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Editorial

“Change begets change. Nothing propagates so fast”

Charles Dickens in Martin Chuzzlewit (1844)

Society, Biology and Human Affairs is closing the first decade of the new millennium by leaving the intimate world of paper and the cosy place in library’s bookshelves to leap into the arms of the world wideweb as an open-access publication.

It is an exciting enterprise, an opportunity for the journal to reach further afield for both, readers and contributors and to experiment with new formats in search of wider impact.

It is also a time of renewed efforts, determination and compromise to continue to be a space of dialogue, to share ideas and experiences and to showcase high quality inter-disciplinary work.

Much time and effort has been put into this exercise. I would like to thank Erika McClure, our Editorial Assistant and our website developers Gareth Hamilton, and Rodrigo Núñez-de la Mora for their help and hard work during this transitional phase. I am also grateful to Librarians Laura Jeffrey and Heather Ewington at Durham University for their valuable insight into the wonders and perils of the open-access world.

This online journey begins with a special issue titled “Space, Movement and Health” with guest editors Kate Hampshire and Simon Coleman. I trust the timely and relevant discussions in it will make a fascinating read.

Alejandra Núñez-de la Mora
Editor
Guest Editorial: Space, Movement and Health

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‘All the world seems to be on the move’ (Sheller and Urry 2006:207). The scale and speed of global movements of people, ideas and commodities is unprecedented, facilitated by high-speed transport, internet connections and an array of other technologies for connecting otherwise distant people and places. These developments have given rise to a surge of mobility-focused work by social scientists, as part of what Sheller and Urry call a ‘new mobilities paradigm’, which takes mobility, rather than stasis, as its starting point in understanding the ‘spatialities of social life’ (ibid.). Or, as Ingold and Vegunst (2008:1) observe, ‘social relations . . . are not enacted in situ but are paced out along the ground’.

There has been a corresponding move away from a narrow focus on economic migration and associated push and pull factors, towards much broader understandings of the different forms that mobility takes: from large-scale international migration, which has been subject to the academic and political gaze for some time, to the multiple smaller, daily movements of people all over the world, which remain largely invisible (Hampshire et al., 2011; Porter et al., 2010a, b). Increasingly, it is recognised that migration is often not a single event, but rather an ongoing process (or set of processes), which can involve individuals and families moving repeatedly over extended periods of time, giving rise to multi-sited and often transnational forms of social organisation (Coleman and Collins, 2006).

However, research on health and migration has not, by and large, taken on board these new perspectives and approaches. The literature is still largely focused on the impacts of one-off migration, typically comparing pre- and post-migration health status or comparing migrant and non-migrant populations (e.g. Landman and Cruickshank, 2001). Where ‘mobility’ (rather than ‘migration’) is considered, most literature focuses mainly on the difficulties and disadvantages in terms of health and access to healthcare experienced by mobile populations (migrant
workers, nomadic pastoralists, refugees and asylum seekers) are disadvantaged in term of health and access to healthcare (e.g. Sandford, 1978; Swift et al. 1990; Clinton-Davies and Fassil 1992; Anarfi, 1993).

This special issue brings together a collection of papers that explore, challenge and problematise the relationships between spatial mobility and health. The forms of mobility considered by contributors are diverse and often overlapping; they are all ongoing (repeated, circular or otherwise) movements (rather than one-off 'migration'): pastoral transhumance, forced migration of refugees, and rural-urban migration for productive (economic) and reproductive purposes.

Several important themes emerge from the research presented here. Firstly, it becomes clear that while mobile populations may face particular difficulties in relation to healthcare (such as exposure to ‘new’ pathogens, mobility-related stress, access to healthcare services), it is not mobility per se that is problematic, but rather the particular circumstances of mobility (or indeed lack of, even restrictions on, mobility) in relation to social, economic and political context. Indeed, Randall describes the complex changes to the health status of pastoralist Kel Tamasheq children in Mali as a result of partial sedentarisation following a major drought, forced migration as a result of conflict and enforced settlement in refugee camps, and finally repatriation involving varying degrees of return to a mobile way of life. The health implications of these changes are far from straightforward, and Randall suggests that it is periods of transition between mobile to immobile lifestyles that pose the greatest threats to health, rather than the fact of being mobile or sedentary per se. Similarly, Janes traces the changes in mobility patterns of Mongolian pastoralists in relation to health and health-service access in socialist and post-socialist Mongolia, and the implications of these re-configured social spaces, risk environments and mobilities on health status and access to health-care. In this context, movement can have both salutary and risk-producing consequences; again, Janes argues that it is not mobility per se, but rather the juxtaposition of eco-environmental risk, social disadvantage and restricted mobility that produces ‘spaces of vulnerability’ in which high rates of ill-health emerge.

A second key theme relates to deployment of agency in relation to mobility and health. This arises most explicitly in Janes’s depiction of Mongolian individuals and households who take strategic mobility decisions that involve balancing a range of competing pressures and needs. Access to town-based health services

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1 Originally presented at a conference ('Space, Movement and Health: Biosocial Perspectives') at the Wolfson Institute, Stockton-on-Tees, University of Durham, on 18 April 2005. The papers published here represent heavily revised versions of papers given. We thank the Biosocial Society for their financial and logistical support in putting on the conference.
entails a restriction of spatial mobility (staying close to urban centres), while pastoral strategies to promote longer-term economic and health security require more extensive movements to take advantage of seasonally-available pastoral resources. In order to manage these competing demands, pastoralists have re-defined (and created new) socio-spatial arrangements, which ‘bring the town into the social orbit of the countryside’ and vice versa. Likewise, Locke and Zhang portray the circular migration of women in China and Vietnam as a strategic means of navigating structural constraints and risks to sexual and reproductive well-being at particular stages of the life course.

Thirdly, while mobility in itself may not be a barrier to healthcare, these papers highlight the difficulties of conducting health-related research and interventions among highly-mobile populations – difficulties that have led to a marked non-mobile bias in research strategies (and arguably ones that have marked much of the history of anthropological fieldwork). Schelling et al. describe the difficulties of sampling and collecting epidemiological and demographic data among nomadic pastoralists in Chad, since pastoralists and other mobile populations are rarely enumerated adequately in censuses and other surveys. Moreover, high levels of mobility can impede longitudinal data collection of other forms of follow-up: Schelling et al. point to the problems in providing follow-up vaccinations for pastoralist children in Chad, for example.

Despite these difficulties, the papers here present some encouraging ways forward. Schelling et al. discuss strategies, co-designed by academic researchers and key local stake-holders, to increase Chadian pastoralists’ access to, and effective use of, health services; these include tuberculosis control programmes and integrating human and animal vaccination campaigns, as well as paying close attention to appropriate methods of information exchange between researchers and mobile populations. Likewise, Randall’s paper points to substantial improvements in child mortality among Tamasheq pastoralists that have arisen from (among other things) increased contact with health services during residence in refugee camps. Repatriated Kel Tamasheq are now more likely than before to seek healthcare for their children than before their exile; ironically, although they are less mobile generally, they show an increased willingness to move to seek healthcare.

Overall, then, our call is for attention to be paid to connections between mobility and health that includes but goes beyond a focus on one-off migration; that appreciates the ways in which positive health outcomes may depend on continued mobility rather than being challenged by it; and that highlights the sometimes problematic ways in which ‘states’ (the etymology of the word itself deriving from Latin stare, to stand) are political entities that often rely precisely
and problematically on stasis among their populations for their bureaucracies to function. It would be ironic indeed if we developed analytical tools to describe ‘new’ forms of ‘global’ mobility but proved unable to comprehend varieties of movement that may seem less spectacular, but which remain a vital dimension of human sociality and well-being.

Bibliography


Nomads, Refugees and Repatriates: Histories of Mobility and Health Outcomes in Northern Mali

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Abstract

This paper reviews the different pathways through which mobility can influence health, positively or negatively depending on context, by changing susceptibility, exposure or quality of care. The impact of different forms of mobility on health outcomes is considered empirically through a case study of Kel Tamasheq, a Malian pastoralist population who have experienced diverse forms of mobility and immobility in recent decades. As nomadic pastoralists they were highly mobile before being forced, by conflict, into sedentary refugee camps in the 1990s. After repatriation some Tamasheq remain nomadic, some have sedentarised and some are semi-sedentary. Over the same period many Tamasheq women have transformed from being obese and highly immobile to much greater individual mobility. We reflect on the implications of different mobilities for child mortality (as an indicator of health). Survival analysis of birth histories demonstrates that in any single time period the most mobile groups had lowest child mortality, and that substantial within-population mortality differentials exist, unrelated to population mobility. Over two decades child mortality declined considerably and more quickly than amongst sedentary Malian populations probably as a consequence of improved access to immunization and health care in the refugee camps and decreased obesity and increased individual level mobility of young women. Understanding mobility and its diverse impacts and influences on a population may contribute to general understanding of factors contributing to health and welfare of children, but this research provides no evidence that spatial mobility per se can be considered a determinant of health or ill health.

Key words: pastoralist; mortality; mobility; health; Mali

Introduction

http://www.biosocsoc.org/sbha/resources/75_2/SBHA_75_2_Randall.pdf
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Mobile people are often thought to be disadvantaged in terms of health whether in developed countries (immigrants, asylum seekers, travellers) or less developed contexts (rural-urban migrants, nomadic pastoralists, hunter gatherers). Although mobile occupational groups, including migrants, long distance truck drivers, fisherfolk and the armed forces (Kissling et al. 2005), are identified as being at increased risk of sexually transmitted diseases and HIV/AIDS, with poverty a contributing factor, mobility might equally be associated with socio-economically privileged groups such as students or international business executives and thus with better than average health outcomes, suggesting a need to consider how mobility might influence health. If mobility as a process modifies health, to what extent is this a direct impact of movement or a consequence of the underlying conditions or situations that generated mobility in the first place, or of the social or psychological contexts in which people find themselves whilst or after moving? Ideally, to establish the impacts of mobility on health, one should compare the mobile with the immobile – but it is rare to find comparable groups of people for whom mobility is the only difference.

Mobility could influence health through three principal pathways: changing susceptibility, exposure or quality of care. I consider each of these and the degree to which one could expect them to interact with mobility in African Sahelian contexts. Figure 1 outlines the major causes of mobility — all of which can take different forms, intensities and meanings for different populations and sub-groups. In order to conceptualise and understand the potential impact of mobility on health it is necessary to think through each of these pathways for the population under question. There is a whole spectrum of determinants of mobility, some of which may be highly stressful and risky, whereas others may be routine and largely risk-free.

**Susceptibility**

There are several different scenarios where mobility might influence susceptibility. Migration is often associated with stress and increased stress levels can decrease the effectiveness of the immune system. This has been suggested as one of the causes of high rates of reactivated TB in migrant populations in both developed and less developed contexts. However, where mobility is the accepted or preferred life-style, as for pastoral nomads, hunter gatherers or travellers, lack of mobility may be more stress-inducing. If mobility impacts on nutritional status (likely for migrants, especially in crisis-induced forced migration) then this could increase susceptibility to disease via an impaired immune system (Ulijaszek 1990). In contrast, for populations for whom mobility
Map 1

is an integral part of the production system, and therefore the means through which food is obtained, immobility has been associated with poorer nutritional status (Fratkin and Roth 2005).

In arid and semi-arid environments mobility is the principal means of exploiting patchy resources (Homewood 2008), population density is low, many infectious diseases cannot be sustained and people are often not exposed to pathogens in childhood and do not develop antibodies (Loutan and Paillard 1992). Such mobile groups may be more susceptible to infectious disease should conditions change. Additionally nomadic individuals generally have low immunisation rates because their mobility renders immunisation programmes costly and logistically difficult, and health service provision is poor in remote areas (Münch 2007). Thus mobility has the potential to influence susceptibility but such influence could operate in different directions depending on the context, the reasons for mobility, the environment within which people are mobile and whether the mobility is part of the ‘normal’ lifestyle’.
Figure 1: Hypothetised pathways between mobility and health

Causes

Proximate Factors

Service system
• Care
• Expose
• Susceptibility

Exposure

New strains pathogens
• New births pathogens

Susceptibility

lack of immunisation
• Health
• immune system
• stress

↑↓

Exposure

Conflict / violence
• migration
• marriage
• economy

Migration

Household
• language
• education
• knowledge

Education

Cultural
• religion
• economy

Values

Figure 1: Hypothetised pathways between mobility and health
Exposure

There are many biological reasons why people who are more mobile might have greater exposure to pathogens. Different pathogens, and different strains of the same pathogen tend to be found in different environments, and thus the more environments an individual encounters, the greater the risk of encountering a ‘new’ pathogen to which s/he has no or little immunity (Dyson 1991a & b). Where water supply is limited and of variable quality the more mobile are frequently forced to use poorer quality water, both for reasons of access (permanent residents control the best water supply) and availability (De Waal 1989). Mobility may also increase individual exposure to environmental hazards either because both the environment and risks are unfamiliar or through the act of movement itself. In contrast, populations for whom mobility is the normal way of life can use mobility and their adaptations to avoid particular hazards. Malian Tuareg avoided going near camps where children were known to have measles (Münch 2007).

Both failure to encounter pathogens whilst children and the ability to exploit mobility to avoid infectious disease occur where mobility occurs in sparsely populated environments. The mobility itself is not really the determinant of low exposure, but rather the package of responses to and adaptations to arid environments include both mobility and low population density.

Access to Care

In the contemporary world mobile groups are most likely to be disadvantaged in terms of access to care, although it is possible to envisage situations where mobility might be beneficial. Mobility in order to exploit patchy resources, where population density is low, is almost invariably associated with poor provision of health care services in terms of distribution, distance, quality of staff and service (an exception being Mongolia in the 1970s and 1980s, Swift et al.1990). Furthermore mobile pastoralist and hunter-gatherer populations are often ethnic minorities who are both spatially and politically marginalised, thus generating additional barriers to accessing health care (Randall 2008). Mobility means that individuals are less likely to speak the same language as health care providers and many migrants have difficulties accessing health facilities because of both language barriers and ignorance of the system (this is equally true in developed countries; Bollini et al. 2007; Davies and Bath 2001; Hoang et al. 2009; Jayaweera et al. 2005). In production systems dependent on mobility, pitching and striking camp and transhuming are additional to other domestic and productive tasks and may impinge on both time and energy available for child care.
Mobility can be highly advantageous in allowing access to care. Provided there are no other major problems such as linguistic or cost barriers, individuals who move can exploit diverse health services with different systems, different subsidies, different specialisations. Hence the relationship between mobility and access to care depends on social context, history, knowledge and resources.

In terms of proximate determinants of health, mobility has the potential to influence health outcomes in both beneficial and adverse ways. This brief overview demonstrates the vast heterogeneity in types of mobility and diversity of the potential impacts on health. It is essential to understand the causes of mobility alongside the degree to which mobility is an entrenched aspect of people’s lives to which they are adapted and through which they exploit their environment. Where mobility is imposed by external conditions and undertaken reluctantly or involuntarily, the implications for exposure, susceptibility and care may be very different.

Materials and Methods

Over recent decades the Kel Tamasheq in North West Mali have experienced a range of different types of mobility and immobility, both voluntary and forced. Their example allows us to consider diverse mobility-health interactions.

Kel Tamasheq live across the northern Sahel and most used to be mobile pastoralists, herding goats, sheep, cattle and camels according to the local environment. Two single round demographic surveys of Malian Kel Tamasheq were undertaken in 1981 and 1982 (Randall 1984, 1996, see map 1): both populations were nomadic pastoralists practicing no agriculture and were socially heterogeneous with representatives of all the different Tamasheq social classes; warriors, religious maraboutic groups, vassals, blacksmiths, and Bella slaves and ex-slaves. A further single round demographic survey was undertaken in 2001 covering largely the same population studied in 1981. Qualitative anthropological fieldwork accompanied the surveys in both periods. In 1989 a health behaviour study was undertaken in the Gourma using illness episode biographies (Randall et al. 1989).

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1 The Tamasheq term for the ex-slave class is *iklan* but this has pejorative overtones. The Songhay term Bella is frequently used.
The three higher status Tamasheq social classes are mainly of Berber origin and are often referred to both by themselves and other Malians as ‘red’. Slavery was widespread in pre-colonial times and most Tamasheq slaves (Bella) were originally captured in raids on villages in the area and further south. Tamasheq-speaking Bella are black African and clearly have different genetic origins to the Berber Tuareg. Many Bella were liberated in the colonial period and after independence, although de facto ownership of slaves continued at the time of the 1981-2 surveys with resident Bella undertaking much domestic and herding work. The 1981-2 surveys included both domestic dependent Bella and independent pastoralist Bella who had been freed for one or more generations.

For both populations the 1984-5 drought led to substantial herd losses, population movements, food aid and a mushrooming of international and local NGOs. Dependent Bella left their owners, people moved temporarily to towns and some Tuareg groups started to sedentarise (Randall and Giuffrida 2006). Those who remained nomadic became less isolated, with increased knowledge about the outside world and contact with development projects.

Conflict and Forced Migration

In 1990 Tuareg rebellion broke out first in Niger, then Mali. Thereafter small bands of armed Tuareg attacked military and administrative posts, sometimes killing the incumbents, usually stealing vehicles. The MPLA (Mouvement Populaire pour la Libération de l’Azawad) was created with the aim of liberating Tuareg territories in the north. The Malian Army responded by patrolling the areas and soon clashed with the rebels. Rebel attacks increased in intensity throughout early 1991 and gradually expanded westwards towards Tombouctou and the Mema (see map), with escalating retaliations by the Malian army on Tuareg and Maures with men, women and children being killed in camps, villages and towns. The Malian population became incited against the ‘reds’ and there were attacks on shops owned by Tuareg and Maures. Physical appearance was a major factor identifying those who were attacked and after the ‘massacre de Léré’ in May 1991, Tuareg in the Delta and Mema areas fled en masse to Mauritania just across the border. Some took their herds and tried to continue pastoral production in Mauritania, facing major problems with access to wells. Others left everything behind or consumed their animals during the flight.

2 The terminology of Bella (black) and Tuareg (red) is used here because physical characteristics largely determined fates during the conflict. For simplicity and because of small numbers, blacksmiths are combined with the Bella although in terms of the traditional Tamasheq class groups they are not captive. Most blacksmiths are black African; they were not persecuted during the rebellion and blacksmith women have always been economically active.
UNHCR, WFP and NGOs responded rapidly to the huge influx of people and three refugee camps were set up. Conditions were poor at first because of the scale of the crisis and the isolation of the area. People continued to arrive in the refugee camps from 1991 until 1994. The main waves into the Mauritanian refugee camps were in 1991-2 and the main exodus was in 1996 under a repatriation programme with spontaneous repatriations occurring throughout the period. Although most camp residents had previously been nomadic pastoralists, there were also refugees who had sedentarized after the 1985 drought, along with civil servants, teachers, traders, craftsmen and students. A few domestic Bella fled with their masters but black Tamasheq were not persecuted and most stayed behind in Mali, some with the animals, some leaving the pastoral sector altogether. The nomadic pastoralist Tuareg majority experienced substantial social change in the refugee camps; they were immobilised in one place in a densely populated environment with large numbers of people from different social groups alongside the educated and people who had earlier abandoned mobile pastoralism and pastoralist areas.

Young people enjoyed the novelty of a varied and active social life. Schools were set up alongside adult training programmes to facilitate economic independence after repatriation. Eventually, health care provision included immunisation programmes, free health and maternity care. Whereas the previously nomadic population studied in 1981 had drunk marsh and river water, boreholes now provided clean water.

**Repatriation and Transformations**

Repatriation made further changes to life-style. Part of the reconciliation and repatriation package developed by the Malian government with UNHCR and other international organizations included promises to build schools, drill boreholes and develop infrastructure in the specific destinations refugees were obliged to name and return to, as well as in other northern communities. For repatriated refugees infrastructure was supposed to be proportional to the population registered. This encouraged sedentarisation and led to a proliferation of wells surrounded by small settlements. People with few or no animals no longer needed to be mobile and many of those who retained animals claimed to have understood the benefits of a sedentary lifestyle, although this transformation included political dimensions (Randall and Giuffrida 2006).

By 2001, four years after repatriation, much of the population was relatively sedentary, few were totally dependent on a pastoral economy and unpaid domestic labour was rare. Participation in formal education was increasing, there
was more knowledge about and demand for modern health services and good quality water was usually close by. All these changes had substantial ramifications for the daily lives of Tuareg women and children.

*Tamasheq Demography*

The 1980s surveys showed Kel Tamasheq to be demographically unusual for sub-Saharan African populations. Heterogeneity in terms of production, environment and social organization within the Malian Kel Tamasheq population means that we cannot generalise about their demography throughout the country but some of the specificities almost certainly apply elsewhere.3 The demographic regime was typified by low(ish) fertility4, largely a function of the monogamous nuptiality regime, and unusual patterns of mortality differentials. Higher status, wealthier, Tuareg children had much higher mortality than Bella children. Tuareg women had higher mortality than Bella women but the opposite was the case for adult men (Randall 1984). Although extra marital childbearing was more acceptable for Bella, overall their fertility was similar to that of Tuareg (Randall and Winter 1985).

The economic and social role of women had had a major impact on the demographic regime (Randall 1984, Fulton and Randall 1985). Traditionally, high-status women in this region did little domestic or livestock related work, made possible by the existence of the dependent Bella population. Differences in behaviour were reinforced by force feeding rich, high status girls and young women and their subsequent obesity seriously limited their physical activity (Randall 2009; Randall in press). Tuareg women were expensive to maintain, often contributing little to the household economy, housework and even childcare. In the quasi-total absence of access to effective health services, childcare patterns were at least partially responsible for the differential mortality rates between social classes (Randall 1984; Hill and Randall 1984).

Nevertheless there was substantial diversity over both time and space. The extent of both force-feeding and slavery had been declining for at least two decades before the 1981-2 demographic surveys, but in the study populations both were still quite frequent. Elsewhere in Mali, Kel Tamasheq had become less nomadic after herd loss in the 1973 drought and the domestic slave

3 The Bella proportion of the population was always much higher in the more southern Tamashque populations (reaching more than fifty per cent), which included the Gourma and Delta populations surveyed. In the far north of Mali, there were few Bella and Tuareg women were more physically and economically active.

4 Total Fertility Rate between 5 and 6 compared to over 7 for other rural Malian populations.
population had declined with Bella moving to urban areas, becoming independent herders or turning to agriculture. In the 1980s there was a tiny urban minority of educated Kel Tamasheq, but in both the populations studied in 1981-2 everyone was nomadic, few had been to school and there was little contact with health services. Most people lived in relatively small, isolated camps (twenty-fifty people) and although men had contact with the outside world through travel and markets, most women led very socially restricted lives.

Results

For all Kel Tamasheq spatial mobility was an integral part of the pastoral production system. In the early 1980s households moved as units and lived in tents or temporary straw huts all year round. Camps moved every few days in the wet season and every month or two in the hot dry season when they had to remain near a water source. Much individual mobility was independent from camp movements. In the wet season young male herders took groups of animals to distant pastures or salt licks. In the hot season animals had to be herded huge distances daily either to water or to pasture. Many children, mainly Bella, took donkeys many kilometres daily for water. At certain times of year some Bella left to go and work on harvests elsewhere in Mali, and some young Bella men went on labour migration to Abidjan and other coastal towns.

Within this geographical mobility there was also substantial residential mobility. Households would leave one camp and join another. Individuals within households moved between camps on visits, especially young unmarried men and children (Randall 2005). Young mothers with children would go on prolonged (several months) visits to their natal home to give birth. Marital breakdown was frequent and children often switched between different households, relatives and camps. These multiple mobilities cannot be broken down in terms of their impact on health but clearly this was a population where mobility permeated all aspects of physical and social life.

Yet, within this highly spatially mobile population, force-fed, obese, high status women whose days were spent sitting or lying in their tents or under a nearby tree were physically amongst the least mobile individuals imaginable. Their value system prioritised obesity and visible immobility. These women walked with difficulty and extremely slowly; when camps were not moving they walked very small distances from their tents, and during transhumance they sat motionless on camels or oxen. There is thus a paradox of immobility within mobility. It is this immobility which appears to have had substantial detrimental health implications both for the women and their children, contributing to the high adult female and child mortality amongst Tuareg relative to Bella.
In 1991 this nomadic pastoral population encountered a new mobility – a forced migration across an international frontier – and then forced spatial immobility in refugee camps. At one level the refugee camps represented little change from their former lifestyle in that, at first, people continued to live in tents, although later many constructed houses. However the changes, of which immobility was just one aspect, were profound and stressful. Oral testimonies suggest the flight was very traumatic and ten years later many women broke down when recalling what had happened. Descriptions of refugee camp life indicate that people adapted to these new, immobile conditions to the extent that many were reluctant to be repatriated and many vowed not to return to a nomadic life once they had returned to Mali. There are many complex reasons behind this change of attitudes: loss of dependent Bella labour was critical because Tuareg women would now have to do the hard work of striking camp and moving. The potential comforts and material possessions of a sedentary lifestyle were now appreciated. The resumption of mobility during repatriation was recalled as being a very stressful period. A decrease in births a year later provides reinforcing evidence for stress (Randall 2004). Maybe transition periods between different lifestyles, whether from mobile to immobile or vice versa, are the most critical for health and well-being rather than a general impact of physical mobility on welfare.

At the time of the 2001 survey there was substantial heterogeneity with respect to lifestyle mobility. Many Tamasheq households had largely abandoned the previous nomadic lifestyle and were sedentary for all or part of the year, although about half the population still transhumed with their animals in the wet season; many men were frequently off herding the remaining animals. Some households remained nomadic, including a few who had never fled to the refugee camps and had been highly mobile throughout the rebellion, hiding in the dunes and mountains to the north. Production-system-determined mobility for the whole population was much reduced but different forms of mobility were emerging, especially for young unmarried women. Not only were few young women fat in 2001 but their increased bodily mobility has contributed to greater social and spatial mobility for this formerly highly restricted group. Young women constantly visit friends and relatives in other camps and sites (often walking quite long distances), continuing the patterns of extensive social life initiated in the densely populated refugee camps where young people's social life was seen as one of the many advantages of camp-life (by them, if not by the older generation). Young women are maintaining this freedom in the post-repatriation life. Marital breakdown (another form of mobility) remains frequent, with attendant child movements.
In 2001 people were still deciding where to live, with whom and with what lifestyle. The new decentralised political system added an additional dimension to such decisions. Some who had been nomadic since repatriation had just decided to stay in one place; others who had been sedentary resumed transhumance. Households who had settled in one community on repatriation moved elsewhere. Post rebellion, mobility thus remains essential but is managed differently (Giuffrida 2005).

**Mobility, Morbidity and Mortality**

Apart from personal observations no health data are available for these populations either in 1981/2 or in 2001. Health is assessed indirectly from mortality data from both surveys. The 1989 health behaviour study (Randall, Diakite and Pairault 1989; Randall 1993) did not generate morbidity or epidemiological data, but does provide insights into the interplay between the health and mobility of a traditional, isolated nomadic Tamasheq population.

Both surveys include birth histories from reproductive age ever-married women, and orphanhood questions for estimating adult mortality; sibling survivorship was asked in 2001. Data quality is problematic. In 1981 age was a totally irrelevant concept and age data were poor despite substantial efforts by the interviewing teams and the development of local calendars. Age reporting was somewhat better in 2001. Nevertheless this was a population who had been through a rebellion, massacres and forced migration, who had long been marginalised and associated censuses with taxation. Absolute age remains unimportant and people do not like talking about dead children. Neonatal mortality was underreported in 1981, rather less so in 2001. Comparisons with national Malian data will use indirect estimates which control for underreporting although DHS data are also likely to include underreporting. Comparative period mortality rates use uncorrected birth history data because the interest is here within-population differentials and we assume that underreporting does not vary by mobility.

Although in 2001 Kel Tamasheq were more sedentary than in the 1980s, some remained nomadic all year round, and more were semi-nomadic. Even those people who claimed to have been sedentary since the rebellion still moved considerably. Unfortunately the data do not allow for time variant analysis in order to establish whether children are more likely to die at times when they are transhuming or settled. One problem is the complexity of movements. Faced with individuals who moved constantly during the last fifteen years, transhuming,
herding, in and out of refugee camps, in and out of villages, men who fought with rebel groups, men who trained in Libya, children moving between mobile, sedentary and refugee camp households, the range of experiences would have been impossible to record and attempts to do so would have antagonised interviewees who rapidly become frustrated when faced with demands for chronologies. Therefore simplified data on ‘way of life’ were collected for each individual for four periods:

Before 1985 Before the drought which decimated the herds and initiated some sedentarisation
1985-90 Between the drought and the rebellion
1991-96 During the rebellion
1997+ Since repatriation

For each period we asked whether the predominant way of life during that time for the respondent had been

1. Nomadic (moving with animals throughout the year)
2. Semi nomadic (moving with animals for less than half the year)
3. Sedentary in a ‘site’ – a Tamasheq sedentarised community
4. Sedentary in a multi-ethnic village
5. In a town
6. In a refugee camp

Such a classification was simple to ask about and most people had no difficulty in answering. It is unable to take account of those with complex itineraries and only records the dominant lifestyle. For example, although those in the southern zone surveyed fled to the refugee camps in 1991, in the more northerly areas many left in 1993 or 1994; yet all who fled would be recorded as being ‘refugee camp’ during 1991-96. These ‘way of life’ data show that the vast majority of the surveyed adult population were nomadic before 1985 and about 15 per cent sedentarised after the drought. About 90 per cent went to the refugee camps and four years after repatriation, about half were sedentary, 15 per cent semi-sedentary and 35 per cent nomadic (Randall and Giuffrida 2006).

5 During the exile in Mauritania many extended families split with one part in the refugee camp collecting rations and other resources and another part remaining nomadic with the animals in the neighbouring area. Individuals often moved between the two states. Furthermore some people (usually young men) left the remote refugee camps to work in Mauritanian towns.
Child Mortality Differentials

Indirect estimates of child mortality by class (figure 2) show that in the 1970s Tuareg mortality levels resembled those of rural Mali, whereas Bella mortality was substantially lower. This pattern was reflected in the 1982 survey in the Gourma (not shown) undertaken with a different research team (themselves mainly Bella), suggesting that these substantial and consistent social class mortality differentials are real and not a function of underreporting (Hill and Randall 1984). Estimates for the whole Tamasheq population in 2001 and for the Tuareg (who were the majority in the refugee camps) show a clear improvement in mortality over time.6

One can draw several conclusions from figure 2. Firstly the substantial social class mortality differentials in the 1970s suggest that population mobility played little role in determining mortality. Both the Tuareg and Bella surveyed were highly mobile and lived in the same mixed camps. Any mortality differences must be attributed to a combination of varying susceptibility and different child care patterns (Hill and Randall 1984; Randall 1984) with their origins in the class prescribed roles and values of women and the frequent obesity (and immobility) of Tuareg women. Secondly the similarity in mortality levels between the Tuareg and sedentary rural Malian children downplays the role of mobility in determining mortality. The DHS sample excluded the rural pastoralist northern part of the country, and no nomadic groups were included in the sampling frame (République du Mali, 1987). At that time the health and immunisation services provided in rural Mali were minimal, whether for nomads or sedentary populations.

The relationship between Tuareg mortality levels and that of rural Mali changed substantively in the 1990s, with Tuareg mortality declining much more rapidly than in rural Mali: by 2000 Tuareg child mortality was much lower. This is surprising because whereas the rest of Mali was peaceful during this decade, and

6 The 2001 Bella estimates are both irregular and unrepresentative because Bella were only 20% of the population in 2001 and were unusual Bella in that they had chosen to continue living in mixed communities. They included a few servile Bella, now paid. They are included for completeness.
Figure 2: Indirect estimates of Tamasheq childhood mortality 1965-2000

Figure 3: Tamasheq reported infant and child mortality by period: source birth histories 2001
experienced substantial economic growth and the first democratically elected government, the Tuareg suffered a vicious rebellion, massacres, persecution, exile to refugee camps, and repatriation after substantial economic hardship and livestock loss alongside a complete overturning of their traditional way of life. Yet their infant and child mortality has declined considerably.

Impact of Events and Crises on Mortality

Direct measures of mortality from birth histories allow a more precise examination of the impact of specific events on mortality and the investigation of the role of different mobilities within this population. From the directly calculated period mortality rates for different ages for the whole population (figure 3), the mortality decline generally stalled during the rebellion and infant mortality increased. For all age groups, mortality had declined significantly during the 1980s compared with the previous decades, suggesting that neither mobility, nor the 1985 drought and its concomitant social and economic crisis, had long-term deleterious impacts on mortality.

The impact of the forced migration and the period in the refugee camps stands out as an interruption to this general decline. Biannual period mortality rates (figure 4) show that mortality increases were entirely concentrated in 1991-2, the initial period of flight and the early refugee camps. By all accounts this early camp period was chaotic. The remote area in Mauritania where people fled had no infrastructure and required a three hour drive over appalling terrain from the end of Mauritania’s long arterial road. At first the camps were disorganised, there were problems with sanitation and water supply and there were epidemics, particularly of measles (where children of all ages were probably susceptible because of previous mobile, low population density living). It was not until medical NGOs arrived, initiated immunisation and set up health clinics that conditions improved. This is a clear case where previously mobility had been an adaptation to potential health hazards, which surged up once people became immobile. The real problem was not the immobility but the high population density and the underlying conditions. After the initial two years in the refugee camps, mortality at all ages declined and the fact that Tuareg infant and child mortality is now well below the national level in rural Mali can probably be attributed to social and attitudinal change induced by the forced immobility in the refugee camps.

Access to Health Care

In the 1980s most nomadic Tuareg had little contact with the health services and the service provision in their areas was extremely poor. They rarely used what
was available because of various constraints (Randall, Diakite and Pairault 1989; Randall 1993; Münch 2007): fear, ignorance, lack of cash, dislike of the way they were treated, inconvenience, cultural barriers, distance, and impracticality. Children were not immunised, traditional medicine was often ineffective and serious illness went untreated. In the refugee camps, once the health care provision had been established, it developed rapidly so that everyone was immunised, there were free preventative and curative services, ante-natal clinics and medical evacuations for emergencies. The educated, urban Tuareg in the refugee camps, long used to making considerable demand on health services, also influenced the attitudes of their rural kin. Literate people were trained as midwives and primary health care workers in order to improve health services on repatriation. Thus the immobile period in refugee camps persuaded Tuareg of the benefits of modern health care whilst removing many of the practical barriers such as cost, distance and mobility. The relative ease of childhood immunisation was probably a critical factor in the substantial declines in child mortality since 1992.

Figure 4: Kel Tamasheq infant and child mortality for 2 year periods: source birth histories 2001
After repatriation rural Kel Tamasheq were more inclined to use health services with the locally trained health workers much in demand, although problems remained with drug supplies and payments. There was improved recognition of conditions for which modern health care is acceptable and effective and an increased willingness to actually seek out care. Herein lies an irony. When Kel Tamasheq lived a nomadic lifestyle there was little willingness to actively seek out modern health care, even when it was available. An apparent consequence of a lifestyle permeated by movement and change was a widespread acceptance of chance, luck or serendipitous encounters. In the Gourma in 1989 if someone fell ill and there happened to be a traditional healer or the mobile Norwegian health clinic nearby, people would seek treatment. However they rarely specifically sought out either modern or traditional health specialists that were any distance away, although there were occasional exceptions, especially for mental health problems. The general principle of health care was to use whatever was locally available; be that foods, plants, animal urine, a knowledgeable old woman or a Norwegian doctor. If the resource was not there, then fate had not meant it to be used. Mobility was rarely used to exploit sparsely distributed health care resources, despite the availability of animal transport and complete acceptance of mobility as the strategy for accessing other patchy resources such as water, pasture and wild foods. It has required sedentarisation and a loss of mobility to induce a change in Tamasheq mind set and a new willingness to move and seek care.

The reduction in mobility and the regrouping of people in sites since repatriation facilitated other health related activities. In 2001 almost everyone had access to well or bore-hole water, and even nomads usually camped within reach of a settled community’s water supply. Generally only young male herders continued to transhum into the delta (where the water quality remained appalling), instead of complete families with women and children. Immunisation campaigns were better received and higher population density, settled communities and new roads had overcome many of the logistic problems. However even the groups who remained nomadic during the rebellion and since repatriation were now much more aware and demanding of health services. The whole population (men and women) have new attitudes towards their health rights and expectations.

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7 This exploitation of chance encounters includes researchers and interviewers who were plagued for medicines in almost every camp we visited.
Changes in Exposure and Susceptibility

Other consequences of the forced migration impacted upon health. The substantial herd loss has reduced the necessity for extensive familial nomadism, but even richer households altered their herding strategies and few complete households spent the dry season in the ethnically mixed and insalubrious inner Niger delta, preferring to stay all year round in the dryer lands north and west of the delta. There is a political dimension to this change, including persisting mistrust of other Malian populations who turned against them during the rebellion (Randall and Giuffrida 2006), but the decision to remain in the dry lands has substantial health benefits. Alongside the appalling delta water supply, living on a flood plain entailed permanent exposure to malaria and other water borne and water based disease. In the 1981 surveys other populations living in the delta had significantly higher mortality than the, generally poorer and more isolated, people from the same ethnic groups, living elsewhere in semi-arid areas (Hill and Randall 1984).

A further critical change influencing child health is the combined impact of the 1985 drought and forced migration on women’s roles, values and health. Whereas in 1981 many reproductive aged Tuareg women had been force-fed, were obese, complained of numerous health problems and delegated most childcare to young Bella girls, in 2001 there were few fat women and all women were more active because most of the dependent Bella labour force had quit. These changes have multiple causes: poverty through livestock loss, the forced migration where Bella were not persecuted and where obese women were a serious handicap, and general social change and attitudes to dependent servitude. Tuareg women are much more actively involved in childcare now, there is more continuity of care, more concern with cleanliness and washing children and a greater awareness of the health status of children. Thinner women are probably healthier during pregnancy too. These changes in women’s roles and relationships with children were not induced by changes in mobility but were part of all simultaneous transformations.

Is Mobility Disadvantageous?

Some Tamasheq sub-groups remained nomadic and highly mobile throughout the 1980s and 1990s. The nature of pastoral nomadism means that such groups were unlikely to have had short periods of other lifestyles during each time period (because their animals perpetually require mobility). During the rebellion period these groups were not only highly mobile, hiding in the dunes and mountains, but also totally unable to access any health services, and thus they provide a good test of whether mobility itself is detrimental to child health.
Using birth history data the mother’s ‘way of life’ was ascribed to the child under the assumption that the child generally resides with its mother, an assumption which, despite child mobility, is fairly robust up until the age of five. For all births since 1991 (i.e. since the beginning of the rebellion and including the most traumatic periods of the rebellion for the earlier births) survival analysis was undertaken for four categories of children: (1) Always mobile: mothers were mobile throughout their lifetime (18% born before 1996). (2) Always fixed: mothers sedentary throughout lifetime (6.2% born before 1996). (3) Refugee then mobile: born in refugee camp, mobile since repatriation (all born before 1996). (4) Refugee then fixed: born in refugee camp then sedentary after repatriation (all born before 1996).

Because most people were in the refugee camps these groups are not strictly comparable; the majority of children with stable lifestyles were born since repatriation. Separate analysis was therefore also done for children born 1991-6. For births during 1980-90 three categories were defined: (1) Always mobile: mothers nomadic throughout period (39% born before 1985). (2) Always fixed: mothers fixed throughout period (24% born before 1985). (3) Mobile then fixed: mothers sedentarized after 1985 drought (all born before 1985).

Table 1: $l_{60}$ (proportion of births surviving to age five) for different categories of mobility in different time periods

<table>
<thead>
<tr>
<th></th>
<th>$l_{60}$</th>
<th>N</th>
<th>Distribution of births over period</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Births 1980-1990</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. always mobile</td>
<td>.796</td>
<td>1321</td>
<td>spread out</td>
<td>1 vs 3: p=0.04</td>
</tr>
<tr>
<td>2. always fixed</td>
<td>.755</td>
<td>286</td>
<td>later</td>
<td>all others not significant</td>
</tr>
<tr>
<td>3. mobile then fixed</td>
<td>.704</td>
<td>81</td>
<td>earlier</td>
<td></td>
</tr>
<tr>
<td><strong>Births 1991-2001</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. always mobile</td>
<td>.882</td>
<td>747</td>
<td>later</td>
<td>1 vs 2: p=0.035</td>
</tr>
<tr>
<td>2. always fixed</td>
<td>.853</td>
<td>695</td>
<td>later</td>
<td>1 vs 4: p=0.013</td>
</tr>
<tr>
<td>3. refugee + mobile</td>
<td>.864</td>
<td>317</td>
<td>earlier</td>
<td>all others not significant</td>
</tr>
<tr>
<td>4. refugee + fixed</td>
<td>.834</td>
<td>493</td>
<td>earlier</td>
<td></td>
</tr>
<tr>
<td><strong>Births 1991-1996</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Always mobile</td>
<td>.902</td>
<td>245</td>
<td>na</td>
<td>1 vs 2: p=0.005</td>
</tr>
<tr>
<td>2. Always fixed</td>
<td>.808</td>
<td>167</td>
<td></td>
<td>1 vs 4: p=0.016</td>
</tr>
<tr>
<td>3. Refugee + mobile</td>
<td>.864</td>
<td>317</td>
<td></td>
<td>all others not significant</td>
</tr>
<tr>
<td>4. Refugee + fixed</td>
<td>.834</td>
<td>493</td>
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</tbody>
</table>
Because of the general mortality decline over time we expected those groups with more children born earlier in the period to have higher mortality. Since births in the later 1980s experienced some of their early years during the period of flight, births 1980-88 were also investigated but outcomes were identical (not shown).

There are limitations to this analysis, not least the different time distributions of births and the crude classification of lifestyle. Nevertheless, with respect to mobility, survivorship is always significantly better for children who remained mobile throughout the whole period, whether during the rebellion or before. Even where the differences are not statistically significant they are always in favour of the more mobile groups (for those born in refugee camps, mobile children post repatriation had lower mortality than fixed children).

Discussion

These results can be interpreted in various ways. Mobility could bring with it more benefits in this particular environment than sedentism, suggesting that the exposure and susceptibility determinants are more important for child mortality than access to health care, and that the benefits of mobility outweigh the disadvantages. Or these results could just represent a selection bias. Mobile households have retained enough animals to warrant mobility; the sedentarized include the destitute but also wealthy leaders and most of the educated Tuareg. Against this argument is the clear evidence from the 1981 surveys that, for this population, wealth and power did not then translate into better child survival.

Analysis of Tamasheq child mortality suggests that mobility itself is not detrimental to child welfare, but the transformation from one lifestyle to another may be associated with increased risk of dying. This in itself is not surprising since people often only transform their lifestyle from one practised for generations if they are forced to through necessity. Much, but not all, of the sedentarization in the mid 1980s was forced owing to drought-induced poverty or destitution. The numbers of children in this category are small but they experienced the highest mortality. The increased mortality in the early 1990s was certainly associated with the forced migration followed by enforced immobility in the refugee camps.

It is the interplay between mobility and immobility that renders this case interesting but which also suggests that one can only understand the impact of mobility on health for any specific population or sub-group through a detailed consideration of the three critical intervening factors: exposure, susceptibility and care. In the 1970s Tamasheq mortality was high, as was mortality elsewhere.
in rural Mali. Within the nomadic Tamasheq population mobile Tuareg had much higher mortality than equally mobile, but poorer and powerless, Bella.

Exposure to disease amongst these two groups was almost identical: they lived in the same camps, drank the same (appalling) water, and ate much the same food, although Tuareg children consumed more dairy and animal products (usually considered to give a nutritional advantage rather than disadvantage).

Susceptibility to disease, particularly malaria, may have been lower amongst the Bella whose black African origins may have conferred higher levels of genetically determined red blood cell adaptations to malaria, although this is speculation rather than built on evidence. In earlier analyses (Randall 1984; Hill and Randall 1984) I suggested that these mortality differentials were probably generated by differential care that children received in terms of continuity of care and the capacity of the carers. The highly obese and immobile Tuareg mothers were both physically unable and mentally disinclined to supervise their children throughout the day; obesity was a physical symbol of women's access to servile Bella labour. Tuareg women without Bella were unable to be obese. However the Bella carers of Tuareg children were usually children themselves and probably not very attuned to their charges' needs, nor able to fulfil them. In contrast, Bella children, until toddlerhood, spent most of their time with their mothers. They were washed more frequently, because their mothers fetched the water; they had access to food throughout the day because their mothers did the cooking. These small differences in daily care, in the absence of modern medicine, probably contributed to the substantial observed mortality differentials. This argument suggests it was the physical personal immobility of the Tuareg mothers compared with the active Bella mothers that generated child mortality differences.

This interpretation is corroborated by the mortality patterns observed since the rebellion. Mortality amongst Tuareg children has declined substantially, partially attributable to immunisation in the refugee camps and changing access to health care. However a major consequence of both drought and conflict was the loss of the remaining dependent Bella labour. Thus previously fat Tuareg women can no longer be as obese because they must do more domestic labour and few households have the livestock for surplus milk and butter to maintain obese women. A final twist emerging in the refugee camps is that young women no longer seek obesity. People would still prefer to be fatter rather than thinner but not to the degree of obesity that was desirable in the 1980s. Thus a combination of circumstances and changes have made formerly immobile women of reproductive age more physically active and more involved in the day-to-day care of their young children. This development of personal mobility in a context of changing spatial and geographical mobility may well be the major contributor to the observed Tuareg child mortality decline.
Mobility is a complex, multi-faceted concept for all populations, but for the Kel Tamasheq the diversity of forms and dimensions of mobility surpasses most other groups. The different comparisons undertaken in this paper allow some insights into the potential impact of mobility on health. Tamasheq-rural Mali mortality comparisons demonstrate that mobility alone contributes little to our understanding of mortality differentials and a nomadic lifestyle is not necessarily disadvantageous. Comparing within Tamasheq sub-groups – Bella and Tuareg in 1981, nomadic, sedentarised and refugees in the 1990s -- reinforces this interpretation. Understanding mobility and its diverse impacts and influences on a population may contribute to our general understanding of factors contributing to health and welfare of children, but this research provides no evidence that spatial mobility per se can be considered a determinant of health. Nevertheless, wider conceptualisations of mobility do allow us to consider determinants of child health that are unlikely to be captured through standard socio-demographic variables and analysis. Personal mobility and how it is constructed and maintained, and the relationship between personal and geographic mobilities are important dimensions of Tamasheq child mortality dynamics.

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Mobility, Animal Source Foods and Micronutrient Needs Among African Pastoralists

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Abstract

Many mobile pastoral populations depend on livestock to provide animal source foods (ASF: meat, blood and animal fat, milk and milk products) for direct consumption or sale for income. Relative to other foods, ASF contain high levels of bioavailable micronutrients such as iron, zinc, iodine and vitamin A, and ASF consumption in moderate amounts has been shown to promote healthy physical and cognitive development and child survival. Nutrition scientists and policy makers have therefore suggested that ASF are a potentially efficient, effective, and sustainable means to reduce major nutrient deficiencies at community and national level. Historically marginal to global economic development discourse, mobile pastoralist populations have become a recent focus of attention as key producers of ASF at the local, regional, national and global level. This paper briefly examines selected data on ASF consumption, micronutrient deficiency, household food insecurity and under-nutrition among mobile pastoralists in sub-Saharan Africa and identifies key challenges for micronutrient needs assessment and nutrition programming to boost ASF production and consumption among mobile African pastoralists.

Key words: hunger; pastoralism; micronutrients; Africa; nomads
Introduction

Many traditionally mobile populations continue to depend on production of various livestock species such as cattle, sheep, goats, camels, yak, horses and donkeys to provide animal source foods (ASF: meat, blood and animal fat, milk and milk products) that can be sold for income or directly consumed (Randolph et al. 2007). Such livestock-dependent “pastoralists” use mobility to manage uncertainty and risk (Schelling et al. 2005a), and generally move with their herds in response to animal needs, seasonal changes in habitat, socio-political arrangements for land use and access, and violent conflict. Mobile pastoralists typically inhabit areas unsuitable for agriculture and industry, such as high altitude, high latitude (Zinsstag, et al. 2006) and/or arid and semi-arid ecosystems, which are often far from major centres of high population density and infrastructural investment (Munch et al. 2007; Weibel et al. 2008). Migratory movements represent a complex response to a mix of abiotic, biotic and human social factors, including conflict (Dyson-Hudson and Smith 1978, Gray et al. 2003).

Mobility often improves human health as part of a suite of pastoralist adaptations that are continually responding to new opportunities and challenges (Ekpo et al. 2008; Fratkin et al. 1999; Fratkin et al. 2004; McCabe 1994; Nathan et al. 1996; Schelling et al. 2005b), but it also imposes constraints on the determinants of human health and well-being (Hampshire 2002; Mocellin and Foggin 2008; Pike et al. 2010), such as challenges to effective public health surveillance and intervention (Bonfoh et al. 2007; Tanner and Zinsstag 2009; Weibel et al. 2008; Wyss, et al. 2003; Zinsstag et al. 2009). Concerns raised about human health and well-being among mobile pastoralists include an apparently high prevalence of micronutrient malnutrition, or “hidden hunger” as it is termed in advocacy and policy development, and the issue of how to better measure and address it. However, the specific ways in which pastoralist mobility improves or undermines micronutrient consumption remain poorly investigated. This brief paper represents an attempt to map out some of the knowledge gaps that must be closed if we are to better understand the relationship between hidden hunger and mobility among pastoralists.

Hidden hunger

Anthropologists, nutritional scientists and development specialists currently distinguish the “hidden hunger” of micronutrient malnutrition from the hunger that comes from a lack of food. It has been defined as “a chronic lack of vitamins and minerals that often has no visible warning signs, so that people
who suffer from it may not even be aware of it” (The Micronutrient Initiative 2010). Nevertheless, such micronutrient deficiency or hidden hunger can lead to early death or significant deficits across the lifespan that may include mental impairment, physical illness and poor productivity. Global estimates are that one in three people suffer from hidden hunger and that women and children from lower income groups in developing countries are the most affected. Recently, health economists have begun to quantify the large impact of hidden hunger using econometrics.

Animal Source Foods

Animal source foods (ASF) contain high levels of bioavailable micronutrients such as iron, zinc, iodine, and vitamins A and B12. These key micronutrients play an important physiological role in fetal, infant and child growth, cognitive development and health (Neumann et al. 2002). ASF consumption in moderate amounts has been shown to promote healthy physical and cognitive development and child survival (Allen 2003, Murphy and Allen 2003). For people of all ages, ASF have the potential to improve diet quality through increased availability of high-quality protein, energy, minerals, trace metals, and vitamins necessary to meet requirements (Allen 2003). Various lines of evidence suggest that meat-eating has been important throughout human evolution (Larsen 2003, Milton 2003), and that non-human milk has been consumed since the earliest domestication of bovines and ovicaprids (Dudd and Evershed 1998). A consensus has recently emerged among community nutritionists that ASF, consumed in moderate amounts and especially by women, infants and young children, may be essential for optimal health.

Within the last decade policy makers have suggested that ASF are “an effective, efficient and sustainable means to remove the major nutrient deficiencies experienced by populations today” (Demment et al. 1998; Brown 2003). Pastoral populations have also become a focus of attention as key producers of ASF at the household, local, national and global level (Demment et al. 2003, Randolph et al. 2007). However, there has been remarkably little work done on the extent to which members of mobile pastoral populations are able to meet their own micronutrient requirements and avoid hidden hunger by consumption of ASF. A conceptual consideration in the absence of data might lead to opposite predictions. On one hand, one might assume pastoralist producers have easy access to adequate intakes of micronutrients from ASF. On the other hand, micronutrient deficiencies are likely to be prevalent in most pastoral populations because they are rural, poor, under-educated, nomadic and dependent on organisation of production at the level of the household for local markets.
Progress on understanding the implications of mobility for micronutrient status is important for nutrition programming among mobile pastoralist populations.

Potential links with mobility

Both the diet of pastoralists, and also any longitudinal nutrition research and data analysis, are complicated by unstable residence. This mobility may have seasonal dimensions. However, it is also linked to transhumance on a weekly or daily basis to fulfill human and livestock needs, residence changes linked to the social dynamics of the life course of individuals and the developmental cycle of households, to conflict, and finally to failures in the food system or the environmental services on which livelihoods depend, for example through climate change.

This point is exemplified by a study conducted in a small community of east African pastoralists, the semi-nomadic Datoga who live in the Eyasi Basin of western Tanzania (Sellen 1995). Table 1 summarizes the migratory movements recorded by repeated census at different times during a 3 1/2 year period of data collection between May, 1989 and December, 1992. In total, 124 households (containing the families of 135 men) were visited during this time, of which 34 (25%) migrated into the area after the study began. Fifty-one percent of the households recruited into the study at some point migrated out of the area before the study ended and were lost to follow-up. An additional 14 households (11.3%) were observed to move out, and then return to the study site at a later date. The study area as a whole experienced a net loss of households in every year, averaging 6 per year (approx. 7%), and over the entire period household emigration was 50% more frequent than immigration. Datoga informants state that the population density in the Eyasi area was increased between the 1960s and the early 1990’s by an influx of Datoga families avoiding interethnic conflicts to the south (such as the violent Sukuma wars of the mid 1980s) or a fear of cattle raiding to the north and west, other Datoga displaced from their original pastures by large-scale agricultural development projects (such as the Hanang wheat project), and also by a reported the influx of shifting cultivators from other parts of Tanzania. The environment appears to have become degraded and would not normally be viewed as an ideal site for settlement in the absence of these other pressures.
Table 1. Stability of residence within four seasonal settlement areas used by a community of Datoga pastoralists in Tanzania.

<table>
<thead>
<tr>
<th>Settlement area or community</th>
<th>Dates of census and number of households (and families) present during each census</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>35 (38)</td>
</tr>
<tr>
<td># remaining</td>
<td></td>
</tr>
<tr>
<td># leaving</td>
<td>-</td>
</tr>
<tr>
<td># settling</td>
<td>-</td>
</tr>
<tr>
<td># returning</td>
<td>-</td>
</tr>
<tr>
<td># fissioned/added</td>
<td>-</td>
</tr>
<tr>
<td># fused</td>
<td>-</td>
</tr>
<tr>
<td># head died</td>
<td>-</td>
</tr>
<tr>
<td>NET CHANGE</td>
<td>-</td>
</tr>
</tbody>
</table>

| B                           | 27 (30)       | 21 (22)       | 14 (15)       | 26 (30)       | 26 (30)   |
| # remaining                 |              |              |              |              |            |
| # leaving                   | -            | 18 (20)       | 14 (14)       | 9 (10)        | 23 (27)   |
| # settling                  | -            | -9 (-10)      | -6 (-8)       | -5 (-5)*      | -3 (-3)   |
| # returning                 | -            | +2 (+2)       | 0 (0)         | +8 (+9)       | +3 (+4)   |
| # fissioned/added           | -            | -            | 0 (0)         | +9 (+9)       | 0 (0)     |
| # fused                     | -            | +1 (0)        | 0 (+1)        | 0 (+3)        | 0 (0)     |
| # head died                 | -            | 0 (0)         | 0 (0)         | 0 (0)         | 0 (+1)    |
| NET CHANGE                  | -            | -6 (-8)       | -6 (-7)       | +12 (+16)     | 0 (0)     |

| D**                         | ?            | ?            | ?            | [7 (7)]       | [7 (7)]   |

| D                           | 28 (30)       | not visited  | 29 (40)       | 15 (23)       | 15 (23)   |
| # remaining                 |              |              |              |              |            |
| # leaving                   | -            | .            | 19 (20)       | 12 (15)       | 14 (22)   |
| # settling                  | -            | .            | -8 (-9)       | -15 (-22)     | -1 (-1)   |
| # returning                 | -            | .            | +10 (+11)     | +3 (+3)       | 0 (0)     |
| # fissioned/add             | -            | .            | 0 (0)         | +1 (+1)       | .          |
| # fused                     | -            | .            | 0 (+9)        | +1 (+3)       | 0 (0)     |
| # head died                 | -            | .            | 0 (0)         | -1 (-1)       | 0 (0)     |
| NET CHANGE                  | -            | .            | +1 (+10)      | -14 (-17)     | 0 (-1)    |

| TOTAL                       | 90 (98)       | .            | 71 (84)       | 70 (84)       | .          |

| Cumulative emigration       | -            | -17 (-19)    | -35 (-40)     | -48 (-60)     | -51 (-63) |
| Cumulative immigration      | +7 (+7)      | +17 (+18)    | +31 (+33)     | +34 (+37)     | .          |

*includes 2 households that left and then returned during this time

**Not included in totals since added to the study area at a late stage
Public health nutrition situation among mobile African pastoralists

Anthropologists have identified some key features of African pastoral diets, using fairly consistent definitions of pastoralism (Galvin 1992, Little 2002, Sellen 1996, Galvin et al. 1994, Sadler et al. 2010). In the last 15 years, there have been a number of excellent reviews of the limited information on the public health nutrition situation among mobile pastoralists in the “grey literature” on pastoralist development (e.g. Blench 2001; see also sources listed at: http://www.eldis.org/go/topics/resource-guides/agriculture/pastoralism; http://www.ids.ac.uk/go/livestock-research). Although the diversity of contemporary pastoral systems limits the value of general conclusions, a short review of the nutrition situation in pastoralist populations reveals some key gaps in information.

Anthropometric indicators

There are virtually no studies of direct links between mobility and diet among pastoralists, so we must instead look at anthropometric indicators. Figure 1 compares body sizes for men and women in seven populations for whom we have good estimates of the mean and distribution of heights and weights. There are almost no good data available in English from beyond Africa. (A recent study among the Evenki of Siberia shows they are short compared to westerners and African pastoralists, but that energy balance is more adequate [Leonard et al. 2002, Leonard et al. 1994]). While much has been made of the tallness of pastoralists, particularly Africans, the available data suggest that their stature falls within the range of well-fed westerners or is less. What is more striking is that men and women in all African pastoralist populations for which there are data fall on the line relating body weight to stature that indicates a body mass index of 18.5. This is in fact the cutoff value below which we currently define moderate chronic energy deficiency (Shetty and James 1994).

Taken together, these data indicate that the average surviving adult in many of these mobile populations has a marginally adequate energy flux, but that this cannot be directly attributable to mobile diets. The distribution around this low mean suggest many individuals are leaner than is healthy. For example, in a study conducted among Eyasi Datoga women in Tanzania, almost half were indicated to be chronically energy deficient (BMI <18.5) and were estimated to have very low fat stores (Sellen 2000a). Other data reveal a complex pattern of vulnerability by age and sex among children from mobile pastoralist populations; children’s anthropometric status appears to be associated with the age- and gender-specific pattern of work activities typical of many pastoral populations.
Figure 1. Anthropometric indicators of nutritional status of adults living in selected, ethnographically studied pastoralist communities and a representative sample from an industrial society (African Americans, 1990).


For example, among the Eyasi Datoga, the prevalence of low anthropometric status of children also typically ranges between 25-50% (Sellen 2000a), a range typical for African pastoralists (Sellen 1996). However these aggregate data mask gendered disparities in the association of indicators of under-nutrition with child age. Results of a gender analysis suggest that younger girls (who must help with arduous household chores such as water-bearing) and older boys (who spend long days away from homes and meals while herding) are vulnerable. More than 40% of girls aged between 9 and 12 presented with stunting and/or wasting, a greater rate than at any other age for girls and more than twice the rate among boys of similar age (Sellen 2000b). A working hypothesis is that this may be attributable to an increased caloric deficit in relation to requirement associated
with the physical workload of water and firewood collection, which can increase with mobility linked to pasture selection. In addition, the highest rates of stunting and wasting for any group of children, exceeding 70% and 50% respectively, are observed among boys aged between 13 and 16 years (Sellen 2000b). A working hypothesis is that this may be attributable to an increased caloric deficit in relation to requirement associated with the physical workload of herding livestock each day, which requires walking and running large distances and also missing meals prepared at the homestead. If this is true, it may mediate a relationship between mobile life ways and delayed pubertal development and achievement of adult stature among males in African pastoralist societies (Sellen 1999).

In fact, very few studies actually look at diet or nutritional status in relation to age, gender, and wealth among pastoral populations, despite a valuable and growing number of studies of gendered livelihoods (Brockington 2001, Brunson et al. 2009, Dancause et al. 2010). Indications are that the quality of the diet varies across the lifespan of individuals (Gray et al. 2008), and on the basis of observations in non-pastoral populations it is reasonable to assume that women, young children and the elderly are particularly vulnerable to under-nutrition.

**Indicators of micronutrient deficiencies**

Studies of micronutrient consumption are rare, despite the knowledge that carbohydrate staple foods such as maize are low in certain nutrients (particularly iron and vitamins A and C). Studies of dietary diversity are usually conducted with tools developed for use in agrarian populations and focus on capturing information on fruit and vegetables as primary sources of micronutrients in the diet. Such tools may not accurately capture the full diversity of the diet, particularly any consumption of wild animal and vegetable foods and also blood from larger livestock (Teklehaymanot and Giday 2010). Only a handful of studies provide estimates of the prevalence of specific micronutrient deficiencies based on biochemical assay or clinical symptoms, and micronutrients such as zinc for which there is no easy assay are largely ignored in the literature. Cow’s milk is usually found to be the main source of vitamin A, vitamin C and riboflavin and a few studies have examined the retention of micronutrients in milk and meat products prepared and stored in rural settings (Amr 1990, Holter 1988). Although several studies, principally in sub-Saharan Africa, suggest protein intakes do not limit growth and functional capacity, we are not yet in a position to say this about micronutrients. Prevalence of anaemia and deficiencies of iron, zinc, vitamin A, riboflavin and other micronutrients are unknown for most pastoralist populations. We also lack data on birth weights and gestation length with which to assess fetal nutrition (Pike 2000).
Production and consumption of ASF

It is often assumed that increasing livestock production results in increased availability and consumption of ASF at household, regional and national levels of analysis. The data on this relationship are equivocal, however. Significant gaps remain in our understanding of: the adequacy of pastoralist diets, the extent to which ASF improve the nutrition situation among pastoral populations and their partners in trade and exchange, the extent to which pastoral households consume the products of their labor or use cash incomes generated by livestock sales to purchase higher quality diets.

There is wide variation in ASF consumption among pastoralist populations worldwide. For example, Casimir (1991) summarized data from a survey of 56 pastoral populations. This comparison suggested that east and southern African pastoralists tend to consume fewer ASF as a proportion of total diet than pastoralists living in Eurasia at generally higher latitudes and altitudes, but also that ASF consumption exceeds 50% of total diet by caloric estimates. There is also variation within regions. For example, for a small sample of just nine African pastoralist populations for whom sufficient data exist it has been estimated that the annual per capita dietary contribution of ASFs varies between 20% and 80% (Galvin et al. 1994). This variation is associated with mobility as a response to seasonality as well as climate change, and reflects the diversity of pastoral systems owing to a complex mix of factors, including climate, ecology, history and political economy.

Production and consumption of meat

Among east and southern African pastoralists, meat is normally eaten during social celebrations such as marriages, funerals, and the births of children; when an animal has died, is dying or deemed incurably sick; or during severe food shortages as a disaster food. This is clearly linked to mobility, since livestock represent a sustainable, renewable and moveable source of milk for continued consumption and sale of meat for cash that can be used to purchase a higher number of calories from grains. Small stock such as goats and sheep are most usually consumed during social events, both because of their faster reproductive cycle and lesser unit value, but also because larger animals would produce a glut of meat that could not be easily transported or stored before spoilage. Indeed, large animals such as cattle and camels are usually only consumed at a feast to which a very large social network is invited and attend, such as funerals of very widely known and respected persons. Meat has high social and economic value and when it is consumed it is more likely to be shared beyond the family or household unit. This is important because such social events where meat is
shared for consumption afford the poorest households that may not have the resources to consume their own small stock opportunities to consume a fat- and micronutrient dense food source that is normally unavailable.

In sum, the data are few but indicate that among mobile African pastoralists meat consumption is infrequent even in wealthier households, and the total contribution to the diet remains modest in caloric terms (Sellen 2003). Nevertheless, the importance of meat as a source of micronutrients is potentially high and more studies of meat consumption by age and gender, and of the contribution of meat to micronutrient requirements, are needed.

Production and consumption of milk

Although few long-term observational studies of animal milk consumption are available, it is a core component of pastoralist diets world-wide and milk is the preferred ASF in virtually all pastoral populations (Sadler et al. 2010). Milk is a nutrient-rich food that is thought to contribute a high proportion of nutrients required by pastoralist people of all ages, but particularly children and women (Hetzel et al. 2004; Sadler et al. 2009; Schelling and Zinsstag 2002). Animal milk can be a major source of energy, vitamin A, fats, and proteins, but pastoralist areas tend to have high rates of indicators of deficiencies in these nutrients, suggesting challenges in supply to meet adequate needs (Wolde-Gebriel et al. 1991). It is widely processed into a bewildering array of dairy products whose storage potential varies greatly (Blench 2001). The relative amounts of fresh versus stored dairy products consumed may be linked to mobility and the use of pack animals (i.e. more mobility and/or fewer pack animals, less storage) but this hypothesis remains untested.

Milk is also widely used to feed infants and young children (Gray 1998, Gray et al. 2008, Gray 1996, Sellen 1998, Sellen 2001), although it is not clear that this results in earlier weaning of children in mobile societies versus others (Sellen et al. 2000). A recent participatory study among pastoralists in the Somali region of Ethiopia found that average consumption of animal milk by children aged 1-2 years was more than sufficient to satisfy estimated energy and protein needs, and that participants perceived direct and important associations between milk intake and weight gain or loss among young children.

Effects of seasonality
The quality of milk produced and the quantity of milk consumed vary seasonally in all mobile pastoralists studied, as do the patterns of festivals and animal deaths that might influence meat supply. Since milk is the largest contributor to the high ASF consumption of mobile African pastoralists, the seasonal fluctuation in milk supply and consumption may be linked to mobility. On the one hand, mobility should facilitate the “smoothing” of milk production across seasons as herds are moved to areas with optimal forage, including areas “set-aside” for dry season grazing through customary land-use practices. On the other hand, seasonality and rainfall stochasticity in arid and semi-arid lands (ASAL) may overwhelm the adaptive limits of mobile African pastoralist food systems.

**Figure 2.** Estimated individual energy intakes for selected African pastoralists.


The indications are that, although chronic energy deficiency and seasonal shortfalls in micronutrient intakes are common, mobile African pastoralists are highly effective at coping with seasonal food shortage. For example, among the
Eyasi Datoga, extended dry season conditions are associated with only marginal drops in adiposity of women and children even though many individuals are in poor physical nutritional status (Sellen 2000b). A comparison across African pastoralist populations suggests adults lose only about 5% of body weight and the prevalence of underweight among children, though already high, does not increase significantly (Sellen 1996). It is important to note that seasonal weight losses are much greater among agricultural populations in Africa and that moderate weight fluctuations are not a known risk factor for poor health among well-nourished populations.

Few studies have examined individual differences in total energy intakes, and all were conducted in the 1980s on African pastoralists (Bénéfice, et al. 1984, Bernus 1988, Galvin 1992, Little, Galvin and Leslie 1988, Nestel 1985, Nestel 1986). It is apparent that population estimates differ quite markedly, and the pattern of seasonal differences in intake depends on the specific ecology (Figure 2). Even when reasonably good individual consumption data are available it is difficult to estimate the adequacy of energy intake. Such data exist for only two populations, both from Africa (Bénéfice, Chevassus-Agnes and Barral 1984, Bernus 1988, Galvin 1992, Little, Galvin and Leslie 1988). Taken together, they suggest that energy intakes do not meet requirements for good health and adequate function, even when averaged across the year (Figure 3).

The effects of seasonal flux in food intake and energy expenditure can be powerful, however. Among the Datoga, the impact of dry season conditions on mothers is exacerbated during lactation (Sellen 2000), highlighting the importance of nutrition at key points in the life cycle and across generations (Little et al. 1992). Indirect data from all other populations studied show lower dietary contributions from milk in some seasons versus others— the “drier” seasons in the case of tropical Africa. A recent study among mobile pastoralists in two areas of Somali Region, Ethiopia, found that on average the amount of animal milk fed to children between 1 and 2 years of age was sufficient to meet requirements for both energy and protein (Sadler and Catley 2010).

Nevertheless, seasonality exerted a strong effect on milk supply and intakes by young children varied by more than three-fold across seasons even in a “normal” year, reducing intakes by 70% among 1 year olds. In drought years, dry season intakes diminished to zero for many young children. Qualitative investigations revealed that adult participants perceived a “direct and important association
Figure 3. Adequacy of caloric intakes for selected African pastoralists.


between reduced [animal] milk intake and weight loss among their young children. Several studies have suggested that household labour stress, women’s work patterns, and kin cooperation strongly affect infant feeding practices among mobile Africa pastoralists (Gray 1998, Sellen 2001), and that all of these can be influenced by season (Sellen 2001). A few reports suggest pastoral diets are seasonally deficient in iron and generally deficient in calcium, vitamin A and ascorbic acid. Nevertheless, mobility appears to be protective against large seasonal variation in nutrient intakes, including micronutrients.

Settlement

In contrast to the rather weak effects of seasonality, several studies on settlement have suggested that there are protective effects of mobility on pastoralist diets. Settlement is associated with a decrease in dietary diversity, an increase in seasonal differences in food intake and a decrease in indicators of both adult and children’s nutritional status (Little, et al. 1993, Nathan, Fratkin and Roth 1996, Shell-Duncan and Obiero 2000). Indeed, settlement of pastoralist families has
been associated with poorer nutritional status of children than that observed among settled agrarian families (Peterson and Benjaminsen 2008).

Settlement involves complex changes in a number of factors influencing nutritional status, and therefore it is difficult to tease apart in analysis the independent influence on diet alone. For example, disease types, prevalence and seasonal distribution will change but few studies are able to separate out the independent and synergistic effects of parasitic and other infectious disease on nutritional status (Alemu and Lindtjorn 1995, Lindtjorn et al. 1992). Most families that settle are “drop-outs” from mobile pastoralist ways of life; they may have been forced to settle through catastrophic or chronic livestock losses and often become dependent on food assistance. Nevertheless, within mobile pastoralist groups a range of wealth measured in terms of holdings is usually observed. It is logical to hypothesise that relative poverty is a strong risk factor for micronutrient deficiency, but the data are sparse and indirect. Several studies have indicated that food intakes and physical nutritional status rarely increase with household wealth in livestock-keeping communities (Fratkin et al. 1999, Grandin 1988, Homewood and Rodgers 1991, McCabe et al. 1989, Nathan et al. 1996, Shell-Duncan and Obiero 2000). Most studies show little or no effect, possibly because households relatively poorer in livestock diversify their livelihoods (Brockington 2001) or because wealthier households share food widely beyond the household or have not always been wealthy (Sellen 2003). Data from a study among the Datoga pastoralist of Tanzania revealed that, although 95% of households studied fell below poverty cut-offs, a 20-fold variation in wealth remained across households and the proportion of stunted and wasted children was lower in wealthier households (Figure 4).

Practical challenges of mobility

It has long been recognized that nomadism presents significant challenges to both research design and provision of services (Swift et al. 1990). The mobility of many African pastoralists presents a set of specific practical challenges of assessment of hidden hunger and micronutrient needs that must be overcome in order to design programmes with the potential to meet the micronutrient needs of vulnerable groups.
Figure 4: Prevalence of low anthropometric scores among Datoga children from families stratified by wealth in livestock.

Adapted from Sellen 2003.

The first challenge is a continuing severe paucity of detailed dietary and micronutrient status data despite many agricultural, livestock and other development projects that engage mobile pastoralists. This is connected in part to a historical weakness in linking agricultural and livelihood assessments and interventions with nutrition outcomes and interventions. Few studies have estimated nutritional status among pastoral peoples. Reports on dietary intake probably exist for no more than 50 communities. Although some extremely detailed studies exist, notably among groups of Turkana, Borana and Maasai, investigators have conducted detailed studies of diet in only about 20 of the world’s pastoral populations. The entire literature is based on dietary, anthropometric, clinical or biochemical assessment of no more than about 5,000 individuals. Non-nutritionists conducted many studies more than 20 years ago on small samples. A majority of reports from Africa have been collected in famine situations.

Second, community-based studies almost always adopt a mixed cross-sectional rather than a prospective cohort design as a logistic response to high pastoral mobility. Sampling bias hampers interpretation of most cross-sectional surveys.
Sex- and age-biased recruitment can be difficult to avoid because of the
gendered and age-structured organisation and spatial distribution of pastoralist
subsistence work activities. Labile family, residential and community organisation
and both daily and seasonal activities present significant logistical challenges to
following up on all individuals. Small sample sizes (< 30 per age/sex group) are
usually achieved owing to a combination of the limitations of low population
density and field logistics (Galvin and Little 1999).

Third, there is an acute paucity of directly comparable data. It is difficult to
compare results between the few detailed studies that exist because methods for
estimating intakes and adequacy of intakes vary enormously. Studies also deploy
a wide variety of analytic strategies to deal with the challenge of averaging across
seasons. Most studies measure only anthropometric status and tell us nothing
about variation in individual micronutrient nutrient intakes. Energy intakes are
almost always reported using grossly aggregated estimates. Methods used to
calculate proportional contributions of dietary components (such as ASF or
plants, fats, proteins and carbohydrates) are often imprecise or not clearly
specified. Individual food and nutrient intakes are very difficult to measure
because of the common practice of eating from a common pot, or usually a set
of gendered and age-stratified shared pots. There is a strong tendency of
individuals in pastoral societies to consume food in several different households.

Fourth, age and sex categories are often lumped in analysis. This limits the ability
to identify vulnerable groups from a life course and gender perspective and can
result in imprecise estimates for individuals. Almost all dietary surveys of
pastoral populations are unable to discriminate individuals with consistently low
intakes from those with intermittently low intakes and those with marginally
adequate or adequate intakes. Age determination without birth records makes
assessment of anthropometric status challenging. Wide disparities exist in the
existing published literature in the population references and cutoffs used in
dietary and anthropometric assessment (Sellen 1996). Methods of data collection
for assessment of diet quality and analytic strategies for dealing with temporal
variability are also widely discrepant. Indicators of poor growth or nutritional
status cannot be directly attributed to poor diet because of confounding and
effect modification by illness, levels of work activity and intergenerational
effects. Comparison among more or less wealthy or economically secure
individuals or groups within communities is often hampered by economic
“drop-outs”, people who switch livelihood strategies in response to loss of
livestock (Sellen 2003).
Summary and conclusions

It is not possible to assess the extent to which mobility protects pastoralists against hidden hunger, but preliminary indications are that it does. A selective review of some relevant published data suggests that a number of nutrition concerns are common to pastoral populations, micronutrient deficiencies may be prevalent in many of them, and the consumption of ASF may not be high and diminishes upon settlement and among impoverished sub-groups. Indicators of household food insecurity and poor individual growth or nutritional status are prevalent in many mobile pastoralist populations but cannot be directly attributed to micronutrient deficiency because of confounding and effect modification by illness, levels of work activity and intergenerational influences. Indeed, relatively little is known about the local, context-specific social and economic processes that likely condition ASF consumption by individuals in mobile households. We are woefully ignorant of micronutrient intakes and micronutrient status of individuals. Future studies should aim to avoid the problems of small sample size, sampling bias in cross-sectional survey, and augment measures of anthropometric status with estimates of individual intakes of micronutrient and ASF.

Despite a paucity of directly comparable data, however, a brief review of evidence for ASF consumption in pastoral populations and of the significant challenges for micronutrient needs assessment and nutrition programming allows for some general conclusions. Given what nutritionists and economists have learned about the importance of ASF in the last 15 years, renewed investigation of whether low consumption has negative impacts on health and well-being in pastoralist populations is warranted. Consumption of ASF is highly variable among African producers. Most pastoral diets are low in energy, as evidenced by high prevalence of chronic energy deficiency in adults and underweight in children, but adequate in protein. Nutrition is only weakly associated with household wealth, and more strongly associated with allocation of food and work within families. Relatively poorer households, women and young children can be assumed to be particularly vulnerable to under-nutrition, but studies suggest that women and children are efficiently buffered from seasonal deficiencies and that older children and boys can be vulnerable to under-nutrition because of the nature of their work. We are too ignorant of individual micronutrient intakes and micronutrient status in pastoral populations. The nomadism of many pastoralist populations presents special challenges for the design of studies to sample, assess or target individuals for nutrition programming, and for evaluation of the short- and long-term effects of nutrition interventions among pastoralists.
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Spatial Mobility and Health in Post-Socialist Mongolia

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Abstract

This paper examines the impact of the post-socialist economic transition on the pastoral population of Mongolia. It summarizes findings from several studies of access to health care, maternal health, and child health undertaken between 2001 and 2007. Together, these studies indicate that recent macroeconomic reforms have reshaped the patterns of movement in the rural countryside, and have led to increasing levels of socioeconomic inequality, insecurity of land tenure, and conflict over spatially desirable resources. These changes are in turn theorized to affect health in two interrelated ways: through determining the spatial and social proximity to health services, and by affecting a household’s level of social and economic well being.

Key words: pastoralism; mobility and health; post-socialist development; Mongolia; social determinants of health
Introduction

The relationship of mobility to health in pastoral populations is complex. Pastoralists are more likely to live in dispersed settlements in remote and often economically marginal geographic areas. This poses a challenge to the distribution and accessibility of health care services. The fact of mobility itself may also interfere with access, especially if care is needed for chronic or emergent conditions, or where effective follow-up treatment is required (Hampshire, 2002). Conversely, mobility of people and animals lay at the very core of the pastoral adaptive strategy. The movement of herds to maximize access to forage in diverse habitats and to avoid drought and severe winter weather is essential to the health of the animals. The health of animals has a direct bearing on the health and well-being of the people who tend them (Fernandez-Gimenez, 1998; Fernandez-Gimenez & Batbuyan, 2004; Griffin, 2001; Humphrey & Sneath, 1999; Janes & Chuluundorj, 2004; Little, 2002; Mearns, 1993, 1996, 2004b).

This paper explores the many dimensions of this complex relationship in the context of the patterns of pastoralism currently practiced in post-socialist Mongolia. The essay has two parts. The first addresses the contemporary history of Mongolian pastoralism, tracing the ways in which state-level institutions – feudal, socialist, and capitalist – have reconfigured the social spaces through which people and their animals move in rural Mongolia. The second assesses the degree to which these reconfigured spaces and patterns of mobility affect access to health care and the implications this has for the health and economic security of pastoral households.

Data are drawn from several sources: an ethnographic survey of 106 urban and rural households in central and west-central Mongolia that focused on household economics and access to health care (Janes 2004; Janes et al. 2005); a countrywide study of pastoral households’ adaptation to climate change in the context of post-socialist development, conducted between 2005 and 2007 (Janes 2010); and an analysis of maternal mortality in Mongolia (Janes & Chuluundorj 2004).
Mongolian Pastoralism through the 20th Century

The Mongolian steppe is comprised of the largest remaining natural grasslands in the world. About 400,000 Mongolians are livestock herders, and some estimate that as much of half of the country’s population depends directly or indirectly on the pastoral production for its livelihood (Fernandez-Gimenez 1999b; Griffin, 2001; Mearns 2004a; Mearns 1996). Herders subsist on the products provided by their animals: meat and dairy products for food; wool, hair, and hides; dung for fuel; and yaks, camels and horses for transport. In addition, they sell or barter animal products, especially skin, wool, hides, and cashmere for additional foodstuffs, clothing, tools, and vehicles.
Periodic drought, extreme winter weather, and a need for access to markets demand that successful herders engage in substantial spatial mobility. For most of the past several centuries Mongolian herders have practiced a truly nomadic form of livestock husbandry. Successful pastoralists tend to migrate every season to maximize the use of natural resources available in different ecological zones. The low population density, low livestock-to-pasture ratio, and largely unrestricted access to resource commons have until recently made high mobility possible. This high mobility is considered by grassland ecologists to be crucial to productivity and the prevention of serious land degradation.

Religious or state institutions regulated the seasonal movement of herders in Mongolia, from feudal times through the collapse of socialism in 1990. Prior to 1921, Mongolia was divided into approximately 100 territories, or “banners” (khoshuun) controlled by the Mongolian aristocracy or high-ranking Buddhist lamas. Herders living within a territory were subject to the authority of the ruling entity in all economic matters. Those herding animals belonging to the elite had access to the best pasture and water resources. Poorer herders were forced into more marginal regions. In both cases the actions and decisions of the elite affected herding activities at the level of the household. By all reports, during the feudal period seasonal movements were often very long, ranging as much as 200km from north-to-south over an annual cycle (Humphrey & Sneath, 1999). Historians have observed that during the feudal period the Mongolian aristocracy was deep in debt to their Manchu overlords, and they were highly motivated to produce surplus products from their territories (Fernandez-Gimenez, 1999a; Humphrey & Sneath, 1999). There was thus substantial investment of time, effort, and labor into managing khoshuun herds to maintain maximum production, and control of the seasonal movement of herding households was in many cases heavy-handed.

Below the level of the khoshuun, day-to-day herding activities have been, and largely continue to be, managed by a group of 2-12 herding households, or khotail. The khotail is the basic independent social and economic unit of livestock production in Mongolia (Mearns, 1996). It consists typically of a group of related households, though kinship is not a strict prerequisite, which assist each other in day-to-day activities. Member households commonly pool both their herds and labor, thus realizing some efficiency in managing grazing and other livestock husbandry activities. The khotail also provides important social resources – support and relief for sick members in a household, sociality, and some ritual activities (Szynkiewicz, 1982). Membership in khotail is not fixed, and can expand and contract based on seasonal labor demands and other economic contingencies, but there is usually a core group of households who reside together for much of the year (Mearns, 1996).
There are few commonly recognized and permanent social groups that mediate between state structures and the khot ail. Many herders recognize some relationships and theoretical obligations and ties of reciprocity with others who share the same geographic place—for example, those who share a water source, valley, or stretch of grassland. These relationships may be activated in case of need—a winter disaster, searching for lost animals, and forth. However, as Mearns (1996) points out, both today as in the past, Mongolian pastoral institutions, “are highly diffuse or immanent, and have no existence independent of the collective activities that constitute them, let alone any formal organizational structure” (p. 314). Formal state institutions have always played an important role in directing herding activities, assigning land tenure, shaping patterns of spatial mobility, and settling disputes among herders over access to resource commons (Fernandez-Gimenez, 1999a).

Subsequent to the socialist revolution of 1921 the state abolished feudal practices and began a series of efforts to control and manage pastoral activities. Collectivisation was attempted prior to the Second World War, but was largely unsuccessful until the mid-to-late 1950s. By 1960, most herders had been organized into herding collectives (negdel), and tended collective-owned animals in return for salary, health, education, and other benefits. The large banners, or khosbuun, were divided into just under 300 soums, or what are now more commonly referred to as counties. Soums were further divided into 2-6 smaller population units called bhag. At the soum and bhag levels administrators assigned specific herding tasks and allocated pasture and winter campsites, though they largely respected pre-existing customary patterns of use (Fernandez-Gimenez, 1999b, 1999a). Although the basic seasonal patterns of movement were preserved under the collectives, the overall distances of seasonal migrations were sharply reduced; unless weather conditions demanded, herders were rarely permitted to leave the boundaries of the collective. The somewhat greater risks entailed by reduced seasonal mobility were buffered to some extent by the resources provided by the collective and provincial administrators. These administrators were oriented to the Soviet-socialist worldview that traditional pastoralism unscientific and inefficient. They sought to modernize herding as part of Mongolia’s goal of becoming a modern, agro-industrial state (Fernandez-Gimenez, 1999a). Major changes to the pastoral economy included: specialized herding of animal species by households; state-sponsored construction of winter shelters and protection of pasture for emergency use; negdel control of the rapid herd movements (traditionally known as otor), which in some cases involved forced migration and subsequent conflict between herders and collective leadership; development of vast numbers of deep bore and mechanized wells to adequate and well-distributed surface water for livestock; provision of veterinary services; provision of mechanized
transportation for seasonal moves; marking of land boundaries, control of access to land by political leaders; formalization of traditional knowledge of herding as part of a larger effort to professionalize herding and subject it to scientific research; and sedentarization of much of the rural population (Fernandez-Gimenez, 1999a). With regard to control of movement, many observers have noted that the building of town centers in each collective, provision of centralized services, and state management of herd mobility were all clearly part of a larger state strategy to erase nomadism and, befitting a “modern” socialist nation, replace it with a settled, intensive form of livestock production (Fernandez-Gimenez, 1999a; Fernandez-Gimenez & Batbuyan, 2004; Humphrey & Sneath, 1999; Mearns, 2004b, 2004a).

The processes of collectivization did not only transform social and spatial relationships in rural areas. Especially from the perspective of health and food security, collectivization transformed the nature, intensity, and human consequences of ecological risk. Strict regulation of access to emergency pasture, good quality veterinary services, maintenance of emergency hay and fodder stocks, provision of reliable water even in remote areas, and minimal livelihood guarantees all served to minimize vulnerability to environmental and ecological shocks, in particular the twin threats of drought and severe winter weather (Baas, Batjargal, & Swift, 2001; Griffin, 2001; Rossabi 2005). The collectives provided high quality medical services through small inpatient clinics and specialized maternal care facilities (maternity waiting homes) in the county centers. These centers also supported community health workers, (bhag emchis), who worked at the bhag level (Janes & Chuluundorj, 2004). All children had access to primary education in the soums. Those who succeeded academically had access to secondary and post-secondary education in provincial centers and the major universities in Ulaanbaatar (Rossabi 2005).

The Post-Socialist Transition

In 1990 the Mongolian government initiated sweeping political and economic reforms. Mongolia accepted a transition strategy based on the then current notion that macroeconomic “shock therapy” was the only effective means to transform centrally-planned economies into functioning market economies. This strategy included price liberalization; removal of restrictions on international trade and foreign investment; privatization of state-owned enterprises, initially by a free distribution of vouchers to the entire population and later through auction to domestic and foreign buyers; and a marked reduction in the size of government (Griffin et al. 2001).
The result was widespread social chaos and economic collapse (UNDP 2000; Griffin et al. 2001). Between 1989 and 1999 government expenditures declined from 50.2 per cent of GDP to 26.9 per cent, substantially outpacing the decline in GDP. This sharp decrease reflects a widespread disinvestment in public goods—social services, health care, and education, especially in rural areas (Figure 2). Today, the government’s ability to provide social services such as education and health care and to combat poverty has been seriously compromised. The retreat of the state is inscribed visibly on the landscape: soum centres are decaying into heaps of rubble, wells no longer function, and public squares and gardens, carefully tended during the socialist period, are now crumbling wastelands covered with weeds and trash.


In rural areas the collectives were dissolved, member households divided up the moveable assets (principally livestock) and households began to herd on an independent basis. Despite this new independence, declining public investments in health care, transportation, wells and protection of surface water, veterinary services, and emergency pastureland and winter shelters have made herders highly vulnerable to unpredictable weather, disease, and market conditions. One
important result has been the rapid increase in socioeconomic inequality and the creation of a rural underclass more vulnerable to climate change (Janes 2010). More marginal herders are forced to rely on wage labor opportunities provided by other, wealthier herders, or they are forced to migrate into towns and cities where they join a growing population of dependent poor (Janes et al. 2005). Economically marginal herders are more likely to dependent on, and subject to exploitation by, their more wealthy neighbours, and are also at the mercy of unscrupulous traders who, knowing poor families have few alternatives for selling their hides, wool, and cashmere, will often offer substantially lower prices for these products.

This changed risk environment, experienced in a social context of increasing inequality, has transformed spatial patterns of social affiliation in two principal ways. First, household needs for cash income to purchase essential commodities and access health care and education for children create ecologically maladaptive incentives for herders to cluster close to administrative and market centres and transportation arteries. This results in greater pasture degradation, reduces access by herders to diverse habitats where they might take advantage of seasonally available resources, and leads to greater conflict among herders over more favorably located resources, especially water. The market economy has also created incentives for urban migration. An emerging adaptive strategy is for some members of households to move to provincial centers and the capital to work for wages, and provide social access to town-based resources. Often, whole households will migrate, particularly if they have several school-aged children, leaving their animals for tending through the winter by close relatives (especially parents and siblings). This is not only a particularly important strategy for ensuring access to health care and education, but links countryside and city through ties of economic reciprocity.

Secondly, herders express deep concerns and anxieties over land tenure, especially in crowded pastures near roads and towns, but more recently, in areas characterized by mining and mineral exploration. In the past, access to Mongolia’s pastoral commons was governed by customary principles: establishment of a reserve, winter pasture, along with built winter shelters; access to surface and well-water; and assistance by herders in neighbouring areas, based on rules of long-term generalized reciprocity, for herders suffering the effects of winter disaster (dzuud) or severe drought. With increasing competition over scarce resources, herders experience a number of conflicts with neighbours over rights to pasture, water, and shelter. Most households (73%) interviewed in 2005 reported conflicts over access to pasture and 83% reported conflicts over access to water (Chuluundorj 2006). It is less likely for county governors to permit herders from neighbouring counties access to their
land, even in times of disaster. Soum governors tend to recognize traditional rights (ties by kinship to land and water), and are often involved in “running off” herders from other areas. There is even talk in some areas of Mongolia for “fencing in pasture” to protect traditional, or “customary” rights (Rossabi 2005). A rapid scale-up of mining activity has placed further stress on herders: mining licensing procedures do not recognize these customary rights.

Conflict over pasture, water, and winter shelters has placed pressure on government to consider land use legislation that would regulate land tenure on Mongolia’s rural commons. While the khot ail quickly reemerged after transition as the basic residential and production unit among Mongolian herders, formal institutions to govern pasture use, which have for centuries been closely associated with state authorities, have not developed. To address this problem, in 1994 the Mongolian parliament passed a land law that authorized land possession contracts. These were highly controversial, and in many localities concerns over implementation, and misunderstanding of the law, have delayed full implementation. Nevertheless, by the end of the decade, local county governors were leasing winter shelters, which are a particularly key resource, to local herders. In some counties, prompted by international intervention, social experiments have been launched to assign water and pasture resources to small cooperative herding groups. Today, leasing most typically is restricted to winter pasture. Our research has suggested that the leasing process has favored wealthy over poor households, duplicating in some ways the patterns evident during the feudal period. Wealthy herders typically have access to the best pastures; poorer families are forced into more marginal areas. Accusations of corruption and assignment of leases on the basis of political patronage are common (Fernandez-Gimenez & Batbuyan, 2004; Rossabi 2005). Depending on the region and availability of water, resource poor households may be forced either to move farther and more often, or to reduce their mobility and crowd around the few accessible water sources, especially along major roads. Contemporary leasing practices create diverse patterns of spatial mobility which tend to be based on social networks, political ties, and socioeconomic status.

Taken together, these factors – loss of diverse habitat due to shrinking migratory territories; the interrelationship of poverty, mobility, and resource use; and the need for herders to maintain ties, either by virtue of proximity or social networks to town and provincial centers in order to access market institutions and health and social services – explains the current relationship of mobility and health in current Mongolia. Throughout the 20th century the migratory range of pastoral households has been steadily reduced, though in the collective period the monitoring and protection of resources by formal institutions managed to control resource degradation. Currently, market pressures, coupled with social
inequality, poses a serious threat to grasslands. Particularly for poor households, impaired access to adequate resources may be related to the poorer health of household members. Health and social resources are less available than they were in the past, must be paid for, and create pressures for herders to remain close to town and provincial centers, and, further, establish and maintain links with households in urban centers. The following case study, collected in 2004, exemplifies the current context of spatial mobility in contemporary Mongolia.

Case Study

Degy was born and grew up in a pastoral household. Her family herded in a region about about 400 kilometers west-northwest of the Mongolian capital of Ulaanbaatar. Degy has been married for ten years. Like Degy, her husband grew up in a herding family. They have one child, a son, eight years old at the time of the interview. Both her and her husband’s parents died in the past few years. Degy and her husband are now the heads of their small household.

About two years before the interview, Degy and her husband decided to move their family and its animals closer to a county center in order to have easier access to education and social services, and to be within a day’s travel of the provincial capital. Like many younger Mongolians who entered adulthood in the new market economy, they realised that their access to a sufficient and reliable cash income depended on their proximity to a market center with reasonably favorable terms of trade. In rural Mongolia, these centers are found in the provincial capitals or in settlements near the international borders with Russia and China. Degy and her husband were joined in their move by Degy’s sister and her family, an unmarried younger brother, and by her husband’s brother and his family. Altogether the three families – seven adults and four children -- comprise a small khot ail that pools labor, animals, and usually moves together. At the time of the interview, Degy and her husband owned approximately 15 cows, 30 yak, 30 horses, 30 cashmere goats, and 15 sheep. Their main source of cash income was the annual sale of cashmere and the weekly sale of milk, fresh and dried curd, and clotted cream during the spring and summer months. Their annual income in 2004 was expected to be about US$500, at the upper range of per capita incomes reported by the herding households interviewed in 2002 and 2004.

The group has had trouble finding the ideal locations for their seasonal camps. Partly this is due to the increase in numbers of herders and animals near the county centers. As younger herders, far removed from the territories where they were born and raised, Degy and members of her khot ail lack customary access to winter shelters and reserve winter pastures. As a consequence, they are forced to live and herd in somewhat more marginal areas: the quality of the forage around their summer camp was considered relatively good, but surface water supplies were unreliable and of poor quality. Already by early July the small stream next to their campsite was virtually dried up, and the families were debating an earlier than anticipated move
to find more secure water supplies. Still, their proximity to schools, health care, and marketing opportunities for their animal products provided advantages that considerably outweighed the benefits of the more productive pasture lands they had left behind.

In the late spring of 2003, Degy became pregnant for the second time. Like many Mongolian women, Degy delayed increasing the size of her family until she and her husband felt more economically secure (United Nations Population Fund, 1998). With the move closer to the provincial capital and the establishment of a reasonably successful dairying venture, the family decided to have another child. Degy expected the child to be born sometime in early March, 2004. She planned to go into the county health clinic, about 10 kilometers away, two weeks prior to the anticipated birth in order to take advantage of the clinic’s “maternity waiting home”, a residential facility developed during the socialist period in order to minimize home births and maximize access to good obstetric care for nomadic women (World Health Organization, 2001). During her absence her son would be tended by other women in the khot ail. Being winter, Degy’s chores could be easily taken up by the other women in the group.

However, in February Degy began experiencing contractions and went into full labor before she could make arrangements to get to the county health clinic. Tended by other women in the khot ail, she delivered a still-born infant at home. Degy experienced heavy bleeding which did not stop. Alarmed, Degy’s husband sent his brother to the county clinic. Degy’s brother-in-law was able to get to the clinic quickly, and with luck, find a fueled ambulance, sober driver, and doctor available to return with him to the camp. Degy was unconscious by the time the ambulance arrived, but with prompt, effective care, she survived. She spent several months in the hospital, and returned home, weak but healthy, in time to help with the spring birthing and milking chores that mark the beginning of the hard summer season, especially for women.

In the literature on maternal mortality, Degy’s case would be considered a “near miss.” Analysis of these cases is useful for highlighting the constellation of factors and events that contribute to a possible case of mortality, while at the same time, particularly with a living informant, identifying the practices that were effective. In this case the delays that often contribute to maternal mortality were avoided or minimized: close proximity to the county health clinic, a responsive health care team, and appropriate intervention together saved this woman (Thaddeus & Maine, 1994). Had the family not moved closer to the county center it is likely that, all other things being equal, she would not have survived (Janes and Chuluundorj 2004). The long-term costs of this strategy, though, are of concern. Degy and her family lack good access to surface water, and they lack customary rights to winter shelter and reserve winter pasture. They have had conflict with local herders, who consider them to be trespassers, and though they have managed to resolve these conflicts, they lack secure, predictable access to winter forage. As a consequence, they have experienced several difficult winters where many of their animals, especially their valuable milk-cows, have died. Especially in this part of Mongolia, summer drought, especially when followed by severe winters, can wipe out an entire herd in a
few weeks’ time. The family and other members of the khot ail consider themselves to be vulnerable and are worried about their long-term economic security. Yet, under current political and economic circumstances they also believe they have little choice. They desire education for their children, they require access to functioning markets to sell their products and purchase necessary tools and commodities, and, as they discovered, they need access to health care.

This family is not unique. Our interviews with rural households throughout west-central Mongolia suggest that the tradeoffs managed by Degy and her family are common. The experience of these rural households illustrate two principles of mobility in modern Mongolia. First, movement is understood to have both salutary and risk-producing consequences. Secondly, recent changes to the Mongolian political economy have substantially refigured the relationship of people to their environment, to institutions of governance, to markets, and to one another. In grappling with these changes, Mongolian pastoralists are experiencing significant threats to their customary traditions of land tenure and patterns of social affiliation. As a result they have shifted their strategies of mobility and are beginning to experience the fracturing and dispersal of kin groups.

Spatial Mobility and Health

Changing patterns of mobility affect health in two interrelated ways. First, where and when people move, decisions by members of herding households to move to town and city centres, and the ability of households to develop relationships of reciprocity with town and city-dwelling kin, affect spatial and social proximity to health care services. Being close to such services, and especially having relatives who can help out when health care is needed, is an important determinant of access. Secondly, patterns of mobility which determine the success of pastoralism — effective use of natural resources, access to quality pasture and sufficient water year-round, freedom to move when conditions dictate, all the while maximizing proximity to market institutions — in turn have a marked relationship to patterns of risk for health and disease. In both cases availability of social resources, particularly social resources which are distributed across the Mongolia landscape, play a large role in effecting social and economic well-being. A household’s level of well-being is the final common pathway determining health and access to health care. Households who can maximize social relationships, especially those linking countryside to city, while at the same time minimizing ecological and economic risks, are those most likely to experience social, economic, and biological well-being (Janes 2010).

From 2002-2004 the research team undertook a study of access to health care in Mongolia. The primary goal was to evaluate market-based health reform,
focusing on the equitable access to health care by poor and middle income households in urban and rural Mongolia (Janes et al. 2005). 106 households, representing the experiences of 542 individuals, were studied. About two-thirds of these households (73) were resident in periurban Ulaanbaatar, though of these more than half (64%) had migrated to the city from rural areas in the past decade. Of the remaining 35 households, 12 were resident in soum or provincial centers, and 21 were rural households engaged primarily in livestock husbandry. Spatial mobility was considerable in all segments of the sample, reflecting the tendency in Mongolia for town and countryside to be linked by kinship and frequent migration.

Table 1 presents descriptive information on the social and economic status of our study sample. About one-half of household studied fell below the Government of Mongolia poverty line. Of these, we judged that just over one-fourth (26%) were vulnerable poor; that is, in addition to low income, they reported high levels of food insecurity. Most of the vulnerable poor were resident in towns and cities, and reflects the unstable employment situation there. A few eke out a living from a small government pension, which in 2002 averaged about $15 per month. Urban residents reported earning an average of US$ 300 per year, though among town and provincial center residents and the vulnerable poor this figure was considerably lower ($118-$150). Conversely, although rural residents reported much lower incomes than city residents ($124), the fact that they depend on their animals for food, occasionally barter for necessities, and are typically engaged in informal exchanges with town and city-based kin, few reported being food insecure.

Of the rural households we studied, 16 depended primarily on the incomes generated by their livestock, while 5 reported living on pensions. These latter households were headed by older men and women who identified themselves as being “retired”, and thus eligible for small government pension payments of US $15-$20 per month. These individuals continued to herd, supplementing a khot ail’s labor supply during the busy spring and summer months, but their herds are often mixed with those of their children. We also interviewed three female-head households. These households were also integrated into larger khot ail. The herding households reported owning about 14 “bod” units of livestock per capita (A bod, also termed a “sheep forage unit” is an indigenous measure that reflect forage needs of the various species. One bod = 1 horse or bovine, .67 camels, 7 sheep, or 10 goats). Based on other studies, these are relatively low levels of livestock holdings (though there is substantial variability), and would place our
Table 1: Socioeconomic and Demographic Characteristics of Sampled Households by Urban, Town, and Rural Residence: Study of Access to Health Care, Mongolia 2002-2004

<table>
<thead>
<tr>
<th>RESIDENCE</th>
<th>Periurban Ulaanbaatar N=73</th>
<th>Rural (herders) N=21</th>
<th>Town and Provincial Centers N=12</th>
</tr>
</thead>
<tbody>
<tr>
<td>N in household</td>
<td>5.3 (sd=2.2)</td>
<td>4.7 (sd=1.9)</td>
<td>4.5 (sd=1.8)</td>
</tr>
<tr>
<td>Female-headed households</td>
<td>20.5% (N=15)</td>
<td>14.3% (N=3)</td>
<td>16.7% (N=2)</td>
</tr>
<tr>
<td>Employment status of household head</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal sector, salaried</td>
<td>34.2% (N=25)</td>
<td>0</td>
<td>16.7% (N=2)</td>
</tr>
<tr>
<td>Informal sector</td>
<td>30.1% (N=22)</td>
<td>0</td>
<td>33.3% (N=4)</td>
</tr>
<tr>
<td>Pensioner</td>
<td>26% (N=19)</td>
<td>23.8% (N=5)</td>
<td>25% (N=3)</td>
</tr>
<tr>
<td>Livestock herding</td>
<td>0</td>
<td>76.2% (n=16)</td>
<td>0</td>
</tr>
<tr>
<td>Of working age, unemployed</td>
<td>9.6% (n=7)</td>
<td>0</td>
<td>25% (N=3)</td>
</tr>
<tr>
<td>% of household residents under 18 or over 54</td>
<td>46.8% (sd=22.1)</td>
<td>51.2% (sd=27.5)</td>
<td>47.6% (sd=14.2)</td>
</tr>
<tr>
<td>Migration status of household head</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban-rural/rural-urban</td>
<td>64.4% (N=47)</td>
<td>4.8% (N=1)</td>
<td>4.8% (N=1)</td>
</tr>
<tr>
<td>Annual per capita income, 2003 USD</td>
<td>$300 (sd=279)</td>
<td>$124 (sd=84)</td>
<td>$151 (sd=119)</td>
</tr>
<tr>
<td>Food insecurity (scale of 0-5, with 5 being most insecure)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worries and anxieties about having enough food</td>
<td>1.7 (sd=2)</td>
<td>.48 (sd=1.3)</td>
<td>1.2 (sd=2)</td>
</tr>
<tr>
<td>Reported food shortages</td>
<td>1.7 (sd=2.6)</td>
<td>.43 (sd=1.4)</td>
<td>1.8 (sd=3)</td>
</tr>
<tr>
<td>Livestock owned (in “sheep forage units” or body)*</td>
<td>0.04 (sd=.32)</td>
<td>13.9 (sd=15.9)</td>
<td>.95 (sd=1.8)</td>
</tr>
<tr>
<td>Poverty status of household (exclusive categories)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Above government poverty line</td>
<td>52.1% (N=38)</td>
<td>33.3% (N=7)</td>
<td>33.3% (N=4)</td>
</tr>
<tr>
<td>Below government poverty line</td>
<td>17.8% (N=13)</td>
<td>57.1% (N=12)</td>
<td>33.3% (N=4)</td>
</tr>
<tr>
<td>Vulnerable poor</td>
<td>30.1% (N=22)</td>
<td>9.6% (N=2)</td>
<td>33.3% (N=4)</td>
</tr>
</tbody>
</table>

* A single sheep forage unit, a traditional term reflecting forage needs = 1 horse, head of cattle, or yak; 0.67 camels; 7 sheep; or 10 goats. The mean per capita SFU for the community studied by Fernandez-Gimenez (2001), ranged from 31 to 48 in 1994.
sample at the lower end of the resource continuum (Fernandez-Gimenez, 2001; World Bank 2006). Yet, as the data in Table 2 suggests, these rural residents experienced far fewer difficulties accessing health care than urban residents. A logistic regression shows that, independent of poverty status, rural residents are much less likely to experience barriers to desired health care (Controlling for poverty status; OR=.241; 95% CI = .059, .985; p< .05).


<table>
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<th>RESIDENCE</th>
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<th>Town and Provincial Centers N=12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance to Medical Facilities (in km)</td>
<td>.9 (sd=.3)</td>
<td>17.7 (sd=8.9)</td>
<td>1 (sd=.1)</td>
</tr>
<tr>
<td>Percent household income spent on health care</td>
<td>4.6% (sd=10.6)</td>
<td>6.4% (sd=20.5)</td>
<td>19% (sd=25.5)</td>
</tr>
<tr>
<td>Experienced financial barriers to health care access</td>
<td>35.6% (N=26)</td>
<td>14.3% (N=3)</td>
<td>17.1% (N=6)</td>
</tr>
<tr>
<td>Experienced other barriers to health care access</td>
<td>31.5% (N=23)</td>
<td>7.8% (N=1)</td>
<td>8.3% (N=1)</td>
</tr>
<tr>
<td>Health costs threaten household security</td>
<td>9.6% (N=7)</td>
<td>4.8% (N=1)</td>
<td>41.7% (N=5)</td>
</tr>
<tr>
<td>Access problems led to delayed or incomplete care</td>
<td>27.4% (N=20)</td>
<td>4.8% (N=1)</td>
<td>25% (N=3)</td>
</tr>
</tbody>
</table>

At the time of our study (2002), full-scale neoliberal reform of the health sector – focusing on privatization of health care resources, establishment of a family doctor system of primary health care, and development of extra-government financing schemes – had yet to fully affect the rural areas. As documented elsewhere (Janes 2005; Janes et al. 2005; Janes 2008), these elements of reform have in towns and cities created an attenuated form of health care at the primary level, and tend to erect information, opportunity, and financial cost barriers that impede movement from one level of care to the next. Individuals, especially those who are economically marginal, often find that they are unable to obtain health care, or find that health care costs seriously threaten their already precarious economic security. These most problematic elements of health sector reform have not yet made it to rural areas, though current, ongoing research (described further below), suggests that access to rural health care system has continued to decline due to rapidly increasing costs and loss of human and material resources. The main difficulties facing herders in 2002 were arranging transport to health facilities. In 2002 costs of transportation represented the
single most significant potential health expense for the rural residents with whom we spoke.

Over all periods of our research (2002-2006) most of the rural residents we interviewed maintained social ties with urban and town dwellers, usually kin, who helped arrange access to essential social services. Of these services, two were noted as being important: access to health care, and local support for children attending school. It was common among our interviewees for one or two members of an extended family to move to a county or provincial center. There, they would provide housing for younger cousins, grandchildren, nieces and nephews attending school, obtain drugs for relatives, and provide assistance for family members who needed medical treatments at the county clinic or provincial hospital. Especially important for those needing care in provincial and specialty hospitals, a town-based relative could be relied on to put up a whole family or provide essential nursing services in the hospital, thus permitting other family members to remain in the countryside and attend to their herding duties. In return, rural herders commonly provide town dwellers with meat and dairy products, and will provide childcare during the summer for their town-dwelling kin when the children are out of school.

Rural households may also herd animals for residents in towns and cities. Unlike other pastoral societies though, absentee herd ownership does not appear to be exploitive, nor does it seem to have detrimental ecological impacts (Fernandez-Gimenez, 1999b). Absentee herd-owning is an informal arrangement, governed by principles of generalized reciprocity, and as a subsistence strategy has clear benefits for both urban and rural residents. The practice creates bonds of reciprocity between town and countryside, which, like the migration of family members to towns, can be used by rural residents to gain access to essential town services, including health care, transportation, and marketing opportunities. For town residents, animal ownership is an economic risk-management strategy, providing critical resources should economic opportunities in town disappear.

By virtue of eliminating much state control and state services in the countryside, the political-economic transition in Mongolia poses new risks to herders. They respond by shifting their patterns of mobility, moving less, staying close to important resources, and creating social ties with kin and friends through selective migration and economic reciprocity that buffer the effects of distance and a decaying rural infrastructure. These new socio-spatial arrangements appear to spread at least some of the immediate risks that emerged subsequent to the demise of the collectives and the emergence of independent, subsistence-based herding. Even among the relatively poor herders we interviewed in our
study, these adaptive strategies appear to have enhanced access to health resources.

While these new socio-spatial patterns appear to confer immediate benefits to herders, the long-term costs of some of these strategies, particularly in a socioeconomic context which has begun to produce inequality in a formerly egalitarian system, may be substantial. As noted above, needs for access to markets, social and health benefits, water resources, emergency pasture, and veterinary services have significantly transformed patterns of mobility and residence. Herders now move much shorter distances than in the past; they congregate near markets, cities and roads; and there is less effective management of the grazing commons. Insecurity over use-rights to winter and spring shelters and adjacent pastures has led many herders to further curtail mobility so as to exercise/maintain these rights, thereby contributing to pasture degradation. Changes to the political and economic environment, coupled with changes to the traditional adaptive strategies that Mongolia pastoralists employed to manage risk, have created new levels and patterns of vulnerability to social and natural hazards in Mongolia’s rural hinterland.

The natural hazards faced by Mongolian herders include local fluctuations in rainfall, the disastrous combination of summer drought and winter cold and snow, called dzund, availability and quality of forage, animal diseases, and fire. These natural hazards combine with emerging social and economic stresses, including: conflicts over pasture (especially near market centers, water, and desirable winter pastures), failure of market institutions, animal theft, emerging social inequality among herders which impairs customary patterns of resource management, and shortages of labor created by rural-urban labor migration. This changing environment of risk occurs in the context of a transformed political economy that has both disrupted traditional adaptive strategies and restricted access to essential resources (Swift, 1999).

It is theorized here that increasing eco-environmental risk, social disadvantage, and restricted mobility combine to produce what may be termed “spaces of vulnerability.” It is hypothesized that it is in these spaces where high rates of ill-health will emerge. In the case of maternal mortality, a particularly important causal pathway operates through the impact of economic reform on the practice of pastoralism in the rural countryside, raising the levels of economic risk borne by individual households, reducing mobility, increasing poverty and social inequality, and exacerbating the insecurity and vulnerability of women (Janes & Chuluundorj, 2004).
Conclusions

So what is the relationship of mobility to health among Mongolians in the post-socialist era? It is clear that recent macroeconomic reform has reshaped the patterns of movement in the rural countryside. But so too did collectivization, and before collectivization the agents of the feudal state. In each historical moment political economic factors altered the relationships of herders to space and to each other. And in each instance, it is likely that shifting patterns of mobility, formal institutional control of herding activities, and state responsibility for herders’ livelihoods had an epidemiologic impact, operating primarily through the pathways of household wealth and access to social resources.

Seen from the vantage point of the 21st century, though, the present situation of Mongolian pastoralists appears to have suffered when compared with much of the previous century. It now seems clear that collectivisation, despite its perhaps misplaced orientation to modernizing pastoralism and settling herders down in an effort to create a modern, intensive form of livestock husbandry, also brought clear benefits to rural Mongolians. Environmental risk was managed. An entire rural infrastructure was built in support of herding – roads, winter shelters, schools, hospitals, and so on. Mongolians began to move less often, and less far, orienting themselves to the many services offered in town centers. Literacy improved, people became healthier, women were able to travel to maternity waiting homes to give birth in safe and hygienic conditions. With the collapse of the socialist state, Mongolians were suddenly thrust back hundreds of years. The rural infrastructure has decayed. The formal institutions that governed herding have disappeared. In the absence of secure land tenure and increasing inequality, conflict is becoming more common. Insecure in their access to traditional winter pastures and shelter, herders are restricting their mobility, and in the process risk overgrazing grasslands. We are witnessing the emergence of a rural underclass: herders with few animals, restricted access to resources, and much more vulnerable to the vagaries of a harsh continental climate.

In terms of access to health care and long-term economic and health security, Mongolian herders face countervailing pressures. On the one hand, access to town-based services demands a shift in spatial mobility to a fairly close orbit around town centers. On the other, a more effective pastoral strategy would involve more extensive moves to take advantage of seasonally available forage and water. To manage these conflicting pressures, Mongolian herders have redefined socio-spatial relationships. Novel social arrangements – deployment of kin to cities and towns and a sharp increase in absentee herding – have emerged to bring the town into the social orbit of the countryside, permitting a
minimum of mobility, while establishing ties for the flow of goods, information, and services. From the perspective of health care access, the households we have studied appear to be managing well enough. It remains a question, however, whether the long-term consequences of reduced mobility and an orientation to town centers in a context of state retreat and market forces will continue to be salutary. Increasing social inequality and vulnerability in the face of substantial natural hazards suggest that it may not be.

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A Better Life? Migration, Reproduction and Wellbeing in Transition

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Abstract

Mainstream theoretical approaches to migration and reproduction in Asia and elsewhere separate questions relating to reproduction from exploration of economic migration, leading to limitations in current understandings. The tendency to see migratory livelihoods in largely productive terms and to conceptualise the reproductive in terms of consequence or constraint neglects the complex inter-linkages between migration and reproduction in the search for a ‘better life’. Addressing these ‘missing links’ involves taking a broader approach to reproductive behaviour that factors in not only sexual relations and reproductive management but also social reproduction, gender relations between men and women and wider well-being. The transitional economies of Vietnam and China have experienced rapid growth in new forms of migration, in particular rural-urban migration that challenge existing presumptions about migration and reproduction. Not only does marriage migration in this context have strong economic dimensions, economic migration also has clear reproductive dimensions. Prevailing policy and popular stereotypes about how migration intersects with reproduction are being undermined by an increasing diversity of migrant strategies for building and sustaining their own families. Moreover existing institutional and policy constraints mean that these strategies often involve difficult and unpalatable trade-offs for individual and family well-being. In both countries the remaining household registration system and the related structuring of social entitlements lead to social exclusion of migrants and their families in urban areas, and perpetuate rural-urban inequalities, with outcomes detrimental to the well-being of current and future generations of the migrants who are trying to build livelihoods and meaningful lives.

Keywords: Rural-urban migration; Reproduction; Gender; Social entitlements; Well-being; Vietnam; China

http://www.biosocsoc.org/sbha/resources/75_2/SBHA_75_Locke_Zhang.pdf
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Introduction

Prevailing analytical approaches to the intersections between migration and reproduction in Asia have focused relatively narrowly on productive labour and fertility. As a result, we argue, these approaches neglect important linkages between migration and reproduction. The first part of our paper reviews theoretical concerns about the way prevailing analytical approaches to migration and reproduction in Asia are framed. The second part proposes a different conceptual approach that offers more scope for inter-linking migration, reproduction and well-being. The third part illustrates the significance of these interactions with reference to Vietnam and China. Our intention is to make a strong theoretical and empirical case for improving understandings of how migration, reproduction and well-being are linked.

We focus on Vietnam and China where the process of economic transition has been accompanied by new kinds of migration, in particular rural-urban migration, which have rapidly gained in momentum. In both contexts, popular opinion and public policy have often been informed by unquestioned assumptions about the nature and meaning of rapidly increasing mobility and its implications for reproductive behaviours and risks to health. For instance, rural migrants have been depicted as evading fertility regulations, as carrying infectious diseases, or as swelling the numbers of sex workers (Tan 2005). Early policy responses to migration, fertility and reproductive and sexual health suggest that migrants and their reproductive behaviours are in some senses trespassing beyond official sanctions. Consequently, Vietnam and China offer strong potential for exploring the linkages between reproduction and migration, and their implications for social policy and well-being.

Analytical Approaches to Migration and Reproduction

It is taken-for-granted in much of the existing literature on rural-urban migration in Asia that ‘[rural] populations migrate to seek a better life’ (Dang et

1 ‘Transition’ refers to the multi-dimensional changes that accompany the dismantling of centrally-planned economies in favour of market-oriented economies. In the case of China and Vietnam transition there have seen limited formal political changes, but included the reorganisation of agricultural production, land use rights and inheritance practice, the reform of state-owned enterprises, the restructuring of the social sector, the emphasis on the ‘rule of law’, important shifts in state-citizen relations, as well as increasing space for the practice of religion and civic activities. Associated with this process are other unintentional developments, such as the growing cultural influence of globalization, that play a significant role in transition.

2 For example, in China the ‘above-quota birth guerrilla’ was a popular comic expression adopted to ridicule rural migrant couples, who were seen as trying to take advantage of an administrative loophole by having ‘above-quota’ children through migration.
al. 1997:322, emphasis ours) and for the most part this has been interpreted in terms of the search for productive livelihood. The dichotomy widely drawn between migration for survival or accumulation (Waddington 2003) betrays the overwhelming concern with material and economic well-being. Indeed, Saith’s (1999) review of migration processes and policies in Asia focuses on ‘migration which is more immediately related to economic factors and motivations’ whilst at the same time recognising that there are other forms of migration broadly defined that are immensely significant in Asia, including marriage-related migration, political migration and the illegal trafficking of women.

These forms of migration are commonly bracketed off as being about something different (customary kinship arrangements, illegality or globalisation) and therefore are dealt with in separate analytical spheres. Marriage and marriage migration are downplayed in the migration literature, because of ‘the general lack of attention on gender, the assumption that marriage is no more than a life event that triggers migration, and the notion that marriage is an end to migration rather than a means to an end’ (Fan and Li 2002: 619; see also Davin 2007; Palriwala and Uberoi 2008).

In contrast, the large body of demographic work that deals with rural-urban migration has tended to focus on its impact on fertility because of the consequences for population growth and associated concerns such as environmental sustainability and urban development. In particular, this work has been concerned with how different migratory processes (temporary, permanent, circular) lead to the ‘adaptation’ or ‘disruption’ of fertility behaviour to varying extents. However, the emphasis on the ‘cumbersome biological acts of fertility’ (Bledsoe 1990:98 cited in Greenhalgh 1995:15) tends to obscure broader reproductive strategies, interests and experiences. Consequently, this literature has not paid much attention to the way that reproductive aspirations may shape migration processes, or how migrants actively negotiate marriage, marital relations, the timing of childbearing and spousal separation, ways of childrearing and children’s education or the implication of these strategies for reproductive well-being and the welfare of individuals and families involved (but see Hoy 1999 and Hoy 2009 for important exceptions).

More recently, the analysis of gender-selective migration has highlighted the importance of linkages to sexuality and reproduction. As migrants, both men and women are often excluded from sexual and reproductive health services at the same time as they are seen as adopting risky non-traditional behaviours (Iredale et al. 2005; Qian et al. 2005; Yang et al. 2005). Male migration has long been associated with the growth of the female commercial sex industry, and the unabated HIV/AIDS pandemic has focused policy attention on migrants’ sexual
behaviours and risks (IOM and UNAIDS 2005; Yang 2004). Where men migrate leaving behind wives and families, they may bring infection back home with them, and unprecedented levels of unmarried female migration have raised concerns about the sexual exploitation and abuse of women, particularly young girls driven into the sex industry by poverty, social exclusion and marginalisation in urban settings, including the urban labour market (Skeldon 2000). In these analyses, reproduction and reproductive ‘ill-being’ are seen in terms of consequences or risks entailed through migration.

In addition, the gendered dimension of migration has largely addressed two themes: firstly, the implications of classic male rural-urban migration for gender relations in rural agrarian production; and, secondly, the consequences of female migration for women’s empowerment since the 1980s as increasing numbers of younger women are leaving for urban areas to work as cheap labour for global capital. This latter research has drawn attention to these workers’ lack of maternity rights, as well as practices of compulsory pregnancy testing, restricted toilet breaks, and sexual harassment that can jeopardise their reproductive health, as well as women’s resistance (Pearson and Seyfang 2001; Pun 2005). Whilst contributing significantly to our understanding of gendered migration, the central concerns have been the relations of production whilst the linkages and intersections between migration and sexuality and reproduction have not been given primary considerations (but see Kabeer 2007 for an important exception addressing social reproduction).

Similarly, livelihoods research on migration has provided valuable insights in understanding the motivations, processes and outcomes of migration, which point to the need for longitudinal perspectives and the recognition of intra-household as well as wider community relations. In the main, however, livelihoods approaches have been insufficiently gendered and also remain concerned mainly with productive issues. For example, studies on household livelihoods in Vietnam tend to overlook gender, and where gender is taken into account, the emphasis tends to be placed on the institutional constraints for women to participate in economic activities. These constraints include cultural norms, gendered roles, expectations and divisions of labour including those around reproductive roles (Kabeer and Thi Van Anh 2002). Thus, reproduction is either downplayed or conceptualised as one of a number of constraints that disadvantage women and this emphasis sits well with that found in the literature on the gendered selectivity of migration.

In short, we have, in this section, drawn attention to the normal demarcation of migration related to reproduction as somehow different from economic migration, to the overwhelmingly productive interpretation of migration as a
material livelihood strategy, and to the focus on the reproductive in terms of consequences and constraints. Against this backdrop, we turn to examine the largely overlooked intersections between migration, reproduction, and well-being and argue for the value of looking in a more interactive way at their inter-linkages.

Reconceptualising the Links between Migration and Reproduction

Making a life is not merely about making a productive living but involves, amongst other things, the creation and maintenance of meaningful familial and social relationships that bring a sense of belonging, achievement and emotional satisfaction. Amongst these relationships, childhood, wifehood and motherhood are central. In addition, access to a productive living (or the fruits of it) is at many points across the life cycle for women achieved through their performance of reproductive roles. Broader understandings of livelihoods such as that offered by Whitehead (2002: 577, cited in Waddington 2003: 5) as ‘the diverse ways in which people make a living and build their worlds’, lend themselves to better situating productive activities as key elements in a larger strategy of living a life. Reconceptualising livelihoods in this way enables us to factor in reproductive dynamics and a broader understanding of well-being in examining migration.

Overcoming the problematic analytical divisions between spheres of production and reproduction and their presumed associations with the male and the female respectively is integral to this task. This will involve going beyond the view that motherhood and the related caring roles of women can be regarded as a ‘reproductive tax’ (Kabeer and Thi Van Anh 2002) to acknowledge the economic components of reproductive strategies and the intrinsic value of reproductive well-being to mobile livelihoods. Chant confirms that for women particularly ‘migration for, or within the context of marriage, is an important factor, notwithstanding that migration for marriage is often associated with economic and social mobility’ (1992: 3). Indeed, the emerging literature on transnational motherhood, such as Parrenas (2001) and Piper and Roces (2003), makes important progress in exploring these tensions for women undertaking care work across international boundaries. We propose a different way forward offered by the growing literature on the social relations of reproduction which draws heavily on anthropology, sociology, politics and gender studies. It engages closely with the way reproductive strategies are embedded in wider social relations and processes, exploring both the ambiguity of lived experiences and the iterative ways that reproductive outcomes are shaped and given meaning as women and, importantly, men attempt to ‘manage’ their reproductive lives (Bledsoe 1994; Greenhalgh 1995; Tremayne 2001).
The social importance of paternity for men, especially of sons, in many settings is well recognised, but there has been little exploration of how this cultural imperative is linked to the everyday reality of reproductive relations or to male ‘reproductive agency’ (Unnithan-Kumar 2001: 31). Men are frequently absent from discussions of fertility and appear only ‘as shadows: as partners by implication of those engaged in childbearing’ (Bledsoe et al. 2000: 1). However, Ali’s work on Egyptian men shows that the ‘caring and affection that these men felt for their wives and children’ was ‘intrinsically linked… to her reproductive and childbearing capacities’ and involved ‘desire to retain control and power’ over them (2000: 130-2). The deeply ambivalent nature of male power over reproduction on one hand, and the ‘massive male disengagement from parental responsibilities’ (Bledsoe et al. 2000: 3) on the other, suggests that far from segregating or stereotyping men there may be much to be gained by taking a holistic look at the changing ways men negotiate their reproductive and productive lives in the context of migration. Emerging, empirically-rich, research on masculinities and migration will make an important contribution in this respect (Yeoh and Hung forthcoming).

Reconceptualising the links between migration and reproduction in these ways means recognising that engaging successfully in migration for productive work may be centrally about, as well as in tension with, being a dutiful wife/reliable husband and a good mother/father. Whilst affirming that the division of household labour is unequal and that the devaluation of reproductive work is problematic, we argue that there remains a need for more serious attention to reproduction in migration research. Migration for a ‘better life’ may be intrinsically about reproductive relations as well as involving distinct reproductive strategies with different implications for reproductive well-being. We now turn to the specific context of growing rural-urban migration in Vietnam and China in order to explore how such an approach to linking migration, reproduction and well-being opens up new insights and valuable concerns.

*Vietnam and China in Transition*

Vietnam and China have experienced a substantial growth of ‘new’ kinds of migration associated with their processes of economic transition. Both nations regard the scale of this mobility and its implications for population growth as a matter of concern and both have a history of attempting to control mobility and fertility, creating quite specific pressures on migration and reproduction. Below, we outline key similarities and differences in the context of transition, migration and reproduction between the two states. We focus on rural-urban migrants...
engaged in a variety of migratory processes often cyclical, or seasonal, that may ‘end’ in return to the village, further migration, or with marriage/occupational success leading to settlement in the city.

In both states transition has been initiated through far-reaching economic reforms, with limited formal political change. Vietnam’s reforms were largely modelled on the Chinese experience (from the late 1970s), but began a decade later (in 1986). Both have achieved high economic growth rates and initially positive responses to new incentives from their large agricultural sectors (Summerfield 1997: 204). Whilst Vietnam has substantially rolled back state employment, China, while attempting to reform state-owned enterprises, has faced huge challenges of tackling unemployment, new forms of poverty, and maintaining social and political stability. As Summerfield argues: ‘[t]he social safety net in Vietnam, in contrast to China, is separate from state-owned industry reducing the welfare loss of cutting state jobs, but in both countries, funding for human security has been problematic since the reforms’ (1997: 204). Although absolute poverty has been reduced, inequality, relative poverty and social stratification have significantly increased in Vietnam and China (Khan and Riskin 2001; GoV 2002; Wang and Hu 1999; Zhang, et al. 2006). Growing differentials between richer and poorer regions, between different economic sectors, between and within rural and urban areas (GoV 2002; Wang 2004) are creating spatial inequalities in incomes, opportunities, and general development. This, combined with relaxed state control over movement, has led to rapidly increasing numbers of people moving, especially from rural to urban areas (Guest 1998; Summerfield 1997).

China has experienced unprecedented large scale rural to urban migration since the early 1980s. This has become known popularly as the ‘floating population’ (liudong renjou) or the tide of migrant labourers (mingongchao) (Zhang 1999: 5) and there are now an estimated 120-200 million migrant workers in Chinese towns and cities (Huang, 2009; State Council 2006: 3-4), constituting more than 10 per cent of the entire population of 1.3 billion. In Vietnam, although the level of migration is relatively modest compared to surrounding countries, it is large compared to pre-1986 and migration to urban areas has accelerated during the 1990s (Zhang et al. 2006). It has been generally understood in both countries that ‘employment strategies to improve the family’s well-being have resulted in increased rural-urban migration by men and young women, while middle-aged, married women remain in the countryside taking care of the farms and children’ (Summerfield 1997:201). However, the aggregate flows mask changing patterns in the character of migration, gender differences in migrant flows and considerable micro-level diversity (see for example: Guest 1998; Dang et al. 1997; Davin 1996; GSO 2005; Zhang 1999).
In both cases migration and its linkages to reproduction are stratified by qualifications for residency and related social entitlements: whereas state-sanctioned migrants, and increasingly wealthy migrants, may obtain or purchase ‘permanent’ urban household registration, those migrants with work or business permits from their home authorities are only eligible for ‘temporary’ residence permits at destination (Zhang 2007). It is estimated that in Vietnam over 80 per cent of migrants have a form of temporary registration (GoV 2002:4), and there have been ‘ongoing concerns that the registration system restricts migrants from accessing services in their places of destination’ (GSO 2005:10). In China the overwhelming majority of migrants are ‘unregistered’ and they have largely been denied rights to urban social security schemes on the grounds that their security is provided by their home villages. Although temporary residence permits enable them to work in urban areas, they need frequent renewal at police stations and involve financial costs (Davin 1996; Li 2004). Attempting to secure a residence permit involves bureaucratic difficulty, frustration, time and substantial costs (Li 2002, 2004; Zhan et al. 2002) and ‘only the most successful migrants could consider purchasing a permanent residence permit’ (Davin 1996: 27).

In both Vietnam and China, the social rights of migrants, particularly female migrants, have been largely neglected by the state as well as by researchers until recently. Migrants’ employment is often short-lived, contracts are non-existent or short term, they are easily fired, most live in poor conditions and they are vulnerable to harassment by the local police/authorities. In China, migrants complain of detention, arbitrary fining or even periodic repatriation to their rural origin (Davin 1996), in the name of ‘maintaining urban order’ (Li 2004) and similar treatment was proposed in Vietnam where the government is concerned about the number of migrants as well as their ‘perceived lack of control of the migration process and a feeling that this has contributed to social problems such as increased crime and other social evils’ (Guest 1998: 6). At the early stage of reforms, both official and popular perceptions of rural migrants were predominantly negative partly owing to the legacy of tight control over population mobility but also as a result of deep-rooted urban bias (Croll 1997; Goldstein et al. 1997; GoV 2001; Guest 1998; Skeldon and Hugo 1999). For example, they have been variously depicted as possessing traditional values and norms of preferring more children, particularly sons, in comparison with urban dwellers; as using migration as a strategy to evade family planning regulations at home; and more recently young female migrants have been linked to prostitution in urban areas.

However, a recent shift towards a more positive public discourse on rural-urban migration, supported by development agencies and by policy-relevant research (such as Xiang and Tan 2005), has led to more ambivalence towards rural
migrants in urban settings. While prejudice and discrimination remain widespread, both the Chinese and Vietnamese governments have recognised migrants’ contributions to economic development and articulated commitments to improve migrants’ working and social security conditions (GoV 2001, 2002; GSO 2005; State Council 2006), including relaxing the household registration system (GoV 2002; Zhan et al. 2002).

These changing perceptions are played out in official policy relating specifically to the reproductive behaviour of migrants. Population policy in Vietnam seeks to limit childbearing but has never been as strict as in China, with a two rather than a one-child policy (Summerfield 1997: 203). In China ‘[m]igrants in the urban areas are perceived as having too many children, because they are ‘difficult to control’ and ‘no-one is responsible for them’” (Davin 1996: 28). In 1991 the government established ‘Measures for the management of family planning in the floating population’ making it a national requirement to carry family planning certificates listing marital status, fertility history and contraceptive status (Goldstein et al. 1997: 481; Hoy 1999: 134). These should theoretically be shown before a residence, business or work permit can be issued, enabling government personnel in destination areas to police migrant’s fertility behaviour (Hoy 1999: 135). In Vietnam, although the two-child policy has been more loosely implemented, with wide variations in adherence, malpractices have been reported (Banister 1993; Johansson 1998), and from 1988 families who did not observe the two-child limit were prohibited from moving into urban centres and industrial zones (Banister 1993: 82). However, fears that Vietnam might follow China’s harder line on population have been dispelled by the strengthening of the official line that all family planning decisions are voluntary (GoV 2002; UNFPA 2004).

Having reviewed the general situation and prevailing interpretations of links between migration and reproduction in Vietnam and China, we now probe some inter-linkages between migration, reproduction and well-being that relate closely to the theoretical concerns raised in the previous section. Firstly, we draw attention to the significant economic content of marriage migration and, vice versa, to the significant reproductive content of economic migration. Secondly, we question the prevailing stereotypes that married women are either left behind with young children in the villages or come to the city to evade family size restrictions. Thirdly, we raise emerging concerns about managing reproduction around migration and point to the difficult trade-offs and unpalatable compromises they imply for family and individual well-being. Our attempt is necessarily selective and in particular is limited with respect to men because of the lack of published data.

Marriage, Mobility and ‘Economics’
The general understanding in Vietnam and China is that the majority of migrants move in search of work, that young women migrate before marriage and afterwards are ‘tied to the bamboo grove’ (Fong 1994 cited in Kabeer and Thi Van Anh 2002: 120) by their reproductive roles and responsibility for rural farming households. Similarly older women who do migrate are seen as ‘naturally’ following partners (Dang et al. 1997: 333). These generalisations see economics as the driver of migration with marriage and reproduction as consequence or constraint. As noted, this perspective neglects both important economic elements to marriage strategies and reproductive dimensions to labour migration.

Tellingly, in Vietnam intra-provincial migration is usually excluded in migration studies because ‘marriage migration’, which is frequently intra-provincial, is seen as being unrelated to ‘responses to socio-economic development’ (Dang et al. 1997: 322). However, Murphy (2002) demonstrates that young women in villages in Anhui Province, China, often attempt to secure a better life in the future through marrying well. Indeed, Fan and Li (2002) explore new longer distance patterns of women marrying into better-off villages with high rural–urban migration in western Guangdong. They report that some men migrating to urban areas had difficulties finding a suitable marriage partner in their villages because large numbers of women were also migrating. Their subsequent marriages with women from inferior situations were characterised by greater social differences between husbands and wives, suggestive of retrogressive intra-household relations, and marrying-in wives were left at home to manage the farm and the children, making their husbands’ continued migration possible. This demonstrates that changing patterns of marriage mobility may be integral to processes of socio-economic development, especially in the context of institutional imperatives to retain the family farm, and that they have implications for the character of reproductive relations.

It is also clear that labour migration itself may be about opening up space for different life options for young unmarried women, crucially including escaping the life of a rural farm wife. Strategies include young women sending remittances to increase obligations in the natal home to make a good marriage for them; searching for a desirable and ideally urban marriage partner themselves; and shoring up their personal financial security, making them less reliant on either father or husband (Wan 1993 cited in Davin 1996; Zhang 1999). As one young woman in Tianjin, China said: ‘I hope I can marry and settle in the city if possible, and have a happy, stable marriage. I want to achieve something meaningful in my life’ (Zhang 1999: 35). Zhang points out that most of the female migrants she interviewed intended to delay their marriages in an attempt
to work for longer periods or even settle in the city (1999: 31): for these women their urban jobs were often the means for social mobility that significantly included improvements in marital prospects, expectations and obligations.

**Left-Behind or Evading Family Planning Regulations?**

The generalised narrative that the wives of migrants are to be found raising children in rural areas is in tension with official and popular perceptions that migrants come to urban areas to escape restrictions on fertility as well as with the emerging evidence about the marital status and behaviours of migrants. Recent research shows that there are growing numbers of married women and couples in migrant populations and a significant proportion of female migrants are bearing or raising children in the cities, but at no greater rate than their rural contemporaries (Hoy 2009; Zhang 2010).

In Vietnam, 59 per cent of women migrants in Hanoi in 2004 were married as were 46 per cent in Ho Chi Minh City (GSO 2005:31-2). At least 36 per cent of migrant women in Hanoi and 16 per cent in Ho Chi Minh City were accompanied by school age children (ibid.: 68). Rates of contraceptive use amongst older married women are similar to those of urban residents and whilst younger migrants are slightly less likely to use contraceptives, this appears to reflect a desire to ‘catch up’ after delayed marriage (ibid: 7, 148). Despite their predominantly temporary residential status, it seems likely that substantial proportions of these migrants have married in the city and would like to settle permanently there (ibid: 57-8).

In China, the significant differences between married and unmarried women labour migrants in Shanghai suggest that the former ‘are probably accompanying and working with their migrant husbands’ and it is estimated that as many as a third of rural labour migrants are migrating as couples (Roberts 2002: 492). Rather than a ‘floating population’, they may be ‘the vanguard’ of potential settlers (ibid.). This has led to the emergence of ‘urban villages’ (chengzhong cun) (Zhang 2007) as well as residentially- segregated communities of rural migrants and their families in the suburbs of China’s large cities (Zhang 2010). Hoy’s study in Beijing in 1994 of 403 ever-married women of reproductive age who were registered as temporary migrants found that 80 per cent had children and of these, the majority migrated after the birth of their first child (61 per cent) (1999). Hoy’s findings for registered temporary migrants concur with Goldstein et al.’s findings in 1988 in Hubei Province that unregistered migrants ‘seldom…[moved]…to circumvent the nation’s family planning policies’ (1997: 488) and that ‘temporary migrant women do not have more children than their non-migrant counterparts’ (ibid.: 490).
Managing Reproduction during Migration: Choices and Trade-Offs

In Vietnam and China the household registration systems and their function of mediating access to urban social entitlements has been intended to discourage the migration of dependents, thus retaining the costs of reproducing the migrant labour force largely within the countryside, and to preserve social order in the growing cities. These institutional barriers pose severe constraints to migrants trying to build and sustain marriages, child-bearing and child-rearing. Being ‘left behind’ or temporarily returning to the village is among the ways in which women migrants and their families navigate these structural constraints and risks at particular life stages (see for instance, Fan and Li 2002: 634). Family separation may be resolved sooner or later, either by return of husband or onward migration of the family, or take on new configurations, for instance as children become old enough to be left with rural grandparents whilst their mother rejoins her husband to work in the urban area.

In Vietnam, lack of permanent residency creates problems for migrants with access to housing, credit, employment and the registering of motor cycles but is less conclusive with respect to social services for migrants (GSO 2005: 4). The stricter adherence to registration requirements in Ho Chi Minh City and the Southern Industrial Zone before 2005 meant that a fifth of migrants faced economic problems for schooling children in the city, as compared to less that ten per cent of non-migrants (GSO 2005).

In China, the restrictions related to the household registration system ‘induce many migrants to send their children back to their home areas when they reach school age, even if they have not done so earlier. Even migrant women who marry urban residents may face this problem, as the children’s household registration follows that of their mothers’ (Davin 1996: 26). Few of the 70,000 school age children of migrants are enrolled in city schools (Ding and Stockman 1999:127), migrants are disproportionately subject to out-of-pocket expenses for urban health services in comparison to residents (Zhan et al. 2002: 51), and pregnant migrants, lacking maternity leave and rights, usually go back home to deliver to avoid the high urban maternal health charges and may experience worse birth outcomes (Davin 1996: 29; Zhan et al. 2002; Zhang et al. 2006).3

This, combined with the impact of the overall restructuring and reform, has rendered migrant women workers with specific reproductive needs particularly

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3 Zhan et al.'s (2002:49) found that 44 per cent of the 2,381 migrant mothers who gave birth at three hospitals in Minhang District in Shanghai between 1993-1996, had no prior ante-natal visits as compared to only five per cent of permanent residents and the number of still-births amongst migrants (1.5 per cent) was twice that of the control group (0.8 per cent).
vulnerable. In Vietnam, despite the institutional legacy of the Communist Party, ‘women are losing some of these rights...[including]...labour laws, extensive access to maternity benefits and child-care centres’ (UNDP 2000: 9). In China the legislative framework ‘[d]ating from a time when rural women were not allowed to leave the land is especially weak in protecting the large numbers of female migrants who have started working in the city in recent decades’ (Zhang 1999: 33).

Once they have given birth, migrant women must make difficult choices and craft complex strategies to rear their children. Three-generational households, where grandmothers are available to care for small children, are less common and entitlements to grandmothers’ care are structured by gendered intergenerational obligations that prioritise sons and their children over daughters’ (Davin 1996: 26). Leaving very small children with others for extended periods may entail risks including serious malnutrition, neglected health, even death, as well as psychological and developmental problems for children (Xiang 2005: 3-4; Ye et al. 2005). Women who cannot make suitable arrangements for childcare and schooling either return to rural areas, or look after the children in the city without being economically active when children are young.

Family separation for labour migration involves dilemmas and hardships (Xiang 2005). In China and Vietnam, Summerfield reports that ‘growing numbers of men either divorce or illegally start a second family in the city. Migration is now contributing to a small but growing trend for families to break up’ (1997: 206). Revealingly though, Fan and Li’s Guangdong study found a new kind of marriage between migrating women and men formed on the basis of affection where, in four out of the five cases, husband and wife as migrant returnees stay back in the village to work rather than face spousal/parental separation (2002:632-4).

For many, migration is motivated by survival needs and involves unpalatable compromises with strong reproductive dimensions. Illustrative examples include: the young Chinese woman who bought her way out of an unhappy marriage by forfeiting her son and raising child support for the father through labour migration (Davin 1996: 28); the Chinese migrant who tolerates the infidelity, diminishing remittances and visits from her absent husband and at the same time finds the children she has ‘left behind’ to be alienated and undisciplined (Xiang 2005); and the large numbers of middle aged migrant women who work as scavengers because they lack marketable skills and do not want to return home unemployed (Ding and Stockman 1999: 128).
Conclusions

The way in which reproductive strategies and capabilities are articulated with migratory processes has important implications for migration studies. Although it is well recognised that particular flows of migrants often tend to be structured by sex and by stages in the life course, especially the reproductive and marital life course where women are concerned, there has been little investigation of what this means for managing reproductive life. Rather than seeing reproductive factors as given constraints or triggers that play into who migrates and for how long, or separating out economic migration from migration ‘for’ marriage, we have argued that there is value in exploring how reproductive strategising articulates with migratory processes for women and men who are ‘making a life’. This approach may be central to understanding the impact of migration on different aspects of well-being, including sexual and reproductive well-being, as well as to identifying and addressing the specific social needs of migrants.

The changing character of rural-urban migration in Vietnam and China suggests that there are powerful context-specific linkages between migration, reproduction and well-being that merit greater attention. Here, many young women migrants aspire to a different sort of life, including a different sort of reproductive life, and their mobility may contribute to the renegotiation of gender relations in both rural and urban areas.

In contrast to the view that women in migrant households are ‘left behind’ after marriage, the ways of negotiating marriage and migration are much more diverse and complex than commonly portrayed. Migrant couples may both return to the home village after marriage, or migrate together either leaving children behind, sending them back, returning temporarily, or keeping the family together in the city. The alternatives of the wife and/or her children staying behind either temporarily or permanently involve dilemmas and hardships that can put the health, well-being and relationships of children and the mother at risk.

Improved understanding of these dynamics is important if social policy is to contribute to improved well-being. Despite the growing momentum of ‘new’ migration in Vietnam and China, the institutional constraints on movement and fertility that structure social entitlements are yet to be fundamentally challenged. This has interacted with the declining public financing of social provisions and with cultural expectations around marriage, child-bearing, child-rearing and inter-generational relations in ways that are strongly gendered. Migrants have been socially excluded in particular ways and the remedy involves pursuing strategies to enhance their entitlements and rights in urban society. Improving working conditions is of fundamental importance, but strategies also need to go beyond this to build broader entitlements for migrants and their families, in
particular to health, including maternal and child health, and education for migrant children. More determined and forceful national public action to counter growing spatial and social inequalities is also important so as to ensure that whole communities are not left behind by transition (Xiang 2005). This policy will play a role in enhancing the social resilience and adaptability of rural-urban migrants and also in reducing the risks, vulnerabilities, and perhaps the distances associated with building and managing family life for migrants.

The dearth of information about migrant men’s reproductive agency is particularly striking, especially at a time when there is growing concern over their disengagement from the family, but for women too the linkages between reproductive and migratory motivations, strategies and vulnerabilities are poorly understood. Priorities for enhancing understanding must include both macro-level analysis to build a stronger reproductive and demographic picture of migration and detailed micro-level work investigating migrant livelihood trajectories, reproductive histories and well-being outcomes over longer time periods so that we can begin to understand the many ways in which migration as it is interconnected with reproduction plays a role in ‘building a meaningful life’.

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Health Research Among Highly Mobile Pastoralist Communities of Chad

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Abstract

Mobility and socio-cultural factors render the access to primary social services of mobile pastoralists difficult. Arid and semi-arid regions have been neglected by governments in economic development and establishment of public services. A main cause of increased maternal and neonatal mortality among mobile pastoralists is late medical attendance. Disease frequencies of mobile pastoralists do not differ substantially from those of people in poor and remote rural zones, but periodic exposure due to migration, late response to a disease (also due to pressure to move on), inappropriate information, geographical dispersion of networks and close contact to livestock can lead to increased disease occurrence, for example of tuberculosis. Pastoralists often utilise a combination of formal and informal or traditional and western-type medical services. Even with good quality fixed or mobile clinics, significant barriers to service delivery may prevail, for example owing to the mistrust between health service providers and pastoralists. We describe how interdisciplinary research and stakeholder workshops were the prerequisite for testing adapted health interventions among highly mobile pastoralist communities of Chad. Their experiences, local concepts and propositions were essential in this process. The health of their animals is of great importance to pastoralists. Health care providers can harness the good knowledge of pastoralists on animal diseases. A combination of vaccination service for pastoralist children and women with vaccination of the livestock was tested. Sharing of transport logistics and equipment between physicians and veterinarians reduced total costs. Joint delivery of human and animal health services within a One Health approach was highly valued by pastoralists.

Keywords: Pastoralism, mobility, One Health, health services, arid and semi-arid regions

Introduction

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In this paper, we describe how evidence generated during initial research was the prerequisite for testing health interventions among nomadic communities of Chad. First, we review issues related to health status of mobile pastoralists and their animals. Difficult access of nomadic pastoralists to health services is mirrored in challenges of conducting research and intervention studies to obtain health indicators needed for appropriate health service planning. The good health of their livestock is pivotal for nomadic pastoralists and animal health may provide a key entry point for the provision of both human and animal health services. We describe the set-up of our interdisciplinary study among nomadic communities of Chad in 2005 and present results showing interrelations between morbidity and mobility. To bridge the ‘applicability gap’ between research results and testing of interventions, close stakeholder involvement played a crucial role. Interventions deriving from this process are described. These include the establishment of communication platforms, joint human and animal vaccination campaigns, adapted and appropriate information in view of behavioural changes as well as training of nomadic midwives. In the last part, we discuss challenges and successes of our work in a highly mobile context and provide an outlook on planning towards integrated and sustainable health and veterinary services for nomadic pastoralists of Chad.

Health of Mobile Pastoralists and Animals

An estimated sixteen per cent of the 35 million people of the Sahel are mobile livestock breeders (Bonfiglioli and Watson 1992) and there are up to 50 million nomadic pastoralists in Africa, Central Asia, the Near and Middle East, and India. Nomadic and transhumant pastoralists use mobility to manage uncertainty and risk (including drought, diseases, raids, insect vectors) in zones with a low net primary productivity, high inter-annual variability of rainfall and high variability in productivity (‘patchiness’) (Niamir-Fuller 1999). Their mobile and flexible way of life is adapted to exploiting variable natural resources and is driven by the needs of their animals.

Mobility can be used to avoid or reduce exposure to pathogens but mobility may also put nomads at periodic risk of infection, especially around water points (Rahmann 1996). Loutan and Paillard (1992) suggested that Tuareg nomads of Niger may constitute a reservoir of susceptible individuals owing to their low vaccination coverage. Prothero (1965) focused on the interaction of migration and the WHO-malaria-eradication-programme. He stated that migrants passing through a malaria-prone area might build up and maintain a reservoir of malaria transmission. Seasonal morbidity patterns of semi-nomadic Fulani differed considerably from those of settled Rimaibe of Mali (Hilderbrand 1985).
The mobility and dispersion of mobile pastoralists leads to subsequent difficulties in getting and maintaining preventive and curative treatments, as well as information on health-related matters and education. Mobile pastoralist families with their animals have to avoid cultivated croplands where rural health services are typically located, which may hinder their access. Movement from place to place jeopardises treatments, especially those requiring a long follow-up such as treatment against tuberculosis (Caselle and Galvagno 1992). The lack of maternal health services including attended skilled birth delivery is associated with a high pregnancy-related morbidity and mortality. Women’s access to health services depends on the network they can mobilise to receive the necessary resources and having a male chaperone to secure treatment (Hampshire 2002). The situation may be complicated because families are periodically separated.

Mobile pastoralists are prone to be the subject of misunderstandings, including the prevailing thinking that they need to settle to benefit from social services (Azarya 1996). In addition, they rarely have a strong voice to raise their demands, which also needs lead to low prioritisation by policy makers and thus inadequate policies (Wiese 2004). Socio-linguistic barriers exist at rural dispensaries between nomadic groups and health workers (Loutan 1989). Pastoralists may be treated with disrespect or have to pay under-the-counter sums. Discrimination against them when drugs were in short supply at health centres has been documented (Sheik-Mohamed and Velema 1999; Swift et al. 1990).

Studies to determine health indicators (such as predominant morbidity, mortality, fertility) and inequalities in health between mobile pastoralists and settled communities are rare. Such information is crucial for the definition of intervention priorities and appropriate health policies for nomadic people -- and their subsequent implementation. Marked differences in mortality rates have been reported between different Malian nomadic groups (Hill and Randall 1984). Few studies have evaluated delivery of primary health care services to nomadic populations (Swift et al. 1990), although an intervention showed that mobile health services reaching nomadic camps were avidly used by nomadic pastoralists (Green 1979). From our experiences in Chad we know that pastoralists seek particular western-type drugs for particular, e.g. chloroquine for malaria, antibiotics for respiratory diseases and drugs against trypanosomosis of cattle and camels. Elsewhere, the costs of mobile services were much higher than those of static facility services (Brenzel and Claquin 1994; Imperato et al. 1973) and were thus not sustained. The training of community health workers (CHW’s) proved promising in Niger (Loutan 1989), among other reasons because women need no special permission to consult a nomadic CHW as they would for outside practitioners. Community-based animal health service projects
partly fill the gap in chronically underserved rural areas (Woodford 2004). Vaccinations at markets have been conducted, but it has proved difficult to reach children and women, who stayed in the camps, as well as to overcome the overt resistance of nomads because the programme did not take into account their fear of being counted for taxation purposes (Imperato 1969).

In Africa, the ability of health and veterinary systems to deliver services is constrained by declining public-sector budgets, loss of confidence as a result of unmet demand, a severe shortage of human resources, especially of qualified personnel (Wyss et al. 2003), inadequate infrastructure and equipment, and weak monitoring and information systems (Cheneau et al. 2004). Given that resources are scarce, new interventions must be as cost-effective as possible, make best use of existing resources and consider communities’ priorities and fears. The evaluation of these points was an important goal of our research work.

**Sampling in a Highly Dynamic Context**

Approaches to data collection in mobile contexts, and particularly with a view to gathering adequate epidemiologic and demographic data in nomadic communities, require special attention. For example, the complex task of research work in nomadic settings was described by Randall (1994) for Mali. Socio-economic indicators could hardly be established, although researchers lived in camps for two years, and the evaluation of the camps’ demography was difficult owing to people’s unease in talking about resources but also as a result of the time limitation of the study.

Difficulties in selecting a representative sub-sample of nomadic populations in the absence of a sampling frame based on a census are present in virtually all mobile pastoralist settings. Chabasse et al. (1985) sampled all members of eight major camps located around water points during one month at the end of the dry season. For our study on morbidity among Chadian nomadic pastoralists, the establishment of an initial list with boulamas (heads of nomadic camps) to draw a random sample was laborious. Still, one camp of an important leader per ethnic group needed to be included to keep the study credible among pastoralists and several selected boulamas could not be re-found in time. In the camps, the pastoralists’ work rhythm allowed for interviewing only in the early morning or in the evening before sunset.

To know the proportion of vaccinated children and women is important for planning of vaccination services. The size of the target population must be known for the example of vaccination coverage and other objectives.
However, most Sahelian countries face problems in sampling nomadic communities for census. Although we have been conducting research and interventions among nomadic communities in Chad for seven years, the sizes of the communities were largely unknown. The most recent Chadian census of 1993 was not appropriate for the counting of mobile communities. To assess the size of Somalian pastoralists, Kalsbeek and collaborators (1986) have implemented a cross-sectional sampling at waterpoints, but have experienced several logistical difficulties in organisation of timely data collection. Another approach used to account for mobile families in low-density zones has been aerial surveying. Two observers in an airplane independently record tents, people and livestock herds in randomly selected geographical sectors. Considering that not all individuals are equally visible, this sampling approach needs a correction factor for lack of visibility, which is evaluated during field studies (Ministère de l’Elevage et des Ressources Animales 1993). The use of capture (mark)-recapture methodology for population size estimation of Sudanese nomads was suggested by Elgoul (1978). This has been used for a long time by zoologists to estimate the abundance of wild animal populations and offers an interesting approach in accounting for ‘hard to reach’ populations. Briefly, a sample of individuals from a target population is ‘captured’, ‘marked’ and released, and a second sample ‘captured’ at some later time. Using the numbers of individuals caught in both samples (the recaptures) and the numbers caught in just one sample, it is possible to estimate the number not captured in either sample, thus providing an estimate of the total population size. This original form of the method implies that the population is closed. Obviously, the method needs to be adapted to mobile populations with unknown size.

**Considering the Well-Being of People and Animals**

The interrelationships between pastoralists and their livestock are far reaching. Transactions of property, services, and social events are related to livestock exchange. Livestock is the basis of economic wealth and social respect, and is the main source of income and nutrition. Because of the paramount importance of livestock to pastoralists, breeding practices are taught to youngsters and the recognition and treatment of different livestock diseases are later learnt from elders (Majok and Schwabe 1996). Knowledge of human diseases is not accumulated equally systematically, and only few members of the community acquire specific skills in treating people (Wiese and Tanner 2000). Traditional healers in many pastoral societies work with both people and animals, but their role and importance vary across different ethnic groups.

The American epidemiologist Calvin Schwabe (1984) focused his attention on the commonality of human and veterinary health interests. He discussed the
added values to public health of ‘one medicine’ in a broad range of fields such as food and nutritional security and mental health. Majok and Schwabe (1996) and others (Ward et al. 1993) advocated inter-sectoral collaboration between the health and veterinary services. The more recently evaluated institutional Collaborations in the context of a ‘one medicine’ approach seek to identify appropriate control strategies for zoonotic diseases, and to strengthen systems by proposing new health services for remote livestock holders, while better using existing resources (Schelling et al. 2005b; Zinsstag et al. 2005).

In recognition of the mutual interdependence of humans, animals and their ecosystems, comparable unifying concepts and institutional developments have emerged. For example, ‘ecosystem health’ sees sustainable development expressed as the mutualism of the health of humans, animals and the ecosystems in which they co-exist. This extends the concept of ‘health’ to that of the whole ecosystem (Forget and Lebei 2001).

**Interdisciplinary Research Programme in Chad**

In Chad, the proportions of fully immunised children and mothers are below fifty per cent (World Health Organization 2006) and are unacceptably low in rural zones. Outreach health services are virtually non-existent for rural communities living far away (more than fifteen kilometres) to the nearest health facility, affecting forty per cent of the rural population (Ouagadjo B. et al. 1998). Livestock is, after petrol, the most important export good. Approximately ten per cent of the population are nomads. Three quarters of cattle are kept in the Sahelian zone, about eighty per cent thereof in mobile systems.

In 1996, the Swiss Tropical Institute (STI) conducted an exploratory study on access to health services of nomadic pastoralists in Chad (Wiese and Tanner 2000). Based on its recommendations and those of a first national workshop, the research and action programme ‘Improved access to health services for nomadic pastoralists of Chad’ was launched in 1998. The programme was aimed at overcoming barriers of access to health care of nomadic pastoralists by generating a scientific basis for the development and validation of adapted, efficient and innovative strategies. Specific objectives were to: i) identify perceived health priorities of nomads ii) evaluate morbidity of nomadic communities and their livestock based on epidemiological studies iii) recommend, test and validate efficacious, efficient and appreciated health interventions in nomadic settings with special consideration of women and children.
Research studies included the disciplines of anthropology, biology, veterinary and human medicine, epidemiology, microbiology and molecular biology. In addition, Martin Wiese of the University of Freiburg im Breisgau has done a socio-geographical study. Population-based microbiological and epidemiological work can lead to the identification of appropriate strategies of control. However, for effective implementation of control measures in the field, the socio-cultural context of a disease has to be known. For example, important public health diseases may not be perceived as such by individuals and communities – and vice versa. Treatment-seeking behaviour is strongly influenced by cultural norms. The Fulani concept of pulaaku encompasses a high degree of self-control, which may result in attendance of health services only at an advanced stage of disease (Krönke 2004). The aim of the socio-geographical surveys was to provide a basis of understanding of the ecological, socio-economic and political dimensions of nomadic livelihood in the complex crisis situation of Chad. This study complemented the research studies on perceived ill-health (the emic view) and health risks (the etic view) at the intersection between medical, environmental and social sciences by taking a vulnerability approach.

The research programme has been implemented in two prefectures of Sahelian Chad, the Chari-Baguirmi and the Kanem (Figure 1) with three ethnic nomadic groups: Fulani, Arabs and Dazagada. Detailed descriptions including historical roots of the communities are given in Wiese (2004) and Krönke (2001).

**Examples of Interrelations Between Mobility and Morbidity**

In the Chari-Baguirmi and Kanem of Chad, Wiese has analysed in detail the spatial and temporary ill-health patterns (Wiese 2004). He has assessed that access to key pastoral resources and related conflicts with sedentary communities strongly influenced care-seeking behaviour. This result was in line with the appreciation of nomads’ emphasis on everyday concerns to secure their livelihood (Wiese 2004). In our own biomedically rooted study conducted in 1999 and 2000, we have observed for example that exposure to malaria was dependent on mobility patterns, that access to health services was more than usual difficult during long transhumance routes, and of livestock-sourced food varied with changing environment and season.
The main diseases and conditions found did not differ substantially from morbidity typical for the Sahelian zone such as respiratory diseases, malaria and diarrhoea. Arab camel breeders usually stayed in a dry environment, where they had very low to non-existent prevalences of clinical malaria. However, a peak of malaria occurred during the wet season when they were exposed to infection. In contrast, most Fulani breeders stayed at the borders of Lake Chad during the dry season -- a more humid environment favouring the insect vector -- and Fulani experienced higher clinical malaria frequencies during the dry season but lower ones during the wet season (Schelling et al. 2005a).

Participants in the survey made less use of the marabouts’ and the dispensaries’ services during the wet season. Lack of time owing to the constant pressure to move on, limitations in remote zones or blockages through cultivated fields might have been responsible for this phenomenon. Dispensaries where antimalarial drugs (chloroquine) were known to be in short supply during the wet season were avoided. Interestingly, unmarried women and men had fewer opportunities to visit a marabout or a dispensary than other group members,
probably because it was hard to afford a visit to a marabout or a dispensary, or to contact a chaperone during the highly dynamic movements of the rainy season (Schelling 2002). Marabouts in particular demanded high charges for consultation (Wiese and Tanner 2000).

Vitamin A levels in women’s sera were directly correlated to the vitamin A levels in the livestock’s milk (Zinsstag et al. 2002), and thus milk can be seen as an important source of this vitamin; however it is not sufficient since two thirds of tested nomadic women were deficient in vitamin A. We found the same very low consumption of fruit and vegetables among pastoralists as in other migrating populations in Sudan and Kenya (Holter 1988; Nathan et al. 1996). Indeed, the highest milk levels were found in herds of green pastures around Lake Chad, but these pastures could not be used during the rainy season because they were flooded. Moreover, access to pastures during the dry season became difficult owing to increased agricultural activities. The exclusion of pastoralists from more productive pastures (with higher agronomic potential) by farmers and blocking of traditional transhumance routes led to significant disruption of the annual transhumance cycle, increasing the ecological and economic vulnerability of pastoral systems in dryland Africa. The faster-growing agricultural communities approaching from the South and a certain depletion of the natural resources in the North put pressure on the nomadic pastoral communities to encroach into marginal zones. In many instances, they would prefer to avoid zones such as the islands of Lake Chad with immense insect infestations and zones known to be highly contaminated with anthrax spores. In very remote zones, they are also far away from markets and health/veterinary facilities.

**Stakeholder Involvement**

The programme aimed to show the relevance of obtained research results, to provide authorities with information needed for decision-making in a context of extremely scarce resources. Stakeholders were academic institutes within a North-South research partnership, the Ministries of Health (MoH) and of Livestock Production (MLP) (which hosts the veterinary services), NGOs working with pastoralists, international bi- and multilateral organisations such as WHO and UNICEF, and donors; on the community level there were nomadic families (men, women and children), their representatives and associations, as well as the staff of local health and veterinary posts.

Subsequent national stakeholder workshops (in 1998, 1999, 2002 and 2005) were organised to provide information on obtained research results, to formulate health service priorities from a range of options, and to readjust ongoing interventions. Nomads could express their concerns and needs directly to the
authorities and also voiced non-health related demands such as access to water. Results were also reviewed in the communities during focus group discussions and regional workshops to obtain a broader perspective from nomadic men and women. Given the diversity of interests among the stakeholders, the priority-setting process was pragmatic in the sense that interventions could be carried out by the health and veterinary services. However, it has been moving incrementally towards inclusion of other communities’ priorities such as education, which has been tackled in collaboration with UNICEF Chad.

The first national workshop set the overall aim and approach of the programme. The second one recommended testing of joint human and animal vaccination campaigns, improved access to essential drugs, and training of community veterinary workers and traditional midwives. During the third workshop, final research results and initial experiences with interventions were presented. The participants also identified new research and intervention objectives such as poverty-reduction strategies. A recommended development goal -- based on the communities’ demands -- was the strengthening of local and national legislative capacities to design a pastoral code that would secure their transhumance routes. The fourth workshop addressed policy issues for ownership-building by communities and public health and veterinary services of successfully tested interventions. In the following we present four priority actions that were negotiated among stakeholders and implemented for testing to formulate recommendations.

Testing of Identified Priority Interventions

Vaccines: Pastoralists’ Observations on Health Outcome in Livestock

Pastoralists have had experience with livestock vaccination for decades. Cattle and camel owners acknowledged good experiences with livestock vaccines, particularly of rinderpest. Further, Fulani have a traditional vaccination of cattle against contagious bovine pleuropneumonia (CBPP). Satisfaction with veterinary vaccination has been assessed in over 100 interviews.

Pastoralists continuously evaluated the post-vaccination outcomes in their animals. They used a range of criteria to define a good vaccine, for example a sufficient birth rate in the herd. The best outcome of a vaccine was seen to be the elimination of the disease, as was seen for rinderpest. However, Fulani and Arabs questioned the quality of livestock vaccines used at the time of the study. The majority reported that the vaccines were less efficacious than some years earlier. Their main argumentation was: ‘If we refuse livestock vaccination it is because there are vaccines which do not work. Even if you vaccinate every year, the animals continuously die. Otherwise, how could a breeder refuse a good
vaccine?’ (Fulani (Pullo) man). Occurrence of post-vaccination reactions after vaccination of CBPP in cattle has also contributed to the reluctance of owners to use existing vaccines. Explanations were related to failure in vaccine production, to the lack of arrival of the good (‘real’) vaccines, and to expired or incorrectly stored vaccines (Footnote 1). Pastoralists also stated: ‘There are breeders who select cattle for vaccination – the next year it is those cattle that were not vaccinated who will die. We breeders, we do not vaccinate every year – especially when animals are healthy. The selection for vaccination kills our cattle’ (Fulani man).

Insufficient vaccination coverage as a result of lacking veterinary infrastructure and refusal of livestock owners was thought by authorities to be responsible for anthrax outbreaks. Anthrax is a fatal bacterial disease of people and livestock. Pastoralists knew that people could infect themselves by contact with contaminated animal carcasses (Krönke 2004). Control of anthrax in an endemic setting such as Chad includes annual vaccination of livestock. Since pastoralists provided an impressive insight on their observations, the quality of the vaccine was checked for the first time for many years. Indeed, the locally produced vaccine was found to be inefficacious and thus the laboratory examination confirmed the concerns of the livestock owners. Based on these research results, the livestock production unit was rehabilitated in 2003 and 2004.

Information and Training of Community Members

Insufficient access to health and veterinary information was an important issue raised by pastoralists. Information materials -- pictograms and short movies in the three local languages of Fulfulde, Arabic and Gourane -- were developed with popular nomadic leaders of the three ethnic groups, health and veterinary personnel, actors and artists. Topics were vaccination of children/women and livestock but also issues suggested by the communities (such as care of sick children). Emphasis was put on possible side effects of vaccination and on the distinction between prevention (vaccination) and therapy (treatment), since the majority of pastoralists perceived no difference. The importance of revaccination of children was demonstrated in a schematic way, with the construction of a tent in three parts (Figure 2). An evaluation study showed that having seen these pictograms substantially increased the adult’s understanding of human vaccination. The showing of information material was accompanied by discussions with health and veterinary personnel. Nobody wanted to miss the event when the movies were shown at dawn in a camp.
Figure 2: Pictograms used during information campaigns and by facilitators to explain the importance of revaccination of children until three doses of vaccines are received. Only the third dose will fully protect the child (in the images represented by a family) in the tent.

Three nomadic community-based veterinarians and twenty-five traditional midwives were trained by professionals. Individuals with a strong commitment were selected by the communities for training. Midwives were especially trained for use of hygienic obstetric methods and pre-natal examinations, particularly to refer a pregnant woman as early as possible to a health centre in case of feared birth complications. One midwife noted that women now ask about the use of contraceptives. The midwives report all births to the next health centre, a pioneering affair in these communities. The project organised midwives and community veterinary workers to have regular contacts with the health and veterinary personnel, respectively. This has been important to continue supervision, to follow-up on the book keeping and to provide them with new drugs.

Towards Tuberculosis Control Strategy in a Mobile Context

The prevalence of clinically suspected tuberculosis cases among adult nomadic pastoralists in Chad was 4.6% (Schelling et al. 2005a). Bovine tuberculosis can be transmitted by close contact to infected cattle and consumption of raw milk. We found that 17% of cattle in same pastoralists camps were tuberculin positive (Diguimbaye-Djaibe et al. 2006).

Nomadic pastoralists of Mauritania and Chad perceive tuberculosis as a frequent disease. They consider tuberculosis incurable as well as hereditary and are unaware of the existence of a treatment. In addition, tuberculosis is a stigmatised disease. These first results of a Mauritanian sociologist conducting a comparative study between Mauritanian and Chadian pastoralist communities justified the establishment of a study on adapted information campaigns in the zone of Bassiknou. Bassiknou lies in the vast South-Eastern part of Mauritania (Hodh Elchargui) and is a high tuberculosis incidence region. During a
participatory approach using the methodology of SARAR (Self-esteem, Associative strengths, Resourcefulness, Action planning and Responsibility [Srinivasan, 1970]) discussions with participants were animated and reflected on the present situation as well as on solutions. Drawings and pictograms were interpreted and improved by participants who most often were illiterate. Images were based on typical knowledge and behaviour and messages of the National TB programme were adapted to the pastoralist context. This study also evaluated the extent to which knowledge on bovine tuberculosis in cattle (a well known infectious disease) could be used for health education, using by socio-linguistic analyses of how pastoralists perceived illnesses. Forty-five representatives of the nomadic communities including traditional healers were trained in prevention, recognition and treatment of tuberculosis to continuously inform their communities.

Subsequently, markedly increased numbers of nomadic pastoralists have been registered at the diagnostic centre of the zone (personal communication Mohamed Ould Taleb, National TB Programme). All results have been shared with the national programme against tuberculosis. The number of diagnostic centres should now be increased. However, in the meantime, distances to the nearest centre will remain very long for pastoralists in this sparsely populated region. Furthermore, this is only a first step towards a challenging tuberculosis treatment programme when mobile pastoralists need to adhere to a rigorous and daily drug-intake schedule over a period of six months.

**Combined Human and Animal Vaccination Campaigns**

In 2000, after our biomedical surveys, the prevalence of fully immunised nomadic children and women of two Chadian districts was zero (Daoud et al. 2000), although the communities wanted access to vaccination of children. In the same nomadic camps the livestock was compulsorily vaccinated by veterinary teams arriving in the vicinity of the families. The national workshop of 1999 recommended testing the feasibility of joint human and livestock vaccination campaigns.

Next to support and follow-up of activities, the project played a facilitating role to harmonise the timing of activities of the public health and veterinary services. The campaigns were set up with the local health and veterinary personnel to avoid parallel structures, and making use of all existing infrastructures (cold chain and transportation means). The National Expanded Programme on Immunisation (EPI) provided the human vaccines and was involved in continuous monitoring. Since 2000 fourteen vaccination campaigns for nomadic children, women and the camp’s livestock have been carried out during the dry
season among the three ethnic groups in their zones of concentration. Each vaccination campaign was composed of three vaccination rounds, with a view to ensuring a complete course of vaccination. The capacity of existing mobile veterinary infrastructures was extended for simultaneous vaccination of people and animals during at least one round for 10/14 campaigns.

Veterinarians have vaccinated a total of 150,000 livestock against anthrax, pasteurellosis, blackleg and CBPP. A total of 4,700 children younger than 5 years of age was fully immunised after three contacts to the vaccination team; 7,700 women have received at least two doses against tetanus from the public health workers. A cost analysis showed that the bulk of the costs of vaccination campaigns for both public health and veterinary sectors were the costs of vaccines and supply (fifty-five and fifty-six per cent, respectively). The principal shared cost between the two sectors was transportation. Overall, shared operational costs of the public health sector represented fifteen per cent of the total costs when one out of two vaccination rounds was conducted jointly (Bechir et al. 2004).

Challenges of our Programme in a Highly Mobile Context

Difficulties in the organisation of research and intervention studies resulted mainly from the highly dynamic way of life of nomads as well as periodic lack of vaccination supply and limited or not well maintained infrastructure of the governmental services. The planned schedule of the vaccination campaigns could therefore often not be followed. Representatives and group leaders of the communities strongly influenced the perception and willingness of pastoralists to participate. In most cases their influence was positive, but in some instances, if a leader disagreed, whole pastoralist groups were lost for research and intervention. Not all zones are covered with livestock vaccination services. Some zones are assigned to private veterinarians who are not in fact present in the zone to provide vaccinations.

For the three clinical surveys, the same boulamas and their camps were repeatedly visited. It was always possible to find the boulama but, especially during the wet season, this might take quite some time and involve travel over many kilometres. These repeated visits showed high variability of the camp’s member-composition between visits. Only fifteen percent of camp members have been encountered twice. We have expected a more stable composition of camps and have intended initially a follow-up study, but then had to adapt the study design.

A high proportion of children (in average 64%) could not be vaccinated three times during one campaign. These children were thus not fully protected against
diphtheria, whooping cough (pertussis), tetanus and polio. More than a quarter of drop-outs has continued vaccination in subsequent years and one contact already immunises children against measles and yellow fever. Nevertheless, it remains critically important to offer a full course of vaccination within one year.

It was most challenging to estimate the proportion of nomadic children and women reached during the campaigns. We have estimated population sizes with mark-recapture methods while using the vaccination cards as ‘marks’ and with data from transect studies where ‘marked’ and ‘unmarked’ individuals have been ‘recaptured’ randomly. During transect studies, among those who reported having been vaccinated, one third of people have lost their vaccination card and so they could not be registered as ‘marked’ because time of vaccination was unknown. It was problematic to identify appropriate areas for transect studies since many unvaccinated communities enter into the vaccination zones (which are geographically limited in a rather imprecise way). One transect study failed to detect ‘marked recaptures’. Obviously, the study was not done in the target population.

Planning for New Adapted Interventions

Pastoralist communities highly value the combined approach of considering the health of their livestock and of their family members. Veterinary vaccination was no longer refused by pastoralists as was often the case before they arrived with the medical people. Typically, first contact between pastoralist families and the health personnel was established during the vaccination programme. This is essential for mobile pastoralists to perceive quality services and to trust the health providers, so that the public health sector can use the campaigns as a gateway to the pastoralists. Increasingly, parents and children are visiting health centres for vaccination services. In addition, joint health and veterinary vaccination reduce operational costs of interventions in comparison with single-sector vaccination. Translation into national strategies would make the approach more sustainable. This may become a model for other governments who face similar difficulties in reaching remote rural people because communities are reluctant to comply with public or private officials and/or because of insufficient infrastructure and resources.

In a country such as Chad, with serious shortages of qualified personnel and research capacities (Wyss et al. 2003), capacity-building is an important aspect. Public health workers need to be trained to ensure desired quality of care. Mothers can be trained to peer-educate other mothers in early case-management at the household level (Randall 1994). Trained midwives can act as catalysts in the training of mothers (case-management of sick children) and promote
contraceptive methods. In parallel, veterinary personnel should be introduced into livestock management strategies and more nomadic community veterinary workers are needed.

Other opportunities of combined delivery should be reviewed to add value to resources put into a mobile infrastructure and thus make interventions more cost-effective. Preventive health interventions such as breast feeding counselling, insecticide-treated bednets, iron and vitamin A supplementation and presumptive treatment for intestinal worms could be gradually integrated to joint vaccination and treatment campaigns to make interventions more cost-effective. Encouraging people to seek care early when they and their children require it is an important task. This is challenging in communities who have had few good experiences with the static services offered. Education of the population facilitates knowledge transfer and education of children is desired strongly by the communities.

We conclude that the knowledge generated by this programme has led to innovative interventions that have been planned and carried-out with all stakeholders. We argue that joint human and animal health services also have relevance to settled pastoralists and mixed livestock-crop farmers in remote rural zones.

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**Notes**

Vaccine conservation in ice, which used to make an impression on nomadic breeders, is nowadays redundant, because current vaccines, with the exception of the vaccine against CBPP, are heat-resistant and do not need to be stored cooled. The fact that pastoralists noticed that vaccines were no longer stored on ice illustrates the attention they paid to the work of the veterinarians.
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