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# Cattle Raiding, Cultural Survival, and Adaptability of East African Pastoralists<sup>1</sup>

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Since the late 1970s, cattle raiding with automatic weapons has escalated among nomadic herding societies in northern East Africa. We examine the impact of AK-47 raiding on the adaptability of Karimojong agropastoralists in northern Uganda. Most notably, raiding is linked to a loss of population resilience in Karamoja, measured in increased mortality of young children and of adult males in their prime reproductive years and decreased female fertility. AK-47 raiding has acted both directly and indirectly as a Darwinian stressor in this population, compromising long-standing adaptive strategies and intensifying selection pressure. We briefly discuss similar effects of recently altered patterns of raiding among related Turkana pastoralists in Kenya. We then consider the process by which this traditional cultural institution was modified in the interests of preserving cultural identity. We conclude nonetheless that cattle raiding with automatic weapons constitutes singularly maladaptive cultural behavior in contemporary pastoralist societies. Indeed, it represents the single greatest threat to their biobehavioral resilience and ultimately may have profound evolutionary costs in terms of pastoralists' survival.

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I. We are indebted to the Karimojong women who spoke with eloquence and honesty of the deaths of so many of their parents, husbands, siblings, and children during the terrible closing decades of the 20th century. Their stories were united by stark themes of violence that overshadowed all other considerations, compelling us to examine our data in a different, darker light. We thank Rada and Neville Dyson-Hudson and several anonymous reviewers for their comments on an earlier draft of this paper. This research was funded by Wenner-Gren Grant # 6276, National Geographic Society Grant

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Beginning in the last decade of the colonial era (1952–62), the Karamoja region of northeastern Uganda was the target of a series of ill-conceived economic development programs that interfered with long-standing strategies for herd management, land use, and resource allocation in a highly unpredictable and seasonally arid savanna ecosystem (Mamdani, Kasoma, and Katende 1992). These projects effectively uncoupled indigenous livestock and rangeland husbandry, and the resulting overgrazing and environmental degradation were blamed for an ecological catastrophe in the late 1970s that reportedly left the human population increasingly vulnerable to food shortages and disease outbreaks. A few reports from the district in the ensuing decades suggested that Karimojong pastoralists led a far more precarious existence at the end of the 20th century than they had 50 years earlier. Therefore, a study was initiated by Gray in 1998 to document changes in the structure and functioning of an African pastoralist ecosystem as a result of economic development and modernization and to quantify the effects of this transformation on human biobehavioral adaptability.

During the year-long field season, however, a modern form of cattle raiding with automatic weapons—what we designate here as “AK-47 raids”—appeared to be the chief impediment to established adaptive behavioral responses of Karimojong pastoralists to environmental stress. This perception was validated as our biological and demographic data took shape during subsequent analyses. Indeed, their adoption of this new form of raiding appears to have caught the Karimojong on the horns of a dilemma of Darwinian proportions: while AK-47 raiding may have augmented their collective cattle wealth and thus ensured their cultural survival as pastoralists, at the same time it gave rise to increasingly unequal access to the herds within the Karimojong population and severely constrained the ability of the most vulnerable segment of the population—women and young children—to buffer themselves from abrupt fluctuations in environmental quality. Since the 1970s, armed cattle raiding has exacted a mounting toll on the human population in terms of mortality and morbidity and impaired the capacity of the Karimojong to ensure the health and survival of their children. In Darwinian terms, human agency in the form of collective violence appears to have acted as the principal agent of selection among Karimojong pastoralists in the second half of the

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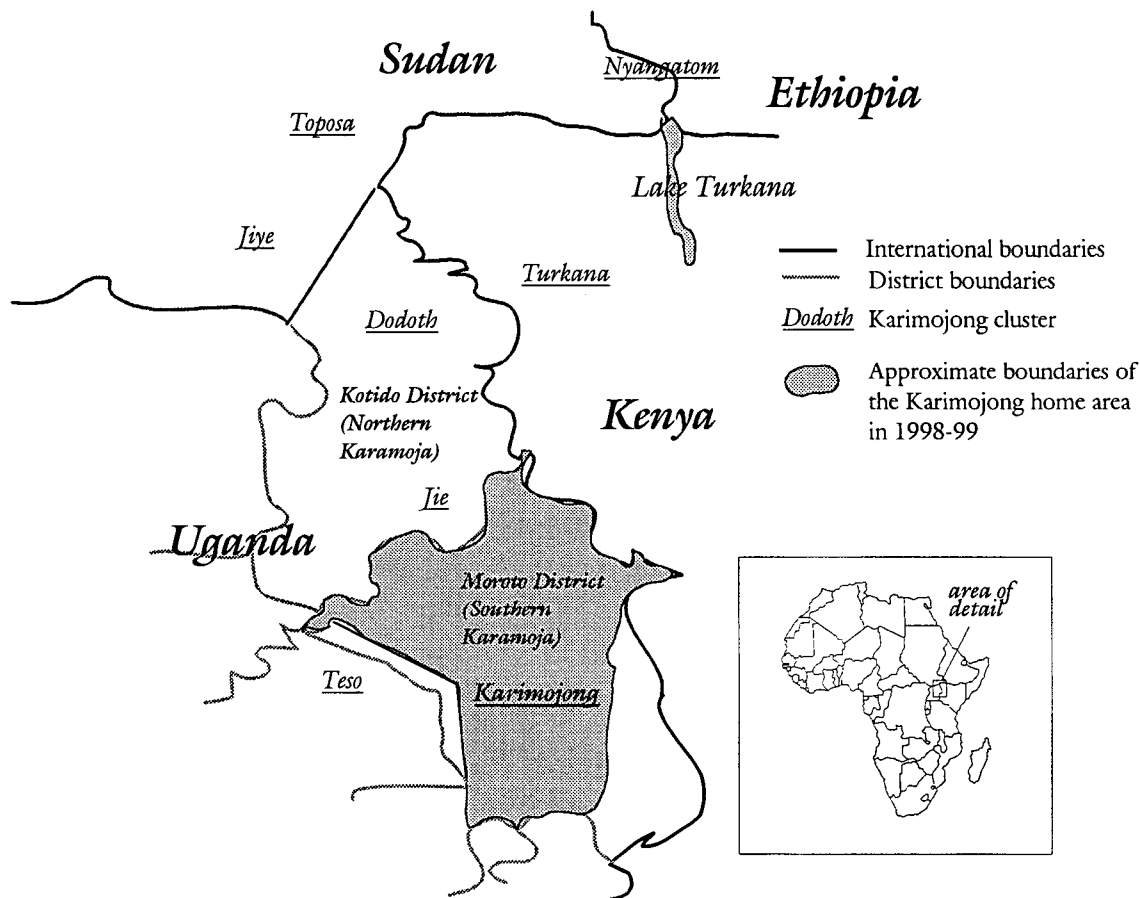


FIG. 1. Karamoja, showing approximate locations of the homelands of the Karimojong-speaking cluster of the Eastern Nilotes (Ateker) (Gray 2000).

20th century. In this paper we examine its effects on explicitly Darwinian parameters, mortality and fertility.

Secondarily, we are concerned with the dual role of culture as adaptation and as stressor. Eschewing for the moment the debate over biological and environmental determinism versus historical and sociocultural process, we assume at the outset that cattle raiding arose as a cultural institution in East Africa at the interface of biological, environmental, and sociopolitical imperatives. Moreover, we suspect that it was at one time adaptive, an integral component of a profoundly contingent, flexible, and successful subsistence strategy—one that has had remarkable staying power in the harsh ecosystems of the Rift Valley (Gifford-Gonzalez 1998, Marshall 1990, McDonald 1998). Ironically, by the 1990s, the same institution may have effectively abrogated the value of specialized pastoralism as an adaptive strategy in these notoriously unpredictable savanna systems. Indeed, in its present form cattle raiding appears to be sublimely maladaptive. In the course of our discussion here, we also consider this premise.

## Background

The Karimojong are members of a group of specialized pastoralist societies identified collectively as the Karimojong Cluster of the Eastern Nilotes (Gulliver 1955) or, alternately, as the Ateker, or “clan,” cluster (Lamphear 1992). Currently they include the Jie and Toposa, in southern Sudan, the Nyangatom, in southern Sudan and Ethiopia, the Turkana, in northwestern Kenya, and the Iteso, Karimojong, Jie, and Dodoth, in northwestern Uganda (fig. 1). As far as can be determined on the basis of scant archeological data and oral traditions, they are all descendants of Sudanese peoples who migrated south some 500 years ago to a location in northern Karamoja that they recognize as their ancestral homeland. A second dispersal, beginning some 300 years ago, gave rise to their modern territorial configuration (Lamphear 1976).

Investigation of the impact of economic development on the Karimojong was initiated as a direct outgrowth of an earlier study of human ecology in Karamoja (N. Dyson-Hudson 1966) and a later, long-term study of hu-

man adaptation among nomadic Turkana (the South Turkana Ecosystem Project, STEP [Little and Leslie 1999]). The Karimojong and the Turkana diverged from a common ancestral population sometime in the mid-1800s (Barber 1968, Lamphear 1976), and as recently as the 1960s the two populations still demonstrated marked cultural and biological affinities reflecting their shared ancestry (N. Dyson-Hudson 1966; R. Dyson-Hudson 1960; Gulliver 1951, 1955; Lamphear 1976). Adults in both populations exhibit the classic Nilotic physique (Roberts and Bainbridge 1963), combining tall stature and extreme thinness, but earlier investigators found neither group to be acutely at risk of malnutrition and their overall health remarkably good. In a pioneering study carried out in the early 1960s, Jelliffe et al. (1964) suggested that the growth, nutritional status, and health of Karimojong children at that time reflected successful adaptation to a harsh environment and nomadic lifestyle. Their conclusions would eventually be validated by similar findings in South Turkana, where between 1979 and 1995 members of the STEP team documented a human population whose biological and cultural adaptations were prototypes of human biobehavioral plasticity (Little and Leslie 1999).

During the period of the Turkana study, however, a very different picture began to emerge from Karamoja. The Karimojong suffered a devastating famine during a severe drought in 1980 (Dodge and Wiebe 1985:127–89), during which child mortality was upwards of 60% (Bielik and Henderson 1981, 1985) and female fertility reportedly dropped to zero (Alnwick 1981, Akol and Gray n.d.). The drought was equally severe in Turkana District, but its effects on the human population there were damped relative to its effects in Karamoja. Furthermore, whereas the Turkana steadily recouped their livestock losses from the drought during several years of good rainfall in the middle to late 1980s, the same period in Karamoja was characterized by chronic food shortages and a continuous threat of famine; reportedly, food aid has been required there in every year since 1980 (Cisternino 1985). A series of health and nutrition surveys conducted among the Karimojong in the 1980s and 1990s reported malaria in epidemic proportions (Devlin 1998), recurring outbreaks of measles, cholera, and meningitis, and wasting and stunting among Karimojong children symptomatic of chronic moderate-to-acute nutritional stress (Alnwick 1981, Mears and Riley 1987, UNICEF 1993; see also Moroto Diocese 1995). In critical indicators of population resilience, the Karimojong appeared to have veered sharply away from a more positive situation a few decades earlier.

At the outset of her research, Gray shared the view that attributed this loss of population resilience directly to unsustainable economic development in Karamoja in the form of agricultural intensification, coercive resettlement of nomads, and concomitant restrictions on pastoralists' access to large areas of traditional grazing land (Mamdani, Kasoma, and Katende 1992, Okudi 1992). By reducing the mobility of people and herds in response to environmental stress, these initiatives promoted over-

grazing and undermined local strategies that facilitated recovery of the rangelands during the intervals between droughts. Effects of development policies appeared to have precipitated an ecological crisis (Wilson 1962, cited in Mamdani, Kasoma, and Katende 1992) that culminated in the collapse of the cattle herds during the drought of 1979–81 (Cisternino 1985, Gray 2000, Gray, Leslie, and Akol 2002, Mamdani, Kasoma, and Katende 1992). As a consequence, many Karimojong had become dependent on a profoundly unreliable agricultural subsistence, heightening their vulnerability to undernutrition in the dry season and to famine during droughts.

Thus, the situation of the Karimojong in the 1990s appeared to be a textbook example of the impact of unsustainable economic development on a pastoralist system (Gray, Leslie, and Akol 2002). Given the availability of comparative data for closely related pastoralists in Turkana, where at that time economic development had been limited, we were presented with a natural laboratory in which to quantify effects of economic development and modernization on human health, adaptability, and fitness in a traditional society (Garruto et al. 1999).

### Guns and Cattle in Karamoja, 1998–99

The Karimojong have traditionally engaged in opportunistic sorghum cultivation in years of adequate rainfall (approximately one out of every three years), and they maintain semipermanent homesteads (*ngireria*, sing. *ere*) in the agricultural zone to and from which adult males, herd boys, and unmarried girls migrate seasonally with the herds. Women and young children remain in the homesteads year-round when the sorghum harvest is good but typically follow the herds during drought years. The research plan for the first field season in Karamoja called for the collection of baseline data on fertility and mortality, health and nutritional status, and child growth in a random sample of homesteads in each of three major territorial sections of the Karimojong: Pian, Bokora, and Matheniko (fig. 2). The goal was to collect reproductive histories for all adult Karimojong women in each homestead sampled and to conduct anthropometric examinations of the women, their husbands, and their children. Fieldwork was to be restricted to the agricultural homesteads because the focus of the study was on women and children and because most people were assumed to have very few livestock as a result of losses suffered in the 1980s and early 1990s. Cattle migrations were expected to be relatively small-scale if they occurred at all.

In August 1998, when the study began, the Karimojong were heavily armed: in each of the 33 homesteads sampled, at least one adult male was in possession of one or more automatic weapons. In the majority of homesteads, all of the younger herders were armed. The supply of guns in the district seemed to be bottomless, and the thriving black market in automatic weapons was linked inextricably to the acquisition of cattle (Gray 2000, Mirzeler and Young 2000; see also Hutchinson 1996:109),

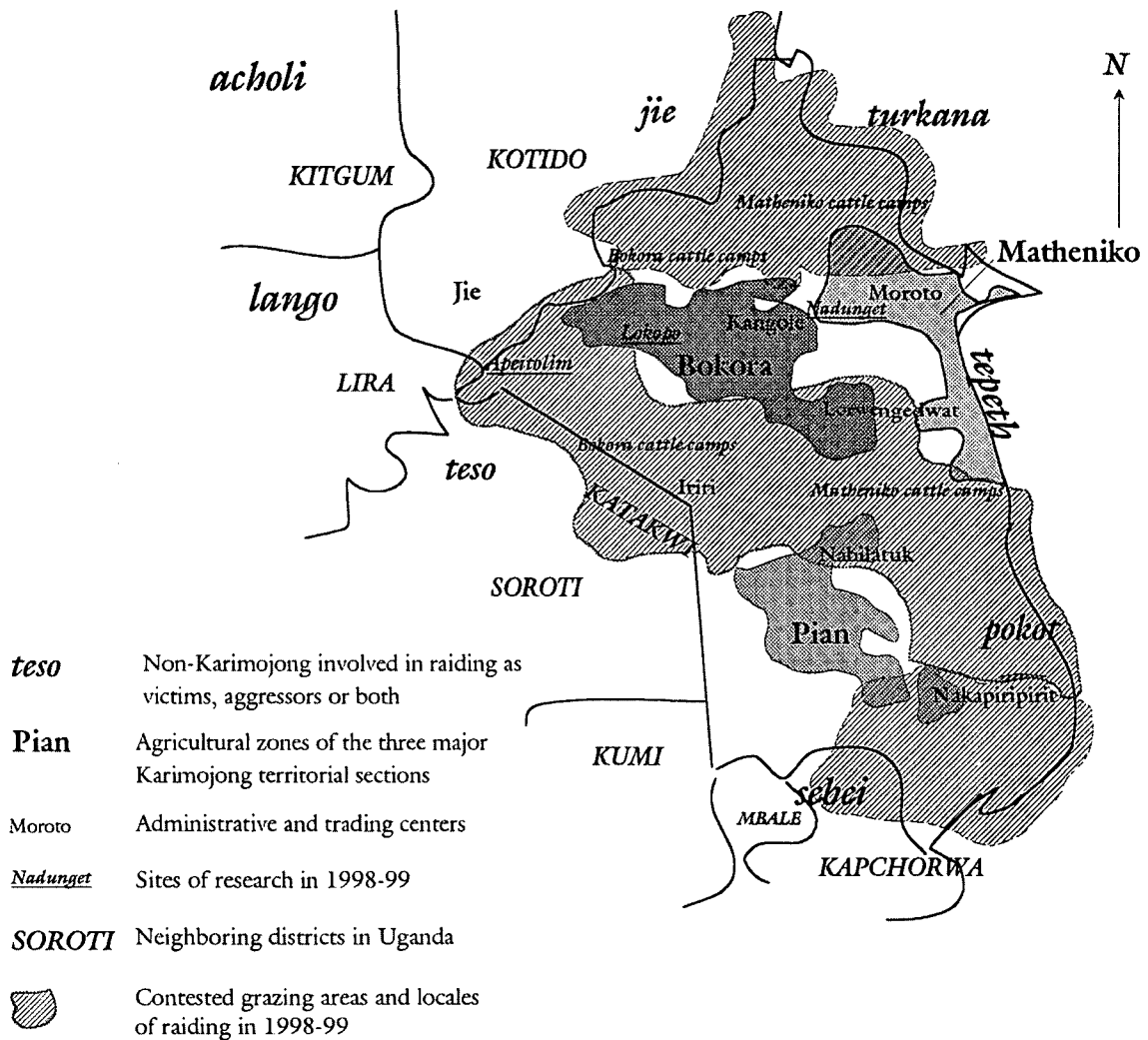


FIG. 2. Approximate locations of the home areas, cultivation zones, and cattle camps of the three major territorial sections of the Karimojong, 1998–99 (Gray 2000). Also shown are contested grazing areas in which inter-ethnic raiding was concentrated in 1998–99 and the groups involved.

which, contrary to initial assumptions, still shaped every aspect of Karimojong society and culture in 1998 just as they had in the 1950s (N. Dyson-Hudson 1966). In fact, in 1998–99 the Karimojong were in possession of sizable mixed herds of cattle and small stock, but these appeared to change hands regularly as a result of AK-47 raids, the most frequent and most lethal form of armed violence at that time. Raids were on a massive scale, involving large groups of marauders of different homestead and territorial affiliations who had formed alliances to assault other clusters of homesteads or cattle camps. As a defensive measure against these raids, herders had begun to migrate collectively: although the great mass of animals presented a larger target, the greater number of armed herders enhanced their ability to fend off attackers. On the first day of travel to homesteads in Bokora, the research team found itself in the middle of the rainy-

season migration, and its vehicle was surrounded by tens of thousands of livestock migrating toward the agricultural zone. The dry-season migrations were of the same magnitude.

In addition to cattle raids, isolated attacks on homesteads, vehicles, and individuals also were common. Indeed, guns were used for resolving disputes at every level of Karimojong society, from the homestead to the territorial section. Assaults were often directed at non-Karimojong, especially neighboring Teso, Pokot, and Tepeth, but they were just as likely to be intraethnic, pitting members of the Matheniko territorial section against members of the Pian or Bokora sections. Much of the violence in 1998–99 was between sections, and casual travel from one home area to another was risky because it required travel through targeted grazing areas or on long and especially dangerous roads. Fieldwork in Pian

was especially problematic, involving travel along the notoriously insecure trunk road that extended south from Lorwengedwat to Mbale, where vehicle hijackings by armed Karimojong, Pokot, and Tepeth bandits were frequently reported. In the end, work was concentrated in four clusters of agricultural homesteads in Matheniko (Nadunget) and Bokora (Lokopo and Apeitolim). The team also made a brief visit to cattle camps in north-western Bokora but, given the logistics and the risks involved, was unable to incorporate a camp component into the study in any systematic manner.

## Results of the 1998–99 Karamoja Study

In spite of the instability in the region, between August and March Gray and her team interviewed over 300 Karimojong women and 33 senior herd owners and carried out anthropometric examinations and nutritional assessments of the women, their husbands and children, and all other relatives in residence. In all, nearly 900 individuals participated in the study. Here we summarize results for child growth (Wiebusch 2002), adult and subadult mortality (Sundal 2002), and female fertility (Gray and Akol 2000, Gray and Pike 1998) and compare them with our findings in Turkana.

### CROSS-SECTIONAL GROWTH OF KARIMOJONG CHILDREN, 1998–99

Mean height and weight of Karimojong children younger than age five in 1998–99 were below the National Center for Health Statistics third percentiles, and these children were on average shorter and lighter than both their counterparts from the 1960s and the Turkana children measured in the 1980s, who tracked more closely to the tenth percentile (fig. 3). By age five, however, mean height of Karimojong children in the 1990s was virtually indistinguishable from that of Turkana children, and they were slightly heavier than those children. Inasmuch as these are cross-sectional data, it is highly unlikely that convergence of growth curves for Turkana and Karimojong children in middle childhood is a result of catch-up growth (Tanner 1986) in the Ugandan group. Gray (2002) has argued that their apparent acceleration in middle childhood is in fact a measure of the intensity of selection pressure operating on Karimojong children in infancy and early childhood: by age five, the smallest Karimojong children have died. Since growth in this period is a measure of a child's experience of environmental stress, we assume that the smallest children died because they were most frequently exposed and least resistant to infection and malnutrition. Surviving children were larger and presumably healthier because they were more resistant to nutritional and disease insults. The absence of a similar correction in the Turkana data suggests lower mortality of young Turkana children, presumably because they were either less exposed or less susceptible to these stresses. A later deceleration in growth of height and weight of Turkana children, after age four, probably

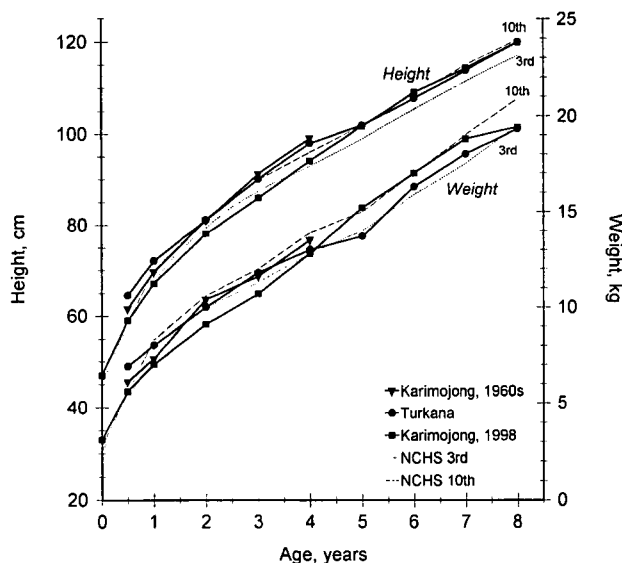


FIG. 3. Comparison of growth in height (recumbent length) and weight of Karimojong children in 1998–99 study, Turkana children (Little, Galvin, and Mugambi 1983, Little and Gray 1990), and Karimojong children measured in the 1960s (Rutishauser and Whitehead 1969). The 1969 Karimojong sample was restricted to children age five years and younger. NCHS third and tenth percentiles (Kuczmarski et al. 2000) are shown as the average of the curves for boys and girls.

represents a true adjustment in velocity of growth to changes in diet and activity that occur after weaning in this population (Gray 1999). These hypotheses are given some support by patterns of infant and child mortality in the two populations.

### SUBADULT MORTALITY IN KARAMOJA, 1940–99

In marked contrast to the Turkana (Leslie et al. 1999a), Karimojong women interviewed in the late 1990s were surprisingly forthcoming regarding their children who had died. Their willingness to provide this information may be a function of their shared experience of child deaths, inasmuch as 64% of these women reported at least one such death. Exclusion of prima gravidas and women experiencing secondary sterility increased the proportion who had experienced the death of a child to 70%; 45% cited two deaths, and one-quarter reported that three or more of their liveborn children had died.

Of 1,457 live births of Karimojong women between 1940 and 1999, 348 (24%) died before the age of five and 393 (27%) before age ten (estimates up to age ten are 19% and 28% for females and males, respectively [Sundal 2002]). Probabilities of dying between consecutive age classes ( $q_x$ ) for subadults from 1960 to 1999 are presented in table 1 for the combined sample and for Matheniko and Bokora sections. Available estimates for Tur-

kana also are shown. The Turkana estimates have been corrected for underreporting (because women were reluctant to discuss child deaths or, in the case of elderly informants, because the deaths had occurred so long ago that women failed to recall them), whereas the Karimojong data are uncorrected estimates based on the direct reports of informants. They therefore may be conservative, even given the willingness of Karimojong women to discuss child deaths, because of the faulty recollections of the oldest women. Nevertheless, even without corrections for unreported deaths, the lowest estimates of mortality of Karimojong children in every decade from 1960 to 1990 are higher than the highest corrected estimates for Turkana children. For the three decades between 1960 and 1990, combined mortality risks in infancy ( ${}_1q_0$ ) in Karamoja range from approximately 13% to 20%. The probability of dying between ages one and five years ( ${}_4q_1$ ) ranges from 13% to 18%. Mortality varies by decade, with the highest mortality reported in the 1960s and 1970s. In the two decades from 1960 to 1980, the probability that Karimojong children would die before age five was 30% ( ${}_5q_0$ ) and before the age of ten ( ${}_{10}q_0$ ) nearly 40%. For all age-classes and in every decade except the 1990s, child mortality in Karamoja exceeded that recorded for nomadic Turkana, for whom corrected estimates of  $q_x$  were 13% to 21% and 20%, respectively, for under-fives and under-tens. Moreover, on a continent in which infant and child mortality rates exceed those of most other regions of the world (Barton and Wamai 1994:34), the rates for Karamoja are equal to some of the highest.

ADULT MORTALITY, 1920–99

In addition to information on the deaths of their children, women were asked to provide mortality data for their mothers, fathers, siblings, husbands, and co-wives. In all,

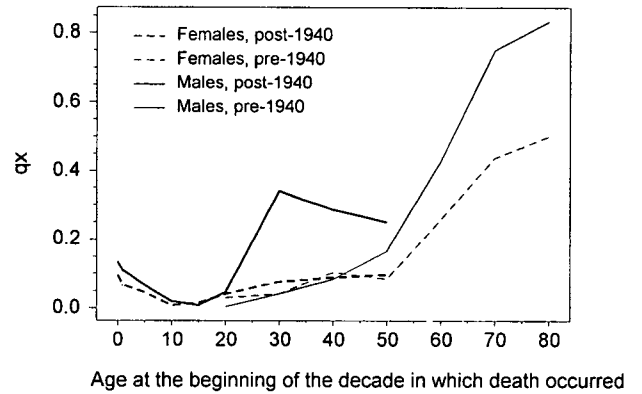


FIG. 4. The probability of dying between ages  $x$  and  $x + n$  ( ${}_nq_x$ ) among Karimojong males and females born before and after 1940.  $x$  is presented as 5-year intervals between age 4 and 19 years and as 10-year intervals beginning at age 20.  ${}_nq_x$  is calculated as a proportion of the number of individuals surviving to the beginning of each interval. To control for censoring bias, only those who were old enough to have lived through a specified interval were used in the calculations for the post-1940 cohort.

Gray obtained data for a total of 2,235 individuals born between 1860 and 1999. Figure 4 compares age-specific mortality risks ( $q_x$ ) for males and females in this sample. The data are presented for two cohorts: those born before and those born after 1940. Birth and death years for most adults are approximations (early 1940s, middle 1940s, and so forth); therefore, after age 19,  $q_x$  was calculated for ten-year intervals. Because the post-1940 cohort is subject to censoring bias at each age  $x$ , our computations

TABLE 1  
Probability of Dying between Ages  $x$  and  $x + n$  ( ${}_nq_x$ ) in the Karimojong Sample for the Decades from 1960 to 1999 for Bokora and Matheniko Territorial Sections and Comparative Data for Turkana (Leslie, Dyson-Hudson, and Fry 1999)

Sample	Number of Births	${}_1q_0$	${}_4q_1$	${}_5q_5$	${}_5q_{10}$	${}_5q_0$	${}_{10}q_0$	${}_{10}q_5$
1990–99								
Bokora	339	.106	.040	0	—	.142	.142	—
Matheniko	157	.191	.102	.009	—	.274	.280	—
Combined	496	.133	.058	.002	—	.183	.185	—
1980–89								
Bokora	276	.129	.105	.028	0	.221	.243	.028
Matheniko	117	.128	.176	.048	.013	.282	.316	.060
Combined	389	.129	.127	.034	.003	.240	.265	.037
1970–79								
Bokora	158	.146	.185	.091	.040	.304	.367	.127
Matheniko	90	.167	.173	.097	.036	.311	.378	.129
Combined	248	.153	.181	.093	.038	.310	.371	.128
1960–69								
Bokora	119	.193	.114	.094	.026	.286	.353	.118
Matheniko	77	.208	.180	.060	.021	.351	.390	.080
Combined	196	.199	.140	.081	.024	.311	.367	.104
Turkana	—	.09–.14	—	—	—	.13–.21	.200	—

TABLE 2

*Leading Causes of Subadult and Adult Deaths (Percentage) in Moroto and Bokora Territorial Sections, Moroto, Uganda, 1860–1999, Determined from Maternal Recall and Verbal Autopsy during 1998–99*

Cause of Death	Infants (N = 209)	Age 1–4 (N = 121)	Age 5–9 (N = 60)	Age 10–19 (N = 21)	Adult Females (N = 172)	Adult Males (N = 268)
Acute respiratory infection	14	8	10	–	–	–
Diarrhea <sup>a</sup>	12	23	20	6	21	13
Malaria	15	17	6	–	2	1
Famine	5	5	8	12	10	12
Measles	17	25	22	–	–	–
Meningitis or hepatitis	6	9	6	6	4	3
Tuberculosis	1	1	6	–	8	4
"Chest"	–	–	–	–	8	10
Maternal	–	–	–	–	6	–
Old age	–	–	–	–	10	6
Violence	–	–	2 <sup>b</sup>	19	3	28
Suicide	–	–	–	–	4	2

SOURCE: Sundal (2002).

NOTE: Deaths of "unknown" etiology (approximately 25% of all deaths reported) are not included in these calculations. A number of deaths were from miscellaneous causes. Among infants, 10 of these were neonatal or perinatal deaths. Among subadults, 19 deaths were attributed to nonspecific sickness (*edeke*), including 9 from "evil eye." Among adults, 30 deaths were attributed to nonspecific sickness and 13 resulted from a variety of infections and abscesses.

<sup>a</sup>Includes diarrheal deaths from all causes.

<sup>b</sup>Combined percentage for ages 1–9 years.

for that group are based only on those individuals old enough to have completed each age-interval (who were at risk of dying or who died during each ten-year period). Individuals born before 1940 were either older informants or informants' parents; thus, we have no data for subadult deaths in this cohort. Conversely, the post-1940 cohort provides ample data on mortality in childhood and in early to middle adulthood, but data for individuals older than age 59 are lacking. However, the overlap of the two cohorts in their early and middle adult decades (age 20 to 50 years) allows cross-cohort comparison of mortality risks in those age-classes.

Mortality of females in the post-1940 cohort is slightly higher between age 20 and 40 years than among females born before 1940 (survivorship to age 50 of females who attained age 20 is 84% and 80% for the pre- and post-1940 cohorts, respectively), but mortality differences between the two male cohorts are dramatic. In their fourth and fifth decades, the probability of dying was .34 and .28 among males in the younger cohort, whereas among males in the earlier cohort the risks at the same ages were .04 and .08, respectively. Of those males in the post-1940 cohort who attained age 20, only 45% survived to age 50, compared with 87% of males in the pre-1940 cohort, for whom a steep increase in  $q_x$  occurred after age 59.

Human mortality is typically highest at the oldest and youngest ages in all populations and is lowest in the second decade; in the third and fourth decades, mortality tends to be slightly higher than between ages 10 and 20, and the pattern is subject to variation among populations (Coale and Demeny 1983:11). The probability of dying also tends to be higher among males than among females at all ages. However, the exceedingly high probability of dying between ages 30 and 49 among Karimojong males

born after 1940 is striking; furthermore, sex differences observed in the Karimojong sample are far greater than what is generally observed (Coale and Demeny 1983).

We do not have comparable adult data for the Turkana, but the indirect estimate of survivorship to the middle of the third decade (to age 25) in that population is 81% (Leslie, Dyson-Hudson, and Fry 1999), compared with 78% and 70% among females and males, respectively, in the post-1940 Karimojong sample. Mortality thus appears to be higher in their first two decades in the Ugandan group among both males and females. Again, the difference is pronounced for Karimojong males.

#### CAUSES OF MORTALITY IN KARAMOJA (1940–99) AND TURKANA

Table 2 summarizes the leading causes of subadult and adult mortality in Karimoja from 1940 to 1999, based on maternal recall and verbal autopsies conducted during interviews. Percentages are estimates based on the sample of individuals for whom a cause of death was identified, approximately 75% of the total reported deaths. We assume that these estimates are representative of overall morbidity patterns in this population. Measles (*puuru*), diarrhea, acute respiratory infections, and malaria were the principal causes of child deaths up to age 10 years (Sundal 2002). Famine (including *akoro*, "hunger," and *lobute*, "swelling") accounted for 10% of all recalled deaths of children older than age 5 years. Only 21 deaths were reported of subadults aged 10 to 19, but most individuals in this age-group died of causes other than sickness, including famine (three) and violence (four).

Adult females in this sample died of diarrheal disease, famine, and a variety of other illnesses, including tu-

berculosis and an ambiguous ailment referred to simply as "chest," meningitis, and a number of ailments associated with pain in the head and gut (Sundal 2002:104). Adult males died from a host of similar diseases, but noninfectious causes accounted for 44% of all male deaths, including famine (12%), violence (28%), and suicide and accidents combined (4%). Only 6% of men and 10% of women were identified as having died of causes typically associated with old age.

The leading causes of child morbidity among nomadic Turkana are consistent with the findings in Karamoja (Shelley 1985, Brainard 1991, Shell-Duncan, Shelley, and Leslie 1999), reflective of a common pattern throughout sub-Saharan Africa (Barton and Wamai 1994). On the basis of the results of anthropometric examinations, however, the overall nutrition and health status of Karimojong infants and toddlers in the late 1990s was poor in comparison with their Turkana counterparts as well as with Karimojong children examined in the 1960s (Rutishauser and Whitehead 1969; Gray 1998, 1999). This was a puzzling finding inasmuch as the three years preceding the study had seen abundant rainfall in Karamoja, good-to-excellent sorghum harvests, and a steady increase in the size of the herds. Moreover, all of the Karimojong homesteads visited during the field season were within 5 km or less of a hospital, health clinic, or dispensary or were visited monthly by a mobile clinic operating out of St. Kizito's Hospital in Bokora (reputed to be one of the best hospitals in Uganda). In addition to its mobile clinics, St. Kizito's operates an ambulance service for rural homesteads and antenatal and child immunization programs (~50% of Bokora children in the sample had received at least one immunization [Wiebusch 2002]).

In contrast, in the 1980s all functioning health units in Turkana were located in settlements that were on average 10 km or more distant from the cattle camps of the nomadic population. Nearly 70% of nomadic homesteads were outside of a radius of 20 km from a health care facility. The few mobile clinics in the district were for the most part out of operation because of inadequate maintenance of vehicles (TRDP 1989). Thus, although Turkana District boasted four hospitals, eight health centers, and 35 dispensaries in the 1980s, their utilization by pastoralists was minimal. As a consequence, although immunization and health coverage of women and children in Turkana settlements may have paralleled coverage in Bokora, it had met with limited success in the nomadic sector (TRDP 1989).

One notable difference in patterns of adult morbidity in the two populations emerges from the comparison of outpatient reports for Karamoja (Devlin 1998) and Turkana (TRDP 1989). References to trauma are relatively scarce in the Turkana data, whereas they figured prominently among the causes of outpatient visits and adult deaths in the Karimojong sample (Devlin 1998:65); among the latter, trauma was frequently a consequence of gunshot wounds.

#### FERTILITY OF KARIMOJONG WOMEN

Our preliminary estimate of completed family size among postreproductive Karimojong women interviewed in 1998–99 is 6.4. This approximates estimates for nomadic Turkana women (Campbell et al. 1999, Leslie et al. 1999a). However, fertility appears to have decreased among postreproductive women born after 1940 in comparison with women born prior to that year. Median completed family size of women born after 1940 was 6, compared with 7 for women in the older cohort ( $p = .004$ , Kruskal-Wallis test).

Approximately 40% of Karimojong women interviewed in 1998–99 reported at least one failed pregnancy: we include in this category all miscarriages and stillbirths as well as children who died perinatally (before they were given a name, which typically occurs within 24 hours after birth). Fifteen percent of the women had experienced two or more pregnancy losses. The proportion of failed pregnancies was 11% among postmenopausal women in the sample (the average number of pregnancy failures was .8), and the proportion and number of pregnancy failures did not vary significantly by cohort. Estimates of failed pregnancies are markedly higher than comparable estimates for nomadic Turkana women (Campbell et al. 1999:339; Brainard 1991; Leslie et al. 1999a).

Mean age at the birth of their last child was younger by one year among postmenopausal Karimojong women than among nomadic Turkana (39 years versus 40 years [Leslie et al. 1999a]), and for this variable significant intercohort differences were observed in the Karimojong sample. Termination of reproduction was three years earlier among Karimojong interviewees born after 1940 than among those born prior to that year (37.4 years compared with 41 years,  $t = -3.75$ ,  $p = .0003$ ). The range in age at termination of childbearing was 23–47 years in the former group, compared with 27–48 years in the older cohort, suggesting that some of the variation is accounted for by the greater risk of terminating reproduction in the first decade of the effective reproductive span in the younger cohort. Indeed, the majority of reproductive pathologies recorded in this study were among women born after 1940. These included three cases of biological termination of reproduction prior to age 30, all in women who reported three or fewer pregnancies; five probable cases of secondary sterility (premenopausal women for whom more than 11 years had lapsed since the birth of their last child; for three of them, over 20 years had lapsed) and two unequivocal cases (one in a woman who was postmenopausal in 1998–99 and the other in a woman in her mid-20s who had been diagnosed clinically after her only pregnancy ended in miscarriage). In the pre-1940 cohort, cessation of reproduction prior to age 30 was ascertained reliably for only one woman, who reported two live births and whose last two pregnancies had ended in a stillbirth and a miscarriage. One other woman in this cohort was barren, and no women reported experiencing secondary sterility. In all, 12 (4%) of 302 women in the study had experienced premature



biological cessation of reproduction, and 10 of these were in the post-1940 cohort. If we include in the sample of postreproductive women the three women who had not conceived in over 20 years since the birth of their first child, early termination of reproduction reaches 12% in this group (8 of 66), compared with 5% (2 of 41) in the pre-1940 cohort.

We cannot discount the possibility that women born before 1940 who experienced impaired fecundity were more likely to have died or to have migrated and thus are not represented in our sample. Considered alongside mortality trends in Karamoja in the 1960s and 1970s, however, lowered fertility of the post-1940 cohort is probably a real demographic phenomenon. We propose a causal link between these population trends and an escalation in the frequency and ferocity of Karimojong cattle raids. The effects of raiding were mediated by a purposeful modification of the sociopolitical structure of Karimojong pastoralism, a change that undermined human behavioral responsiveness and in effect intensified selection pressure. In the next sections we examine the personal experience of this transformation and describe its historical origins and chronology. We then track its impact on the Karimojong population in relation to the trends we have identified.

## The Experience of Violence in Karamoja

### DEATH AND REMEMBRANCE

The majority of female informants who participated in the 1998–99 study were nonliterate, possessed only a vague understanding of the Western calendar, and kept no records of vital events. Instead, the timing of births, deaths, and other milestones in women's reproductive histories was estimated from a calendar of local events compiled by Akol and Gray (n.d.) during the course of the field season. A response to the question of when a child was born or died typically began with a woman's recollection of what she was doing or where she was at the time of the event, information which was used first to locate her experience in relation to the local calendar and then to calibrate it with Gregorian time. Here we summarize three of these accounts.

Born in the mid-1940s, the first informant entered her reproductive years in the mid-1960s. Of her nine live-born children, only three survived in 1998. She herself was one of ten children, two of whom had died—one during childhood and the other as he fled west toward Teso with his wife and children to escape famine (probably in 1968). The informant recalled:

All [of her dead brother's family] were killed there, by Iteso. My father died of hunger during famine. He had three official wives and one inherited wife. His second wife also died during the famine, in Lorikita. The inherited woman died of cholera, during the famine. Her son was a big boy when he was killed by Jie in the same year, at Kamarumor. My mother

. . . is the first wife and is still living. I had nine children and one miscarriage. . . . I left my first husband, because five of the six children by him died. This bride price never was paid in full, because we migrated to Jie before it was completed: only the child price (*ekucul*) was paid. Two children died of measles in the same year: one is buried on the grounds of St. Kizito's hospital. One child, a toddler, was scaring birds in the garden, and he fell from the platform and was killed. Three others died in early infancy; all three were twins. One fell sick with fever; we took her to [St. Kizito's Hospital in] Mathany. She was given medicine and injected, then sent home. That night the condition worsened and the child died.

The second informant was also born in the 1940s and was one of eight children, four of whom survived in 1998. Of her six live-born children, three were living:

One son died when he was about ten years old. I was breastfeeding that child when cattle were seized at Angoro, when they were giving out relief food [1967–68]. He was killed by Bokora during the raid on the kraals at Naitae, beyond Rupa. . . . My father . . . was killed in a raid by the Turkana. I was a girl—he was middle-aged. The woman [her mother] died of diarrhea, as an old woman.

In her late 40s, the third informant had no living children. Three had died in childhood and one as a neonate; another was stillborn. She was one of four children, one of whom was dead by violence. Her parents and husband were all dead:

My husband . . . was killed in a border skirmish by "rebels" [probably Acoli] in the time of Obote, during the trouble with Kenya [the early 1980s]. My father . . . was a young man when he was killed in the kraals, by Pokot: this was around Amudat, in the south [Pian]. My mother died of swelling [of hunger, *lobute*]. This was sometime after Akoro [the famine of 1980]: when they burned Kangole, our heads still were shaved [in mourning for her mother's death]. You mourn your parents a long time, even now. Loneliness makes me suicidal, but God told me it wasn't time. Satan tempted me, but God is there and saved me even as I took medicine to die. In quarrels, they [neighbor women] ask me, "How many children do you have?" and I tell them, "Oh, you ask God!"

These three accounts are a sampling from over 300 similar stories recorded during the field season. The central motifs of these recollections and of the local calendar itself are famine, sickness, and death, linked by running themes of violence and flight. The summary that follows is informed both by this local perspective and by a more familiar sequence of historical, political, and environmental events. Table 3, an abbreviated version of the event calendar, summarizes the local perspective on the Karimojong experience in the late 20th century, when

TABLE 3  
*Critical Events in Karamoja from 1940 to 1999 and Events Commonly Associated with Them by Informants in 1998-99*

Date and Name of Event	Description
1940s, Lorengalaga, "marriage bands rusted" Nataparin, "dams" Ngaduruko, "thorn trees" Maring, "hysteria"	The second year of a drought that began sometime in the early 1940s, probably ~1943. The bands rust because women do not have ghee with which to grease them. Construction of dams by the colonial administration begins in Karamoja, probably sometime in the late 1930s. The last recorded women's age-set initiates its members in the same year as the previous age-set, Ngakomomwa, "ant hills," is closed. Thorn trees are associated with rain, ant hills with the dry season. ~1945-49. A hysterical disease in which people assume the identities of people from other communities becomes widespread. 1945-49.
1950s, Lotira, "the sun was stubborn" Apule, "where the Karimojong began" Ngigetei, "gazelles"	A drought begins in 1952 or 1953 and is followed by a very good harvest. ~1954. The last official transfer of authority from the senior male generation-set to the junior set. Probably 1955 or 1956 (recorded for Pian by N. Dyson-Hudson [1966]). The first age-sets of this generation-set are initiated, sometime between 1956 and 1958.
1960s, Logogwotho, "luggage" Lolibakipi, "green water" Namongo, alluding either to cows or to sweetness	A period of much raiding and retaliation in Karamoja. There is no food in Bokora, and people migrate widely in search of assistance and wage labor. ~1965-67. There is so much rain that sorghum sprouts before it can be harvested. The rains continue from the wet season of 1961 until the late spring of 1962. Called Achakaekipul, "the rain unlocked," in the Turkana calendar (Leslie et al. 1999b). Name of a woman who inspired a movement in which people collected their troubles in a vessel passed from homestead to homestead and cast them out into the bush. Probably 1962-63. Female informants still remember the song that was sung at this ritual.
Mukuki, "grabbing" Nagilgil, "helicopter" Kalameriaputh Lopetun, "widespread"	Government soldiers raid homesteads in search of spears, and people are punished or imprisoned if they had them or hid them. 1962-63. Government helicopters are used to confiscate cattle in retaliation for the killing of a government-appointed Bokora chief, Apanyanginyang. 1961-63. Bokora raid Jie at this place; the Jie and Turkana retaliate, and more Bokora are dispersed. ~1966. A cattle epidemic decimates Bokora herds. Food relief is provided for the first time. 1968-69.
1970s, Lobulbul, "cattle disease," "swelling" Amin, "the time of Amin," "Amin stripped the people," aslo Nawaikorot Kolera, "cholera" Ngamatidae, "homemade guns" Ebuta, "didn't seed" Ngimatheniko, "Matheniko"	An epidemic of hemorrhagic septicemia in Bokora kills the remaining cattle, leaving people destitute and without food because they also have been unable to plant. 1974-75. Amin's troops slaughter people at Nawaikorot protesting his prohibition of the wearing of traditional dress. 1971. An epidemic and immunization campaign across the pastoralist zone in northern Uganda and Kenya. 1971-72. The Matheniko begin to raid the Bokora with homemade weapons. 1974. The sorghum planted flowers but does not seed. Probably 1976-77. Amin is ousted and the Matheniko raid his barracks in Moroto, hauling off thousands of AK-47s. 1979.
1980s, Akoro, "hunger" Apaloris Amilica, "militia" Nakoko, "theft"	The famine of 1980, probably the defining event of the modern Karimojong experience. A respected Matheniko elder by this name is murdered by the Teso on his way to peace talks, setting off a bloody sequence of raids and retaliations in Teso and Karamoja. 1982. Bokora acquires guns. Acoli troops sent in to confiscate cattle as punishment for the ongoing violence are waylaid by the Bokora and killed and their weapons taken. 1983. Government helicopters bomb homesteads, confiscate cattle, and set fire to all of the major trading centers and cattle markets in Karamoja. Oboto is overthrown, and many more guns are obtained in another raid on the Moroto barracks. All of the Karimojong are now heavily armed with automatics. 1984-85.
Three-piece, "the three-piece-suits"; alternately, "hung by three pieces"	Museveni assumes power in 1986. Men in suits appear in the district in anticipation of parliamentary elections. Museveni's soldiers descend on the district to confiscate weapons. People who refuse to give them up are tied together at their knees and elbows and hung from poles. Raiding resumes between Matheniko and Bokora. 1987-88.
1990s, Apuno Matakul, "where people drink urine" Ateregaegae, "meningitis"	A Matheniko spokesman by this name is ambushed by Bokora en route to peace meetings. Several elders are killed in this attack. January 1992. A major raid on Bokora is mounted by Somali, Turkana, and Matheniko raiders. The Bokora go after them and slaughter them at this desolate place where there is no water, ~1991 (1987 is an alternate date). The decade is marked by a series of similar, large-scale raids. An outbreak and immunization campaign. 1991.

Nakadanya

A ceremony in which power is transferred from the senior to the junior generation-set, scheduled in late 1998 without the consensus of the elders. The ritual is not carried out according to established custom, and elders predict that it will increase intraethnic violence.

SOURCE: Akol and Gray (n.d.).

NOTE: Events in the late 1990s have yet to be named.

pastoralists saw themselves forced to the brink of cultural extinction (calendar events are indicated in parentheses in the summary that follows). Their response was a purposeful elaboration of institutionalized cattle raiding made possible by their fortuitous acquisition of automatic weapons. While this strategy may have guaranteed their cultural survival—at least temporarily—it was embraced at great cost to human survival and well-being.

#### CATTLE RAIDING AND CULTURAL SURVIVAL IN KARAMOJA, 1950–99

The establishment of colonial authority in East Africa in the early 20th century interrupted a long-standing tradition of interethnic cattle raiding among the pastoralist peoples of the arid north (see, for example, Fukui and Turton 1979, Kurimoto and Simonse 1998). Hostilities were typically concentrated in periods of extreme environmental stress, and raiding may have been integral to the success of nomadic pastoralism in this profoundly uncertain context because it provided a means to recoup livestock losses to drought and disease outbreaks and to redistribute people and herds quickly in response to abrupt fluctuations in the resource base (Gray 2000; Hendrickson, Armon, and Mearns 1998; Lamphear 1976, 1988; Leslie et al. 1999b; Little et al. 1999a).<sup>2</sup> Its adaptive significance for pastoralists notwithstanding, the instability it created made institutionalized raiding untenable under British colonialism. Indeed, both raiding and nomadism posed real threats to the colonial economy. Most problematic was the threat of encroachment by nomads and their herds on rangelands that either were claimed by European settlers, had been set aside as hunting preserves, or had been designated by the colonial administration as the permanent territory of some other “tribe.” Typically, the latter were those who had established close ties to the colonial administration and received most of the benefits of colonial economic development (Barber 1968, Lamphear 1992). In the Ugandan and Kenyan Protectorates, these groups occupied the fertile agricultural and grazing lands in the south and in the highlands, and their assimilation into the colonial polity was critical to British economic interests (Mamdani, Kasoma, and Katende 1992; Bouckaert 1999:28–29). In contrast, the northern pastoralist zone was important economically only briefly, as a source of ivory. By the 1920s the elephant herds had disappeared, and thereafter the north was seen as a no-man’s-land between the developing south and the southern extent of the Ethiopian empire

(Barber 1968), serving only as a route for an expanding and troublesome northern gun trade (Barber 1968, Mamdani, Kasoma, and Katende 1992).

To safeguard its economic and political interests in the south, the colonial administration pursued a policy of disarmament, coercive containment, and forcible settlement of pastoralists in the north. In Karamoja, transhumant migrations were restricted by periodic military operations to enforce new district and tribal boundaries, by the designation of vast areas of the rangelands as forest or game preserves that were off-limits to herders (also contributing to the southern expansion of the tsetse fly zone [Mamdani, Kasoma, and Katende 1992]), and by the establishment of “closed” districts in Karamoja and in neighboring Turkana in which rights to unrestricted travel and trade were limited to representatives of the colonial administration (Barber 1968, Cisternino 1979, Mamdani, Kasoma, and Katende 1992). Cattle raiding was checked by heavy-handed punitive campaigns in which livestock were confiscated in large numbers by government troops (Barber 1968, Lamphear 1992), a means both to compel recalcitrant herders to submit to colonial authority and to implement the government’s policy of destocking.

Initially, restrictions on pastoralists’ mobility and access to rangelands had limited impact, inasmuch as their herds had been decimated in the early 1900s by the combined effects of the rinderpest epidemic and government confiscations (Mamdani, Kasoma, and Katende 1992). Karimojong herds were reduced further by disease and drought in the 1930s and 1940s, remembered by older informants as a time of unremitting hardship that was punctuated by Lokwakoit, in the 1930s, named for the “white bones” of dead cattle (probably from East Coast fever [Mamdani, Kasoma, and Katende 1992]), and Loringalaga, “when women’s marriage bands rusted,” in the 1940s. The last known female generation-set (Ngaduruko) was initiated in the late 1940s, reflecting a Karimojong belief that social discord was the root cause of their ongoing misfortunes (according to informants in 1998–99, women’s generation-sets were traditionally associated with the maintenance of domestic harmony and peace: it is of interest that this tradition has virtually disappeared in recent decades).

Conditions improved in the 1950s, apparently a decade of good rainfall. As the herds recovered, however, livestock needs for water and forage increased proportionately, and colonial restrictions on livestock migrations became more burdensome to herders. The few economic development initiatives undertaken in Karamoja by the colonial and postcolonial governments—largely to facilitate taxation of herders—only exacerbated the effects of

2. As Krystina Rigdon has suggested, it may also have enhanced the resilience of the herds through genetic admixture.

prohibitive policies on pastoralists in that they entailed either intensive development of irrigated agriculture, which accelerated environmental degradation in the district and the depletion of scarce water and forage resources (Mamdani, Kasoma, and Katende 1992), or ranching schemes on the Western model, which assumed ecological equilibrium and called for destocking to the level of hypothetical carrying capacity (Barber 1968, Cleave 1996, Fleay 1996, Mamdani, Kasoma, and Katende 1992; see also Ellis and Swift 1988, Gray, Leslie, and Akol 2002).

After Ugandan independence in 1962, interethnic relations quickly deteriorated throughout the fledgling republic. Policies toward northern pastoralists, already repressive, became increasingly capricious as Uganda began its descent into civil war. Concurrently, environmental conditions worsened, heightening competition among pastoralists for rapidly dwindling resources. According to the local calendar of events, the 1960s was a period of hunger and social upheaval. The killing of a Bokora chief, Apanyanginyang, triggered the last of the punitive campaigns carried out by the colonial administration, during which large numbers of cattle were confiscated (the use of helicopter gunships to bomb pastoralists is reported in the calendar for the first time in this decade, immediately prior to independence, but in fact may have occurred after 1962 [Crawford Young, personal communication, 1999]). Animal confiscations continued in the postcolonial era against a backdrop of drought, poor harvests, and livestock epidemics. In the mid-1960s the threat of famine forced impoverished Bokora to migrate in large numbers to neighboring districts to escape insecurity and starvation, initiating a diaspora that would continue into the 1980s (Logogwotho). Many women reported that they never saw members of their families again. There was widespread hunger in 1967, and this appears to have been the first of a series of food shortages in which traditional strategies to avert large-scale famine broke down: a large-scale international aid intervention was mounted in Karamoja for the first time during this crisis, and by far the most extreme solution to an imminent pastoralist disaster in the north was proposed. Calling for resettlement of the entire Karimojong population on combined ranching and farming schemes in the west of the district, the outrageous project was submitted for consideration by the minister of regional administration in 1968 but wisely dropped before it was begun (Mamdani, Kasoma, and Katende 1992). Nevertheless, it underscored a widening disjunction between pastoralists and government after the collapse of colonialism.

The 1970s appear to have been worse as a consequence of drought and the oppressive policies of Idi Amin, who held power for most of the decade. Women recalled having had their beads and clothing cut off their bodies by soldiers who were enforcing Amin's prohibition of traditional dress (recalled in the calendar as "Amin stripped the people"); old women remembered burning goatskins in great fires and pounding piles of beads into dust. People were compelled to abandon traditional subsistence

activities to plant cash crops such as cotton. There was an outbreak of cholera. Asian traders, who supplied the Karimojong with many basic goods, such as cloth, sugar, and soap, were expelled (Wilson 1985). For the Bokora, the decade was horrific, bringing recurring famines, epidemics, and dispersals. People reported having sold their children in Mathany market during Lobulbul [a livestock disease that ravaged the herds in 1974–75] because they had no food to feed them. Throughout the decade, Karimojong migrated in large numbers to Teso, Masindi, Iganga, and Mbale and to Busia, in Kenya.

The impact of the environmental disasters and political repression of the 1960s and 1970s was aggravated by a virtual pandemic of cattle raiding, which had erupted again in the mid-1950s as herds recovered and available rangelands shrank (N. Dyson-Hudson 1966, Barber 1968). During the 1960s Jie, Turkana, Pokot, and Karimojong mounted increasingly aggressive raids against their neighbors throughout the north (Thomas 1965, Leslie et al. 1999b). Local political relations at this time were complicated by the constant presence of government and rebel troops and by the manipulation of pastoralist politics by outsiders (including Sudanese factions) whose allegiances shifted opportunistically with prevailing winds in the brutal civil war (Kidon-Unyang 1987; Pirouet 1991; Woodward 1991; Mamdani, Kasoma, and Katende 1992; Brett 1996; Bouckaert 1999:30–35). Modern weapons, now procured with relative ease in a context of civil war in Uganda and southern Sudan, were in demand among pastoralists across the north, and the savagery of raids intensified in corresponding fashion.

The pivotal event in recent Karimojong history came on the eve of Amin's ouster in 1979 (Ngimatheniko), when Matheniko raiders ransacked his abandoned armory in Moroto and reportedly made off with tens of thousands of automatic weapons (Alnwick 1985, Wilson 1985). In an effort to overcome the reversals of the 1960s, the Matheniko had joined forces in the early 1970s with their former foes, the Turkana. With them they had initiated raiding on other Karimojong sections, sometimes using homemade guns (Ngamatidae). After their acquisition of automatic weapons, they raided with the Turkana indiscriminately in Karamoja and across other northern districts. In the early 1980s (Amilica), the Bokora also acquired automatic weapons and now engaged in retaliatory raiding against the Matheniko. By ambushing government troops sent in to quell the violence, other Karimojong sections procured automatic weapons, and by the middle of the decade everyone was armed. The Karimojong now raided widely outside of Karamoja, particularly in Teso. In retaliation, the Teso killed a Matheniko elder in 1982 (Apaloris), setting off a particularly savage cycle of Teso-Karimojong raids (Nakicimet). A series of revolving-door regimes during the savage last years of the Ugandan civil war sent troops to punish and disarm the Karimojong; between 1984 and 1987 they managed to subdue the pastoralists by burning market centers to the ground and bombing homesteads from helicopter gunships (Nakoko). After Yoweri Museveni's victory in 1986 and the subsequent conclusion

of the war in the south of the country, the new National Resistance government immediately launched a disarmament campaign ("three-piece") in Karamoja in an effort to pacify the north and consolidate power. Remembered by informants as especially brutal, the campaign apparently succeeded only in intensifying the hostility of northern pastoralists toward the government in the south. Subsequently, armed looting of government and nongovernment facilities and convoys became the chief strategy for recovery and resistance (Knutsson 1985).

The violence continued unabated in the early 1990s, when the Bokora, by resorting to large-scale raids on the Teso, in particular, recovered from the devastating losses of the previous decades. People recalled raids at Natheperwae, Turutuko, Batanga, "Alinga's kraal," and, especially, Matakul, where a combined raiding force of Somali, Matheniko, and Turkana was slaughtered by the Bokora. There were desultory attempts to restore peace: in one infamous meeting the Bokora agreed to meet in Kangole for talks, where instead they ambushed and killed the Matheniko representatives, including an influential herder (Apuno), and set off another wave of retaliation. People in surrounding districts were, however, the chief targets of cattle raids, and under pressure from representatives of Teso, Sebei, Lango, and Acoli the government called a peace conference in Kampala in 1994 (GOU 1994). In the period that followed, herders were called upon to disarm and cattle whose ownership was disputed as a consequence of raids were confiscated and held in government facilities. The peace held for two years, then collapsed in the period before the parliamentary elections in 1996. At that time, members of parliament who had enforced the government's policies for peace retreated under threats of death, and politics as usual resumed in 1996. With the exception of this brief hiatus, the decades between 1980 and the present time have been marked by unabated armed violence in a context of recurring drought and continuous food insecurity. In late 1999, several hundred raiders were reported to have been killed by helicopter gunships (Gray 2000; see also Dawes 2001), and in an attempt forcibly to suppress the raiding in 2000–2001 Kampala armed people in adjacent districts at the same time as it carried out yet another largely unsuccessful disarmament operation in Karamoja.<sup>3</sup>

## Cattle Raiding and Biobehavioral Adaptability

Widespread adoption of automatic weapons and the resultant transformation of cattle raiding occurred against a backdrop of unrelenting drought in the north. Almost immediately, AK-47 raids compromised the ability of the local population to respond effectively to steadily dete-

riorating environmental conditions: in the spring of 1980 Matheniko raids compounded the effects of drought, precipitating the famine known by the Karimojong simply as Akoro, "hunger." In the years since, raiding has become the principal constraint on Karimojong biobehavioral adaptability.

### EFFECTS OF AK-47 RAIDING ON MORBIDITY AND MORTALITY IN KARAMOJA

Increasing mortality of adult Karimojong males after 1940 is linked directly and unequivocally to the intensification of cattle raiding. In the 1950s, when cattle raiding resumed in the north, violence accounted for an estimated 22% of all adult male deaths, an increase of approximately 10% from the preceding two decades (Sundal 2002; fig. 5). By the 1970s, when automatic weapons were adopted by the Matheniko and their neighbors, raiding accounted for 35% of adult male deaths, and the proportion has remained constant at approximately 33% in the ensuing decades. Between 37% and 44% of males in this sample who died between age 30 and 60 died violently, and 25% of deaths of men between ages 60 and 69 were attributed to violence (fig. 6). Additionally, a significant proportion of male deaths in all age-classes were attributed to famine-related causes (diarrheal infections, hunger, and "swelling"), which are indirect consequences of modern raiding. In all, direct and indirect effects of AK-47 raids accounted for an estimated 45–70% of adult male deaths in this sample. For males aged 30 to 49, these combined estimates exceed 70%. In the 30–39 age-group, the number of deaths by violence approaches 50%, whereas for men aged 40–49 cause of death is more evenly distributed between violence and famine (35% to 40%). These results most certainly explain the high probability of mortality during these decades among men born after 1940 (fig. 4). Karimojong males in their 20s appear to be at somewhat lower risk of dying. We hypothesize that this is an effect of the timing of their formal attainment of adult status through their initiation into the age-set system: traditionally, raiders were initiated males of the junior generation-set (N. Dyson-Hudson 1966:185–86). Today, Karimojong males are initiated in their middle to late 20s. For boys in school, initiation and the assumption of their role as herders and warriors may be postponed even longer. Thus, while uninitiated herd boys may die as a consequence of raids on cattle camps, they are less likely to be actively involved in carrying out raids.

Whereas many women reported having lost their parents, spouses, and adult siblings directly to AK-47 raiding, changing patterns of child mortality and morbidity in Karamoja are associated with its indirect effects on subsistence activities and food production, residence patterns, and access to health care as a consequence of reduced population mobility. In 1998–99 the threat of raids induced herd owners to move their livestock to remote grazing areas, beyond the range of marauders, during the dry season, while heightened risk of ambushes during seasonal migrations compelled them to forgo movement

3. In addition to the inaccessibility of much of Karamoja, a steady flow of arms across the Sudanese border continually undermines government efforts to disarm pastoralists at the present time. In fact, the major constraint on raiding appears to be the high cost of ammunition.

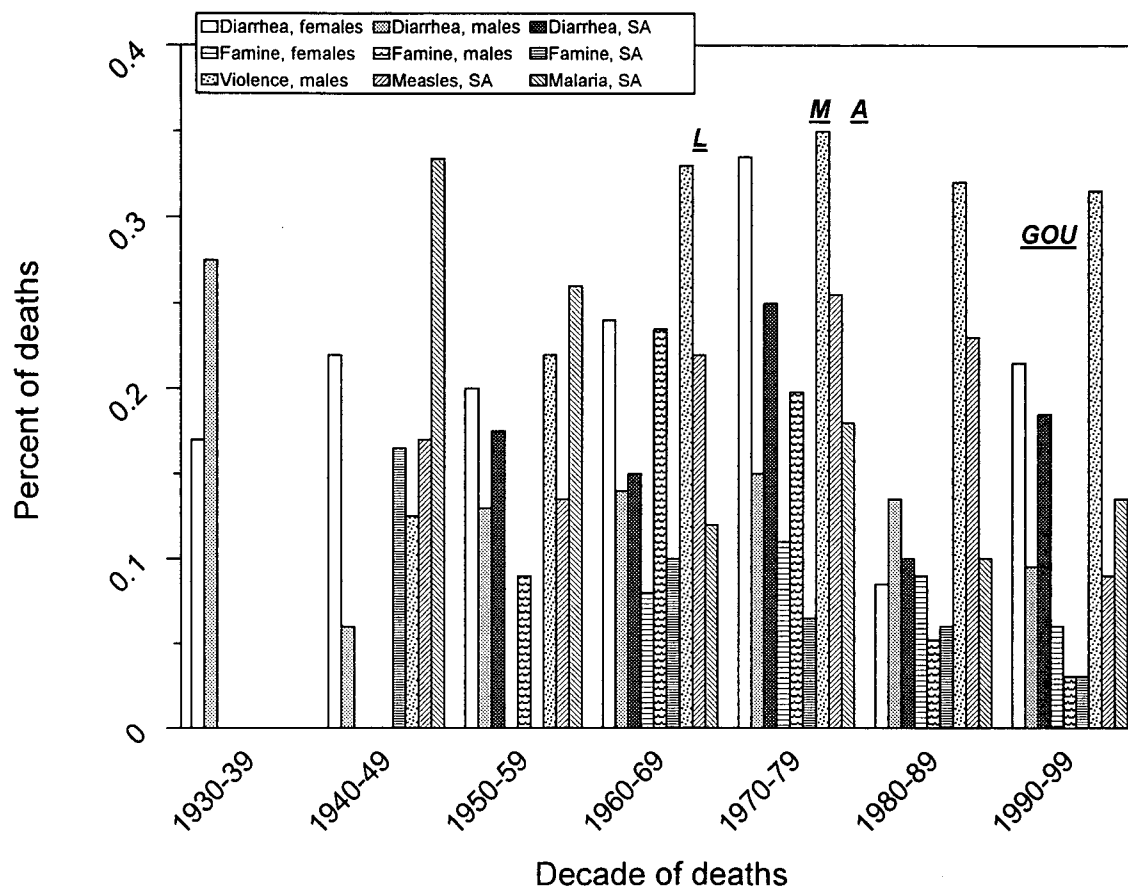


FIG. 5. Patterns of morbidity and mortality in the Karimojong sample from the 1930s to the 1990s. Only major causes of death are shown. SA, subadults. Concurrent social and political events from the Karimojong event calendar: L, Logogwotho; M, Ngimatheniko; A, Akoro; GOU, the government's peace initiative in the mid-1990s.

back to the agricultural zone in what was an exceptionally good rainy season, when returning herders otherwise might have assisted women in preparing fields for planting.

The loss of men's labor and the threat of attacks on individuals curtailed women's agricultural activity and subsequently diminished sorghum yields in spite of good rainfall. At the same time, women, young children, and the elderly were forced to remain in the agricultural homesteads regardless of the inadequacy of the harvest because they were unable to undertake the long, dangerous trek to distant cattle camps alone: informants also reported numerous attacks on solitary women, and raiders have been reported to steal wives as well as cattle (GOU 1994). Loss of access to the herds deprives children of a critical source of protein and micronutrients and may be the most important factor in the epidemiology of toddler kwashiorkor in this population (Wiebusch 2002). Indeed, a frequent request from women interviewed in 1998–99 was for transport to the cattle camps, because Karimojong mothers were well aware that their

children were healthier and grew more rapidly when they had access to the herds.

Since the famine of 1980, relief food has been available at a number of distribution centers in the district. Homesteads nearest the relief centers have become the loci of dense concentrations of displaced and nutritionally vulnerable people, where crowding and contamination of already inadequate water supplies ensure that epidemics will spread quickly (see Allen 1996, CDC 1992, de Waal 1987, Mohamed 1999). The establishment of these settlements corresponds with changing trends in morbidity from 1960 to the 1990s (fig. 5). Prior to 1960, malaria, gastrointestinal disease, and miscellaneous "other" causes accounted for most deaths. The pattern changed in the ensuing decades, when measles mortality dominated: measles outbreaks were responsible for 22%, 26%, and 23% of subadult deaths from known causes in the 1960s, 1970s, and 1980s, respectively, compared with 15% to 17% in earlier decades. Simultaneously, malaria-related deaths fell from over 30% in the 1940s to less than 12% in the 1960s. The timing of the peak in measles

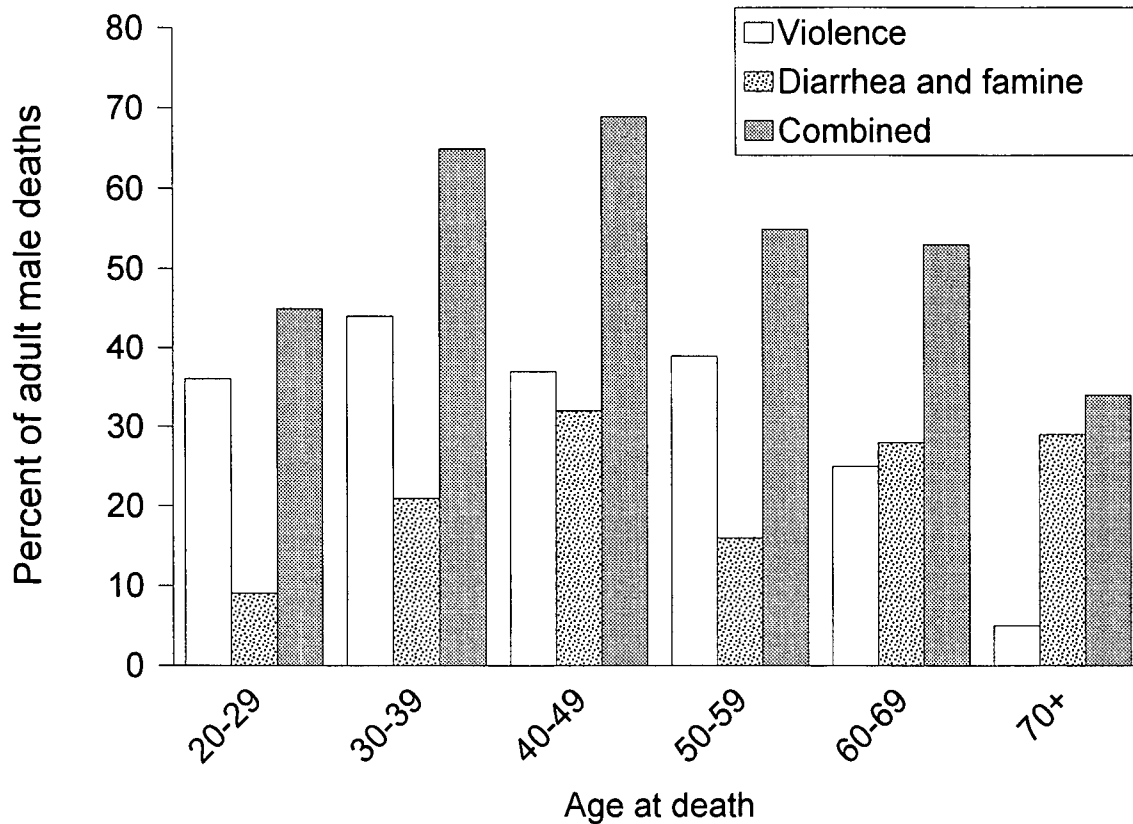


FIG. 6. Proportion of adult male deaths attributed to direct and indirect effects of AK-47 raids, by decade of death.

deaths, in the 1970s, was synchronous with the Bokora dispersals and the establishment of relief centers in the district. Measles deaths declined somewhat but remained high in the next decade, probably reflecting sustained high mortality in settlements established during the famine. Subsequent introduction of immunization programs by aid agencies in response to increasing measles mortality most certainly accounts for the decline in measles deaths after the 1980s (Wiebusch 2002). Deaths from diarrheal diseases showed a corresponding increase and decline: in the local calendar, 1971-72 is referred to as *Kolera* (cholera). Subadult mortality from meningitis and hepatitis, recognized diseases of crowded, unsanitary conditions, also increased in Karamoja after relief centers became established in the district: the proportion of subadult deaths attributed to meningitis and hepatitis outbreaks increased from approximately 5% prior to 1980 to 15% in the 1990s (Sundal 2002:102). In the local event calendar, 1991 is known as *Ateregege*, "meningitis," named for an epidemic and vaccination campaign in that year.

Subadult deaths attributed to famine (synonymous with hunger) declined simultaneously with the increases in measles, meningitis, and diarrhea deaths. The most likely interpretation of this pattern is that the contin-

uous presence of relief operations after 1980 reduced the prevalence of malnutrition at the same time as it heightened exposure to infectious diseases. A spike in deaths from malaria appeared in the 1970s, but generally the number of malaria-related deaths also decreased after 1960 (fig. 5). Attenuation of mortality from malaria may be linked to improved prophylaxis after relief centers were established in the district or to the drought conditions of the late 1970s and 1980s. A more plausible explanation is that the most vulnerable children were more likely to die of measles or diarrheal infections: the dramatic decline in measles deaths in the 1990s is concurrent with a slight increase in malaria mortality.

Raiding also interferes with the transport of essential commodities and with the maintenance of Karamoja's minimal infrastructure. Access to clean water and soap is unreliable in rural homesteads across the district, and the lack of hygiene exposes very young children chronically to multiple secondary infections, such as scabies and worms, further damping their resistance to acute infections (Wiebusch 2002). The formal health care sector is particularly vulnerable: with few exceptions, government-operated health care facilities in Moroto were poorly supplied and understaffed in 1998-99 in spite of the habitual presence of numerous international aid

agencies in the district (including the Danish aid organization DANIDA, Doctors Without Borders, the Sisters of Charity, Guinea Worm 2000, the Comboni Missionaries, UNICEF, Save the Children, the World Food Program, and the Italian medical missionary program CUAMM, among others). The health care system has become a prime target of raiders, and attacks on health units and on vehicles transporting health care workers, drugs, and supplies are increasingly common. In the 1980s, drugs stolen from the health sector in Karamoja appeared for resale in markets in Mbale, according to Whyte (1991). Doctors Without Borders, which was participating in the rehabilitation of the health care sector in 1998, withdrew in late 1999 in response to attacks on health care workers. Consequently, Karimojong are at once more exposed and more vulnerable to infection and unlikely to be seen by a trained professional or to receive adequate treatment after diagnosis even if they do have access to a medical facility.

Three narratives summarize the local perception of the quality of health care in the district. One woman told us, "If you go to the hospital [district hospital in Moroto], you wait and wait. They take blood, your temperature, but the child is sick and you have to wait. You always wait a long time, until [that child] dies in your lap." A second informant reported that all of her children were dead, even though she had sought medical treatment for each of them:

The first child was crawling when he died of pneumonia in the time of Amin's takeover [early 1970s]. He was sick one week, then I took him to hospital [in Moroto], and he died there. The second child died of measles—she was old enough to collect firewood. She went to the hospital and recovered after one week and came home, but then she got measles and died: the family had said not to take her to hospital.<sup>4</sup> Nothing can be done for measles. Grief for this girl caused me to miscarry: it was born early and died the next day. The third child died when she was crawling—she had a fever but the hospital wouldn't admit her, and she died in three days.

A third woman tersely recalled the consequences of the breakdown of the health care system in Karamoja during the exceedingly violent years of the early 1980s: "I was nursing a child—he was about one month old. The child died of fever—it cried and then it died. I couldn't get to the dispensary, because we were running, running, from the soldiers. Anyway, the medical staff had run away, too."

#### EFFECTS OF AK-47 RAIDING ON THE PROXIMATE DETERMINANTS OF FERTILITY

The association between cattle raiding and damped fertility of women born after 1940 appears to have been

4. Consensus among informants was that people went to the government hospital "to die." A similar attitude toward the district hospital in Moroto was articulated by Turkana subjects in the 1990s.

mediated by two proximal effects (Davis and Blake 1956; Wood 1994:69–72): (1) the changing structure and duration of sexual unions and (2) heightened risks to women's reproductive health. The first is a consequence of increasing male mortality in raids. If the fertility patterns of Karimojong males are similar to those of Turkana males, then over 50% of the men in this sample died in their reproductive prime (approximately age 25–54 [Leslie, Dyson-Hudson, and Fry 1999]), and the majority of these deaths resulted in the premature termination of a sexual union. Since Karimojong men are older than their wives by ten years or more (men typically marry first in their 30s, whereas women marry in their late teens to early 20s), deaths by violence of men in their 30s and 40s produced a number of widows still in their reproductive years. Ironically, that men marry in their fourth decade may amplify their mortality risks from violence at that age, if, as we suspect, AK-47 raiding has become the principal means to procure bridewealth.

In the past, widows from marriages that had been formalized by the payment of bride price were remarried to male relatives of their dead husbands, generally within the year. In this sample, remarriage to an in-law still appeared to be the rule for women in their 20s and early-to-mid-30s. For older premenopausal women, remarriage was no longer a given. We surmise that the inequitable distribution of livestock created by AK-47 raiding (Gertzel 1988) has made payment of bride price increasingly burdensome for many men. A concurrent decline in the ratio of marriageable men to marriageable women as a result of high male mortality in raids (Sundal 2002:93) may have necessitated a relaxation of proscriptions against informal sexual unions; consequently, more Karimojong women are "unmarried wives" in unions not officially sanctioned through the exchange of cattle. A young wife is effectively less expensive, and a union with such a woman may present a more attractive reproductive option to a young man who might otherwise be compelled to accept responsibility for an older widow and her dependent children. Certainly, many women in this sample who were widowed in their 30s or early 40s had failed to remarry, a phenomenon contributing to earlier social termination of reproduction in the post-1940 cohort.

Both formal and informal marriages appear to have become less stable as a consequence of AK-47 raids. Informal unions may be costly for males, but they also are less binding and may be dissolved readily. Both the man and the woman are then free to enter into unions with other individuals from other lineages: unofficially married women in the study commonly reported participating in two or three such unions. One Matheniko informant explained her daughter's confusing reproductive history: "That daughter has been married three times. She had three children by her first husband, then he was killed by Turkana. She had one child by her second husband, who was killed by Tepeth in 1995. Then she married again and has one child by that man." At the same time, some women for whom an official marriage had been negotiated recalled that the marriage had broken



down because the husband's cattle were stolen before the bride-price payments had been completed (in some cases, during the exchange). Other Matheniko women reported having moved to the home of a formally contracted spouse and, indeed, having borne him several children only to have the contract nullified before the full bride price had been paid when another man stepped forward with the full payment, acquired recently in a raid. Finally, displacement of the Karimojong as they fled to escape food shortages and raiding led to the termination or temporary disruption of both official and informal unions, when spouses and often their children went in different directions in search of wage labor or alternative support systems. Many were separated for a decade or more, and the adults entered into informal sexual unions with other individuals. A cassava development project in Apeitolim is populated largely by returnees, most of whom found that they had no spouses or families to which to return.

Our data show an emerging marriage pattern of serial informal unions of short duration that deviates from the pattern prior to the 1950s. Women in the post-1940 cohort were significantly more likely to be unmarried wives—married without the exchange of cattle and a formal marriage contract between two homesteads (odds ratio 6.0; 95% confidence limits 3.56–10.03). Seventy percent of the women in this cohort were unofficial wives. Given such a high percentage, intercohort differences are unlikely to be an artifact of ascertainment bias among older women as a consequence of more of the pre-1940 cohort's having died or left the pastoralist system.

#### INDIRECT EFFECTS OF AK-47 RAIDING ON WOMEN'S REPRODUCTIVE HEALTH

At present we have few data on the effects of these unstable unions on women's reproductive health, particularly on the incidence of sexually transmitted diseases and HIV/AIDS. However, AK-47 raids have affected their utilization of the formal health care sector and their access to antenatal and obstetric care. Further, amid the social turmoil generated by raiding, indigenous institutions that ensured preferential care of pregnant and breast-feeding women (Gray 1994) appear to have broken down (see also Madut Jok 1999). In the intervals between informal sexual unions, whether they are terminated as a result of "divorce" or the death of the male, an unmarried wife's status in relation to her social networks is ambiguous. Neither her agnatic nor her affinal kin are under obligation to provide for her, and this compromises her access to critical resources (sorghum fields as well as livestock) and consequently her health and nutritional status. Termination of a union when the woman is pregnant—a situation frequently reported by women in the study—may therefore jeopardize pregnancy outcomes as well as maternal and infant survival.

On the basis of data compiled from reports by district health units in Karamoja for the years from 1992 to 1996, we estimated maternal mortality in this population to exceed 1,700 deaths/100,000 pregnancies (Gray and Pike

1998; see also Barton and Wamai 1994). During the 1998–99 field season, we recorded 33 pregnancies in our sample. One of these most certainly would have resulted in the death of the mother during childbirth without the intervention of Gray and her team. A second childbirth in which intervention was not possible did end in maternal death (a third woman, who was taken by the team to St. Kizito's in her third trimester and was subsequently diagnosed with severe malaria, would otherwise have miscarried, at considerable risk to her own survival). These outcomes denote a maternal mortality rate of 1 in 17 pregnancies among women who do not have access to obstetric care: childbearing in Karamoja represents an appallingly high risk to women by any standard or definition.

#### DIFFERENTIAL EFFECTS OF AK-47 RAIDING IN BOKORA AND MATHENIKO

Perhaps the most compelling evidence of the human impact of AK-47 raiding in Karamoja is found in divergent population trends in Bokora and Matheniko. First, Matheniko women were significantly more likely to report a child death than Bokora women (odds ratio 1.5; 95% confidence limits 1.03–2.21), and in every decade since 1960 mortality prior to age ten years tends to be higher in the Matheniko sample than among the Bokora (table 1). The difference is marked after 1980, when the probability of dying before age ten in the Bokora sample dropped from a high of 37% in 1970–79 to 24%. Decreases in Bokora rates are apparent for all age-classes in this period but are most pronounced between ages one and five years (–8%) and between ages five and ten years (–6%). There is some suggestion that the decreasing trend in child mortality continued into the 1990s in Bokora (the infant mortality risk reached a low of 11% in this decade, whereas mortality between ages one and five years dropped to 4%, the lowest rates since the 1950s). In contrast, in Matheniko the probability of dying before age ten never dropped below 30% in any decade, and it floated at or above 40% from 1950 to 1980. Furthermore, infant mortality in this section actually was lowest in the 1970s and 1980s, when it was highest in the Bokora sample. Infant deaths in Matheniko increased in the 1990s, whereas mortality rates of older subadults (ages five to ten years) never fell below 6%.

These differences may be explained by distinct responses of the two territorial sections to the crises of the 1960s and 1970s (Gray n.d.). To ensure their own survival, the Matheniko emphasized armed diplomacy—first by realigning themselves with their former adversaries in Turkana, who were heavily armed at the time, and second by embracing AK-47 raiding. In subsequent decades, this militarism has assumed an elaborate, almost stylized quality that is synonymous with Matheniko cultural identity as "warriors" (Gray 2000). Today they are recognized throughout northwestern Uganda as the most conservative, most bellicose section of the Karimojong, and they are more likely to be involved in cattle raids both as perpetrators and as the

targets of retaliation. They are also more openly defiant of government interventions of any kind. Consequently, Matheniko children are more vulnerable to direct and indirect effects of violence, are less likely to go to school, and have more limited access to health care: few of the Matheniko children in our study had been immunized (12% of Matheniko children in the study, compared with 50% of Bokora children), even in homesteads within 5 km of Moroto District Hospital.

This contrasts with the Bokora response to the crisis, in which they initially were victims rather than aggressors. Left destitute by the droughts, famines, and raids of the 1970s, they were more likely to be recipients of international aid after 1980. Their close association with donor agencies and enhanced access to education and health care may explain the steady decline in subadult mortality in Bokora after 1979. Increasing immunization coverage probably explains the decrease in under-five deaths, whereas the declining mortality of school-age children is most likely an effect of their enrollment in government and mission schools. Older children tend to be at higher risk of nutrition-related mortality (table 2), and parents in Bokora may have opted to enroll children in school, where they could take advantage of donor-subsidized meals programs. Attendance at schools actually may have afforded children dual protection from raids and starvation. Today, the majority of Karimojong civil servants, business people, and educators are Bokora, who are well integrated into Ugandan national culture and who navigate smoothly between their Ugandan and Karimojong identities.

Marriage structure also differs by territorial section. In Matheniko, the emphasis on AK-47 raiding facilitated the accumulation of disproportionately large herds by some men after the 1970s. This in turn supported an increase in bride price in that section from 20–30 head of cattle in the early 1950s to 100–150 head by the early 1980s, according to informants. Bride-price inflation itself may now be both a cause and an effect of Matheniko raiding. On the one hand, it is an exceedingly difficult and slow process for many men to complete such steep payments by means of traditional mechanisms (N. Dyson-Hudson 1966), but on the other hand the high cost of marriages is an added incentive for herders with few cattle to invest at least some of their animals in modern weapons, which can then be used mount raids to procure the requisite cattle. Livestock of less well-armed Bokora herders have been a favorite target, and a dramatic reduction in the number and size of their herds after 1975 has made it increasingly difficult for many Bokora families to complete bride-price payments. Accordingly, a greater proportion of official marriages might be anticipated in the Matheniko sample than in the Bokora sample. Our data support this hypothesis: 61% (125 of 204) of the Bokora women were married without cattle compared with 40% (38 of 95) of the Matheniko women (odds ratio = 2.4; 95% confidence limits 1.44–3.90). Moreover, this is not simply an effect of premarital liaisons among young women who eventually may be expected to be contracted formally in marriage: when the sample is re-

stricted to women aged 30 to 59 years, intersectional differences in the percentages of official and unmarried wives are unchanged.

## Human Adaptability in South Turkana Reconsidered

When the STEP research began in 1979, cattle raiding was acknowledged as one of the principal stressors shaping Turkana behavioral responses. Although their main adversaries at that time were the Pokot, the Turkana themselves had been involved in armed raiding against the Karimojong, Dodoth, and Toposa. The Karimojong event calendar provides considerable detail regarding Turkana aggression, documenting Turkana raids against Bokora, in particular, in 1966–67, 1974–75, and 1978 (see also Thomas 1965). In the late 1970s the government of Kenya disarmed the southern Turkana, leaving them essentially defenseless against the heavily armed Pokot, who subsequently perpetrated a number of brutal raids in South Turkana between 1977 and 1984 (R. Dyson-Hudson 1999, Leslie et al. 1999b). Theft and raiding in four Turkana families (Dyson-Hudson and McCabe 1985, McCabe, Dyson-Hudson, and Wienpahl 1999) accounted for 15% of their total livestock losses in the second year of the drought of 1979–81 and 35% of losses in the first year of recovery. During the drought, the herd owners moved their main camps on average 15 times per year, and over 20% of their moves were based on the probability of attacks by Pokot or other raiders (McCabe 1987, Pike n.d.).

Nevertheless, concerns for forage and water still exceeded security concerns during most of the period of South Turkana study, and during a three-year period of good rainfall in the late 1980s the threat of raids was greatly diminished. However, the late 1990s saw an escalation in AK-47 raiding across the whole of the northern pastoralist zone. In the last decade of the 20th century insecurity in Turkana paralleled that in Karamoja, with a familiar pattern of AK-47 raids and counterraids, government retaliation, and ineffective disarmament campaigns that perpetually shifted control of the guns (and with it the advantage in raiding) back and forth. Virtually every pastoralist group in northern Kenya and Uganda was caught up in the devastation (Little et al. 1999a), although most of the violence involved Jie, Karimojong, Pokot, Nyangatom, Turkana, and Tepeth.<sup>5</sup> Between 1992 and 1999, the Pokot carried out 14 large-scale AK-47 raids in critical dry-season grazing areas in South Turkana (Pike n.d.). In 1991 a massive operation against the Bokora by a combined force of Turkana, Somali, and Matheniko ended disastrously for the raiders in their slaughter at Matakul (table 3) and triggered predictable retaliation. In spite of continued efforts by both

5. Formerly hunters and gatherers, the Tepeth of the mountainous zone along the Kenya/Uganda escarpment have acquired cattle in recent decades and are now engaged in raiding against the Karimojong, reportedly in alliance with the Pokot.

Ugandan and Kenyan governments to effect an end to the violence, by late 1998 both districts were in chaos. In that year schools were attacked in both Turkana and Karamoja and schoolchildren were killed; at least 100 people were killed in a Pokot raid at Kainuk in early 1999 (Pike n.d.). In 1993 none of the Turkana herders participating in a study conducted by Pike (1999) were armed; in a follow-up study in 1998, every herder was in possession of an automatic weapon.

In Turkana, mobility is the most effective strategy for damping the impact of raids on the human population. Herders respond to the continuous threat of raids by moving their main camps (which include women and children as well as adult males and herd boys) more frequently and into more remote grazing areas. During 1998 the average number of camp moves of herders interviewed by Pike (n.d.) was 24, and 100% of these moves were in response to the threat of raids. Moreover, many of the herders in South Turkana, where Pokot raids were concentrated, moved farther north, where they came into conflict with other Turkana territorial sections. By the late 1990s AK-47 raids had escalated to such a degree that Turkana herders, who previously had migrated in small, independent groups (Dyson-Hudson and McCabe 1985), also began to move their herds in large-scale mass migrations, a defensive strategy adopted from the Karimojong (N. Dyson-Hudson 2000, Pike n.d.).

As in Karamoja, the escalation of AK-47 raids in Turkana was associated with heightened stress in the human population. In 1994 the South Turkana landscape was denuded of cattle, whereas in 1990 it had featured vast herds wherever one looked. In the space of less than four years, the herds had virtually disappeared, and Turkana informants attributed the collapse chiefly to raiding by Pokot and Jie rather than to the recurring droughts and generally dry conditions from 1990 to 1994. More important, the losses appear to have been universal, and during the drought of 1993–94 emergency food relief was distributed in South Turkana for the first time (Pike 1999). Long-standing strategies for damping the impact of drought and averting famine in Turkana depend on differential fitness of family herds within networks of “cattle kin” (Dyson-Hudson and Dyson-Hudson 1999, McCabe 1990), but no such variability exists in relation to large-scale assaults with automatic weapons. Where all herds are affected equally, mechanisms for deflecting or redistributing stress break down.

In response to looming famine, pastoralists were compelled to curtail their migrations and move closer to food distribution centers, where they remained until 1995, when the intervention was terminated (Pike n.d.). In interviews in 1994 many people said that access to food relief as well as fears for their personal safety influenced them to remain close to the distribution centers. As in the case of Karamoja, morbidity was high in these dense settlements, where there were outbreaks of measles and hepatitis, as well as of chloroquine-resistant malaria. The magnitude of the health crisis was such that some district health units closed their doors in 1993 because no drugs were available at the time to treat the epidemics

and because health care workers were themselves fearful of becoming infected.

Shell-Duncan et al. (1999) conducted a study of health and immune function in South Turkana during the first two years of the calamitous period from 1990 to 1994. In contrast to the findings of Gray (1992, 1998), who studied maternal and infant health and nutrition in the period prior to the escalation in AK-47 raiding (1989–90), the families sampled in the Shell-Duncan et al. study were largely sedentary, and their children were at heightened risk of acute malnutrition and multiple infections. The contradictory results of these two studies, carried out within two years of each other, underscore not only the dramatic effects of spirals of raiding and drought in Turkana but also the speed with which human resilience may shift in response to social as well as environmental conditions. In this regard, the lack of seasonal effect in Shell-Duncan’s study is particularly revealing (Little et al. 1999a:325–26; see also Galvin 1985): among some herding units, customary responses to drought may have been secondary to responses to the escalation in cattle raiding.

The most telling evidence of the impact of AK-47 raids on the human population in South Turkana is provided by Pike (n.d.) in her 1998 study. In a preliminary investigation of the psychosocial effects of raiding, 82% of herd owners interviewed cited raids as their principal source of anxiety, whereas 72% and 45% of women cited food shortages and raids, respectively. In both Turkana and Karamoja, these two are linked unequivocally.

### Culture as Stressor and the Persistence of Pastoralist Systems

Even at an early stage of fieldwork and analysis, it is clear that AK-47 raiding seriously constrained the bio-behavioral adaptability of the Karimojong in the last decades of the 20th century. Through its effects on seasonal migrations, subsistence activity, the structure of marriage, and the stability of social networks of the Karimojong, as well as on the operation of trade routes in and out of the district and on health care delivery, armed cattle raiding emerges as the critical factor in recurring famines and epidemics in Karamoja since the 1970s. Its impact on human biological resilience is incipient in the Turkana case, but raiding was implicated unequivocally in a series of population crises there in the 1990s (Hendrickson, Armon, and Mearns 1998, Pike n.d.).

It might reasonably be argued that AK-47 raids currently represent the single greatest risk to the persistence of the pastoralist systems considered here and to the continued survival of pastoralists themselves; if so, the persistence of such a seemingly maladaptive institution demands further investigation. We are not in agreement with Hendrickson, Armon, and Mearns (1998) and Fleisher (1998, 1999), who argue that AK-47 raiding is a predatory strategy carried out for personal gain and resulting from the erosion of the moral economy. Rather,

we argue that its genesis lay in the elaboration of an adaptive cultural response to environmental uncertainty that was altered in response to increasing sociopolitical uncertainty (see also Mamdani, Kasoma, and Katende 1992:47). The greatest risk to pastoralists' survival in the late 20th century was not drought or disease but their vulnerable position vis-à-vis governments that either punished them or exploited them according to prevailing political currents, ultimately marginalizing them and endangering their subsistence base. In this process, cattle raiding, transformed by a combination of serendipity and proximity to the expanding illicit trade in automatic weapons, became the chief mechanism for cultural survival. This hypothesis requires consideration of the nature of Ateker cultural identities.

Broch-Due (1999) and Gray (2000, n.d.) have argued the primary cultural identification of Ateker pastoralists is as pastoralists, and it is determined by the possession of cattle: people with cattle are Turkana or Karimojong or Jie, whereas people without are not. Cultural identity is therefore contingent on the preservation of the pastoralist subsistence base. Cattle keeping itself has no guarantees, but given the striking failure of alternative subsistence strategies in the pastoralist zone, enumerated in detail in Majok and Schwabe (1996), this is a pragmatic ideology. Not surprisingly, pastoralist families identify themselves primarily with their herds, and insofar as other associations promote the survival of those herds they may identify themselves secondarily with groups at different levels of the territorial hierarchy. None of these allegiances takes precedence over the primary identity with cattle.<sup>6</sup> Indeed, without cattle, cultural identity becomes irrelevant because survival of the family—the principal herding unit—is at best improbable. In other words, cultural survival hinges less on the persistence of a group of people than on the persistence of a group of herds—a proposition that receives support from the shallow genealogical memory of informants in Turkana and Karamoja. Seen from this perspective, the elaboration of raiding becomes the chief mechanism for both family and cultural survival, and militarism becomes synonymous with cultural identity.

Pastoralists thus find themselves trapped between cultural and Darwinian imperatives. Whereas AK-47 raiding may be the most effective strategy by which to maintain their pastoralist subsistence and identity, it endangers their biological resilience and threatens the persistence of human and livestock lineages in the pastoralist system (see also N. Dyson-Hudson 1966:247). In Darwinian terms, it has intensified selection pressure on the Karimojong through its impact on mortality of adult males and children and on female fertility. This proposition raises questions regarding the position of cultural behaviors in models of human ecosystems (Lit-

tle et al. 1990, 1999b), in which cultural institutions typically have been viewed as parts of a smoothly working homeostatic system. Clearly, such a simplistic, functional analysis is inappropriate in relation to modern cattle raiding, regardless of its probable adaptive function in prehistory. Like the famous spandrels of San Marco (Gould and Lewontin 1979), AK-47 raiding arises at the intersection of set of environmental, political, and social vectors. In contradistinction to its architectural analogue, however, raiding with automatic weapons appears to have assumed a distinct trajectory, in the process becoming an increasingly capricious driver in a nonequilibrium, nonhomeostatic system (Gray, Leslie, and Akol 2002). In this view, AK-47 raiding operates as a positive feedback effect in pastoralist societies; by definition, it can be aborted only by a change in state either of the effect itself or of its target. While this understanding may illuminate the mechanisms by which maladaptive cultural behaviors become widespread, the outcome of this intrinsically evolutionary process remains obscure. Gray (n.d.) has argued that their stubborn adherence to modern raiding does not bode well for the persistence of pastoralist cultures in Africa in the long term, given the negative impact of AK-47 raids on human welfare, economic development, and pastoralists' integration into the national and global economies.

The present escalation in AK-47 raiding does not derive from familiar environmental stressors such as cattle disease and droughts but rather promotes them and aggravates their impact on the human population (Hendrickson, Armon, and Mearns 1998). This disjunction between cultural imperatives and environmental constraints does not negate a fundamental role of the environment in the shaping of culture itself (broadly defined as a human behavioral character), nor does it imply in any way that the human capacity for culture is distinct from our biological nature. Rather, it presumes that conditions under which erstwhile adaptive cultural institutions become maladaptive may arise, at least in part, from the internal structures of culture itself (see also Madut Jok 1999). In this way, the process of cultural selection may preserve behavioral traits in a population that ultimately set the stage for its demise. With specific reference to AK-47 raiding, we are suggesting that cultural rationalizations may temporarily override environmental and evolutionary sense. In asserting that a cultural institution may constitute an independent agent of selection, we confront the dual potential of culture as both adaptation and Darwinian stressor. In effect we come full circle: although cultural stress may emerge independently of classic evolutionary constraints, cultures, in the end, are only as permanent as the populations that bear them and ultimately are themselves vulnerable to the vagaries of evolutionary change.

6. It is significant in this respect that, in contrast to other herding systems, East African pastoralism appears to have emerged as a distinct cultural adaptation well before the introduction of sedentary agriculture and the rise of state societies in the region (see Gifford-Gonzalez 1998).

## Comments

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Gray and colleagues have done a remarkable job in re-viving field studies in this war-torn corner of East Africa. They offer a wonderful brew of demography, ethnography, and sociopolitical history for the Karimojong, representing the very best tradition of anthropology as a multidisciplinary enterprise, and their paper deftly links observations on marital practices, political developments, and NGO interventions into a story that is both convincing and shocking. While many of the elements—settlement as a cause of environmental degradation and disease, bridewealth inflation as a cause and consequence of raiding, and unstable wealth investments precipitating poor outcomes for morbidity and mortality—are familiar, all these pieces fit into the picture of chaos that emerges for northern Uganda from newspaper stories and brave NGO workers. While one might want to quibble with the explicit causality that Gray et al. attribute to AK-47 cattle raiding *per se* rather than to the broader circumstances of what has been effectively been a civil war of several decades or, alternatively, to question some of the causal arrows in their argument (for instance, unstable marriage not only causes but results from low fertility), I would far prefer to draw attention to the high quality of the ethnographic, demographic, and historical fieldwork.

I am not overly impressed, however, with the theoretical framework, which seems neither novel nor incisive. Gray et al. are certainly correct in claiming that once-adaptive behaviors or institutions can become mal-adaptive in novel circumstances and that culturally transmitted institutions can impose constraints on potential behavioral or institutional shifts that would seem to offer greater adaptive value. I have argued, for example, that Kipsigis agropastoralists who are running out of land in Kenya's Kericho highlands "should" adopt unigeniture to prevent total fragmentation of their landholdings or dowry to attract wealthy sons-in-law (Borgerhoff Mulder 1995) but do not do so because of deeply held views pertaining to equality among sons (and the insignificance of daughters) that derive from their pastoralist ideology. Such arguments can be broadened to the study of historical constraints on cultural variability in East Africa (Borgerhoff Mulder et al. 2001) and lie at the heart of major theoretical models regarding the relationship between cultural and biological evolution (Boyd and Richerson 1985). In this respect Gray et al.'s theoretical conclusions are hardly new.

Rather than explore further these intriguing dynamics, they seem content to emphasize that cultural institutions cannot be viewed as part of a smoothly working

homeostatic system (surely something we have been aware of since the demise of structural-functionalism) and to stress the true but, again, hardly novel point that for pastoralists raiding and militarism are practically synonymous with cultural identity. These are all valid observations and are beautifully illustrated with the data from Karamoja but are already widely if not uniformly accepted. Furthermore, Gray et al. reveal some confusion between individual and group selection insofar as they are puzzled that armed raiding is both "the chief mechanism for cultural survival" and devastating for fertility, health, and survival. Regular Darwinian evolutionary processes clearly have the potential to drive aggregate outcomes into suboptimal states (Rogers 1988), and all individually adaptive strategies come with costs (often, in the case of pastoralists, incurred by other household members [Borgerhoff Mulder and Sellen 1994]); this is why behavioral ecologists are always talking about trade-offs and how these shift under new social, political, and environmental conditions. Karimojong armed cattle raiding comes with terrible costs, but how do these compare with the costs experienced by hypothetical clans or families that abjure raiding altogether? Framed in this way, armed raids are surely best seen as an adaptive response to novel sociopolitical circumstances and opportunities—the punitive campaigns of governments, the misguided initiatives of development agencies, and the flood of automatic weapons into the area—and are clearly motivated by a combination of personal protection and private gain, both of which in this cultural and ecological context require the amassing of livestock. In my view Fleisher's (2000) perspective remains unscathed. The empirical content of this paper nevertheless remains a major anthropological contribution.

GÜNTHER SCHLEE

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Some of the terms used by Gray et al. need translation; a reader who takes the Darwinian terms too literally may get it all wrong. What they mean by "selection" is not selection for specific traits and thereby selection as an agent of biological evolution but simply mortality. And, correspondingly, the "Darwinian imperative" simply tells us to survive and to reproduce if we want to be around in the next generation. Gray et al. do not discuss whether under the combined effects of cattle raiding and drought the bearers of certain genes are more likely to survive than others. One might think that smaller individuals, the ones with cheaper bodies in terms of nutritional needs, would under certain conditions have an advantage, but that is not Gray et al.'s argument. They discuss whether pastoralism among the Ateker will disappear because the bearers of this culture, obeying its norms, destroy each other physically. If this were to happen, those who have managed to quit the system by becoming urban elites or agriculturalists might manage to

survive even though they bear the same genetic traits. Gray et al. are writing, then, about a cultural system and the chances of survival of its bearers, not about biological evolution. That they do so in Darwinian terminology may be confusing.

Given these clarifications, the argument is convincing and substantiated by compelling empirical detail. Ateker culture has become self-destructive. Ateker cattle raiders hurt their communities not by being free riders or by acting against the norms of their culture but by obeying cultural norms and thereby initiating a process of violent escalation that may lead to the end of Ateker culture by the physical annihilation of its bearers. This point is counterintuitive. The popular assumption is that culture is good and mostly adaptive. Cattle raids have always been a part of Ateker life, and not much has changed apart from the technology of killing, which was revolutionized by the mass influx of AK-47s. The formerly adaptive level of violence—just enough to keep the predatory state at a distance—appears to have escalated beyond a level that can be regulated by local forces. Because this point has been made well, I shall just pose some questions that Gray et al. have not addressed in this paper and that might form the topic of the next one.

How do Ateker explain what is going on? Cultural systems that are self-destructive are not new to us. In a highly competitive market economy people may be forced to use nonrenewable resources faster than they would like to and may knowingly destroy the basis of their economic activities, regretting the weakness or absence of overarching institutions that would prevent them and their competitors from doing so. Are Ateker actors aware that what they are doing is unsustainable? Is there an emic theory that corresponds to Gray et al.'s? If not, it might be interesting to hear alternative Ateker theories about Ateker.

If the Ateker do not develop institutions capable of stopping the vicious circle that Gray et al. describe, might outside intervention achieve this? Can any policy advice be derived from this paper? Much effort is being devoted to small-arms control, and the UN spends considerable money on it. I have been asked in my role as an "expert" in the Somali peace conference in Kenya to persuade my fellow Germans or Europeans to send an army to disarm the Somali, because they are unable to do it themselves. At the same time, Knighton (n.d.), writing about the same area as Gray et al., warns against unbalanced disarmament and points to the possibility of marauding state agents' attacking unarmed civilians.

Another question is whether there are thresholds of escalation beyond which irreversible processes of mutual destruction set in and deterrence and the preservation of group identities are no longer possible. Turton (1994: 27–30) seems to describe a case in which an influx of AK-47s helped the Mursi, not far from Karamoja in southwestern Ethiopia, to keep the Nyangatom (who are part of the Ateker) at a distance and preserve their group identity for the time being. This case clearly deviates from the model described by Gray et al., which may have to be expanded to accommodate it.

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Gray and colleagues are to be commended for raising some important questions about the negative impact on East African pastoralist lifeways of the militarization of both government and peasantry and the increased availability of modern weapons. The retrospective evidence presented for an association between a shift in raiding practice and reduced livelihood security, reduced fertility, reduced marital stability, and age- and sex-specific increases in mortality is certainly plausible, if hardly direct and not subjected to formal epidemiological test. I hope that their paper will stimulate further research on this urgent humanitarian, environmental, and social issue and suggest four questions that might be pursued.

First, how has the increased stochasticity of marital arrangements (and, presumably, of livestock holdings and wealth differentials) attributed to AK-47 raiding undermined the status of women? Observations from pastoral populations subsisting in more peaceful circumstances do lend indirect support to the hypothesis that Karimojong demographic shifts may be linked to changed patterns of household food production, caregiving, and health seeking, but the changing role of women in more violent societies (particularly as agents rather than victims) remains understudied. For example, pastoral women's work is often highly valued when the production returns from animal husbandry or alternatives are high (Brockington 2001, Horowitz and Jowkar 1992), and this influences household formation strategies (Sellen 1999, Sellen, Borgerhoff Mulder, and Sieff 2000) and increases women's economic autonomy (Fratkin 1989, Talle 1988). This may not be so when household herd size and persistence depend mainly on herd-owner firepower.

Second, is AK-47 raiding really cultural maladaptation? Natural selection occurs only when excess deaths are linked to heritable phenotypic differences. The high contribution of violence to deaths among men and teenagers, high maternal mortality, and very high subadult mortality rates in comparison with those in other pastoralists and agropastoralists (Sellen and Mace 1999) are cause for concern. However, the most commonly reported causes of death remain those related to infection and undernutrition, and the data presented show an underlying secular decrease in infant and child mortality. Thus, unless there is something genetically different about those killed by gun violence, the data do not well support the interpretation that increased raiding alters either the direction or the intensity of selection. From a human behavioral ecological perspective, the salient evolutionary issues may be how survivors find strategies to cope with the threat of violence and negotiate new social relations.

Third, how are we to tease out the independent effects of more lethal weaponry from the accompanying social, political, and economic upheaval the Karimojong have

experienced? Few details are presented about the specific forms of cattle raiding and their historical role in community organization and ecological adaptation prior to the acquisition of AK-47s in 1979 or about subsequent changes in the social organization of raiding parties, the frequency of cattle raids, and the number of deaths per raid. It would be useful to know how an increased threat from armed raiders influences decisions about herd management, mobility, and allocation of household labor to defense and other activities (Borgerhoff Mulder and Sellen 1994, Coppolillo 2000).

Fourth, can understanding of both the individual motives for specific raiding activities and the geopolitics of livestock markets help color the sketch of what is going on in Karimojong? Surely detailed comparative studies are needed before we can reject suggestions (Fleisher 1998, 1999; Hendrickson, Armon, and Mearns 1998) that shifts in raiding practice are best understood in terms of individual motivations and changed patterns of conflict and interest among kin, affines, and others. For example, among the Datoga (Barabaig) and Maasai resident in the Mbulu, Eyasi, and Ndotu regions of Tanzania in the early 1990s, young, unmarried men in the warrior age-sets sometimes sought to obtain handguns and semiautomatics in order to increase their ability to kill "enemies of the people" (natural predators and raiders from other ethnic groups) with the aim of more quickly acquiring cattle, through the usual traditional mechanisms of cattle gifts, and thus brides and prestige. Most of them were frustrated in this by the high cost, illegality, and limited supply of such weaponry, the stern opposition of most elders, and a reasonably effective system of local law enforcement in response to internecine murders. Without guns and with severe consequences likely, attempts at "hit-and-run" killings appeared far more common than successful ones, and few men acquired livestock directly through raiding. Nevertheless, attitudes at the community level were changing in response to the appreciable losses of livestock to organized raiding by outside groups armed with semiautomatic weaponry (and even helicopter gunships, by some accounts), which is one of several factors that contributed to the gradual impoverishment of Datoga families (Sellen 2003, Sieff 1999). We heard that some armed raiders stole cattle to order for wealthy traders based in Nairobi and elsewhere and that the cattle were rebranded and rustled to markets in Kenya with the assistance or collusion of police, customs officers, politicians, and businessmen in both countries. We were unable to verify these reports, and it is possible that many were embellished or were "rural myths" reflecting general concerns about the failure of government to represent and protect the interests of the nomads and traditional hostilities to other clans and ethnic groups. In any case, the lower frequency of armed raiding in northern Tanzania is probably linked as much to increasing economic growth and diversification and the relative stability of traditional local and national political systems as to continued difficulties in obtaining nontraditional weapons.

## Reply

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All three commentaries point to weaknesses in the theoretical argument of the paper, and I concede that this is somewhat tentative as it stands. We have argued that AK-47 raiding negates pastoralism as a subsistence strategy in East Africa—a conclusion apparently more tenable than our corollary hypothesis that it acts as a Darwinian stressor in pastoralist populations. Demonstration of specific Darwinian effects of the violence is problematic, to be sure. In addition to the perpetual challenge of distinguishing between group and individual effects, it requires that we track associations between distal effects of violence and the proximal variables that mediate them. As Sellen notes, the demographic effects of cattle raiding discussed in this paper are indirect, apart from the deaths of (mainly male) victims of gunshot wounds. Distal effects are expected to be mediated by a complex interaction of intermediate variables ranging from cultural responses—altered marriage practices, for example—to individual physiological responses that may be under strong genetic control, such as the function of the endocrine system in response to chronic psychosocial stress. Any of these may promote intergenerational changes in gene frequencies as a result of selection against phenotypes that are less biologically resilient or less likely to reproduce (less marriageable or more likely to die in their prereproductive years).

Both Borgerhoff Mulder and Sellen note the need to quantify presumptive selection against individual phenotypes. The questions who dies in raids and whether this mortality correlates with specific phenotypes are apropos. The existing evidence is suggestive. In 1998–99 I observed that the physical maturation of Karimojong schoolboys appeared to be late relative to that of herd boys, although the small sample sizes of the latter preclude statistical analysis of the differences using existing data. Some schoolboys in the sample who were in their late teens showed no signs of the onset of puberty, and their age-set initiations—a necessary prelude to active participation in raids—were observed to be similarly delayed. Aside from their absence from the seasonal migrations and cattle camps that are the targets of raids, I hypothesize that schoolboys are unlikely to engage in raiding until after their third decade, if at all. Those who remain in the pastoral system, however, begin raiding in their late teens or twenties and are more likely to die as a consequence of their herding activities, residence at cattle camps, and active participation in raids. Their higher risk of mortality at all ages after approximately age ten may result in their leaving fewer offspring than their schoolboy counterparts. If boys who become herders are more physically robust, such selection may influence several biological parameters in the population in succeeding generations, including but not limited to

stature, body composition, and endocrine profiles. A question with obvious relevance for our argument is whether the segregation of fast and slow developers or, alternatively, of big and small boys is culturally dictated.

Which of these raider-herders ultimately survive also has implications for microevolutionary changes in the population. In addition to obvious physical traits such as rate of maturation, size, physique, and physical prowess, personality traits such as aggression, response to stress, intelligence, and emotional resiliency may be major predictors of individual survival in a society anchored in violence. Maternal biological and behavioral traits are expected to influence all of these hypothetical outcomes. Caretaking behavior, which appears to have been altered by the violent social context (Gray n.d.), may have direct effects on child health, child development, and child survival. More important, however, may be maternal traits that underlie women's apparent acquiescence in raiding and killing and related maternal strategies that reinforce aggressive traits in their children and are effective in enculturating them to violence. Heritability of such behavioral phenotypes has direct bearing on the mechanisms by which a militant ethos is transmitted cross-generationally and on its population consequences in succeeding generations.

The second part of our theoretical argument—that AK-47 raiding is maladaptive in the strict Darwinian sense—assumes that if unchecked these hypothesized effects may precipitate both cultural and population extinction. My purpose in putting forward a hypothesis that is on the surface sublimely untestable is to shift the focus away from cultures as an adaptive response to environmental stress to culture as a kind of stressor. A widely theorized but inadequately quantified feature of cultural systems merits consideration here—that cultural institutions may be utterly dissociated from evolutionary imperatives and may perversely undermine adaptive responses. In fact, culture is a mechanism by which human groups may collectively *choose* to preserve maladaptive traits which otherwise would be eliminated by natural selection. Once separated from their ecological and biological brakes—that is, from their classic Darwinian constraints—these institutions may assume their own destructive trajectories, with the result that they come to exist “simply” for culture's sake and to satisfy some peculiar human need for “cultural” identity, an inherently ideological trait. Cultural selection does not operate according to prescribed Darwinian rules, given that it involves human manipulation. Nor does it conform to definitions of artificial selection, since the changes in phenotype frequencies hypothesized here are presumably not purposive. Furthermore, cultural behaviors with the potential to eliminate entire herding lineages would appear to be irreconcilable with individual interests, yet they are, inexplicably, individually compelling. The process is analogous to “runaway” selection (Fisher 1930), since both phenomena involve individuals' adhering to a particular biobehavioral strategy beyond the point of sustainability simply because that is what other members of the group do.

What checks the rate of culture change in most cases is that cultural behaviors are parts of a complex of interconnected institutions. With regard to the singular case of the Karimojong, I hypothesize that AK-47 raiding dislodged or nullified other cultural structures that may once have modulated its effects (the transformation of Karimojong raiding itself has been examined at length in Gray 2000 and n.d.), and Schlee also wonders whether the adaptive transformation of cattle raiding by the adoption of automatic weapons has crossed a hypothetical threshold beyond which the cultural system is no longer either effective or sustainable. Having assumed its own independent and nonhomeostatic trajectory, raiding now operates as a distinct stressor independently of or, more correctly, in opposition to both environmental and other cultural pressures.

Borgerhoff Mulder rightly observes that the revelation that cultural systems are nonhomeostatic is old news, but awareness of a concept is not synonymous with its integration into prevailing models. In fact, both she and Sellen lean toward a view of AK-47 raiding as adaptive, and adaptation is inherently homeostatic: the Red Queen (Van Valen 1973) runs as fast as she can to stay roughly in the same place while the environment shifts about her. Culture, in contrast, is predicated on the capacity for rapid behavioral change in response to an unpredictable environment. The divergence of rates of genetic and cultural change gave humans a distinct evolutionary advantage because in most instances it allowed them to circumvent the Red Queen's dilemma altogether. Evidently, however, there are evolutionary limits to the magnitude of this rate disparity.

Schlee observes that AK-47 raiding need not result in the bleak evolutionary scenario we predict if pastoralists simply adopt some other form of subsistence that is more adaptive in their current environmental, socioeconomic, and political situation. That most Karimojong are strikingly averse to doing so requires that we entertain other contingencies. Forcible dispersal of the entire Karimojong population if they persist in their present strategy has been baldly proposed by both members of Parliament and other influential observers in Uganda (Gray 2000, Mamdami et al. 1994). Such a draconian measure is equivalent to population extinction in the genetic sense, and any autochthonous behavior that promotes this outcome must be viewed as maladaptive in the strict biological sense. Socioeconomic alternatives have been presented to the Karimojong, but these programs have done little more than reinforce intra- and interethnic differences. Ultimately they appear to have been exploited by the Karimojong to enhance or to alter access to guns and cattle (Gray 2000). In this case ideology has effectively prohibited the tradeoffs that Borgerhoff Mulder hypothesizes.

Long-term investigation of these hypotheses is scheduled to begin in early 2004. Proposals pending at various funding agencies include a study of women's roles and women's agency in Karimojong society since the adoption of AK-47 raiding, one of the four problems enumerated by Sellen. The research will examine how the changing reproductive and social value of Karimojong



women has influenced their reproductive ideologies, resulting in their complicity in the violence as a means to enhance their own reproductive success, social status, and survival. A proposed study of the women's generation-set system among the Karimojong focuses on the role of other cultural institutions in moderating inter- and intraethnic hostilities. This system, which should not be confused with more informal female age-grades, may have functioned to restrain the militancy of its male counterpart, for which organizing and executing raids was a major occupation (Lamphear 1998). The female system appears to have fallen into disuse sometime in the 1970s, however; its abandonment thus coincides with widespread adoption of AK-47 raiding. Another study is in preparation on the structure of raiding: who raids, why, and when (and the related question of who has access to the guns).<sup>1</sup> The objective of this study is to measure costs and benefits of individuals' complicity in raiding in terms of survival, marriageability, and reproductive success. Examination of the relationships between the individual and the group effects of these strategies will explore hypothesized tradeoffs. A longitudinal study of maternal strategies and of child survival, child morbidity, and child growth and development will be undertaken to ascertain how women's behavior and thinking are influenced by the violence and to quantify relationships between maternal behavior, personal characteristics of mothers and their children, and child outcomes.

Schlee is concerned with how this research may be used to assist efforts to stem the violence in eastern Africa and asks what is known of the opinion of the Karimojong themselves regarding the sustainability of their present strategy for cultural survival. Whereas the emotional impact of individuals' experience of violence was patent during their interviews, data on the effects of collective experience on ideological structures are lacking at present. In 1998–99 a few Karimojong expressed their concern that the guns would result in the total annihilation of their people, but these were all members of an educated elite that is largely alienated from the pastoralist system. It seems to me that collective awareness that their individual actions imply costs for population survival *in the long term*, regardless of ostensible short-term benefits, may compel herders to consider alternative strategies more seriously than has been the case with peace initiatives to date.

The overarching objective of the proposed fieldwork is to collect empirical biobehavioral evidence of cultural behavior as maladaptation. Specifically, the goal is to quantify the role of collective violence as an agent of cultural selection that may shape biobehavioral variability in a population. Unlike many studies of human warfare and aggression in biological anthropology or be-

havioral ecology (see, for example, Betzig 1997 and Martin and Frayer 2000), this work is less concerned with what or why human violence *is* than with what it *does*. I have elected, for the present, to treat the origins of human violence as distinct from its impact on the structure of modern human populations. Ultimately we may find ourselves concerned with the essence of human violence itself, but such a discussion is largely irrelevant unless preceded by the empirical study of its effects on the persistence of populations. It is precisely in the area of the latter that our methodology, data, and theory are lacking.

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1. Differential access to weapons and ammunition may be a major factor influencing both individual and group behaviors. However, the routes of small-arms flow and the means by which they are procured are closely guarded information in Karamoja. Their investigation raises thorny ethical and methodological issues as well as obstacles to funding.

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