, commonly situated at the political economic margins, contend with myriad threats to livelihoods. Considerable evidence suggests that over the past 20 years, pastoralist communities have shaped new relationships with the land both in terms of mobility patterns and land use.[1] These shifting relationships have been attributed to a suite of factors including population pressure in the more productive areas of the pastoralist zone, repeated multi-year droughts, and increasing access to markets, schools, and religious institutions.[2] While drought is the most commonly assessed threat to livelihoods, the impact of inter-community violence is increasingly included as a key consideration in household economic viability and pastoralists' identities.[3] Similar to drought, inter-community raiding can erode livestock holdings or follow a pattern of boom and bust cycles, with some winners and losers in terms of livestock holdings and access to grazing areas.[4] Permanent violence and insecurity also impact pastoralist mobility in general with households creating mobility maps that factor in the safety and security of their families.[5]

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A livelihoods approach allows us to consider the strategies households use to respond to shifts in resources. This approach often extends the evaluation of food security to nutritional assessments of the most vulnerable household members (i.e. under-five year olds and pregnant and lactating women).[6] We fully concur with this approach but draw on the work of Anthropologists and others[7] to suggest that children across all age groups serve as sensitive indicators of household and community well-being. Moreover, the age, or developmental stage-specific strain may vary in culturally specific ways. In this paper, we offer data from a recent comparative study on the consequences of inter-community violence to suggest that sampling across age groups within the household tells a more robust story about strain and threats to livelihoods than land tenure, livestock losses, and under-five nutritional assessments alone can offer.

Background

In 2008, we initiated a longitudinal study to compare the consequences of low-intensity violence among three ethnic communities, the Pokot, Samburu, and Turkana, in the pastoralist zone of northern Kenya.[8] We take as our starting point the urgency of documenting small wars, or what Nancy Scheper-Hughes describes as places of "quiet, unnoticed suffering."[9] In each of the pastoralist communities of northern Kenya, families have lost loved ones, lost access to critical grazing areas, and have intermittently struggled to re-organize livelihoods around major droughts and security concerns. While each community has shaped their own responses to low-intensity violence and each one has a distinct historical relationship with colonial rulers and post-independence governments, there is much they share when it comes to vulnerability, grief, and loss. As one Turkana woman told us "these guns bring much suffering."[10] While the contextual nuance of the ways in which each pastoralist community reorganizes and rebuilds matters greatly,[11] especially for intervention work, to a larger global health audience we believe there is value in reframing from the particular to the wider lens of regional political and economic marginalization.

Scholarship exists to document the anthropological understandings of the causes and consequences of violence within ethnic communities, including richly detailed accounts for the communities in which we work.[12] Yet, as Bollig and Österle suggest, more comparative work is needed to examine the social costs of violence in precise and careful terms.[13] One important goal for this longitudinal study was to examine how the similarities and differences in community responses to the violence shaped nutritional status, health, and emotional well-being.[14] By linking the social costs of violence to health, broadly defined, we hoped the circumstances of pastoralist communities would engage wider audiences including policy-makers interested in how conflict shapes health.

While many explanations for the violence in the pastoralist zones of Kenya have been proposed, most of them center on small arms, marginalization/poverty, and conflict over resources. Although small arms are more widely available, several authors suggest that the scope and intensity of the violent conflict does not appear to be any worse now than in the past few decades.[15] Yet, in interviews with members of the communities in which we work there is a general feeling that the attacks have become worse with the introduction of small arms. Population growth has certainly occurred for most of the pastoralist communities in northern Kenya, and this growth combined with important loss of key grazing areas associated with land grabs and other changes to land tenure shape some of the challenges

pastoralist communities face. In addition, as has been argued, retaliation and revenge may also serve as a means to recover lost animals in an area of Kenya where legal recourse for the loss of one's livelihood is unreliable.[16] Whatever the root causes, it is clear that where different ethnic communities meet, historical circumstances, current alliances, interactions over resources, and who conducted the most recent attacks against whom shape local conflicts.[17] Indeed, we echo McCabe in suggesting that the current violence "can only be understood as part of broader political and economic relationships on the regional, state, and international levels."[18]

In keeping with the suggestions of De Waal et al.,[19] it is important to highlight the nature of the violence pastoralist communities are experiencing. Assumptions of simple tit-for-tat cattle-rustling, as is so often suggested in the media, are misleading at best. Rather, the violence in this area includes a suite of potential threats that include ambushes in public places, in homesteads at night with women and children included as targets for killings, sniper-style attacks for men who are guarding water sources, and other types of common crimes. As a result, each group has crafted a collective and household level response to contend with the risk of livestock losses, loss of access to grazing area due to insecurity, and the threat of fatal ambushes. Our goal was to assess the direct and indirect consequences of this violence by conducting a baseline assessment of nutrition, health, and psychosocial well-being.

For this study, we used a case/control research design. Our criteria for the three control communities included: (a) no active experience of raiding for the past two years; and (b) a majority of the households were actively engaging in pastoralist livelihoods rather than wage labor. In addition, for intellectual and logistical reasons we chose to focus on communities who were at the edges of a contested valley, or within a two days walk of this valley. These communities are referred to as "less affected sites" (LASs). Our case communities (highly affected sites, HASs) were active sites of violence, two of which experienced attacks during the study period, and the other was not attacked but the herds were located in places that were highly vulnerable to attack. We randomly sampled 30–35 households in each of the 6 field sites ($n = 1972$ individuals), with a few additional households sampled in three communities to keep the sample sizes comparable across communities. To evaluate the direct consequences of violence, we documented the number of deaths a household experienced due to violence, health, or old age, and whether or not they had experienced livestock losses.[20] Nutritional and psychosocial well-being were considered indirect but highly significant consequences of the violence.

For the Pokot field sites, the LAS is located adjacent to town centers and the residents represent a mix of permanent and seasonal households. It is a fairly poor community with relatively low livestock holdings, and a small dam serves as the primary source of water for people and livestock. The Pokot HAS is well protected and remote, by choice. Households from the Pokot HAS have fairly large livestock holdings, but the animals are kept at seasonal cattle camps. This strategy shelters women and children from the violence, but leaves them with few livestock for food. Some households, but by no means all, kept only a handful of milking small stock to feed fairly large households. As has been documented increasingly across East Pokot communities, rain-fed maize production also occurs at this location.[21]

For the Samburu, the LAS is on the drier end of the Samburu highlands, with sparser access to mixed agriculture. The Samburu HAS is a beautiful highland site with larger

livestock holdings, mixed agriculture, and a stronger wage labor contribution to the household economy. The households in this community chose to keep most livestock in highly mobile livestock camps, but with access to milking animals for women and young children.

In the third pastoralist group, the Turkana, we struggled to find a site that was minimally affected by the violence. In the end, our chosen field site was a compromise of logistical considerations and how recently the site had been attacked. In this site we sampled pastoralist households that lived at the edges of a town center. At the end of the study, this field site became an active site for raids. Our Turkana HAS is best characterized as an internally displaced persons (IDP) camp. Some families relocated to this site after losing their herds, with relief food being distributed by World Food Program and the United States Agency for International Development (USAID) Food-for-Peace program. Other households have larger livestock holdings, but they keep the animals away from the compounds. While young and older men alike moved in and out of this site, women and children were fairly sedentary, with some children attending the local primary school. Some small stock were kept close by for milk. This site resides at one of the edges of both Samburu and Pokot pasture and experienced many smaller-scale tit-for-tat raids.

While each of these communities relies on the pastoralist livelihood, they have diversified in slightly different ways. Diversification strategies range from a reasonably strong reliance on wage labor as a supplement to household incomes, a mix of opportunistic rain-fed agriculture to some light cash cropping, to women engaging in income-generation activities such as weaving palm fronds or baking mud bricks. Such strategies and innovations are described throughout the recent volume by Catley, Lind, and Scoones, and we view them as a critical part of the process of persistence.[22] In turn, these communities have developed unique responses to and the experience of low-intensity violence. We do not view these responses as a limitation of the study, but rather something to be expected when comparing different communities.

Methods

To ensure valid, reliable, and comparable data collection, we hired 13 Kenyan research assistants. We recruited three teams of researchers, one each from Pokot, Samburu, and Turkana. All of the team members were multi-lingual and fluent in the local language, Kiswahili, and English as is common for Kenyans. We conducted a week-long training session on nutritional assessments, interviewing techniques, and, given the delicate nature of research on violence, a special unit on the importance of confidentiality and ethical human subjects research was also provided. In addition, we worked collectively to translate, back-translate, and ensure comparable interpretations for each question on our survey instruments. We obtained research clearance from the Government of Kenya, and our human subjects protocols were approved by the University of Arizona and Western Michigan University.

Our research teams visited each household four times over the course of two years to conduct nutritional status assessments following Lohman et al.[23] If a household member was absent, the teams made every effort to visit again to locate and measure the missing participant. Weight, height, mid-upper arm circumference (MUAC), and two skinfold measures (triceps, subscapular) were conducted. These measures were converted to

body mass index (BMI, weight, kg/height, m^2), the skinfold measures were summed, and BMI was converted to *z*-scores for the children under the ages of five years using the World Health Organization (WHO) growth standards.[24] For children ages 6–15 years we used the National Health and Nutrition Examination Survey reference standards, following WHO recommendations.[25] To avoid the potential overestimation of undernutrition we included MUAC measures as a cross-validation approach.[26] For children under 60 months of age, we used a MUAC cut-off of <11.5 cm to validate the severity of undernutrition. None of the children in our sample had a MUAC below this cut-off. To classify adults (>age 20 years), we used the WHO criteria for BMI of grade I underweight (18.49–17), grade II (16.99–16.0), and grade III thinness (<16).[27]

We used mixed approaches to assess wealth, including a self-report of subjective wealth, participatory wealth rankings, and a quantitative economic questionnaire. The subjective wealth report was a simple question that asked household heads (and their wives if they were married men) to answer the question "compared to the wealthiest and poorest households in the area, where do you place your household?" The participatory wealth ranking exercise was conducted with five to six elder men in each community. Most of the field sites had five wealth categories (rankings) although one had six wealth levels. The wealth criteria were notably different for each field site, but each relied heavily on livestock holdings for their primary criterion and some inclusion of mixed livelihoods across the three ethnic groups. In addition, we collected detailed economic information using a locally developed protocol. We administered this survey to heads of the household and to each wife if the head of the household was a man. These economic data included information on livestock sales, milk off-take, monthly purchases, and wage earnings, among others. We used these data to create a wealth index using principal components analysis (PCA). The correlation matrix revealed the PCA loading for the site-wide analysis was not a reasonable predictor by site, suggesting no one set of variables adequately explained wealth across communities. Instead, we created a site-specific wealth score using the upper, middle, and lower confidence level means to designate three wealth categories per site. These site-specific categories were used as a diversification score in all of the statistical analyses.

Descriptive statistics were conducted to evaluate the distribution of each dependent and independent variable. All of the multivariate analyses controlled for age and sex. For simple comparisons across groups, we used analysis of variance (ANOVA). These findings are presented with the figures. To offer a more detailed understanding of the differences, we used multi-level mixed effects models for panel data. Multi-level mixed effects models allow us to examine the random effects of inter-correlations within sites, households, and across longitudinal measurements and the fixed effects of age, sex, wealth, diversification, and level of education on BMI and MUAC. Because wealth can vary greatly in pastoralist communities, we included the participatory wealth ranking and the diversification score as an independent predictor variable in all of our multivariate models. All statistical analyses were conducted in STATA version 11 (STATA Corp, College Station, TX).

Results

Table 1 provides the mean ages of the adults by field site. Men's and women's ages do not vary significantly by field site ($F = 0.79$; $p < .073$). As is true across the pastoralist zones of

Table 1. Sociodemographic characteristics for each community.

	Mean age of adults		Mean education levels	
	Males	Females	Males	Females
Pokot LA	39.2 ± 14.5	33.7 ± 14.4	1.69 ± 1.31	1.13 ± 0.48
Pokot HA	36.7 ± 14.3	35.4 ± 12.7	1.23 ± 0.70	1.19 ± 0.60
Samburu LA	35.0 ± 16.1	39.5 ± 13.8	2.26 ± 1.54	1.31 ± 0.98
Samburu HA	37.6 ± 16.2	37.9 ± 16.7	2.75 ± 1.57	1.46 ± 0.93
Turkana LA	38.0 ± 14.5	39.8 ± 13.7	3.39 ± 1.88	2.8 ± 1.96
Turkana HA	40.3 ± 15.1	34.6 ± 11.2	1.87 ± 1.05	1.56 ± 0.52

Notes: Education levels correspond to 1 = no formal education, 2 = less than one year, 3 includes primary school, 4 includes secondary school.

northern Kenya, education levels are low with correspondingly low literacy rates. Given the proximity to the town center, the Turkana LAS has higher education levels.

Adult BMI levels hover around the 18.5 international reference cut-off for low weight-for-height for both men and women (Figure 1). There are no statistically significant differences in BMI for men or women across the six field sites (Figures 1 and 2). Table 2 shows the results of the multivariate analysis of variance (MANOVA) test for differences in men's and women's BMI by age group. There are no statistically significant differences across sites within age groups for men or for women. In the youth analyses, while no statistically significant differences exist for older boys across field sites, the differences are noteworthy for the 10–15 year olds with the majority of these younger boys well below international cut-off for underweight-for-height. Similarly, older girls have much higher

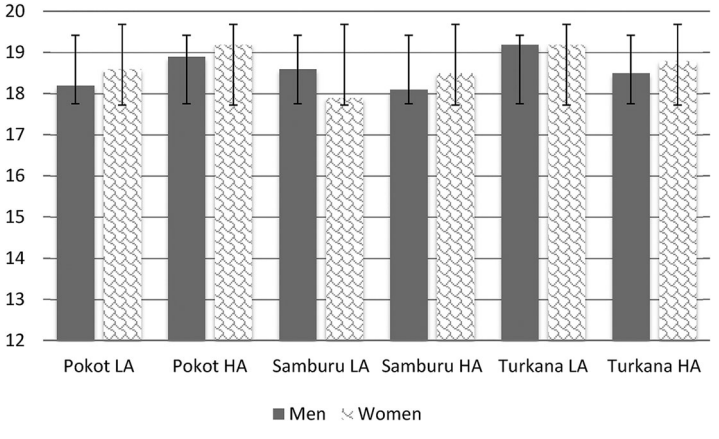

Figure 1. Adult BMI levels for men[1] and women[2] by field site.
Notes: [1]men, $F = 1.37$, $p < .24$; [2]women, $F = 0.83$, $p < .53$.

Table 2. Multivariate ANOVA of BMI by age group.

	Men				Women			
	Sum squares	df	*F*	*P* value	Sum squares	df	*F*	*P* value
20–29 years	51.40	5	0.74	0.59	21.55	5	0.83	0.53
30–39 years	5.99	5	0.59	0.71	33.17	5	1.27	0.29
40–49 years	7.18	5	0.23	0.94	49.56	5	1.37	0.25
50–59 years	18.53	4	1.15	0.36	29.29	5	0.59	0.71

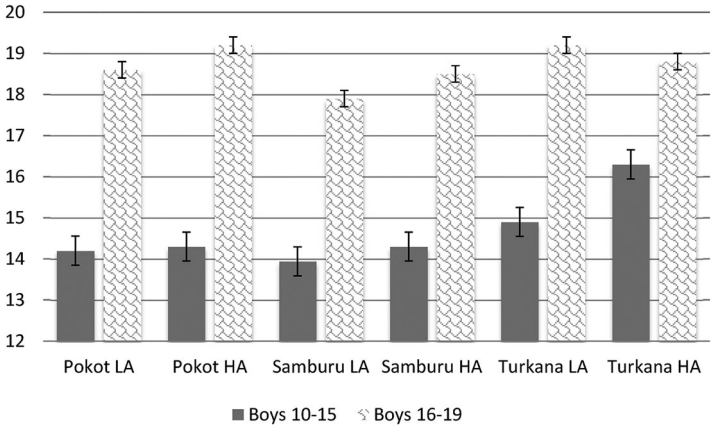

Figure 2. Boys ages 10–19[1,2] years BMI (kg/m^2) by field site.
Notes: [1]boys 10–15 years, $F = 4.26$, $p < .001$, [2]boys 16–19 years, $F = 1.84$, $p < .13$.

BMI levels compared to younger girls, and younger girls vary significantly by site (Figure 3). As is true for the boys, the 10–15 year old girls have precariously low BMI levels. The sample sizes for the younger Samburu girls in the HAS are low ($N = 9$) and may drive the very low BMI of 13.1.

Nutritional status for the younger children ages six to nine years are presented in Figures 4 and 5. The weight-for-height values are presented as z-scores. The boys have z-scores that are close to −2 standard deviations below the reference means. The differences across field sites are not significantly different for either age group. In Figure 5 the z-scores for girls also hover at −2 standard deviations below the reference mean with no statistically significant differences across field sites.

MUAC values are presented for boys (Figure 6) and girls (Figure 7) for 3 age groups (6–9, 10–15, 16–19 years). The MUAC values vary significantly by site for the 6–9 year old boys and the 10–15 year old boys (Figure 6), with the Samburu LAS having the lowest

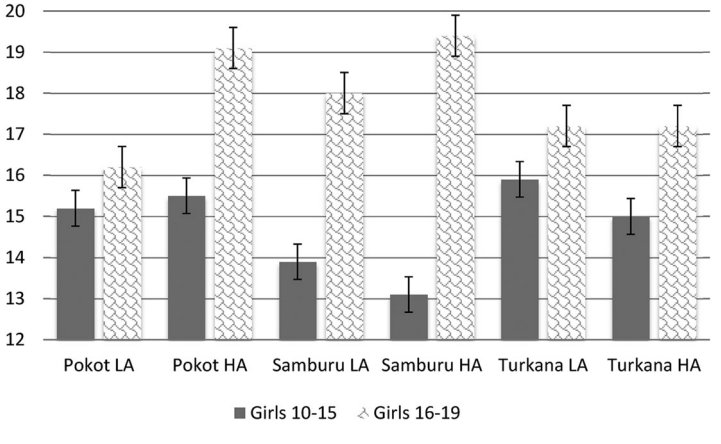

Figure 3. Girls ages 10–19[1,2] years BMI (kg/m^2) by field site.
Notes: [1]girls 10–15 years, $F = 3.25$, $p < .01$; [2]girls 16–19 years, $F = 1.29$, $p < .29$.

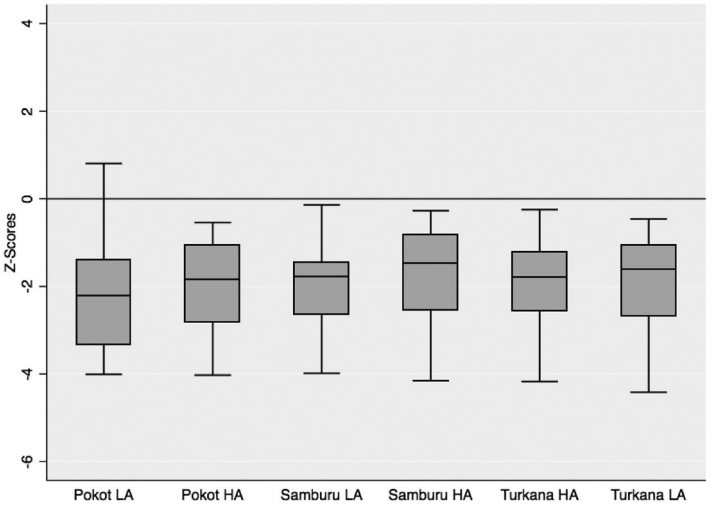

Figure 4. Boys ages 6–9[1] years weight-for-height *z*-scores by field site.
Notes: [1]boys 6–9 years, $F = 0.85$, $p < .519$.

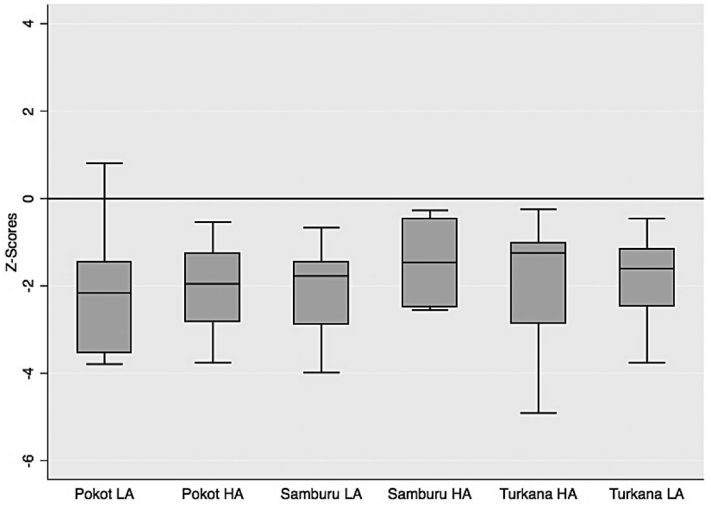

Figure 5. Girls ages 6–9[1] years weight-for-height *z*-scores by field site.
Notes: [1]girls 6–9 years, $F = 0.44$, $p < .82$.

values for both age groups. The girls are similar, with the 6–9 and 10–15 year old girls showing considerable variation across sites (Figure 7). Significant differences in MUAC values occur across field sites for boys (2–5 boys, $F = 20.65$, $p < .0001$) with the Samburu LAS driving the variation (mean *z*-score for Samburu LA = −3.43). The 2–5 year old girls do not vary significantly across sites ($F = 2.17$, $p < .13$), with means that range from −2.53 standard deviations below the reference mean for the Samburu HAS to a −1.64 standard deviations for the Turkana HAS.

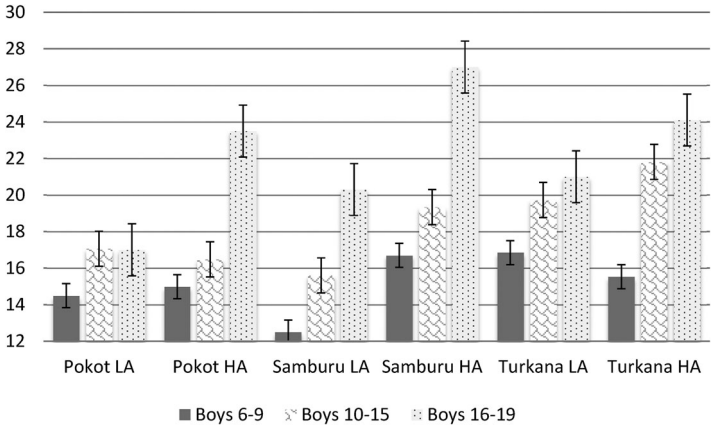

Figure 6. MUAC for boys ages 6–19[1,2,3] years by site.
Notes: [1]boys 6–9 years, $F = 5.07$, $p < .001$; [2]boys 10–15 years, $F = 6.00$, $p < .001$; [3]boys 16–19 years, $F = 1.84$, $p < .13$.

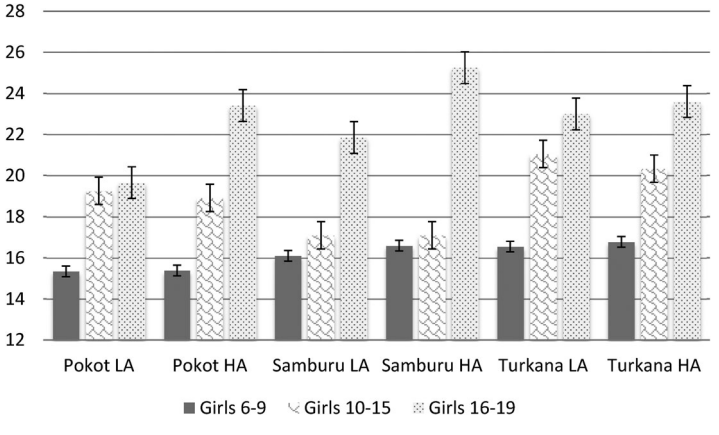

Figure 7. MUAC for girls ages 6–19[1,2,3] years by site.
Notes: [1]girls 6–9 years, $F = 3.04$, $p < .014$; [2]girls 10–15 years, $F = 6.00$, $p < .001$; [3]girls 16–19 years, $F = 1.49$, $p < .22$.

Finally, we present the results of the multi-level mixed effects models in Tables 2, 3, and 4. For adults, ages 21 through 59 years there are no significant differences in BMI between men and women, no differences by age, wealth, education levels, or by diversification index. The random effects findings suggest there is considerable variation within sites and within households (5% and 95% confidence intervals are well above 0). MUAC shows no difference by age, sex, education, or diversification index score. Wealth, however, is negatively associated with MUAC and MUAC decreases across rounds two to four (Table 3).

For children and young adults, BMI is not sensitive to round of measurement (Table 4) but MUAC does vary significantly by round of measurement. Age, sex, wealth, and

Table 3. Multi-level mixed effects model for adult (ages 21–59 years) BMI and MUAC.

BMI	Coefficient	SE	5% CI	95% CI
Round				
1–2	2.077095	1.446	−0.758	4.912
2–3	−0.056	1.3803	−2. 762	2.649
3–4	−0.0107	1.536	−3.023	3.001
Age	0.049	0.035	−0.020	0.120
Wealth	−0.057	0.421	−0.883	0.767
Education	0.306	0.454	−0.584	1.197
Diversification index	0.210	0.415	−0.781	0.597
Constant	16.85	2.703	11.55	22.15
MUAC	**Coefficient**	**SE**	**5% CI**	**95% CI**
Round				
1–2	0.212	0.251	−0.280	0.705
2–3	−0.685**	0.228	−1.133	−0.237
3–4	−0.636**	0.268	−1.160	−0.112
Age	−0.0167	0.010	−0.036	0.003
Sex	−0.380	0.319	−1.001	0.246
Wealth	−2.292*	0.150	−0.587	0.003
Education	−0.056	0.142	−0.336	0.222
Diversification index	−0.041	0.021	−0.245	0.012
Constant	26.367	0.924	24.556	28.179

*p<.01.
**p<.001.

diversification index scores do not predict variation in BMI. However, age and sex both predict variation in MUAC, with girls having higher circumferences, on average, than boys and MUAC increasing with age. Age reveals a negative association with MUAC but that association is driven by the lower MUAC values for the 10–15 year olds. When the age groups are disaggregated then MUAC is highest for the 16–20 year olds. Wealth and the diversification score predict MUAC.[28] In results not shown, if girls and

Table 4. Multi-level mixed effects model for children and young adults (ages 6–20 years) BMI and MUAC.

BMI	Coefficient	SE	5% CI	95% CI
Round				
1–2	−0.008	4.355	−8.544	8.528
2–3	7.472	4.202	−0.764	15.71
3–4	0.125	4.574	−9.194	9.444
Age	0.374	0.390	−0.390	1.139
Sex	2.516	3.190	−3.736	8.770
Wealth	−1.870	1.261	−4.343	0.602
Education	1.135	2.309	−3.391	5.662
Diversification index	1.795	1.357	−2.393	0.507
Constant	12.722	8.403	−3.759	29.20
MUAC	**Coefficient**	**SE**	**5% CI**	**95% CI**
Round				
1–2	0.552 **	0.122	−0.792	0.319
2–3	0.746**	0.118	−0.978	−0.513
3–4	0.914**	0.135	−1.118	−0.648
Age	−0.627**	0.019	−0.590	0.664
Sex	−0.380**	0.319	0.523	1.211
Wealth	0.011*	0.095	−1.176	0.198
Education	0.234	0.145	−0.050	0.520
Diversification index	0.313*	0.235	−0.758	1.110
Constant	10.18	0.634	8.938	11.42

*p<.01.
**p<.001.

boys are evaluated separately, higher wealth and more education are significantly associated with higher MUAC for boys/young men but they do not predict variation for girls/young women.

Linking livelihoods, violence, and evidence of household strain

What we hope these data make clear is that there are no nutritional winners in these three pastoralist communities. Yet, by including nutritional assessments across all age groups we better understand where the strain emerges in the shifting responses to multiple insecurities. While gains (and losses) in livestock holdings vary greatly by site, none of the communities engaged in conflict show signs of clear nutritional benefits. Given the need to separate herds from women and younger children for security this finding is not surprising. For example, herding strategies among the Karimojong in Uganda take men and teenage boys far away from household encampments with the erosion of health and nutrition for women and younger children.[29] Gray et al.[30] found evidence of noteworthy growth faltering by age six months for Karimojong children that persists beyond weaning. Our data reveal a somewhat lower prevalence of undernutrition compared to what Iannotti and Lesorogol report for Samburu households. [31] For the communities we are working among, families often take as many proactive steps to protect children as their resources allow, not the least of which is regularly skipping meals.[32] Indeed, in our sample 221 adults reported eating inferior foods in the past week, and 201 adults reported that they were not eating enough to feel satisfied (results not presented).

Providing food for children is a continual, primary concern for pastoralist families.[33] Hunger serves as a powerful idiom of distress,[34] with women and men in all of the communities we work in reporting sleeplessness and some reporting a profound sense of hopelessness when the children must go to bed hungry. Indeed, one Samburu mother emphasized the tensions inherent in the common practice of assigning children to care for frail grandparents. At one point in the interview, she noted, "Old people don't even have an idea of what a child will eat. So they [children] become hungry, they become hungry for lack of food." Then, in describing the hardships associated with the 2009 drought, she noted the consequence for grandparents' of this inability to provide food for the children who care for them: "Aish, it was very hard since you know grandparents bring nothing. They depend on other people to feed them and the children can eat all of the food and leave a grandparent hungry."[35] Thus, within the same interview, this mother noted that grandparents fail to feed children adequately, but that in times of acute scarcity, this can, in turn, adversely affect grandparents also.

In addition to pointing to the difficulties associated with balancing the nutritional needs of growing children and frail elder adults, this respondent's comments also highlight a salient strategy for augmenting children's caloric intake: children do not uniformly eat in their own mother's houses. During periods of extreme distress, such as the 2009 drought, whole families rely on the wealthier members of their social networks, as another Samburu noted in detail when she credited her family's survival to one of the research assistants co-interviewing her:

> Many people could have died because of the hunger, since there was no day that you cannot hear that people fainted because they lacked food and the goats no longer get prices [due to

> emaciation]. If it weren't for you and Nt----, we could have died of hunger, since no one would even buy shoats' skins. What were we going to eat? A person who stays with her children was good in that drought, since God had brought us together and we stayed in one place, and God enabled us to come back again well.[36]

Scholars suggest that in difficult periods, households will employ a host of fission-fusion strategies as they struggle to balance the livestock to household dependency ratio.[37] While never preferred, households are sometimes wiling to trade-off lower nutritional levels as a means to keep the entire family in the pastoral sector. Hunger serves as a powerful idiom of distress in interviews with Turkana and Samburu women, with the inability to offer enough food to children as the focal point of this distress.[38] Women are not alone in their distress. McCabe offers the following: "A good herd owner is one that makes sound decisions concerning mobility and herd separation and that does not slaughter or sell animals without a very good reason (e.g., to feed children who are not getting enough milk). I have seen Angorot go for three days with no food, allocating his own milk to the children."[39] If this balance is too precarious, then families utilize a suite of strategies that range from sending a few children to live with wealthier relatives or sending wives with small children to town centers.[40] Similar to what has been documented among Turkana households, Straight has observed that when social networks begin to fail, Samburu families do not hesitate to send their children to eat in other households – a strategy supported by the fact that, while adult visitors can be given a cup of tea and politely sent on their way, children must be fed. Given the complex multiple threats that households are currently navigating, we suspect that the tendency for children to engage in "mobility within mobility" – moving between houses and settlements in already mobile communities or even when pastoralists settle – is worth revisiting. Indeed, with more systematic empirical evidence, children's "mobility within mobility" may help explain why household wealth is an uneven predictor of child nutritional well-being.

As we note however, none of these pastoralist strategies are perfect, particularly during the highest periods of food scarcity. Inter-community violence complicates matters further. Access to milk is critical for child health and well-being, and the herding strategies associated with the violence represent a tightrope of keeping families safe from raiding and not compromising child nutrition.[41] But this tightrope is imperfect and this, together with what we know about cultural patterns specific to children, represent a powerful set of new questions for us to explore. Some of the questions include how pastoralist communities navigate the transition to independent herding for younger adolescent boys and girls in the face of violence. Iannotti and Lesorogol found a very similar pattern of low weight-for-height in 10–15 year old boys, and suggest this is the age at which independent herding begins.[42] They also interpret the improved nutrition for the older teens as a benefit of the communal meals that young Samburu warriors share. We see a very similar pattern of low nutritional status for younger teens (10–15 years) and higher nutritional status for older teens for all 3 communities. For the younger teens, it is worth knowing what developmental markers their parents might be watching or is the demand for labor a driving force in decision-making even while they fear for their teens' lives?

While strain is present, there is no evidence of major social disruption. Instead, one explanation for this strain is the incorporation of coping strategies into everyday livelihoods that under ordinary circumstances might be associated with cumulative and

repeated shocks.[43] Over time, these higher risk strategies come with trade-offs that can erode resilience or at least constrain long term planning.[44] Families understand that poorer access to livestock is a high price to pay for security and talk about it in powerful ways. For example, in a longitudinal evaluation of dietary diversity, Iannotti and Lesorogol found considerable erosion in the overall quality and diversity of Samburu diets even after controlling for wealth.[45] This finding is important because it helps us make sense of how households incorporate the purchase of grains and cereals into their overall herd management strategy. Similarly, Lind and Eriksen document changes in how communities diversify their herds and reprioritize camels and goats when faced with major herd losses.[46] Such changes have important implications for nutritional health. A considerable body of evidence points to milk as critical for child nutrition, yet when it is absent, families, especially women do not sit by passively.[47] As we and others have argued elsewhere, longer-term resilience is as much a desire for dignity as one of economic persistence; pastoralist communities will go to great lengths to maintain their identities and livelihoods.[48]

There are limitations to our study that are worth noting. While this sample represents the largest inter-community nutritional survey from the pastoralist zones of northern Kenya, the sample sizes are small once age, sex, and wealth are all parsed by field site. One counterbalance to this small sample limitation is the household level sampling with data from all adults and all children in the household. The second limitation to our findings is linked to wealth. While the Samburu sites have clear wealth stratification, the poor households appear to be over-represented in our Less Affected sample, and the wealthy households are over sampled in the HAS. Similarly, our Turkana LAS included five households who were no longer part of the pastoralist sector, and thus we added five additional households in the second round. A third limitation includes the timing of the study. These data represent measurement across a severe drought. We evaluated the first measurements (2008–2009, early to full blown drought) with two post-drought measurements (late 2009–2010), and the results are mixed. Adults experience an erosion of MUAC over the course of the study with no differences in BMI by round. Similarly, children and young adults do not experience significant differences in BMI by round, but MUAC varies significantly for each round of measurement, with evidence of improvement over time. We are currently building models to examine these wealth and diversification findings in greater detail across age groups. Finally, the over-representation of poorer households in two of our field sites may mask some of the associations between wealth and nutrition, a circumstance we are addressing in our current project on pastoralist youth.

Linking livelihoods and health resilience is not unprecedented, MUAC is used for early famine warning systems, for example, or the household livelihood security approach advocated by Frankenberger.[49] In many ways, we could argue the households we studied are doing precisely what they should be doing by buffering the under-five year olds with some communities succeeding a bit better than others. The lower nutrition for children once they move away from this period of high mortality risk is a reasonable approach, if less than ideal. As the 16–19 year olds move to more autonomous daily lives, their nutrition improves. This improvement may also be linked to the slower final stages of growth and development. As importantly, it may also reflect a strong pastoralist value to prepare young people for adulthood, whether that be as a wife or a warrior.[50] Examining how households are balancing out food needs with safety and careful herd management

seems overdue. With better linkages we can begin to disentangle the precise pathways in the lived experience of conflict and insecurity. As Panter-Brick and Leckman suggest in a recent editorial, "there is no longer much room for conceptual laziness and methodological naïveté in cross-cultural research on resilience."[51] Incorporating health, broadly defined, into livelihood resilience approaches holds great promise for examining the profound marginalization pastoralist communities experience. Indeed, we believe the articles in this volume set the stage for improving conceptual and methodological rigor.

Notes

1. Bollig et al., "Inscribing Identity," 57–9; Fratkin and Roth, *As Pastoralists Settle*; Greiner, "Unexpected Consequences," 420–4.
2. Bollig et al., "Inscribing Identity," 57–9.
3. Bollig and Österle, "We Turned our Enemies," 23–51; Broch-Due, "Remembered Cattle," 50–88; Gray, "A Memory of Loss," 401–18; Pike et al., "Documenting," 45–52.
4. Bollig and Österle, "We Turned our Enemies," 23–51; Gray et al., "Cross-sectional Growth," 193–202; McCabe, *Cattle Bring Us*; Mirzeler and Young, "Pastoral politics," 407–29.
5. Österle, "Armed Economies," 193–222.
6. Baro and Duebel, "Persistent Hunger," 521–38.
7. Galvin, "Transitions," 185–98; Galvin et al., "Diet," 113–32; Gray et al., "Mixed-longitudinal Growth," 499–509; Iannotti and Lesorogol, "Animal Milk," 66–76; Thorton et al., "Coping Strategies," 461–76.
8. Pike et al., "Documenting," 45–52.
9. Scheper-Hughes, "Small Wars," 889–900; Desjarlais and Kleinman "Violence and Well-being," 1143–5.
10. MLE Interview 2010, Pike data.
11. For a useful example: Lind and Eriksen, "Impacts of Conflict," 249–70.
12. Bollig and Österle, "We Turned our Enemies," 23–51; Broch-Due, "Remembered Cattle," 50–88; Eaton, "The Business of Peace," 89–110; Lind and Eriksen, "Impacts of Conflict," 249–70; McCabe, *Cattle Bring Us*; Straight "Making Sense of Violence," 31–40.
13. Bollig and Österle, "We Turned our Enemies," 23–51.
14. For example: Straight et al., "Suicide," 557–8.
15. Eaton, "The Business of Peace," 89–110.
16. Ibid.; McCabe, *Cattle Bring Us*.
17. Bollig and Österle, "We Turned Our Enemies," 23–51; Eaton, "The Business of Peace," 89–110; Greiner, "Unexpected Consequences," 420–4.
18. McCabe, *Cattle Bring Us*, 283.
19. De Waal et al., "Epidemiology," 368–77.
20. Pike et al., "Documenting," 45–52.
21. Greiner, "Unexpected Consequences," 420–4.
22. Catley et al., *Pastoralism and Development.*
23. Lohman et al., *Anthropometric Standardization.*
24. de Onis et al., "Development," 660–7.
25. Ibid.
26. Myatt et al., "The Effect of Body Shape," 5–20.
27. WHO, "Physical Status," 183–212.
28. In more detailed, unpublished analyses of youth, wealth predicts variation in body fat levels for both girls and boys.
29. Gray et al., "Cross-sectional Growth," 193–202; Gray et al., "Mixed-longitudinal Growth," 499–509.
30. Gray et al., "Mixed-longitudinal Growth," 499–509.
31. Iannotti and Lesorogol, "Animal Milk," 66–76.

32. Galvin, "Nutritional Ecology," 209–21; Galvin et al., "Diet," 113–32; Iannotti and Lesorogol, "Animal Milk," 66–76; Iannotti and Lesorogol, "Dietary Intakes," 475–82; McCabe, *Cattle Bring Us*; Pike, "Maternal Body Composition," 658–72.
33. Galvin et al., "Diet," 113–32; Gray, "Ecology," 437–65.
34. Pike, "Biosocial Consequences," 729–40; Pike and Williams, "Incorporating Psychosocial Health," 729–40.
35. NLE 2012 Interview, Straight data.
36. NKTL 2012 Interview, Straight data.
37. Galvin et al., "Diet," 113–32; Lind and Eriksen, "Impacts of Conflict," 249–70; McCabe, *Cattle Bring Us*.
38. Pike, "Biosocial Consequences," 729–40; Pike and Williams, "Incorporating Psychosocial Health," 729–40; Straight et al., "Suicide," 21–30.
39. McCabe, *Cattle Bring Us*, 112.
40. Galvin et al., "Diet," 113–132; Galvin and Little, "Dietary Intake," 125–46.
41. Gray, "A Memory of Loss," 437–65; Little et al., "Infant," 187–206; Sadler et al., "Milk Matters"; Sellen, "Polygyny," 329–71; Sellen, "Weaning," 233–44.
42. Iannotti and Lesorogol, "Animal Milk," 66–76.
43. Baro and Duebel, "Persistent Hunger," 521–38.
44. Roncoli et al., "The Costs and Risks," 119–32.
45. Iannotti and Lesorogol, "Dietary Intakes," 475–82.
46. Lind and Eriksen, "Impacts of Conflict," 249–70.
47. Galvin et al., "Diet," 113–32; Iannotti and Lesorogol, "Animal Milk," 66–76; Sadler et al., "Milk Matters."
48. Bollig and Österle, "We Turned our Enemies," 23–51; Broch-Due, "Remembered Cattle," 50–88; Gray, "A Memory of Loss," 401–18; Pike et al., "Documenting," 45–52.
49. Frankenberger, *Managing Risks*.
50. Little et al., "Infant," 187–206; Straight, "Sense of War Songs," 71–78.
51. Panter-Brick and Leckman, "Editorial Commentary," 12.

Acknowledgements

We are grateful to the communities who participated in this research for their hospitality and cooperation. We would like to thank the anonymous reviewers. Finally, we offer a note of thanks to Michael Bollig and David Anderson for all of their efforts in organizing this volume and asking us all to think more precisely about resilience.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The research was supported by a National Science Foundation Collaborative Grant [BCS 0822915 Straight /0822951 Pike], with additional support from the NSF Office of Science and Engineering Education. Other sources of support include Social and Behavioral Sciences Research Institute (SBSRI) at the University of Arizona, and Western Michigan University's Faculty Research and Creative Activities Award, with a new award from the National Science Foundation [BCS 1430860/1430790] for continued work among teens.

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References

Baro, M., and T. Duebel. "Persistent Hunger: Perspectives on Vulnerability, Famine, and Food Security in Sub-Saharan Africa." *Annual Review in Anthropology* 35 (2006): 521–538.

Bollig, Michael, and Matthias Osterle. "'We Turned Our Enemies into Baboons': Warfare, Ritual and Pastoral Identity Among the Pokot of Northern Kenya". In *In the Practice of War: Production, Reproduction and Communication of Armed Violence*, edited by M. B. Aparna Rao and M. Bock, 23–51. New York: Berghahn Books, 2008.

Bollig, M., C. Greiner, and M. Österle. "Inscribing Identity and Agency on the Landscape: Of Pathways, Places, and the Transition of the Public Sphere in East Pokot, Kenya." *African Studies Review* 57 (2014): 55–78.

Broch-Due, Vigdis. "Remembered Cattle, Forgotten People: The Morality of Exchange and the Exclusion of the Turkana Poor." In *The Poor are not us: Poverty and Pastoralism in Eastern Africa*, edited by David M. Anderson and Vigdis Broch-Due, 50–88. Oxford: James Currey, 1999.

Catley, Andy, Jeremy Lind, and Ian Scoones. *Pastoralism and Development in Africa: Dynamic Change at the Margins*. London: Routledge, 2012.

Desjarlais, Robert, and Arthur Kleinman. "Violence and Well-being." *Social Science & Medicine* 45 (1994): 1143–1145.

De Onis, Mercedes, Adelheid W. Onyango, Elaine Borghi, Amani Siyam, Chizuru Nishida, and Jonathan Siekmann. "Development of a WHO Growth Reference for School-aged Children and Adolescents." *Bulletin of the World Health Organization* 85, no. 9 (2007): 660–667.

De Waal, Alex, Chad Hazlett, Christian Davenport, and Joshua Kennedy. "The Epidemiology of Lethal Violence in Darfur: Using Micro-data to Explore Complex Patterns of Ongoing Armed Conflict." *Social Science & Medicine* 120 (2014): 368–377.

Eaton, Dave. "The Business of Peace: Raiding and Peace Work along the Kenya-Uganda Border (Part I)." *African Affairs* 107, no. 426 (2008): 89–110.

Frankenberger, T. *Managing Risks, Improving Livelihoods: Program Guidelines for Conditions of Chronic Vulnerability*. 2nd ed. Tucson: Tango International, 2003.

Fratkin, Elliot, and Eric A. Roth. *As Pastoralists Settle: Social, Health, and Economic Consequences of Pastoral Sedentarization in Marsabit District, Kenya*. New York: Kluwer Plenum Press, 2004.

Galvin, Kathleen A., D. Layne Coppock, Paul W. Leslie, E. Fratkin, and E. A. Roth. "Diet, Nutrition, and the Pastoral Strategy." In *African Pastoralist Systems: An Integrated Approach*, edited by Elliot Fratkin, Kathleen A. Galvin, and Eric Abella Roth, 113–132. Boulder, CO: Lynne Reiner, 1994.

Galvin, Kathleen A., and Michael A. Little. "Dietary Intake and Nutritional Status." In *Turkana Herders of the Dry Savanna: Ecology and Biobehavioral Response of Nomads to an Uncertain Environment*, edited by Michael A. Little and Paul W. Leslie, 125–146. Oxford: Oxford University Press, 1999.

Galvin, Kathleen A. "Nutritional Ecology of Pastoralists in Dry Tropical Africa." *American Journal of Human Biology* 4, no. 2 (1992): 209–221.

Galvin, Kathleen A. "Transitions: Pastoralists Living with Change." *Annual Review of Anthropology* 38 (2009): 185–198.

Gray, Sandra J. "Ecology of Weaning among Nomadic Turkana Pastoralists of Kenya: Maternal Thinking, Maternal Behavior, and Human Adaptive Strategies." *Human biology* 68 (1996): 437–465.

Gray, Sandra J., Brandi Wiebusch, and Helen A. Akol. "Cross-Sectional Growth of Pastoralist Karimojong and Turkana Children." *American Journal of Physical Anthropology* 125, no. 2 (2004): 193–202.

Gray, Sandra J. "A Memory of Loss: Ecological Politics, Local History, and the Evolution of Karimojong Violence." *Human Organization* 59, no. 4 (2000): 401–418.

Gray, Sandra, Helen A. Akol, and Mary Sundal. "Mixed-longitudinal Growth of Breastfeeding Children in Moroto District, Uganda (Karamoja Subregion). A Loss of Biological Resiliency?" *American Journal of Human Biology* 20, no. 1 (2008): 499–509.

Gray, Sandra, Mary Sundal, Brandi Wiebusch, Michael A. Little, Paul W. Leslie, and Ivy L. Pike. "Cattle Raiding, Cultural Survival, and Adaptability of East African Pastoralists." *Current Anthropology* 44 (2003): S3–S30.
Greiner, Clemens. 2012. "Unexpected Consequences: Wildlife Conservation and Territorial Conflict in Northern Kenya." *Human Ecology* 40, no. 3 (2012): 415–425.
Iannotti, Lora, and Carolyn Lesorogol. "Animal Milk Sustains Micronutrient Nutrition and Child Anthropometry among Pastoralists in Samburu, Kenya." *American Journal of Physical Anthropology* 155, no. 1 (2014): 66–76.
Iannotti, Lora, and Carolyn Lesorogol. "Dietary Intakes and Micronutrient Adequacy Related to the Changing Livelihoods of Two Pastoralist Communities in Samburu, Kenya." *Current Anthropology* 55, no. 4 (2014): 475–482.
Little, Michael A., Sandra J. Gray, Ivy L. Pike, and Mutuma Mugambi. "Infant, Child, and Adolescent Growth, and Adult Physical Status." In *Turkana Herders of the Dry Savanna: Ecology and Biobehavioral Response of Nomads to an Uncertain Environment*, edited by Michael A. Little and Paul W. Leslie, 187–206. Oxford: Oxford University Press, 1999.
Lind, Jeremy, and Siri Eriksen. "The Impacts of Conflict on Household Coping Strategies: Evidence from Turkana and Kitui Districts in Kenya." *Die Erde* 137, no. 3 (2006): 249–270.
Lohman, Timothy G., Alex F. Roche, and Reynaldo Martorell. *Anthropometric Standardization Reference Manual*. Abridged edition. Champaign, IL: Human Kinetics Books, 1988.
McCabe, J. Terrence. *Cattle bring us to our Enemies: Turkana Ecology, Politics and Raiding in a Disequilibrium System*. Ann Arbor: University of Michigan Press, 2004.
Mirzeler, Mustafa, and Crawford Young. "Pastoral Politics in the Northeast Periphery in Uganda: AK-47 as Change Agent." *Journal of Modern African Studies* 38, no. 3 (2000): 407–429.
Myatt, Mark, Arabella Duffield, Andrew Seal, and Frances Pastuer. "The Effect of Body Shape on Weight-for-Height and Mid-Upper Arm Circumferences Based Case Definitions of Acute Malnutrition in Ethiopian Children." *Annals of Human Biology* 36, no. 1 (2008): 5–20.
Österle, Matthias. "Armed Economies, Militarized Identities, Excessive Violence: Automatic Rifles and the Transformation of Nomadic Pastoralism in Northwest Kenya." In *Aridity, Change and Conflict in Africa*, edited by Michael Bollig, Olaf Bubenzer, Ralf Vogelsang, and Hans-Peter Wotzka, 193–222. Köln: Heinrich-Barth-Institut, 2007.
Panter-Brick, Catherine, and James F. Leckman. "Editorial Commentary: Resilience in Child Development–interconnected Pathways to Wellbeing." *Journal of Child Psychology and Psychiatry* 54, no. 4 (2013): 333–336.
Pike, Ivy L. "Age, Reproductive History, Seasonality, and Maternal Body Composition During Pregnancy for Nomadic Turkana of Kenya." *American Journal of Human Biology* 11, no. 5 (1999): 658–672.
Pike, Ivy, Bilinda Straight, Matthias Oesterle, Charles Hilton, and Adamson Lanyasunya. "Documenting the Consequences of Endemic Warfare in Three Pastoralist Communities of Northern Kenya: A Conceptual Framework." *Social Science & Medicine* 70, no. 1 (2010): 45–52.
Pike, Ivy L. "The Biosocial Consequences of Life on the Run: A Case Study from Turkana District, Kenya." *Human Organization* 63, no. 2 (2004): 221–235.
Pike, Ivy L., and Sharon R. Williams. "Incorporating Psychosocial Health into Biocultural Models: Preliminary Findings from Turkana Women of Kenya." *American Journal of Human Biology* 18, no. 6 (2006): 729–740.
Roncoli, C., K. Ingram, and P. Kirshen. "The Costs and Risks of Coping with Drought: Livelihood Impacts and Farmers' Responses in Burkina Faso." *Climate Research,* 19 (2001): 119–132.
Sadler, Kate, Carol Kerven, Muriel Calo, Michael Manske, and Andy Catley. *Milk Matters: A Literature Review of Pastoralist Nutrition and Programming Responses*. Addis Ababa: Tufts University and Save the Children, 2009.
Scheper-Hughes, Nancy. "Small Wars and Invisible Genocides." *Social Science & Medicine,* 43, no. 5 (1996): 889–900.
Sellen, Daniel W. "Polygyny and Child Growth in a Traditional Pastoral Society." *Human Nature* 10, no. 4 (1999): 329–371.

Sellen, Daniel W. "Weaning, Complementary Feeding, and Maternal Decision Making in a Rural East African Pastoral Population." *Journal of Human Lactation* 17, no. 3 (2001): 233–244.
Straight, Bilinda. "Making Sense of Violence in the 'Badlands' of Kenya." *Anthropology and Humanism* 34, no. 1 (2009): 21–30.
Straight, Bilinda, Ivy Pike, Charles Hilton, and Matthias Oesterle. "Suicide in Three East African Pastoralist Communities and the Role of Researcher Outsiders for Positive Transformation: A Case Study." *Culture, Medicine, and Psychiatry* 39, no. 3 (2015): 557–578.
Straight, Bilinda. "The Sense of War Songs." In *Violence: Ethnographic Encounters*, edited by Parvis Ghassem-Fachandi, 71–78. Berg: Oxford, 2009.
Thornton, Philip K., Randall B. Boone, Kathleen A. Galvin, Shauna B. BurnSilver, Michael M. Waithaka, Joan Kuyiah, Stanley Karanja, Ernesto González-Estrada, and Mario Herrero. "Coping Strategies in Livestock-Dependent Households in East and Southern Africa: A Synthesis of Four Case Studies." *Human Ecology* 35, no. 4 (2007): 461–476.
World Health Organisation (WHO). *Physical Status: The use and Interpretation of Anthropometry*. WHO Technical Report Series No 854. Geneva: Report of a WHO Expert Committee, 1995.