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From the Editor-in-Chief

In this issue of *World Health & Population* (WHP), we continue with the series of reports on health issues faced by rural-to-urban migrants in China. These papers are based upon the ongoing research by Xiaoming Li, Bonita Stanton and others affiliated with Johns Hopkins, Wayne State, Beijing Normal and Nanjing universities. The paper by Li et al. addresses social stigma and mental health needs of rural-to-urban migrants, and lays out a framework for future research. We hope to continue offering the output from their ongoing and important research through WHP.

Other papers in this issue represent a somewhat eclectic mix of research from five different countries: Democratic Republic of Congo (DRC), Ethiopia, India, Nigeria and Sudan. From the DRC is a well-written paper by Nkosi and associates reporting focus group results on caregiver burden associated with HIV/AIDS. Although the situation they report is grim and seemingly unaddressable, at least in the short run, their research is nonetheless important for raising our awareness of the problem, and, once again, pointing out the complexity of the HIV/AIDS pandemic. Chandrashekhar et al. present highly focused outcomes research on cataract surgery in rural South India, and strong recommendations with regard to "quality versus quantity" in terms of procedures. The authors are concerned that the incentives for cataract surgery are skewed towards doing the maximum number of cases versus achieving good outcomes in the maximum number of times. Prasartkul and Vapattanawong look at death registration data in Thailand and posit very credibly why there is under-reporting. They also make some interesting and reasonable policy recommendations with regard to reforming the death registration process; however, the most useful take-away for researchers and policy-makers outside of Thailand is that you can credibly use survey data to validate secondary data, even in developing country situations. Doocy and Burnham, from Johns Hopkins University, provide an interesting discussion of assessment of socioeconomic status (SES) in the context of food insecurity in Ethiopia. In particular, they correlate various measures of SES with physical well-being as measured by mid-upper arm circumference (MUAC), and conclude that income, education and housing quality are better indicators of SES than home or land ownership. Uneke et al. describe the public health implications of bacterial infection and growing antibiotic resistance among school children infected with schistosomiasis in Nigeria. Although this paper is more clinically focused than most for WHP, the issues around antibiotic resistance are important to surface. Finally, the paper by Ali et al. is notable by its addressing a relatively untouched area: pharmacist manpower issues in a developing country. Pharmacists provide a much more critical primary care role in many developing countries than they do in North America or Western Europe. Ali and his colleagues designed and conducted a survey that looked at the movement between the public and private sector of pharmacists in Sudan. Although remarkably narrow in its focus, the survey and research efforts and results are nonetheless quite interesting.

We hope the mix of papers in this issue is engaging to our readers, and the contributing authors and editorial staff of WHP are interested in any comments or suggestions you might have. Please feel free to write or e-mail us.

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Family Caregiving for AIDS Patients in the Democratic Republic of Congo

Thomas Matukala Nkosi, Walter Kipp, Lory Laing and Judy Mill

Abstract

We conducted a qualitative study of women who were caregivers for HIV/AIDS-affected spouses in Bumbu Zone, Kinshasa, Democratic Republic of Congo in 2003. Twelve caregiving women, six home-based care workers and five key informants were interviewed via focus group discussions. Most women reported huge problems in providing care to their spouses due to psychological, social and economic factors. The secrecy around HIV/AIDS issues and care was a significant theme in the findings. The self-reported health status of the caregivers indicated poor health.

Introduction

Sub-Saharan Africa is considered the region most affected by HIV/AIDS. AIDS is now the leading cause of death worldwide, killing 2.4 million people in 2002. Approximately 3.5 million new infections occurred worldwide in 2002, while 29.4 million Africans now live with the virus. UNAIDS estimates that some three million Africans with clinical AIDS require medical care (UNAIDS 2002). However, adequate treatment and care of HIV/AIDS patients is almost non-existent, and only a tiny fraction of those who are in need of treatment is receiving it.

Supporting and caring for people living with HIV/AIDS depends on many factors: family income, family cohesion and the country of residence, to name a few. UNAIDS reported that, in developed countries, people living with HIV/AIDS are well taken care of, and that HIV/AIDS-related mortality has been significantly reduced. In contrast, UNAIDS concludes that treatment services for AIDS are not accessible for most of the sub-Saharan rural population, and that the gap in HIV/AIDS care between the rich and poor countries is widening quickly (UNAIDS 2002).

Literature Review

No published research from the Democratic Republic of Congo (DRC) regarding caregiving for AIDS patients was found. Several authors reported from Uganda that traditional home care is not always feasible, and that neighbours often refused to help families requesting it (Ntozi 1997; Seeley et al. 1993). Others stressed that home care services in Africa, if they exist at all, are often

overwhelmed in the attempt to provide adequate services (Jackson and Kerkhoven 1995; McDonnell et al. 1994). These authors stressed that new approaches are needed. Most often the burden of care for AIDS patients in Africa falls on family members, especially on women, who are traditionally considered the principal caregivers (MacNeil 1996; Olenja 1999). This poses enormous stress on women in a society where they are already overburdened with their responsibilities for the general health of their families, household food security, their children's welfare/education and for managing scarce resources. Furthermore, persons with HIV/AIDS (PWAs) and their caregivers in sub-Saharan Africa live in communities where stigma surrounding HIV infection and clinical AIDS exists (Kalondo 1996; Anderson 1994; Mill 2000; Mwinituo and Mill 2006). Stigma often leads to social isolation and loneliness, not only for PWAs, but also for their informal caregivers at home (Casaux and Reboredo 1998).

The importance of family caregiving, especially in poor rural settings where formal healthcare services are virtually absent, has been stressed (Robson 2000; Ntozi 1997; Chela et al. 1989; Reijer 1999). However, few studies have addressed issues facing family caregivers for AIDS patients. Brouwer and colleagues (2000) and MacNeil (1996) described the struggle and difficulties of Buganda women in Uganda of providing love and care for their relatives with HIV/AIDS. Ndaba-Mbata and Seloilwe (2000) reported that family caregiving in Botswana was poor because family caregivers were not trained to provide basic care. Olenja (1999) found that training in AIDS care was grossly lacking at the community and household level in Kenya, and that AIDS caregivers were worried about their lack of skills. In South Africa, caregivers for children with AIDS had a huge knowledge gap related to the provision of appropriate primary care for affected children (Zimba and McInerney 2001). Ugandan mothers caring for their children with HIV/AIDS had a heavy emotional burden, which prevented them from following the advice given to them by healthcare workers and from delivering proper care for their children (Brouwer et al. 2000). Robson (2000) found that young Zimbabwean girls were disproportionately burdened with caregiving responsibilities for family members with AIDS, which negatively affected their education and career options.

From the literature review, it is evident that the care of the caregiver is a neglected aspect of HIV/AIDS research. Most of the HIV/AIDS control programs in sub-Saharan Africa do not provide caregiver support, with the Democratic Republic of Congo (DRC) being no exception. Home-based care programs, which exist in a number of countries, primarily focus on the needs of HIV/AIDS patients with limited attention to caregiver issues. Our experience with caregiver support programs in sub-Saharan Africa has demonstrated that care for the caregiver is a topic of little importance to the public, governments and the international donor organizations. However, as caregiving is predominantly the responsibility of women, it impacts women in a most dramatic way and poses a major obstacle for the advancement of women's issues and rights.

To highlight problems associated with caregiving of HIV/AIDS patients, Thomas Matukala Nkosi conducted a study in Kinshasa, the capital of the DRC, from September to November 2003, as part of the requirements for a Master's thesis. The remaining authors of this paper participated as members of Nkosi's supervisory committee in the research during the study design, data collection, analysis and dissemination phases. In particular, this study had the following objectives: (1) to describe the problems faced by women as informal caregivers for their husbands living with HIV/AIDS; (2) to identify the problems, which influence the health status of women caregivers; and (3) to describe the process caregivers use to seek support for the care of their AIDS patient(s) from family, friends and local organizations.

This information was considered crucial for policy formulation, as well as for planning and resource allocation for new and existing support programs to help female caregivers of family members suffering from HIV/AIDS. This study was part of a larger study that included both quantitative and qualitative methods to assess the care burden of informal caregivers. The quantitative part of the study showed, in addition to the high care burden, a low self-reported health status of the women caregivers in Kinshasa (Kipp et al. 2006).

Background Information

In the DRC, 25% of the sexually active population are HIV positive (Congolese Ministry of Social Affairs and Public Health 2002). The average age of men with HIV/AIDS is 35, and the average age of women with HIV/AIDS is 25. The highest HIV prevalence is found among young women 20–24 years of age.

Kinshasa, the capital of the DRC, is administratively divided into zones. The responsibility for HIV/AIDS control lies within the municipal health departments in the zones. Bumbu zone (190,000 population) is poor and has particularly low development indictors. HIV/AIDS-affected patients are cared for in municipal health centres. Bumbu has a home-based care program (Sacome+) that provides care for primarily HIV/AIDS patients.

Sacome+'s home-based care program for people living with HIV/AIDS and their families mostly relies on unpaid volunteers with limited autonomy. The Sacome+ activities include home visits and surveys, home-based counselling, psychological support group meetings, nursing care or medical assistance, the provision of supplies such as laboratory tests, basic treatments, help with hospitalization fees, referrals, psychosocial counselling, pastoral support, welfare assistance (funeral organization and costs) and legal aid (related to inheritance). In terms of preventive activities, Sacome+ has organized training and awareness-raising sessions throughout Kinshasa. Currently, Sacome+ has approximately 300 clients infected with HIV/AIDS in its outreach program in Bumbu. The capacity of the home-based care services is limited, so that on average only one home visit per client is possible within one month.

Methodology

A mixed method research design, using surveys and focus groups to collect the data, was used for the study. The survey results are published elsewhere (Kipp et al. 2004). Participants of the study were identified from the population of Bumbu through the Sacome+'s existing client list. Women, who were caregivers for husbands who had been living with HIV/AIDS for at least six months, and who voluntarily agreed to participate in the study, were recruited for focus group discussions (FGDs). Eligibility criteria were as follows: between 18 and 49 years, caring for a spouse with AIDS in the home and having one or more children. We focused on caregivers whose family responsibilities also included caring for children. All care recipients had clinical AIDS, which would have required antiretroviral (ARV) treatment, but none of them received ARV treatment. Most of their HIV positive caregivers, however, seemed to be in an asymptomatic stage of HIV infection, as assessed by their working capacity (no clinical examination was done), and few may have been eligible for or required ARV treatment.

In addition, key informants from Bumbu and Sacome+ staff were also asked to participate in FGDs. Persons who were seen as being a meaningful source for information on caregiving issues for AIDS patients were contacted by Nkosi, and the study objectives were explained. Those who agreed to be interviewed were recruited into the study on a volunteer basis. The membership of the FGDs is shown in Table 1.

Table 1. Characteristics of the focus groups

Population	Total number	Number of females	Number of males	Language of discussion	Number of focus group discussions
Caregivers	12	12	0	Lingala	3
Sacome+ staff	6	3	3	French	1
Key informants	5	3	2	French	1

The topics of the FGDs were designed to address the issues identified through information from the literature, from Sacome+ staff, as well from our own experience. For example, caregivers were asked questions around their daily work with the patient, their care burden and how they were coping with it. Sacome+ staff questions focused on the service delivery of the home-based care program, their perspective of the caregiver problem and shortcomings in their support to the caregivers and their patients. Key informants were asked more general questions about home-based care for AIDS patients (e.g., whether these services are important and how they could be strengthened, and if the home-based care services were appropriate and culturally accepted.)

A focus group discussion guide was developed to explore the experiences of the caregivers. Twelve caregivers were selected from the home-based care list of Sacome+. Participants in the key informant FGD were health planners, policy-makers and civic leaders from the zone of Bumbu. All FGDs were tape recorded after consent for recording was given by participants.

Qualitative analytical techniques included content analysis (theming, coding, categorizing, abstracting). Abstracting was done by transforming data from individual instances to create general categories that were derived from the data. Transcriptions from the tape were done word-by-word in the language as shown in Table 1. Transcripts in Lingala were translated by Nkosi and a research assistant into French and then into English. Transcripts in French were translated by N. Nkosi into English. All translations of transcripts were reviewed by a faculty member from the University in Kinshasa, who was fluent in all three languages. A trained research assistant in qualitative methods was the moderator of the FGDs. The first author took notes and recorded facial expressions and body language.

The study was approved by the Ethics Review Board of the University of Alberta. Local approval for this study was given by the Director of Sacome+ who accepted the ethical approval of the University of Alberta and decided that it was not necessary to seek approval by the ethics review committee at the School of Public Health in Kinshasa. All participants were provided with an information and consent letter. Participants signed the consent form. The focus groups were conducted in locations suggested by the participants, and names were not recorded on the data collection sheet, thus protecting the anonymity of all participants.

Results

All individuals who were approached by Sacome+ staff agreed to participate in the study. During the interviews, it became evident that all caregivers were also HIV positive. Interestingly, the caregivers disclosed their HIV status voluntarily to the interviewers without being directly asked.

Becoming a Caregiver

Most caregivers said that they became a caregiver because of love and a sense of family responsibility for caregiving. Their devotion to their spouse is reflected in the following statements.

> "At the beginning, I did not know that my husband had HIV/AIDS. He had a fever almost every day, but all the fever medications could not stop his fever. Later he told me 'I am condemned to die because I was diagnosed as being infected with HIV/AIDS.' I was disappointed and shocked; I cried a lot [cries and pause]. I asked myself what to do. Should I leave him alone or not? I thought of my children, and I decided to stay with him because I still loved him. I also thought that leaving my husband alone would never solve any problems. Since nobody was there to take on my responsibility, I took over my family responsibility in a positive way. I said, 'I am not giving up on my loved (my children and husband) ones.' (Caregiver, participant #3)

> "My husband became sick with fever, cough, diarrhea and headaches and was taken to the hospital where he was diagnosed as being infected with HIV/AIDS. My husband's supervisor asked me if my husband hadn't told me anything about his medical situation. I said no, and his supervisor told me, 'Madam your husband has HIV infection. Our company doesn't need

his services anymore, so you must leave it.' Because I loved my husband, I decided to take care of him. I also decided to ensure that my children would always be taken care of." (Caregiver, participant #7)

Lack of alternative treatment options was the second factor that influenced participants' decisions to become informal caregivers. In the excerpts below, two of the 12 participants recount their experiences.

"We tried to get the medications for my husband. We were told that tritherapy is very expensive and hard to handle. We could not afford it. I asked how expensive tritherapy was, and when I heard how much it would cost, I immediately understood that we didn't have that money to get my husband access to tritherapy, so I took him home." (Caregiver, participant #4)

"My husband was hospitalized. After two weeks, it became difficult to pay the hospital fees. We did have outstanding fees to pay. A nurse came to tell me that the hospital needs money. If we cannot pay, we better go [long pause] home. I did not have any choice, so I decided to go home with my husband." (Caregiver, participant #9)

Stigma was also a factor that led the caregivers to take on their husband's care at home. Patients and their caregivers did not want to risk being shunned by their relatives and friends and did not want to appear in public. In the following statements, two participants share their experiences following diagnosis.

"Since everybody not only left us alone, but also did not want to see us or even to hear from us, I could not leave my husband dying, quietly but surely, alone. That's why I am taking care of him." (Caregiver, participant #2)

"Having HIV/AIDS infection in Congo is like being a dangerous criminal. As soon as my neighbours and relatives heard about my husband's sickness, they concluded that [stammering] no one in my family could be visited. I had then to do something for my nuclear family." (Caregiver, participant #10)

Experiences of Caregivers

Most participants reported that their caregiving experiences were traumatic and very stressful. They said that they had been very disappointed by family, friends and the community's reaction to their husband's sickness and found caregiving a difficult task to handle. These difficulties included an overwhelming lack of resources, low health status of the caregiver and economic constraints as highlighted in the following four statements.

"How can it be easy if you have to do everything by yourself? Besides, you have nothing [sad smile], and you have been diagnosed as being infected with HIV/AIDS yourself?" (Caregiver, participant #3)

"Like now I haven't eaten yet since yesterday, but I have to care for my husband. I have to find some food for him because if he doesn't eat, it will affect him a lot. On the other hand, my children must eat too, but I have nothing to give them. Can somebody live with all of this stress [cries]?" (Caregiver, participant #6)

"I cannot help my husband 100% since I have to first think about my own medical condition [Long pause]. I think my husband is somewhat lucky to have me. I wonder if anyone will help me like that. My children are still too young to care for a sick person, so they will not be able to

help me out. You see, when this comes to mind (and it does all the times), I feel like I have to give up and kill myself. In that context, how can it be easy to take care of my husband?" (Caregiver, participant #9)

One participant reflected on social aspects of family life in a polygamous household setting and the consequences when the male breadwinner of the household becomes HIV infected. She said

"My husband had three wives. I am his first one. He married the other two only a year ago. At that time, he was not aware of his sero-positive HIV/AIDS status. When all of us knew it, my husband's two last wives left us leaving behind them two little kids they had with my husband. I now have to look after my own children, my husband and those two little abandoned ones. Can you imagine how hard it can be?" (Caregiver, participant #11)

Support for Caregivers

The only formal support participants mentioned came from Sacome+, but the sources of informal support varied. Six caregivers had not received any informal support. One caregiver reported that extended family were the only members of her informal support system, whereas three caregivers mentioned religious leaders/people, husbands' professional colleagues and friends as part of their support network. Two caregivers said that friends and neighbours were the only ones providing informal support for them. In the following comments from participants, it is apparent that the support from friends was not always positive.

"One day I was crying with my three kids. My husband was laying flat and could not even move his legs. I did not know what to do or where to go, so I started crying loudly. My neighbours heard me and called for my mother. Instead of coming alone, she came with one of my best friends. When they got to my place, they just looked at me and said 'why are you killing yourself without asking for any help?' I did not say anything, I just kept crying. Spontaneously, they went on by doing what was required to help me." (Caregiver, participant #5)

"At the beginning, we were hesitant to approach anyone. We were worried that they would turn against us, and some of them (despite their social rank) actually did. Because of that, we still feel hurt and angry. We received some help from people (neighbours) but they were negative and judgmental. We could not even lie because the help we were seeking would lead to questions, which required us to tell the truth. Since we were in need, we did not have a choice. We had to take the risk of being truthful even when we were not sure how the person would react." (Caregiver, participant #8)

Caregivers Health

Many participants pointed out that their lives were very negatively impacted by the caregiving burden. Caregivers believed that, as a direct consequence of their caregiving responsibilities, they were not able to participate in social activities, to work and to enjoy life. Almost all participants mentioned experiencing many health problems since they became caregivers. These may have arisen due to the physical and psychological burden associated with their caregiving tasks. Two of the caregivers comment on their health in the following passages.

"Before, I never came down with all these diseases I have now. I almost never got sick before. Since I am doing all of this for him [the husband], it looks like I am even more sick than him." (Caregiver, participant #4)

"You know what? I have been out of my mind since I started caring for my husband. Knowing that this will end when he dies, I always have headaches, stomach-aches and anorexia. I don't

think I will ever get well again in my lifetime. Don't forget that I am sero-positive myself." (Caregiver, participant #6)

Opinions of Health Workers and Community Leaders about Caregiving

Healthcare workers and opinion leaders confirmed what was mentioned by the caregivers, that the caregiving responsibilities were huge, and that the problems associated with it were often insurmountable. They also reported that support services were inadequate and that the stigma associated with HIV/AIDS was very strong.

"Helping a loved one with a serious illness such as HIV/AIDS is a big responsibility, especially as the illness progresses. In the majority of our cases, the husband whom the wife is caring for has become very dependent on her. It is an especially big responsibility when we know that those women (caregivers) don't have the help they need to do they job." (community leader)

"The thing is they [caregivers] never been prepared for their role and don't even have enough skills to handle their tasks, which is a risk because it happens that they have to act like us [health professional providers], especially at night." (health worker)

"I don't think caregivers realize how big their responsibility is because they don't always take care of themselves. I know that they don't have the means to do so, but it seems like they have lost the sense of purpose in their lives. Some of them sometimes express the feeling that they have given up on everything." (health worker)

"There are a lot of gaps between what we know are needed and the services provided." (medical doctor)

"There is a lot that could be done to develop the services given to HIV/AIDS people and their families in terms of infrastructure, service provider training, medical supplies, etc. But nobody cares." (community leader)

"Most communities still make moral judgements on people living with HIV/AIDS and on their families. Consequently, individuals' fears regarding confidentiality are particularly strong. Because patients and their families have the perception that staff can spread the content of their files behind their backs, confidentiality must be the principle that leads home-based care programs." (community leader)

Discussion

We assessed the experiences of 12 women in the Bumbu Zone, Kinshasa, Democratic Republic of Congo, who were caring for their husbands with AIDS. This was supplemented with information about caregiving issues from health workers in the home-based care program for AIDS patients and key informants. Results from this research demonstrate that in the study population, women's caregiving responsibilities for AIDS patients are enormous and overwhelming. It is likely that there is an even greater burden on caregivers in rural areas of the DRC, where conditions are much worse than in the capital and very few support services exist. All women who participated in the study were also HIV positive, highlighting the need for prevention efforts to limit HIV/AIDS transmission in discordant married couples. The women experienced considerable suffering when they saw the clinical consequences of the disease in their spouses. They worried about how they would handle their own illness and who would care for them when they became sick.

There was a high level of stigma and secrecy around HIV/AIDS issues in the current study. For example, one woman was told by her husband's employer that he was HIV positive. In addition, there was little communication between couples themselves, because some of the caregivers learned about their husband's HIV infection very late in the disease process.

The overall results from our study indicate that women who are caregivers for their HIV/AIDS-affected husbands are overwhelmed with their responsibilities and bear a high burden due to the poor conditions in Kinshasa. Participants reported high levels of social isolation and stress, low levels of health and a deep unhappiness in life. This is congruent with most of the findings from the other studies from Botswana, Kenya, Uganda and Zimbabwe about caregiver burden, which we reviewed.

Lack of support was a common theme among all of the participants in the study. Support was often not available or refused to be given. It also seemed sometimes that the caregivers do not ask for the needed support given the stigma or the "shame" of being HIV infected or having a husband who is HIV positive. In Kinshasa, care for an AIDS patient in the final stage of the illness means "intensive care" at home on an earthen floor, possibly without water and electricity. Lack of support, including support services for caregivers, was also highlighted as a major caregiver issue in studies from Botswana, Uganda and Zimbabwe (Ndaba-Mbata and Seloilwe 2000; Seeley et al. 1993; Jackson and Kerkhoven 1995). The lack of formal support services for caregivers is highlighted by the fact that care for the caregiver does not appear as a component in most documents about HIV/AIDS programming in sub-Saharan Africa.

Conclusion

Our study highlights the significant problems in sub-Saharan Africa, which are associated with family caregiving for patients with AIDS. Based on the findings, we wish to highlight three issues.

1) The caregivers in our study were so overburdened and so desperate that they could not look after their own physical, social and mental well-being. The limited research on informal caregiver burden emphasizes the absence of, or the limited capacity of, specific support programs to provide family caregiver support. Although a goal of HIV/AIDS control programs in several African countries is "to reduce the social impact of HIV/AIDS on families and communities," little action exists to address caregiver issues and socio-economic problems related to them.
2) Stigma toward HIV/AIDS patients and their caregivers was a significant problem for the participants in our study. This is somewhat surprising, considering that the HIV/AIDS epidemic is very mature in the DRC. This is in contrast to our experience in western Uganda, where stigma toward persons with HIV/AIDS appears to be diminishing. The broad social impacts of stigma, trends in AIDS stigma and factors that promote or reduce stigma require further investigation. This knowledge is necessary to design specific interventions to actively mitigate the stigma against HIV/AIDS.
3) The huge caregiving responsibilities in sub-Saharan Africa are a gender-related issue of utmost importance and are a significant obstacle to the advancement of women's issues and rights. It is surprising that the burden that women experience in providing AIDS care has not been identified more often in the international development literature or by the international donor community as a major gender issue. Caregiver burden and stigmatization against persons and households with HIV/AIDS is strongly associated with, and contributes to, the care burden of caregivers, who are mostly women (Powell-Cope and Brown 1992). It prevents women from participating in social and developmental activities and programs. This is counterproductive to international efforts to strengthen the role of women in societies of developing countries and to enhance their rights. Community development in Africa suffers because women cannot contribute. Over time and on a large scale, the impact of HIV/AIDS will have serious negative consequences for women specifically, and for society as a whole.

These three issues are so interwoven in the sub-Saharan African culture that it will take amazing skills and substantial resources to break the negative impact of this vicious cycle, which causes desperation at both the individual and societal level. The rollout of ARVs in the Congo would be a tremendous boost to address each of the above issues. Many care recipients could again become

productive within their families and caregiver burden would be reduced substantially. In addition, it has been shown in Haiti and South Africa that when AIDS patients are treated, stigma decreases (Castro and Farmer 2005; World Health Organization 2004). Although the discussions about the benefits of ARVs have not been linked to caregiver burden, it is logical that immediate and successful treatment of AIDS patients would be the best relief for family caregivers.

Our study results, which reveal limited or absent support services for family caregivers with extremely high care burden and who are therefore at great risk for ill health, indicate the need to address the agenda of caregiver burden in the DRC Congo and elsewhere in sub-Saharan Africa. We suggest three immediate steps in a change process that could make a difference for female family caregivers in Africa: (1) The decision of HIV/AIDS programs to include family caregivers as legitimate clients in their plans and budgets, which would make it possible to initiate programs of support for them. These could be delivered in an integrated fashion in combination with other programs such as family planning outreach. (2) The conscious decision of local health and social services to target this caregiver population as one of their priorities with the existing resources. This could result in specific indicators for program development of caregiver support and resource deployment. (3) The direction of funds for female caregivers. There are many national and international agencies that generously fund gender programs of all types. Some of these funds could be diverted and targeted towards the female family caregivers of AIDS patients.

It must be recognized that the most challenging aspect of this magnitude of change is not the policy development per se, or even the allocation of the resources required, but rather the shift in thinking required that would result in recognizing and serving families rather than individual patients.

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Social Stigma and Mental Health among Rural-to-Urban Migrants in China: A Conceptual Framework and Future Research Needs

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Abstract

There are over 100 million individuals in China who have migrated from rural villages to urban areas for jobs or better lives without permanent urban residency (i.e., "rural-to-urban migrants"). Our preliminary data from ongoing research among rural-to-urban migrants in China suggest that the migrant population is strongly stigmatized. Moreover, it appears that substantial numbers of these migrants experience mental health symptoms (e.g., depression, anxiety, hostility, social isolation). While the population potentially affected is substantial (more than 9% of the entire population or about one-quarter of the rural labour force in mainland China) and our data seem to indicate that the issue is pervasive in this population, there is limited literature on the topic in China or elsewhere. Therefore, in the current article, we utilize secondary data from public resources (i.e., scientific literature, governmental publications, public media) and our own qualitative data to explore the issues of stigmatization and mental health, to propose a conceptual model for studying the association between the stigmatization and mental health among this population, and to identify some future needs of research in this area.

Rural-to-Urban Migration in China: "Floating Population"

The term "rural-to-urban migrants" used in this article refers to those individuals who move from rural areas to urban areas for jobs and better lives without obtaining permanent urban residency (China National Bureau of Statistics [CNBS] 2001). In China, these individuals also are often referred to as the mobile population, peasant-workers, temporary migrants, rural migrants, migrant workers, or floating population (Zhang 2001; Lin et al. 2005).

Migration from rural to urban areas was restricted in China through the household registration ("hukou") system for almost a quarter century until economic reform took place in the late 1970s. Under the "hukou" system, everyone was assigned to a particular place of residence and the Chinese population was officially divided into urban residents and rural residents. Rural residents were prohibited from moving into the cities. The rural economic reform with the introduction of the Household Contract Responsibility System in 1979 resulted in a rapid growth in agricultural output (i.e., an increase of 56% from 1979 to 1985) and a large surplus of agricultural labourers, estimated at 300 million excess farmers as of 2000 (Wakabayashi 1990) . Concurrently, rapid economic growth in urban areas had increased the income disparity between urban and rural areas to a historically high level. Rural incomes were 55% of urban incomes in 1983, but decreased to 31% in 2005 ($402 in rural areas and $1,296 in urban areas) (CNBS 2006a). This increasing income gap has provided a strong incentive to rural residents to migrate to urban areas in search of better lives. Consequently, hundreds of thousands of Chinese peasants are transient, displaced from their native villages to cities, forming the "floating population," one of the largest internal migrations in recent history in China (Seeborg et al. 2000). Most of these migrants come from the poor rural areas of the interior provinces with weak industrial bases. Because of existing legal restrictions on employment and housing in urban areas (Zhou 1997), this movement has largely been in the form of temporary migration (i.e., 80%), rather than permanent relocation (Zhou 1999).

The most recent population statistics released by the Chinese government indicated that there were 147.35 million migrants in China as of November 2005 (CNBS 2006b). However, no information was available for further analysis of their demographic characteristics. According to the China 2000 Census Data (the most current national database with demographic statistics) (CNBS 2001), there were 121 million migrants in China in 2000. Among those migrants, 88.4 million (73%) were from rural villages and 32.7 million (27%) were from townships or small cities. In terms of destinations, 78.65 million (65%) migrated within the same provinces and 42.42 million (35%) migrated to different provinces. The general geographic trend of migration was from the middle and western parts of China to the eastern and coastal areas. Nationwide, 13% of all rural families have one or more family members who migrated to urban areas (CNBS 2001). Recent ethnographic studies among several migrant communities in Beijing (Zhang 2001) have found that most of the Chinese rural-to-urban migrations are in the form of chain migrations based on kinship ties and native-place networks.

With support from National Institute of Mental Health (NIMH), we conducted an HIV/STD intervention feasibility study among young rural-to-urban migrants in two major Chinese metropolitan areas (Beijing and Nanjing) from 2001–2005 (Li et al. 2004; Li et al. 2006). Although the NIMH project was not designed to study the stigmatization and mental health issues associated with a migratory lifestyle in China, our preliminary data suggest that the migrant population is strongly stigmatized. Moreover, it appears that substantial numbers of these migrants experience mental health symptoms (e.g., depression, anxiety, hostility, social isolation). While the population potentially affected is substantial (more than 9% of the entire population or one-quarter of the rural labour force in mainland China) and our data seem to indicate that the issue is pervasive in this population, there is limited literature on the topic in China or elsewhere. Therefore, in the current article, we will utilize secondary data from public resources (e.g., China Census Data, scientific literature, governmental publications, public media) and our own qualitative data to explore the issues of stigmatization and mental health, to propose a conceptual model for studying the association between the stigmatization and mental health among this population, and to identify some future needs of research in this area.

Data Resources

The data we analyzed in the current article include the China 2000 Census Data, the secondary data from scientific literature, governmental publication, public media and the qualitative data we collected in Beijing and Nanjing, China. The China 2000 Census Data were collected from all

Chinese citizens who resided in China from November 1 to November 20, 2000 (CNBS 2001). The qualitative data were collected in Beijing, China's capital, and Nanjing, the capital city of Jiangsu Province in eastern China. Beijing covers 16,800 square kilometres with a population of 13.82 million. The Beijing municipal government has jurisdiction over eight urban districts, eight suburban districts and two rural counties. There are about three million rural-to-urban migrants (70% male and 30% female) in Beijing (Beijing Municipal Information Office [BMIO] 2002). Among the migrants in Beijing, about 25% are employed by construction companies, 20% are self-employed and 40% work as temporary workers (hourly waged or short-term contracted) (BMIO 2002). Nanjing, which is about 1,200 kilometres from Beijing, has jurisdiction over six urban districts, four suburban districts and five rural counties with a total area of 6,516 square kilometres and a total population of 5.3 million. The rural-to-urban migrant population in the Nanjing metropolitan area is estimated at 800,000.

During the qualitative phase of the NIMH research project, we interviewed a purposeful sample of 90 rural-to-urban migrants (50 in Beijing and 40 in Nanjing). The recruitment and data collection procedure of the qualitative study has been described elsewhere (Hong et al. 2006a; Hong et al. 2006b). Briefly, the migrants were recruited from their work places, labour markets or homes through a network sampling. Local community leaders (both formal and informal) in the migrant settlements served as facilitators for the recruitment process. All interviewers were trained graduate students and junior faculty members in the field of psychology and education in Beijing Normal University and Nanjing University. Individual interviews were conducted in private places established as convenient for the interviewees. Each participant was assured of his/her confidentiality in the study, and an informed consent form was signed before the interview started. Each interview took about 60 to 90 minutes; all interviews were audio-taped and transcribed. The Institutional Review Boards at West Virginia University, Beijing Normal University and Nanjing University approved the study protocol. The demographic characteristics of the 90 migrants are shown in Table 1.

Demographic Characteristics of Rural-to-Urban Migrants

Age

The majority of the migrants are young, most commonly aged 20–29, with the next highest concentrations in the adjoining age group, 15–19 (Zhou 1999). The China 1990 census data indicated that 50.7% of the migrants were 15–29 years of age; the China 1999 1% population survey indicated 71% of the migrants were between 15–34 years of age (Wan 1995). The Chinese Academy of Social Sciences recently estimated that over 80% of the rural-to-urban migrants are less than 35 years of age (Wu and Zhou 1996). China 2000 Census Data indicated a median age of 32.8 years, younger than either urban permanent residents (39.6 years) or rural permanent residents (34 years) (CNBS 2001).

Gender

There were more males than females in the early waves of rural-to-urban migration (i.e., pre-1990). According to a 1986 survey of 70,216 migrants (Tie 1999), 74% were males and 26% were females (Tie 1999). However, there has been an increase in female migration since the early 1990s. The 1995 China 1% Population Survey showed that 57.6% of the migrants were male, which was consistent with the China 1990 Census Data (55.5% of the migrants were male) (Wan 1995). Both 1990 and 1995 data indicated that there were more females than males in the 15–19 age group (Wan 1995). Gender distribution of migrants varies greatly by occupation, with more males being in construction and more females in domestic service and entertainment industries (Qian 1986).

Education

In general migrants tend to be more educated than rural residents who do not migrate but less educated than urban residents. China 1990 Census Data revealed that the average years of education was 6.27 for rural residents, 7.44 for migrants and 8.86 for urban residents (Wan 1995). China 2000

Census Data indicate that 10.3% of the adult migrants (15 years of age and older) were illiterate, 24.2% finished elementary school, 52.2% finished middle school, and 13.3% finished high school. There is a substantial gender difference in the level of education, as 50% of the female migrants only finished elementary school (CNBS 2001).

Table 1. Demographic characteristics of 90 migrant participants

Variables	N	%
Age (years, mean=24.54)		
15–19	3	3%
20–24	49	54%
25–29	31	34%
30–37	7	8%
Gender		
Male	44	49%
Female	46	51%
Marital Status		
Single	69	77%
Married	19	21%
Divorced	2	2%
Education Completed		
Primary education not completed	3	3%
Primary school	11	12%
Junior high	36	40%
High school	9	10%
Post-secondary school[1]	30	33%
Age of First Time Working in Cities		
Less than 19	53	59%
20–24	25	28%
25–34	3	3%
Nor reported	11	12%
Years in Cities		
1–4	21	24%
5–8	17	19%
>=9	14	16%

[1]Including vocational school and three-year college

Marital Status

China 2000 Census Data indicate that 20.3% of adult migrants (15 years of age and older) were single (17.6% and 19.4% for urban and rural counterparts, respectively). Among those who migrated to other provinces, 29.2% were single (CNBS 2001). A study among migrant construction workers (98% male) in Beijing revealed that 39% were single, 51% were married and 10% were either widowed or divorced (Du 1986).

Cultural and Social Context of Migrants' Lives in Cities

Migrant Community in the City

In recent years, numerous migrant communities (or "migrant villages") have been established in almost every Chinese city. Some of the communities have gone through development, demolition and eventual reconstruction (Zhang 2001). Most of these migrant communities were organized based on the migrants' common place of origin, while some were organized around urban occupation (e.g., construction, textile manufacturers). For example, there are at least eight migrant communities in the four central urban districts in Beijing: "Wali" and "Laiguangyin" communities in the Chaoyang district; "Dongshang" and "Zhongguan" communities in the Haidian district; "Babaoshan" and "Pingguoyuang" communities in the Shijingshan district; and "Majiapu" and "Dahongmen" in the Fengtai district. Each of these communities has at least 10,000 migrant residents. The Zhejiang village (demolished in 1996 and rebuilt in 1998), for example, alone had about 100,000 migrants in 1995 (Zhang 2001). The migrant communities in Nanjing are mainly scattered outside the metropolitan area and located along the major highways. Most of the migrant communities in Nanjing are also named with the migrants' common place of origin such as "Auhui village," and "Xuzhou village" (Zhou 1997). In addition to these self-enclosed migrant communities, many employers in labour-intensive sectors (e.g., construction, entertainment establishments, beauty salons) often provide migrant workers with dormitory-type housing as a means to attract and/or manage migrant workers.

Housing

Most of the migrants are housed in densely populated areas under poor sanitary conditions (Wan 1995; Duan and Zhou 2001; Zeng 1997; Huang 2000). During our interview in Beijing, one 21-year-old male described his domicile: more than 30 people slept in bunk beds in a single room in an unfinished underground storehouse without a window, showers or air ventilation. They were only allowed to take a shower or bath at a nearby building once per week.

Duration of Stay

A 1996 study in Beijing indicated that 24% of the migrants stayed in Beijing for three months or less; 21% stayed from three to six months, 31% stayed from 6 to 12 months, 16% stayed from one to three years, and 7% stayed in Beijing more than three years (World Bank 1997). A 1997 study found that 22% of migrants in Beijing stayed one to three years and 18% stayed more than three years (Zeng 1997). There has been a general trend for a longer stay, particularly among young migrants. A 2000 survey in the Jiangsu Province found that the average stay of young female migrants (mean age 20.8 years old) was 23 months (Huang 2000).

Employment

One-third (33.4%) of the migrants were considered to be "self-employed," 20.2% worked for individual or private business, and 11.8% had their own business (i.e., had at least one employee) (CNBS 2001). Only about 13% of migrants worked for state or local government-owned business, collective business, corporations, foreign joint-adventure, or other large business, compared to 74% of urban residents with employment in the same category. Among the "self-employed," most of them

were working in jobs that urban residents generally find inferior or distasteful (e.g., street food/goods vendors, bicycle or shoe repair, garbage and recyclable collection).

Challenges in City

Worldwide, transitions are difficult; this experience was no different for rural-to-urban migrants in China. Despite their hopes that the city would bring fortunes or opportunities not possible in their villages, many had experiences similar to that of a young man who recalled: "The first time I came to Beijing was 1999; I was only 17… It was really hard. I only had money for taking the bus and all I could afford to buy for food was one big cookie. And the permit checking was very strict in Beijing. I didn't want to beg for help, and so I slept in a big tree." Even those fortunate enough to find work often discovered that they were being taken advantage of by their employers – and with no recourse: "I worked for half a year and earned only 500 Yuan [approximately US $62]. No more! I was tricked by the boss!"

For migrants, the opportunity to find employment that included housing was highly desirable, although often the housing conditions themselves were not optimal: "We cannot care much about personal hygiene. We have too many people. There are 50 [migrants] in our company. We live in a big room. And we plan to have more people soon. The plan is to have 80 people and we will live in two rooms. It is actually a big underground storage space." The challenges in the cities also included unfulfilled physical and emotional needs. One 27-year-old female migrant, who was in Nanjing with her husband, described her sex life in the city: "We live in the company's dorm; we don't have money to rent an apartment. So we basically don't have any sex life. During the four years of working in Nanjing, we almost had no sex, except when we went home during the holidays."

Despite these personal hardships and the initial financial disappointments, many of the migrants grew to embrace this new lifestyle, with its economic rewards, conveniences and faster pace. One young man observed: "Working in here, you get yourself fed, and you get money. Working home – to be honest, you got to be so angry – and it was too tiring. If you work at home [on the farm], you need to pay this, pay that, this fee, that fee, all kinds of taxes. You have nothing left for living."

Mental Health among Rural Migrants in China

There is limited data available on the mental health status of rural-to-urban migrants in China. Through a search of electronic databases including MEDLINE, PsycINFO and Sociological Abstract (CSA), we have only located one English article in this area (Shen et al. 1998). Shen and colleagues examined the mental health symptoms among 371 (166 males and 205 females) migrant workers in Shenzhen, China. They found that migrant workers (mean age 22.90±2.67 years) had poorer mental health status, as measured by SCL-90, than their non-migrant counterparts and general population in China (i.e., the Chinese norms on SCL-90). In their stepwise regression model, several psychosocial factors were found to be predictive of mental health symptoms. These factors include neuroticism, psychological pressure, income, home sickness, marital or love problems, extroversion and introversion, living conditions and social status (Shen et al. 1998). Our qualitative interviews revealed that some migrants in cities demonstrated hostility, social isolation and poor social adjustment. For example, most migrants acknowledged that they did not have any friends in Beijing except knowing some fellow villagers. One 23-year-old girl (a karaoke and dance club attendant who had been in a city for over six years) described her feeling towards people in [name of the city]: "After staying in [name of the city] for so many years, I feel that [name of the city] is so-so; nothing is particularly good. [Name of the city] people are not good. I do not know how to describe them but … women are like shrews and men like thieves …" One 20-year-old male (express delivery worker) described his trouble with sleeping when he came to Beijing. He often could not go to sleep the whole night and often had nightmares: "I cannot describe the situation in my dream. It was a nightmare by all means, but I do not know what kind of nightmare. I soaked wet [sic] when I woke up …"A 20-year-old male repairman described the instance where he drank eight bottles of beer one time and said: "For people like us, when we felt bad, smoking and drinking are the only way to divert ourselves [from bad feelings]."

Stigma and Stigmatization: Conceptual Framework

Stigma has been described by U.S. sociologist Erving Goffman as a quality that significantly discredits an individual in the eyes of others (Goffman 1963). Stigma has important consequences for the way in which individuals come to see themselves. Although there is great variation in conceptualizing stigma (Stafford and Scott 1986), stigma is generally considered to be an attribute used to separate affected individuals from the normalized social order (Gilmore and Somerville 1994). The separation implies a process of devaluation and discrimination against the stigmatized group (Gilmore and Somerville 1994). Other authors have found there is an important distinction to be made between "felt" and "enacted" stigma (Jacoby 1994). Felt stigma arises from the real or imagined stigmatizing response of others, while enacted stigma refers to actual acts of discrimination (Jacoby 1994; Scombler and Hopkins 1986). Some authors choose to refer to discrimination as "enacted stigma" (Malcolm et al. 1998), while "felt enactment" is composed of the "actions or treatment based on stigma and directed toward the stigmatized" (Bunting 1996). Because the concepts of stigmatization and discrimination are closely linked, they are frequently referred to together in this article.

Enacted Stigma

Gilmore and Somerville (1994) have described four main features of any stigmatizing response: the problem that initiates the reaction; the identification of the group or individual to be targeted; the assessment of stigma to this individual or group; and the development of the stigmatizing response. Link and Phelan (2001) proposed a conceptual framework of stigma. In their model, stigma is a process during which five interrelated components converge. The five components include "Labelling" (people identify and label human differences); "Stereotyping" (link labelled individuals to undesirable characteristics or negative stereotypes); "Separation" (place labelled individuals in distinct categories, separating "us" from "them"); "Status loss" (labelled individuals experience devaluation that leads to unequal outcomes); and "Discrimination" (systematic disapproval, rejection and exclusion towards labelled individuals). According to the model, stigmatization is "wholly contingent on access to social, economic and political power that allows the identification of differences, the construction of stereotypes, the separation of labelled persons into distinct categories and the full execution of disapproval, rejection, exclusion and discrimination" (Link and Phelan 2001: 3). Enacted stigmatization is linked to power and cultural beliefs that dominate society and in the norms and values that govern much of everyday life. It creates, and in turn is reinforced by, social inequality. It causes labelled individuals to be devalued and shamed, and others to feel that they are superior. In addition, as a cyclical process, much stigmatization against labelled individuals not only builds upon but also reinforces earlier negative stereotyping.

Felt Stigma

Felt stigma refers to feelings that labelled individuals experience when they internalize the negative responses and reactions of others. It may have an important role to play in affecting the mental health and "policing" the behaviour of those stigmatized. Felt stigma is harmful, both in itself – it can lead to depression, feelings of worthlessness, shame, guilt, low self-esteem, low self-efficacy, withdrawal, and isolation of stigmatized individuals – and because negative thoughts often lead individuals to do or not to do things that harm others or deny them services or entitlements.

Examples of Enacted Stigmatization against Migrant Workers in China

"Stereotyping"

Rural migrants have been distinctly "labelled" and negatively "stereotyped." The common images of rural migrants created by the media are of people who are poor, dirty, ignorant and prone to violence (Huai 2001). In addition, rural migrants have been frequently blamed for the increasing crime rates and social instability in the cities. It was reported by Chinese authorities that "migrant crime" (a distinct crime category used recently by the Chinese justice system and the media to refer to crimes

committed by migrants) accounts for the majority of the crimes in the society. According to the media, migrant crimes accounted for 60% of the total crimes in Beijing in 2001 (Shi 2002). Migrant crimes were reportedly as high as 70% of the total crime in some suburban areas in Beijing. In one southern province where drug trafficking is prevalent, one government agency publicly claimed that "all drug trafficking in the province were committed by floating population" (Guan 2002). While some scholars in China have questioned the use of "migrant crime" as a distinct crime category in government reports (parallel to burglary, rape, homicide, etc.) and the way "migrant crime" statistics were calculated by the law enforcement agencies, such reporting is still a common practice by the government and media in China. Rural migrants (as a whole group) were also blamed in large part for the HIV/STD epidemic in China. The Chinese Minister of Health publicly exclaimed in 1996 (with no sero-prevalence statistics on which to base his assertion) that "the 80–120 million people in the 'floating population' which moves throughout the country in search of work carry the HIV virus into China's population centres" (Wu and Zhou 1996).

"Separation"

The migrants are regarded by governmental officials and local residents as a drain on urban public resources and a threat to the well-being of urban society, despite the fact that the cheap labour and services provided by rural migrants are in high demand in the cities. The following excerpts are from an official document in Beijing: "Outsiders are a necessity for the modernization of the city, since modern cities benefit from the labour services provided by the outsider labour force to their basic industries and essential service provisions; but the cities also have to expend a certain amount of social capital on them. Because the government has a direct responsibility for the development of the social economy and increasing the quality of life for the city residents, both the government and city residents hope that they can get maximum benefit from the labour services provided by outsider workers while at the same time minimizing the social capital expended [on them]. The basic means is to increase the costs of migration, in order to control the overall number of outsiders …" (Beijing Committee of the Democratic League 1999). Such beliefs have been incorporated into some societal policies and institutions. For example, migrants have to pay more than local residents for many of their daily essentials such as housing, utilities, education and transportation. In some central urban districts in Beijing, migrants were not permitted to purchase an apartment unit. In one district of Beijing, for a house rented to or occupied by migrants, the occupant was charged .82 yuan per watt of electricity compared to .42 yuan for local residents. Since 1998, Beijing public transportation authorities have prohibited non-Beijing residents from purchasing a monthly discount bus pass (Wu 2001).

"Status Loss"

According to China's existing laws, a person living in a city without a city "hukou" is required to have a "temporary residency registration" with the public safety agencies. However, most of the rural-to-urban migrants do not have such a license because of the cumbersome and costly procedures required to obtain such a license (Zhou 1997). The government considers the "unregistered" rural-to-urban migration as "illegal" and is attempting to control the migration by a number of restrictive and coercive actions in the cities. There are periodic campaigns for "cleaning-up" (illegal migrants) in many urban areas. The campaigns consist of arresting and deporting migrants back to their home villages. In the first six months of 2002, Beijing municipal government claimed that they had arrested and deported 180,000 "illegal" rural migrants and promised to increase such actions in the future (Wu 2001). During our interviews in Beijing, a 20-year-old male described his experience and his feelings about actions taken by the local government:

> Beijing's joint public safety force ... is not fair in checking our registration or permits! … It was the most difficult situation to handle. If you have your registration card, but do not have a temporary residency permit, they will arrest you and fine you. They can tear up your permit and then say you do not have it and have you pay a fine. Also about deportation, I really do not

> understand it … it was said because of the social order in Beijing, but it was attitudes towards outsiders … Deportation will cost [migrants] five or six hundred yuan … when they deport you, they put you in the van they used to transport prisoners and treat you like a criminal … how can they do that to me? I am this country's citizen …! I do not know whether [the government] has ever thought about our workers. Hope they will think a little bit more for the workers. I was deported last time. I came from Jiangxi and I had required permits, but they still deported me. I came from Jiangxi, but they sent me to Changsha [a city in a different province]!

"Discrimination"

Rural migrants have to overcome a number of barriers in seeking legitimate employment. First, rural migrants are required to pay as many as 12 different fees to local government and obtain up to six governmental registrations or permits for employment (Krieger 1999). These documents include: temporary residency permit, certification for migration, permit for employment, health certificate, certification of marital status and compliance with family planning policy. It normally takes migrants at least three months and costs them from 500 to 1,000 Yuan (about one month salary for most of migrants working at city) to obtain all required documents for employment. Most of these permits/registrations have to be renewed annually. The second barrier is government restrictions on employing migrants in certain major industries and corporations. For example, Beijing municipal government published annual guidelines permitting or restricting certain occupations to employ migrants. In 1999, the list contained at least 36 "restricting" occupations that include telephone operators, store salesclerk, bus driver and conductor, box-office clerk, warehouse clerk and hotel attendants (Wu 2001). The migrants were only allowed to work on jobs related to the handling of corpses, sewage, chemical wastes and construction. In addition to the official restrictions, local businesses also set up preferences to disqualify migrants in their recruitment. For example, almost all the job advertisements in Beijing's local newspapers list "Beijing residency" as an essential requirement. Even most manual jobs open to migrants (such as those in the job market) require "high school education."

"Unfair treatment"

The economic situation and legal status of migrants give them limited options for appropriate employment; many of them are forced to accept jobs with unfair terms and low pay. Some of them have to work "illegally" in informal sectors for minimal salary and substandard working conditions without basic employment rights or job security. Because of the lack of government regulation protecting migrants' rights, many migrants have to work overtime, either as part of their job contract, or to achieve economic survival. Some employers purposely hire migrants without required permits or retain migrants' permits in their own custody, so the migrants have no way to leave and have to endure whatever the employers offer to them. Some employers (particularly those in construction) will promise migrants certain wages, but will only pay the migrants a small allowance (about one-tenth of their wage) monthly and withhold the rest ("back wage") (Huai 2001; Wu 2001). If migrants decide to leave before the project is accomplished, they may lose their entire back wage. A recent homicide case involving a migrant worker who killed four people over 5,000 yuan (about $625) in wage arrears was much publicized in China (Liu 2005). The migrant worker had worked over a year for a building contractor before quitting. However, the contractor refused to pay him the withheld wages, which totalled about 5,000 yuan. The migrant worker chose to end the long confrontational dispute by stabbing the contractor and three others to death. According to a report published by the Beijing-based Legal Aid and Research Center for Youth, employers throughout the country owe migrant workers more than 100 billion yuan ($12.38 billion) in withheld wages (Liu 2005).

"Exclusion" (Education opportunity for children)

Members of the migrant population are often denied many of the basic privileges enjoyed by urban residents, such as access to subsidized housing, subsidized medical care and schooling for their

children. Compulsory education in China, which was implemented in the late 1980s, consists of nine years of schooling including six years of elementary school (Grades 1–6) and three years of middle school (Grades 7–9). However, under China's hukou system, only the local government where a child's hukou is registered is responsible for providing the child with compulsory education (Wan 1995). (It was estimated that 1.8 million school-aged children who migrated to urban areas with their parents were not able to access their right to "compulsory" education (Human Rights in China [HRIC] 2002). Because of increasing social concern about this problem, the Chinese government has posted a number of regulations since 1996 allowing the enrolment of migrant children in schools and encouraging communities to set up privately owned schools for migrant children. However, the majority of migrant children are still denied the opportunity for quality education in urban areas either because of their parents' "illegal status" or because their parents cannot afford the additional fees (usually five to six times higher than what urban residents pay) the school charges for their enrolment (Wu 2001). A survey indicated that only 12.5% of migrant children 6 through 14 years of age in Beijing attend public schools (Shi 2002).

Stigmatization and Mental Health

Several social and psychological theories developed in the United States have hypothesized that the experience of stigmatization may result in negative psychological and physiological changes among stigmatized individuals and lead to greater risk for depressive distress and anxiety, and to higher rates of some psychiatric disorders (Mays and Cochran 2001; Krieger 1999). Societal Reaction Theory (Link and Cullen 1990) or Labelling Theory (Link and Cullen 1992), for example, directly addresses the effects of stigma and negative social attitudes on stigmatized individuals. According to these theories, stigma may lead to labelling and negative societal reaction. As a consequence, stigmatized individuals develop adaptive and maladaptive responses that may include psychopathology (Link and Cullen 1990). Symbolic Interaction Theory and Social Comparison Theory (Stryker and Statham 1985) also hypothesize that negative attitudes and actions from others lead to negative self-perceptions (Rosenberg 1979) and adverse mental health outcomes (Crocker and Major 1989; Jones et al. 1984). Consistent with the Theories of Distributive Justice and Equity (Adams 1965; Walster et al. 1978), Williams and colleague (Williams and Williams-Morris 2000) contend that a higher level of unfair treatment in day-to-day life resulting from a socially stigmatized status can lead to the induction of psychological distress.

A growing body of research on social inequality and mental health outcomes in the United States has provided empirical support for these theories. For example, a study among gay men in New York demonstrated that stressors related to their stigmatization (e.g., internalized homophobia, expectation of rejection and discrimination, and actual prejudice events) were positively associated with distress and independently contributed to a number of mental health symptoms (Meyer 1995). Link and colleagues also indicated that stigma and labelling are related to adverse effects on self-esteem among the mentally ill (Link and Cullen 1990; Link 1987; Link et al. 1987). Williams and colleagues, in the Detroit Area Study (DAS), have also suggested an association between perceived discrimination (both chronic and acute) and mental health, depression and psychological distress (Ren et al. 1999; Williams et al. 1997). Kessler and colleagues, employing data from National Survey of Midlife Development in the United States (MIDUS) (Kessler et al. 1997), demonstrated the associations of perceived discrimination with mental health. Also using MIDUS data, a study found that perceived discrimination was positively associated with both harmful effects on quality of life and psychiatric morbidity among homosexual and bisexual individuals (Mays and Cochran 2001). Based on these empirical results, several investigators concluded that both the psychological and physiological correlates and consequences of discrimination are similar to those of other psychosocial stressors (Dion et al. 1992; Thompson 1996; Al-Issa 1997; Kessler et al. 1999).

Effects of Migration and Stigmatization

The global literature has suggested that migration is associated with a greater risk for poor health

in general and mental illness in particular (Williams 1989; Williams and Berry 1991). This may be due to situational and psychosocial factors such as the impact of socio-cultural patterns of the migration, their economic transitions, reduced availability and accessibility of heath services, and the difficulty of the recipient community healthcare systems to cope with the traditions and practices of the migrants.

Based on the observation that migrants often experience strong feelings of loneliness, alienation, de-socialization, low-esteem and an inability to cultivate or sustain social relationships, the Theory of Social Isolation suggests that situational and psychological isolation (e.g., separation from one's network of social interaction and their original culture and value) precipitates mental illness and that subjective interpretation of isolation may predispose migrants to mental health symptoms (Weinberg 1966). The theory also suggests that a severe limitation of contact and communication with the recipient society and community causes the migrants great stress in the performance of their social roles and might directly or indirectly contribute to the onset of mental illness (Kuo 1976).

In early research on migration and mental health, Kantor (1969) pointed out that migration involves changes in the environment, which implies adjustments on the part of the migrants, and these adjustments may be reflected in improved or worsened mental health. Two existing theories, the Theory of Cultural Shock (TCS) (Oberg 1960) and the Theory of Culture Change (TCC) (Papajohn and Spiegal 1971) emphasize the effect of the acculturation or adjustment process on migrants' mental health. The TCS proposes that migrants entering a society substantially different from their native community will find it difficult to adjust to the "hosting" community because of the value conflicts and feelings of personal inefficacy. The TCC hypothesizes that among migrants undergoing acculturation, adaptation of competing cultural values of the hosting community and deviation from (or devaluation of) their native culture will result in a disruption and a shift in the cognitive and affective modes of behaviour and will have a disruptive effect on their psychological functioning.

The Theory of Goal-Striving Stress (TGSS) proposes the discrepancy between a migrant's pre-migratory aspirations and post-migration achievements (i.e., goal-striving stress or unfulfilled aspiration) is the source of mental distress (Williams and Berry 1991). The TGSS contrasts with other theories in that psychological stress due to other stressors in the migration process (e.g., cultural shock) may be mediated by a lower degree of goal-striving stress (Parker et al. 1969). Studies among Vietnamese immigrants in the United States have found that a high level of goal-striving stress results in elevated symptom levels (McKelvery et al. 1993; McKelvery and Webb 1996).

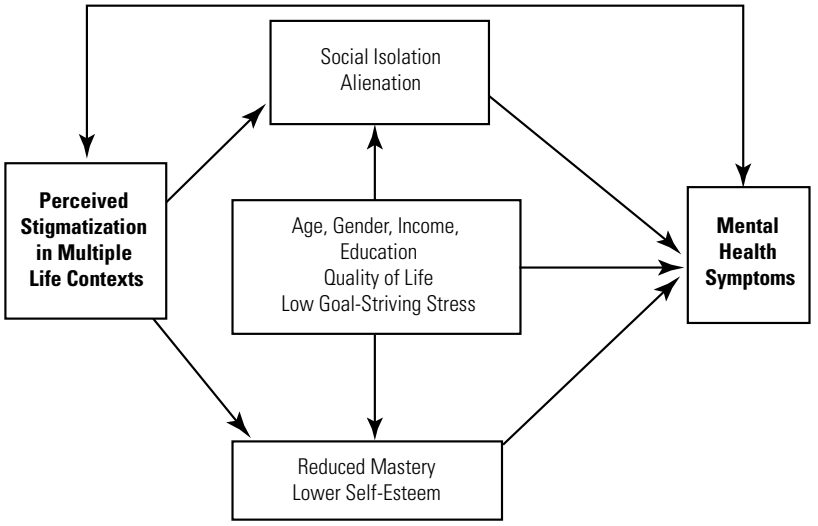
In addition to those psychosocial stressors associated with the migration process, migrants are also frequently discriminated against because of the stereotypes associated with migratory status (e.g., "outsiders"). As discussed in the preceding section, such stigmatization causes anxiety and distress – factors that are known to contribute to mental and physical illness. One of the questions of interest to this article is whether perceived stigmatization has an additional effect to the routine situational and psychosocial stressors associated with migration on the psychopathology among migrants. Several investigators have tried to answer this question among other types of migration (such as immigrants, refugees). For example, studies (Kuo 1995; Noh et al. 1999) found that Southeast Asian refugees in Canada who experienced racial discrimination had higher depression levels than those who had not perceived any discrimination. Also studying immigrants (including Chinese immigrants) in Canada, researchers suggested an association between ethnic discrimination and higher levels of stress, anxiety, depression and hostility (Dion et al. 1992; Dion and Barn 1975; Dion and Giordana 1990; Miritsuga and Sue 1983). While these findings are very informative in guiding the design and development of the hypotheses in this article, direct application of any specific finding to Chinese migrant workers is limited for at least two reasons. First, existing studies have been conducted largely among migrations that were in the form of permanent resettlements such as transculture or transcountry immigrants, war refugees or internal migrants in North American and European countries (Kuo 1995; Noh et al. 1999; Dion and Barn 1975; Dion and Giordano 1990; Miritsuga and Sue 1983; Sluzki 1986; Pernice and Brook 1996). Second, most of the migration in earlier studies was driven not only by economic reasons but also by cultural, political, ecological or religious reasons.

Impact of Stigmatization on Chinese Migrants: A Conceptual Model

While there have been numerous instances of stigmatization and discrimination against rural migrants, there is very limited systematic scientific enquiry exploring the forms and sources of the stigma and the impact of the stigmatization on mental health among this vulnerable population. Based on our observation of the situation in China, we will propose a conceptual model and some hypotheses in this article. These hypotheses and conceptual model will inform and guide future study to explore the association between stigmatization and mental health among this population.

While there has been some theoretical speculation and empirical evidence that stigmatization is a chronic stressor that relates to psychopathology, few studies have addressed how perceptions of stigmatization are directly or indirectly related to psychopathology. Diaz and colleagues (2001) tested a theoretical model between social discrimination (e.g., experiences of homophobia, poverty and racism) and mental health (symptoms of psychological distress) among gay and bisexual Latino men. In the model, they hypothesized that social discrimination influenced mental health through its effect on social isolation and low self-esteem. They also hypothesized that the impact of social discrimination would be mediated by a number of resiliency factors (e.g., community involvement, family acceptance, life satisfaction, role models) that diminished social isolation and increased self-esteem. The data from 912 gay and bisexual Latino men in three US cities generally confirmed the model (Diaz et al. 2001). Similarly, in a study among 3,012 adults of Mexican origin in California, Finch and colleagues found that perceived discrimination was directly related to depression and that the effect was moderated through a number of psychosocial factors (e.g., level of acculturation and gender) (Finch et al. 2000). Dion and colleagues (1992) also suggested that discrimination has a direct link to depression and operates indirectly through stress and diminished self-efficacy. Building upon this previous research, we propose to adapt the model employed by Diaz and colleagues (2001) to conceptualize the relationship among stigma, migration and mental health (Figure 1). We anticipate that status-based stigmatization serves as a stressor for psychopathology and has both direct and indirect effects on the mental health status of migrants with the following hypotheses.

Figure 1. A conceptual framework of relationship among stigma, migration and mental health



First, we hypothesize that stigmatization will exacerbate the social isolation associated with migration. The Theory of Social Isolation postulates that social isolation was the most tumultuous and destructive experience associated with migration. Stigmatization may further set up psychosocial

barriers for migrants to enter a new social network in recipient communities and intensify feelings of loneliness, alienation and desocialization among migrants. In addition, in a highly stigmatizing environment, migrants may withdraw from society as a means of self-protection.

Second, we hypothesize that stigmatization will contribute to poorer psychosocial adjustment in the urban environment, and the poor adjustment in turn will be associated with increased mental health symptoms. While parts of the TCS (Oberg 1960) and the TCC (Papajohn and Spiegal 1971) offer conflicting views (Kuo 1976) and findings from studies testing these two theories have been inconsistent (Pernice and Brook 1996; Beiser 1988), both theories do imply that migrants' self-efficacy (sense of mastery) and ability to adjust, psychologically and socially, to the "hosting" community, will impact their mental health. Many authors have suggested a relationship between perceptions of mastery and self-esteem and psychological well-being (Pearlin et al. 1981; Rosenfield 1997). Therefore, we hypothesize that the stigmatization will affect migrants' mental health by damaging their sense of mastery and self-esteem and reducing their ability to adjust to the urban environment.

Third, we hypothesize that a number of demographic and psychosocial factors (such as age, gender, income, education, goal-striving stress, pre-migratory awareness) will mediate the impact of stigma on mental health symptoms. According to a number of conceptual models of stigma (Gilmore and Somerville 1994; Jacoby 1994; Scombler and Hopkins 1986), the stigmatized individuals need to internalize the "enacted" stigma for the stigma to affect their psychological well-being. Despite stigma and discrimination, most migrant workers in China and their families were financially better off than they had been pre-migration, so their economic gains may mitigate the effects of stigmatization and they may choose not to internalize "enacted" stigma. During our qualitative interviews, most migrants complained about the stigmatization and discrimination in Beijing. However, many of them also expressed pride and happiness when they mentioned the support they provided to their parents or family by sending their savings home. In addition, pre-migratory awareness of stigmatization may also mediate the effects of post-migration stigmatization experience. Our preliminary data indicate that most of the migrants were fully aware of the hardship and discrimination they were going to face in the urban area before they arrived (yet they keep coming), so they might be psychologically prepared to cope with the stigma and discrimination.

With support from the National Institute of Health Fogarty International Center and the National Institute of Mental Health, we are currently collecting data from representative samples of rural-to-urban migrant workers in Beijing to test this conceptual model. Although our data will evaluate the effect of social stigma on the mental health of migrant workers in Beijing, China, the findings and research methodology developed could well apply to migrant populations in other regions and countries.

Future Research Needs

While we hypothesize that there will be different layers (e.g., institutional, cultural, societal, community) and different forms (e.g., prejudice, rejection, discrimination) of stigmatization against rural-to-urban migration in China, many questions need to be answered. For example, what are the structures and social, cultural or economic roots of this stigma? Status-related stigma can appear in a variety of forms, at a variety of levels and in a variety of contexts. Mapping these forms will be the first step towards being able to identify their determinants. In addition, we should explore the association of migrant stigma with broader existing inequalities, injustices and denial of migrants' realization of human rights and fundamental freedoms.

A major methodological issue in stigma research has been the measurement of stigma and stigmatization (Williams and Williams-Morris 2000; Harvey 2001). The DAS study (Williams et al. 1997) and the MIDUS study (Kessler et al. 1997) have provided a comprehensive conceptual framework and a useful approach in measuring stigmatization and discrimination.

In the DAS study, a scale of major experiences of discrimination was used to measure unfair treatment due to race/ethnicity. The scale asks questions in the generic context of unfair treatment

without reference to race or ethnicity. The scale distinguishes major episodic experiences from chronic, ongoing, day-to-day experiences of unfair treatment. This scale also distinguishes past year (recent) experiences of discrimination from earlier lifetime episodes. An additional follow-up question to each endorsed discrimination item ascertained the main reason for unfair treatment. Respondents were allowed to select from a list that included ethnicity, gender, race, age, religion, physical appearance, sexual orientation and income level/social class. Thus, unfair treatment attributed to race/ethnicity can be distinguished from discrimination that was attributed to other social bases.

A revised version of the scale was used in the MIDUS survey. The measure included 11 items of "lifetime occurrences of discriminatory experience" in the areas of education (e.g., denied scholarship), work (e.g., not hired for a job), receiving financial and other serves (e.g., denied a bank loan) and experience with social hostility (e.g., forced out from neighbourhood by neighbours). Respondents were also asked to indicate how frequently (never, rarely, sometimes, often) they experienced each of nine types of discriminatory behaviours on a day-to-day basis (e.g., "people act as if they think you are not as good as they are"; "people act as if they are afraid of you"). Those respondents who indicated any occurrence of discrimination were asked to select one or more of 10 possible causal reasons for the discrimination (e.g., age, sex, race, ethnicity, physical appearance characteristics). The outcomes of stigmatization and discrimination were assessed using two questions regarding the extent (not at all, a little, some, or a lot) to which discrimination has "interfered with having a full and productive life" and "had made life harder." The approaches and format employed in the MIDUS survey may be culturally adapted in future study to assess the stigma and stigmatization among rural migrants in China and other nations or regions.

It is worthwhile to note that most of the assessment approaches in the literature only measure individual level "perception" of stigmatization rather than directly assess institutional or societal stigmatization. Previous research has argued that the effects of institutional and societal stigmatization will most likely be captured in individual perceptions and experiences and in the measures of socioeconomic status (Finch et al. 2000).

It is also clear from the preceding sections that the process of stigmatization can have a wide range of adverse consequences on the well-being of the stigmatized individual. The question then becomes, how best to quantify those consequences. Mental health outcomes, variously characterized in literature as psychological distress, depression, self-esteem, anxiety and psychopathology, have been consistently documented and are therefore a specific focus of this article. However, to asses mental health symptoms alone may not be sufficient, given the observed impact of stigmatization on physical health and social interactions. Therefore, to more fully explore and quantify the outcomes of stigmatization, a broad-based assessment of overall functioning and well-being will add breadth to the measurement and increase our odds of detecting the true impact of migration-related stigmatization. Measures such as quality of life will offer such an assessment by including indices of physical, mental and social well-being.

It has been estimated that the rural-to-urban migration process will accelerate at an annual increase of 8.5 million migrants in the coming decade as modernization and industrialization proceeds in China (Wu 2001). The stigmatization associated with migration will have a negative impact on different levels of society. The identification and development of appropriate interventions to address social stigma require both a good understanding and preliminary data regarding the forms, contexts and outcomes of the social stigma and the mechanisms by which the social stigma affect mental health among the migrant population. Future studies are needed in this regard to enrich our knowledge.

The migrant population has attracted considerable attention from the government, media and society at large. However, there is virtually no systematic scientific effort to study the issues of stigma and mental health among this large and increasing population. Future efforts are needed to develop the local infrastructure and capacity of mental health research among the local professionals. Efforts are needed to bridge the gap between advocacy, policy-making and research in the field by applying a participatory approach that involves many societal sectors (e.g., academic, governmental, communities and migrants) through the research process.

There are mass movements of economic migrants (e.g., rural-to-urban) in many developing countries, particularly in Asian countries (Haour-Knipe et al. 1999). This economic-driven migration is occurring extensively in Western Europe and the United States as well. In particular, Latino immigration to the United States for economic reasons is very large (Finch et al. 2000) and presently very visible due to proposed legislation (Weisman 2006). These migrations will pose challenges to the moral, security, family and disease prevention infrastructures in each nation. Although little research has been conducted to address stigma and mental health issues among these migratory populations, there is certainly an urgent need for addressing stigma and mental health promotion among migrants and to devise effective, affordable and culturally appropriate stigma reduction interventions targeting these populations. Lessons we are learning from the China experience could benefit relevant research on the mental health impact of migrants for economic purposes to the United States and other regions/countries. Future studies, particularly with cross-culturally validated assessment instruments, will benefit other regions and nations in social stigma reduction and mental heath promotion among migratory populations.

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Assessment of Socio-economic Status in the Context of Food Insecurity: Implications for Field Research

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Abstract

Measures of socio-economic status (SES) were compared with a measure of physical well-being, mid-upper arm circumference (MUAC), in the food insecure regions of Ethiopia. Income, housing conditions and education had the greatest correlation to MUAC, and significant differences in these measures were observed between malnourished and adequately nourished individuals. Findings indicate that in rural Ethiopia, income, education and housing quality may be better indicators of SES than wealth and measures encompassing home and landownership.

Introduction

Socio-economic status (SES) usually refers to components of economic and social status that distinguish and characterize people (Morris et al. 2000). While the relationship between SES and health has received increasing notice over the past 50 years, relatively little attention has been devoted to defining SES, validating existing definitions or evaluating existing measures. Lack of conceptual clarity and the bypassing of standard techniques have retarded the measurement of SES (Oakes and Rossi 2003). Indicators of SES are meant to reflect access to social and economic resources that may vary over time (Duncan et al. 2002). Many indicators of SES exist (see Oakes and Rossi 2003 for complete description); however, there is little agreement over which indicators are most

useful (Winkleby et al. 1992). In the context of developing countries, even greater challenges exist in measuring SES, because many indicators are unreliable and insensitive in the framework of developing world economies.

Frequent measures of SES in developing countries include proxies of wealth, income, expenditures, education and housing conditions (Morris et al. 2000). Recent research in Africa alone uses a multitude of indicators, suggesting there is little consensus within the research community. In addition to controlling for educational attainment and housing conditions, studies used self-reported income, asset ownership, expenditures and indices built on a combination of these factors or principal components analysis (Kannae and Pendelton 1998; Groenwald and Tilahuan 1990; Manunebo et al. 1994; Kuate Defo 1994; Morris et al. 2000; Carme et al. 1994; Mock et al. 1993; Gage 1997; Omar et al. 1994; Schellenberg et al. 2003). While measures of SES are consistently associated with health outcomes, indicators are not interchangeable because they measure different components of SES (Adler et al. 1994; Krieger et al. 1997; Williams and Collins 1995; Winkleby et al. 1992). Most field research employs indicators that measure only one or two components of SES; consequently, certain elements of SES are not represented and the degree and significance of correlations between SES measures and health outcomes varies by the components of SES that are assessed.

In many contexts, particularly program evaluations and field research where assessment of SES is not the primary objective, SES is measured by a proxy of one of its components (i.e., income, wealth, education, etc.). Few studies assess multiple components of SES unless at least one indicator is used as a control variable. Consequently, SES is estimated based on a variety of proxies, which may not have relationships with each other, calling in to question the validity and comparability of commonly used indicators. While it is clear that indicators measuring different components of SES are not equivalent, researchers are faced with the challenge of selecting measures of SES that are most relevant to the outcomes of study, and they face limitations in terms of the reliability and practicality of potential indicators.

All proxies are imperfect measures of SES. The principal drawback of income indicators is they are usually self-reported. Inaccuracies are related to reporting biases from (1) motives to report increased or decreased incomes due to misconceptions (such as the belief that survey responses will qualify respondents for aid; (2) the seasonal nature of incomes in agricultural economies results in an increased likelihood of measurement error when monthly income is reported; (3) rapid inflation may increase the difficulty of estimating income over extended periods of time and result in recall bias; (4) in traditional societies where barter is common, the concept of an annual income is unfamiliar to individuals who live day-to-day and may not be able to accurately approximate annual income.

Wealth is a component of SES that is often estimated using material assets. Incorporation of home and landownership in wealth measures is important to consider because of their importance in agricultural economies. However, estimating the value of land is difficult because of varying land quality and other factors. Most homes are constructed with a combination of purchased and gathered goods using household labour, making it difficult to attach a monetary value to the home. Valid proxies of wealth that include home and landownership may be difficult to construct in many contexts; alternatively, housing conditions may serve as a useful proxy for wealth, because in most cultures, there is a relationship between wealth and quality of housing.

Universal problems affecting estimation of SES are the issues of inclusion and weighting of components in the development of indices and composite variables. Weighting of indices and scores could be viewed as arbitrary, as their relative importance is difficult to ascertain, particularly when it may vary by the outcome of study. Methods such as asset-based approaches are dependent on the selection of items included in the measure; however, there is no clear and universally accepted methodology for selection of items, nor are there definitive guidelines for use of a wider set of assets. Ultimately, issues of component inclusion and weighting are a basis for arguments questioning the validity of composite indicators and indices that are frequently used proxies of SES.

Finally, it should be noted that measures of income, wealth and housing conditions ignore intangible non-material assets of social and human capital, both of which are important components of

social well-being and SES (Morris et al. 2000). Educational attainment is a common measure of human assets; however, it fails often to directly measure skills associated with income generation. In developing countries where unemployment and underemployment are prevalent, educational attainment may be a poor measure of SES because of lack of employment opportunity. Similarly, occupational class may inadequately measure SES, particularly in rural areas where reported occupational class is likely to be homogeneous.

The present study was conducted in Southern Ethiopia after a period of drought that resulted in inflation of staple food prices and regional food insecurity. As part of a study of coping strategies in the context of chronic drought and food security, we attempted to measure SES using a variety of indicators. Ideally, an objective measure of well-being could be used to define SES and commonly-used proxies of SES could be compared to this reference; however, no gold standard indicator exists. In addition to comparing associations between different components of SES, the study examined mid-upper arm circumference (MUAC), an objective measure of physical well-being that is recommended for assessing acute adult malnutrition (FANTA 2003). Nutritional status is a plausible biological measure of physical status in the context of food insecurity, because people with better SES are likely to have enhanced nutritional status because they have more resources to meet nutritional needs. In Ethiopia, where food insecurity is prevalent, variation in MUAC by SES is anticipated because access to food is most limited in poorer segments of the population.

Methods

A survey of 819 households was conducted in April 2003 in two predominantly rural sites in southern Ethiopia. A severe drought occurred in the region in 2002/2003, and the two locations were selected because they were affected by drought. The survey was primarily intended as an assessment of population coping capacity in chronic drought conditions and microfinance program outcomes. The primary survey site was the town of Sodo and three surrounding districts in the Southern Nations, Nationalities and Peoples Region (SNNPR) of southern Ethiopia. Three-quarters of the sample was drawn from the Sodo survey site (N=614). The remaining sample (N=205) was drawn from the town of Nazreth and two adjacent districts. Nazreth is located in the East Shewa Zone of the Oromiya region, approximately 100 kilometres southeast of Addis Abba in central Ethiopia. Participants were systematically selected from client lists of the microfinance organization (i.e., every n^{th} client) or were randomly selected neighbourhood controls that were matched by proximity of residence and sex to microfinance clients that were participating in the survey.

Measures of SES included putative proxies of income, wealth, living conditions and education. Selected indicators allowed for the measurement of multiple components of SES and were developed based on commonly used measures. Specific indicators were: reported monthly household income; per capita monthly household income; household asset and livestock value; household asset and livestock index score; housing conditions index score; housing conditions and home/landownership index score; household head educational attainment. Income and asset values were originally reported in Ethiopian Birr and later converted to US$ at a rate of 8.60 Birr per one US dollar (Universal Currency Converter 2004).

Household income was estimated (on a monthly basis) by asking the respondent about economically active members of their household and the money- or product-generating activities in which they were engaged during the year preceding the survey. The monetary value of products produced for barter was used when goods produced were traded and not sold. Because wage income is not frequent in rural areas of Africa, and because work for products is common, income estimates may have relatively low validity due to the difficulty in estimating the monetary value of what is exchanged or produced as the result of labour. In the case of agricultural households where income is largely seasonal, the total harvest income was divided by 12 to obtain an estimate of average monthly income from seasonal sources. Per capita monthly household income was also used as a measure of SES because it incorporates household size (which is often related to SES) and allows for better comparison of income between households. A concern with using per capita income as indicator in

the context of food insecurity is that household size may decrease in times of food shortage (resulting in an artificially elevated per capita income). This is because a common coping mechanism is for household members to leave, either to seek food or work elsewhere in times of food shortage.

Household assets ownership was assessed using an index of 19 currently owned household and productive assets: mosquito nets, shoes, pots and pans, kitchen utensils, table, chairs, cupboard, buffet, refrigerator, television, radio/tape recorder, mattress and bed, sofa, bicycle, cart, animal-drawn plow, agricultural hand tools, metalworking machine and woodworking tools. Assets in the index were those commonly included in asset indices used to estimate wealth in rural Africa and were established based on previous studies (Morris et al. 2000; Schellenberg et al. 2003), as well as preparatory work in the survey region that identified locally important assets. The market value of each item in the index was estimated by averaging values reported from the primary market locations in both survey sites. Ownership of livestock and small animals was also recorded, as these are often principal assets in agricultural households. Seven types of livestock were included: horses, donkeys, oxen, cows, goats, sheep and poultry. In the case of livestock, market surveys were completed in regional markets using animals of average nutritional status (nutritional status was a more important predictor of animal value than animal sex).

Household assets and livestock were assessed independently and were later combined because the pooled measure better represented wealth across urban and rural households. Two measures of household wealth were developed using reported asset ownership and data from market surveys: (1) the total value of household assets and livestock (Ethiopian Birr) and (2) a household asset and livestock index. The asset and livestock index was derived using a methodology developed by Morris et al. (2000), which is based on the assumption that wealthier households will purchase and own more durable goods. Assets are weighted according to frequency in the survey population, and the index score is based on a weighted sum of items owned by the household. The index scores provide a way to estimate household wealth that is independent of item value. In the context of this study, the index approach is advantageous because the values of assets and livestock were obtained via market surveys and may be affected by measurement error. The total value of household assets and livestock was calculated by determining the value of each type of asset, and summing the value of all asset types included in the index.

Housing conditions were recorded by interviewer observation when possible. Measures of housing conditions included: roofing material, flooring material, primary energy source for cooking, household water source and sanitation facilities. Home and landownership were recorded based on respondent-reported information. Two indices for prediction of SES were developed based on dwelling characteristics. One considered home and landownership status in addition to housing conditions, while the other was based only on housing conditions. A total of seven variables contributed to the index score. Measures of housing condition and home/landownership were weighted to reflect their relative importance, because family home and landholdings are the most important assets in most households in rural Ethiopia.

All housing condition predictor variables were originally continuous; however, roofing and flooring material and energy measures were reduced to dichotomous variables, because the prevalence of some characteristics was extremely low (<2%), decreasing the need for an ordinal variable. In the case of energy source, a dichotomous variable was employed to reduce measurement error where the indicator failed to demonstrate access to electricity (it cannot be assumed that if a household had electricity it would be considered the primary source of energy). The value of a dichotomous measure of energy is limited; however, it was included based on the assumption that the poorest households are likely to use dung instead of wood or charcoal as cooking fuel. Home ownership and landownership/leasing were considered in the index as dichotomous measures. The index had a range of 0–20. Land and home ownership each accounted for a maximum of five points; roof type, floor type and primary water source corresponded to a maximum of two points; sanitation facilities and energy source were afforded a maximum of three and one points, respectively, in the index.

Mid-Upper Arm Circumference

MUAC was selected as the anthropometric measure because it is commonly used for nutrition screening in emergency situations, and because it is recommended for assessing acute adult malnutrition and prevalence of under-nutrition at the population level (FANTA 2003). Arm circumference measurements are considered as practical alternatives to BMI in multi-purpose surveys and field studies, and a robust linear correlation between MUAC and BMI has been observed in multiple international settings (WHO 1995a). In the Ethiopian context, previous research demonstrated multiple difficulties in using BMI as an indicator of nutritional status and has indicated that prevalence of malnutrition between ethnic groups has less variation when estimated using MUAC as compared to BMI (Teller and Yimer 2000; Alemu and Lindtjorn 1997). MUAC had been previously used in the Ethiopian context to assess adult nutritional status in multiple surveys with acceptable results (Tilstone 2001; Bohmer et al. 1994). MUAC was measured on each adult respondent. Because distributions of mid-upper arm circumference differ by sex, internal z-scores were employed as a measure of relative nutritional status using a sex-specific reference population. Malnutrition status was determined using sex-specific cut off points of 22.0 cm for females and 23.3 cm for males with severe or moderate malnutrition (WHO 1995b).

Data analysis was performed using SPSS Version 10.0 and STATA Version 8.0. Most indicators of SES had distributions that were skewed to the right. Measures of SES with a skewness value (g1) more than twice its standard error were interpreted as asymmetric and converted to a logarithmic scale for comparison purposes. Proxies of SES were compared using the Pearson correlation coefficient with two-tailed significance tests to assess strength of association.

The study was approved by Johns Hopkins Bloomberg School of Public Health Committee of Human Research and by local authorities in Ethiopia.

Results

Household income in Sodo was US$39 (95 CI: 36–42) as compared to US$32 (95 CI: 28–37) in Adama. Median household income was US$23 per month in both sites, suggesting that distribution of income, and thus inequality, may be greater in Sodo than Adama. The distribution of monthly household income was skewed such that it did not approximate a normal distribution (Q_1=10, Q_2=23, Q_3=55). While total household income is a common measure of SES, per capita income is useful because it provides a standardized way of comparing resource availability for individuals. Household size differed significantly by survey site: average household size in Sodo was 6.3 as compared to 5.6 in Adama (p=.002). Per capita monthly income was similar in the two sites, at US$9 (95 CI: 8–10) in Sodo and US$10 (95 CI: 8–12) in Adama. Median per capita monthly income values were much lower than mean values and were approximately US$4 per person per month in both survey sites. Per capita income distributions did not approximate a normal distribution and were skewed to the right (Q_1=2, Q_2=4, Q_3=12). A strong correlation between the two income measures was observed (r=.894, p=.000, n=802) suggesting that either variable can be used for estimation of SES.

Household assets and livestock value were used to estimate wealth. The distribution of asset and livestock values were similar between the two survey sites and skewed to the right (Q_1=396, Q_2=579, Q_3=814). Mean combined asset values were US$635 (95% CI: 579–692) in Adama and US$646 (95% CI: 615–677) in Sodo; median asset and livestock values were US$556 and US$583 in Adama and Sodo, respectively. Asset and livestock index scores ranged from 1.1 to 1,028, with a mean value of 60.6 (SD=40.9). The distribution of index scores was also skewed right (Q_1=28, Q_2=43, Q_3=64). The relationship between the asset and livestock index and the total value of household assets and livestock was relatively strong, as indicated by the Pearson correlation (r=.649; p<0.01, n=808). Compared to total monetary value of household assets and livestock, the combined asset and livestock index produced slightly different estimates of wealth that reduced inequalities between urban and rural populations.

Table 1. Correlations between measures of socio-economic status and arm circumference

	Log Asset & Livestock*	Log Assets & Livestock+	Housing Conditions+	Log Home/ landowner-ship+	HH Head Education	MUAC Score (N=807)
Log Monthly HH Income (N=802)	.061	.055	.537*	-.029	.418	.231*
	p = .092	p=.129	p=.000	p=.487	p=.000	p =.000
	N=761	N=774	N=579	N=564	N=650	N=791
Log Per Capita Monthly HH Income (N=802)	.054	.041	.509*	-.104*	.410*	.230*
	p=.136	p=.253	p=.000	p=.014	P=.000	p=.000
	N=761	N=774	N=70	N=564	N=650	N= 791
Log Asset and Livestock Value (N=808)			.060	.013	.032	.082*
			p=.157	p=.758	p=.425	p=.000
			N=548	N=543	N=629	N=765
Log Asset and Livestock Index (N=808)			.086*	.005	.045	.088*
			p=.033	p=.899	p=.262	p=.014
			N=558	N=553	N=638	N=778
Housing Conditions Ind. (N=574)					.507	.308*
					p=.000	p=.000
					N=572	N=577
Log Home/landowner-ship Index (N=659)					.069	.089
					p=.101	p=.035
					N=557	N=562
HH Head Education (N=794)						.244*
						P=.000
						N=783

* Monetary value in Birr
\+ Index score

Housing Conditions were employed as a measure of SES by developing indices based on observable dwelling characteristics and home and landownership status. Two separate indices were constructed; one that was based solely on housing conditions and another that included both housing conditions and home and landownership. Participant scores for the housing conditions index approximated a normal distribution and ranged from zero to 10 (the scale range), with a mean value of 5.5 (SD=2.4). The housing condition and home/landownership index had a potential range of zero to 20; however, the range for the survey population was 3 to 19. The distribution was slightly skewed to the left (γ_1=-0.44, SE=0.10) with a mean score of 11.7 (SD=3.1). Correlation between the two indices based on housing conditions was relatively low, with a Pearson correlation coefficient of r=.173, (p<.001), indicating that housing conditions are not a good predictor of home ownership (or vice versa).

Educational attainment among household heads averaged 7.2 years (SD=4.4). The distribution did not approximate the normal curve because of the large proportion of respondents with no formal education (N=135 or 17.0%), and modes at the endpoints of primary and secondary school (8 and 12 years of education). Education level ranged from no formal schooling to 16 years of education. Mean educational attainment in males was greater than in females, with males averaging 7.4 years (SD=4.3) of education as compared to 5.4 years (SD=4.5) among females.

Mid-upper arm circumference for adult males and females, respectively, was 25.6 cm (95 CI: 25.3–25.8 cm) and 26.7 cm (95% CI: 26.3–27.1 cm). Mean MUAC in both survey locations was greater in females than in males. Overall prevalence of malnutrition was 9.3%. Prevalence of malnutrition in males was greater than in females in both survey sites: 12.9% (95 CI: 9.6–15.7) of males and 3.9% (95 CI: 2.3–5.3) of females, respectively, were malnourished. The odds of malnourishment were 3.8 times greater in males than in females (95 CI: 2.0–7.7).

Correlations Between Proxies of SES and MUAC

Few significant correlations were observed between the eight proxies of SES; however, MUAC was significantly correlated with all SES measures (Table 1). As expected, proxies of the same component of SES were highly correlated; however, this is a result of (1) being measures of the same theoretical component of SES and (2) that indicators were sometimes constructed based on the same data. Correlations between variables derived from the same data (i.e., variables that measure the same component of SES such as asset score and asset value) are reported in Table 1 and will not be further discussed.

Significant correlations ($p<0.05$) were observed in 14 of 25 or 56% of comparisons. In general, strength of correlation between the measures of SES was relatively low. Only three of the 14 correlations had coefficients greater than 0.50, and five of the statistically significant correlations had coefficients of 0.10 or less. In general terms, associations between monthly income, per capita monthly income, housing conditions, household head educational attainment were the strongest. Asset and livestock value, asset and livestock index score and the combined housing conditions home/landownership index did not correlate well with other variables; correlations were either insignificant or coefficients were very small ($r \leq 0.10$).

Statistically significant correlations were observed between MUAC (an objective biological indicator) and all measures of SES. Regardless of the relatively low strength of correlation between MUAC score and other proxies, the fact that all correlations were statistically significant suggests that the selected measures of SES do relate to actual physical well-being when MUAC is used as an objective measure of physical/nutritional status. Strength of correlation to MUAC was the strongest for housing conditions, household head educational attainment and income indicators, respectively. Asset-related indicators and the combined housing condition home/landownership index had statistically significant correlations; however, the strength of association was very weak ($r \leq 0.10$).

Measures of SES and Malnutrition

Significant differences in both income measures were observed between malnourished and adequately nourished individuals (Table 2). Mean monthly household income and per capita income, respectively, were US$20 and US$6 greater in households with adequately nourished respondents as compared to those with undernourished respondents. No significant differences in mean asset and livestock value or mean asset and livestock index score were observed between the adequately nourished and malnourished. Significant differences in housing conditions indicators were observed when the population was divided by nutritional status. As compared to malnourished individuals, the mean housing conditions index and the mean combined housing conditions and home/landownership index in adequately nourished individuals, respectively, were 1.0 and 1.1 points greater. On average, household head educational attainment was 2.9 years greater among the adequately nourished group as compared to those that were malnourished.

Table 2. Nutrition and proxies of socio-economic status

	Malnourished (N=71)	Not Malnourished (N=722)	Mean Difference	95% CI for Difference
Mean Monthly Income (US$)	18.8	39.3	20.6*	15.1–25.9
Mean Per Capita Monthly Income (US$)	4.0	9.5	5.6*	3.6–7.5
Mean Asset and Livestock Value (US$)	577.8	648.9	71.1	–22.9–165.0
Mean Asset and Livestock Index Score	49.0	62.1	13.1	-6.1–32.3
Mean Housing Conditions Index Score	4.6	5.6	1.0*	0.4–1.6
Mean Home/Landownership Index Score	10.7	11.8	1.1*	0.2–2.0
Mean HH Head Educational Attainment	4.5	7.4	2.3*	1.8–4.0

* Significant difference ($p < 0.05$)

Discussion

Prevalence of malnutrition (9.3%) was substantially lower than previously reported rates. Acute malnutrition among women in SNNPR (the primary survey site) was estimated at 14.0% in 1997 using MUAC and the same cut off of 22.0 cm to define malnutrition (Teller and Yimer 2000). Other recent studies placed national malnutrition rates for males and females at 24% and 30%, respectively (Demisse et al. 2003 Kaluski et al. 2001; Central Statistics Authority 2001). Low malnutrition rates observed in the study are likely due to the survey design where the sample was not intended to representative of a regional population. In addition, it is likely that prevalence of malnutrition has changed, with changes being either seasonal in nature or longer-term trends over a period of years.

Asset-based measures and the combined housing conditions home/landownership index had low correlations with other SES indicators. These findings suggest that in the context of Ethiopia, and perhaps other regions in Africa where populations depend primarily on subsistence agriculture, asset-based measures and those considering home and landownership may not be ideal proxies of SES. Correlations between measures of income, housing conditions and household head educational attainment were all statistically significant and relatively strong ($r > 0.40$) when compared to correlations observed between other SES proxies. Because measures of income, housing quality and educational attainment were significantly correlated to one another and, in most cases, to a measure of wealth, these indicators of these components of SES may be more ideal for measuring SES in field situations where only a limited number of indicators can be employed.

In the present study, adequately nourished individuals were from households with significantly greater living conditions, household head educational attainment and income. These findings are aligned with previous research in the Ethiopian context, which found that household economic status and education were positively associated with nutritional status in (Demisse et al. 2003; Teller and Yimer 2000). No differences in household wealth, as measured by assets, were observed by nutritional status. Other malnutrition studies in southern Ethiopia have also documented that land holdings and livestock (a common asset among rural households) were not associated with adult malnutrition (Demisse et al. 2003). Findings of the present study, where living conditions, income and education appear to be better measures of SES than household assets, are not surprising in the context of food security and an agricultural economy.

While asset ownership in the early stages of food insecurity may contribute to increased coping capacity, in later stages of crisis, assets are often sold in order to purchase food. In addition to the

expectation that household asset value would decline among households that were using assets sales as a coping mechanism to procure food, household asset value is often in flux and may vary throughout the year, particularly in agricultural economies where harvest and livestock value evolve seasonally. Consequently, an association between household asset ownership and nutritional status would be difficult to ascertain by a cross-sectional comparison of nutritional status and wealth because of the large expected variation in household asset value and the documented relationship between coping capacity and wealth. Relative wealth (i.e., current asset value as compared to asset value before the onset of food insecurity) would be a more ideal measure; however, it is difficult to assess without a longitudinal study.

A well-documented relationship exists between SES and health, and in the context of food insecurity, nutritional status is a good descriptor of current well-being. Comparison of proxies of SES and the relationship of SES measures to physical well-being is important, because many researchers and non-government organizations in the fields of health and development use a variety of indicators as measures SES. Indicators of SES commonly used in developed countries are not always useful or feasible in the context of developing countries and become difficult, if not impossible, to employ for a variety of reasons. In most developing countries, a large proportion of the population, between 20–70%, does not participate in the formal economy and rely on self-employment or microenterprise as a primary source of income (Wilson 2001).

Several implications are apparent for the validity and relevance of standard measures of SES when a large percentage of the population subsists in the informal economy: (1) the assumed association between education, occupation and income does not apply, particularly in countries where unemployment and underemployment are highly prevalent; (2) the validity of measures of income may be low because reliable sources of income data are not available for participants in the informal economy; (3) in countries where a large degree of inequality exists in the population, common measures of SES are likely to be useful in distinguishing between classes; however, the ability to assess differences in SES within the poorest sectors of the population may be limited due to the fact that SES is more likely to be dependent on participation in the informal economy and less tangible human and social assets. Schellenberg et al. (2003) note that signs of social or economic stratification in rural Africa are often hard for outsiders to recognize and suggest that many health researchers have an erroneous perception of relative homogeneity of SES in rural Africa.

Limitations

It should be noted that previous research in Ethiopia documented low intra-household correlations on nutritional status (Lindtjorn and Alemu 1997). This suggests that low associations between individual nutritional status and household level measures of SES may be expected. Of the SES measures assessed in the study, quality of housing conditions had the greatest correlation with physical well-being of participants as measured by MUAC followed by household head educational attainment and household income. The magnitude of the coefficients observed in the present study was less than 0.50 for nearly all comparisons, indicating that measures of different components of SES are only weakly correlated, limiting the strength of our findings in terms of recommendations of proxies of SES. The relatively weak correlations observed suggest that commonly used SES indicators are not uniform measures, and that the socio-economic position of households and individuals within households may vary by the indicator used to measure SES.

Conclusions

When compared to MUAC, strength of correlation was greatest among indicators of income, education and housing conditions, and weakest among asset-based measures and the proxy including home/landownership. Measures of assets or wealth are not ideal indicators of SES in the food insecure context because they are often difficult and time consuming to obtain, may not be able to accurately reflect a diverse population, and may be depleted (as a coping strategies) in periods of prolonged food insecurity. Measures of income, housing conditions and educational attainment as

indicators of SES may be useful in providing a quantitative indication of a household's or individual's relative SES in the context of food insecurity. Significant differences in mean household income, housing conditions and household head educational attainment was observed between malnourished and adequately nourished individuals. These findings suggest that, in Ethiopia, and perhaps other food insecure areas of Africa, measures of income, education and living conditions may be better proxies of SES than measures of wealth such as assets or home/landownership. Validation of existing measures of SES and the exploration of other potential indicators are important future steps in advancing the measurement of SES in the context of developing world economies.

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The Completeness of Death Registration in Thailand: Evidence from Demographic Surveillance System of the Kanchanaburi Project

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Abstract

This study aims to assess the quality of mortality data from the registration system of Thailand. The study takes advantage of the Kanchanaburi Project by comparing the deaths found in the annual censuses to those recorded in the civil registration system in order to measure the level of under-registration. The age and sex pattern of death registration found in this study might be useful information in adjusting the data from this source. Moreover, this study also pointed out a possible gap between the multiple steps of death registration, from notifying the death to officially registering it. This finding suggested a hypothesis to be further tested.

Introduction

The vital registration system is a very significant source of population data in Thailand. The birth and death registration has been implemented in this country since 1917. According to the civil registration law of 1991, births must be registered within 15 days after delivery and deaths within 24 hours of being witnessed. The Ministry of Interior has been compiling the number of births and deaths and reporting to the public annually.

In 1995, a programme to computerize the vital registration of Thailand was accomplished. A 13-digit identification number was assigned to each Thai citizen. Data on births and deaths registered at registrar offices all over the country are entered into a central computer at the Office of Registration Administration of the Ministry of Interior. The computerization of vital registration allows more effective processing of population data in this country. The tabulation of deaths by age, sex, cause and administrative area can be more conveniently done. This source of mortality data, therefore, has

become increasingly significant in computing various demographic and health indicators.

The quality of death registration data should be examined before the data are used, however. The first question to be asked is regarding the completeness of this data source. Estimates of the degree of completeness would help us to adjust the mortality level closer to the real level. Another question about the basic quality of the death registration data is the correctness of the data on various characteristics of the deceased persons, such as age, sex, place of residence, place of death and most importantly, the cause of death. If the mortality data from the vital registration system of Thailand were of high quality, both in terms of completeness and correctness, this data source would be tremendously valuable to policy and program planning concerning the health and quality of life of the Thai people.

This study aimed to investigate the quality of death data from the civil registration system of Thailand. The quality to be assessed here was focused only on the completeness of the death registration. The objectives of this study were to know the degree of completeness of death registration in Thailand, the age and sex patterns of death under-registration and possible reasons why the registration is incomplete.

Completeness of Death Registration Resulted from the Survey of Population Change

The Survey of Population Change (SPC) explicitly specifies the evaluation of the completeness of birth and death registration in Thailand among its main objectives. The SPC is conducted by the National Statistical Office (NSO) every 10 years, at about the mid-period between the two censuses. There have been four SPCs, in 1964–66, 1974–66, 1985–86 and 1995–96. The NSO is planning to launch the next SPC in 2005–06.

The SPC is a national survey with a large sample size. For example, the 1985–86 SPC included about 65,000 households (304,600 persons) and the 1995–96 SPC about 87,600 households (283,100 persons). The SPC is a longitudinal survey, lasting one to one and a half years. For example, the 1995–96 SPC consisted of five rounds, with a three-month interval between each round. The first round was the base population enumeration. In the other rounds, the enumerated households were interviewed only for vital events such as births, deaths and some changes of characteristics that occurred during the previous three months.

The Chandrasekaran-Deming formula was used to estimate the total number of births and deaths in the first three SPCs (Sekar and Deming 1949). Births and deaths from the household sample survey and official registration records were compared case by case to determine whether they were recorded in both sources of data, or recorded in only one source. By this matching procedure, the percent completeness of birth and death registration could be derived. However, this method was not used in the latest SPC of 1995–96. It appears from the questions used in this survey that the completeness of vital registration was computed from positive answers to a single question on whether those events were reported to the registrars. The degree of completeness of death registration reported by the SPCs is shown in Table 1.

Table 1. Percent completeness of death registration derived from the SPC

Year of survey	Total	Male	Female
1964–67	a	65.2	60.0
1974–75	59.4	57.9	61.4
1985–86	75.7	75.0	76.5
1995–96	94.8	94.8	94.9

a. The percent in that particular category is not shown in the SPC report.

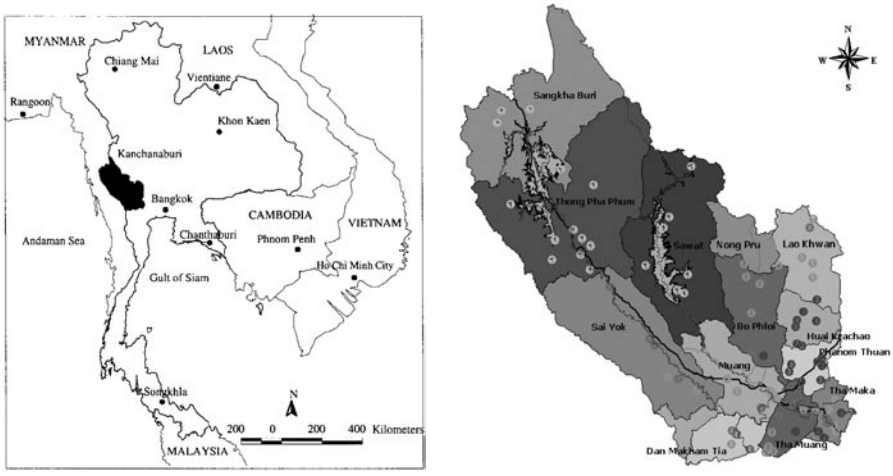
During 1960s and 1970s, only about 60% of the deaths among Thai population were registered. The percent completeness increased to 76 in the mid-1980s. The 95% completeness found in the 1995–96 SPC was questionably high due to the different method used. Thus, the completeness of data from the vital registration system remains a significant issue needing further exploration.

Evaluation of Death Registration by Using Data of the Kanchanaburi Project

Kanchanaburi is one among 76 provinces of Thailand. The provincial city is about 130 kilometres west of Bangkok. The province shares its west border with Tavoy and Moulmein on the Andaman Sea of Myanmar. Two major ethnic minorities, the Mon and Karen, reside along this international border, especially on the Myanmar side. The area of about 19,500 square kilometres makes Kanchanaburi the second largest province after Chiengmai. The province is administratively divided into 13 districts, 98 *tambon* or sub-districts and 915 villages. The population was approximately 795,000 in the year 2003. Two border districts in the north, Thong Pha Phoum and Sangkhlaburi, are mountainous areas where a large proportion of ethnic Mon and Karen live.

The Institute for Population and Social Research (IPSR) at Mahidol University operates a "demographic surveillance system (DSS)" in Kanchanaburi Province known as the "Kanchanaburi Project." The areas of Kanchanaburi were categorized according to the main occupation of the population and land use patterns into five strata, namely: (1) urban/semi-urban (industrialized), (2) rice producing, (3) plantation, (4) upland area and (5) mixed economy. Using a stratified systematic sample design, 86 rural villages and 14 census blocks scattering in all 13 districts of Kanchanaburi were selected to be the field study areas. The project had been following the population changes in the study areas since 2000. The population under surveillance is approximately 53,800 persons in 12,400 households.

Figure 1. Map of Thailand showing Kanchanaburi province (left) and the subject villages of Kanchanaburi Project (right)



Censuses in all selected villages and urban blocks have been conducted annually in July, starting in the year 2000 onward. Data at individual, household and community level were collected by means of interviewing. All people aged 15 years and over in project villages were interviewed. The data collected related to births, deaths and migration, as well as to socio-economic characteristics and health and environmental aspects.

Respondents were asked if any member of the household had died during the year prior to the survey. If any deceased person was found, information about the death such as date of death,

cause of death and whether the death had been registered was asked. The four annual surveys of Kanchanaburi Project found a total of 1,226 deaths, as shown in Table 2.

Table 2. Number of deaths found in the Kanchanaburi Project

Census round	Period coverage	Number of deaths found
2000 Survey	1 July 1999–30 June 2000	407
2001 Survey	1 July 2000–30 June 2001	265
2002 Survey	1 July 2001–30 June 2002	251
2003 Survey	1 July 2002–30 June 2003	303
All rounds	**1 July 1999–30 June 2003**	**1,226**

The deaths found in the censuses were compared with those from the civil registration records. Since an individual identification number was not possible to be asked in the interview survey due to an ethical regulation on personal confidentiality, the matching of the deaths from the two sources could be made only by names of deceased persons. In the annual censuses, the first and last names of deceased members of the households were recorded. These names were matched with those in the official registration records to be discussed later in this paper.

Death Registration Process in Thailand

In Thailand, it is required by law that every death be registered. The organization responsible for compiling the vital data is the Office of Registration Administration (ORA) in the Department of Provincial Administration (formerly called the Department of Local Administration), Ministry of Interior. The registrars are at the district and municipality offices in about 1,100 districts all over Thailand. When a death is registered at the local registrar office, two copies of that record are sent out by electronic means; one to the central registration centre and the other to the Ministry of Public Health. The ORA processes the records of death, as well as of birth, before reporting to the public annually. Only the total numbers of death for the whole kingdom and by province are reported. The copies of death records that are sent to the Ministry of Health are processed to calculate statistics on cause of death, to be reported as health statistics. Computerization since 1995 means that the data can be conveniently tabulated by age and sex and administrative area.

The law states that a person who witnesses a death must report to a government officer within 24 hours. To simplify the process of death registration in Thailand, deaths are classified into three types: (1) deaths occurring in hospital; (2) deaths of natural causes occurring at home; and (3) deaths of unnatural causes. These three types of deaths involve different steps of registration.

(1) *Deaths occurring in hospital.* A physician specifies the cause of death and issues a "Tor Ror 4/1" or "death certifying form." The deceased person's relatives use this form as evidence to register the death at the district or municipality office in the district or municipality where the deceased had his legal residence. The registrar then issues the *"death certificate"* for that death.

(2) *Deaths of natural causes occurring at home.* "Natural causes" refers to illness or disease. In the case of a death of natural causes occurring at home outside a municipal area, the deceased person's relative reports the death to an "assistant local registrar," such as a village headman, who specifies the cause of death and issues a "Tor Ror 4" or "death notification form." The relative uses this form as evidence to register the death at the district office of the deceased. In the case of natural death occurring at home in a municipal area, the death is reported to a policeman, who issues a copy of "record to file," which is used as evidence at the municipality office to obtain the "death certificate."

(3) *Deaths of unnatural causes.* "Unnatural causes" of death include external causes such as suicide, homicide, accident, drowning, animal attack and natural disaster. In this case, a person who was with the deceased or who saw the dead body must report to a local administrative officer or police office who will be accompanied by a physician to do an autopsy to specify the cause of death. The "record to file" and the result of medical autopsy are used as evidences at the district or municipality of the deceased to obtain the "death certificate." This category also includes people who died of illness, but who died outside their homes.

It can be seen that the process of death registration in Thailand involves multiple steps. The first step is to notify an authorized person – village headman, local administrative officer, policeman or health personnel – of the death. That notification, either in the form of village headman's death notification form, hospital death certifying form, police record to file or physician's autopsy result, is used to validate that death in the next step of death registration. When people register the death at the district or municipality office, they receive the "death certificate." After the completion of registration at this second step, the name of the deceased person is removed from the household roster and data on that death are entered into the registration system.

The Matching between Deaths from Registration and those Found in the Surveys

The method used in this study to assess the completeness of death registration is to compare the deaths found in the survey with those recorded in the registration system. Thus, we need the registered deaths in Kanchanaburi during the same time period as the survey. Data on the deaths of Kanchanaburi residents covering the five-year period from January 1, 1999, through December 31, 2003, were provided to us by the Office of Registration Administration, Ministry of Interior. The time period of the registration data was six months before and six months after the period of deaths in the census survey (July 1, 1999, through June 30, 2003). This was to insure that the period of death registration would cover all deaths from the survey.

The number of deaths in Kanchanaburi was about 5,000 per year, which constituted approximately 25,000 cases over five years. The data included in each individual record were (1) address, (2) 13-digit identification number, (3) name of the deceased person (title, first name, last name), (4) birth date, (5) age, (6) nationality, (7) father's and mother's first name, (8) date of death and (9) cause of death. Since an ID number of a person could not be acquired in the survey, one possible reference for matching was the name of the deceased person recorded in the registration and in the survey data.

It should be noted that some features of the Thai language make it difficult to match names. In the Thai script, there are 44 consonants, 21 vowel sounds and four tonal marks. The same sound can be spelled several ways. The same name, if spelled with only one different alphabet or vowel, would be a different name according to the computer. Moreover, Thai people always use a real or official name and a nickname or short name.

As mentioned earlier, there are many people from ethnic minorities living in the two northern districts of Thong Pha Phoum and Sangkhlaburi. The names of ethnic Karen, Mon and Burmese are even harder to spell correctly. The interviewers wrote down the names of deceased persons in the questionnaires according to what they heard. Moreover, they did not know whether these names were the same as the names used to register. To avoid the resulting problems in the matching process, deaths in these two districts were excluded from the study. There were 202 deaths in the two districts and 1,024 deaths in the other 11 districts of Kanchanaburi left in this study.

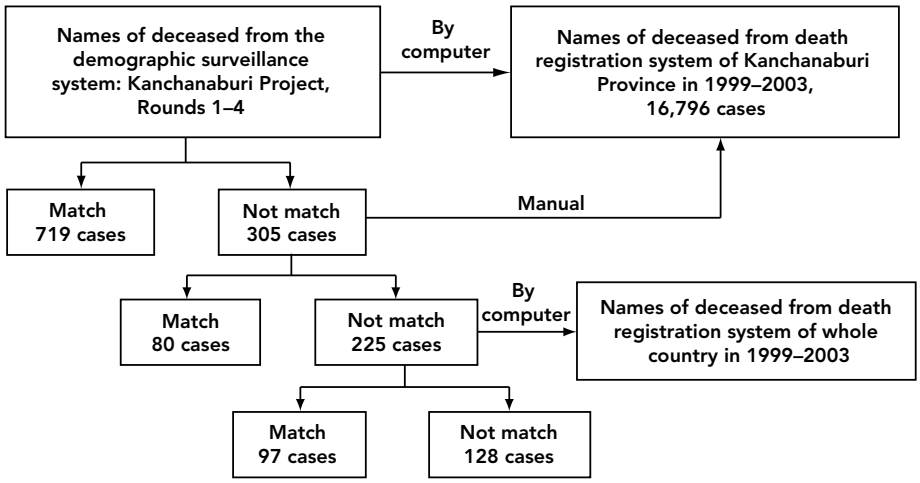
The procedure for matching deceased persons' names in the survey of Kanchanaburi Project with those in the death register involved the following steps.

(1) First and last names of deceased persons were matched by using a computer program. Altogether 719 names from the total 1,024 deaths, or about 70%, were perfectly matched.

(2) The names that could not matched by computer were manually checked. The names of deceased persons who had resided in the survey villages from the registration were compared to the unmatched names from (1). This process uncovered some cases where last names matched, but first names did not. Some names were spelled differently. This step increased the number of matched cases to 799, or 78% of the total.

(3) The 225 names of the deceased persons from the survey that were still not found in the death register for Kanchanaburi were sent to the ORA to check their status in the central registration system. The names as recorded in the survey were still used for this step. Therefore, there are many possible reasons for the names not to be found in the registration, such as different spellings, names reported being different from those registered, or the deceased persons being aliens. The results of this step were as follows: (a) 97 cases where death records were found; (b) 17 cases where several people had the same name, and some were still alive, so that it could not be concluded that the death was registered; (c) 83 names were not found in the central registration system; and (d) 28 people reported dead were found to still be alive.

Figure 2. Results of matching between deaths from registration and deaths found in Kanchanaburi Project



From the above matching steps, the deaths from the two sources that could be matched accounted for 896 cases or 87.5% of the total reported in the surveys. Among the remaining 128 names of deceased persons from the surveys, there was no evidence to prove that they had been registered. At this point, we assumed that these 128 deaths, or 12.5% of the total, were not registered.

The status of death registration, distributed according to age and sex, is shown in Tables 3 and 4. The completeness of death registration in Kanchanaburi Project was 87.5%. The percent completeness of male deaths, 88.0, was slightly higher than that of females, 86.7.

Among the deaths of both sexes, the proportions of under-registration were distributed evenly among adults aged 15 years and over. The percent of deaths that were not registered was highest among the youngest age group, under five years, at 20.8%. The lowest proportion of unregistered deaths (5.9%) was in the 5–14 age group. It should be noted here that the registration status of infant deaths, especially neonatal deaths, cannot be adequately addressed in this study because of the small number of deaths. The percentage distributions of deaths registered and unregistered by age and sex shown here were among population age one year and over.

Table 3. Number of deaths from Kanchanaburi Survey that were registered, by age and sex

Age	Male		Female		Both sexes	
	Registered	Not registered	Registered	Not registered	Registered	Not registered
<5	14	1	5	4	19	5
5–14	12	0	4	1	16	1
15–24	27	6	15	0	42	6
25–34	70	14	35	6	105	20
35–44	67	10	26	3	93	13
45–54	57	11	34	3	91	14
55–64	87	12	41	10	128	22
65–74	101	9	67	8	168	17
75–84	76	6	73	8	149	14
85+	32	5	53	11	85	16
All ages	**543**	**74**	**353**	**54**	**896**	**128**

Causes of Under-Registration

In 1966, the National Statistical Office conducted a supplementary survey after the SPC to collect the data on the causes of under-registration of vital events in Thailand (NSO 1969a). This sample survey asked about the knowledge of, attitude toward, and practice concerning official registration of births and deaths. At that time, the completeness of death registration was still very low, at about 60%. The main causes of death under-registration were lack of knowledge and lack of incentives to register, due to low penalties. Unfortunately, the national surveys on causes of under-registration of vital events have not been conducted since then.

Prohmmo and Guest (1996) studied factors determining people's decision to register deaths. The study attempted to assess people's ideas about the registration of deaths. Qualitative data were collected from two villages in Khon Khaen Province in the Northeastern Region of Thailand. This study found that, in the villagers' opinion, steps in death registration were redundant and should be reduced to a minimum. People believed that death registration was necessary only in some matters, such as those concerning the reimbursement of cremation funds, inheritance and life insurance. Registration of deaths among children, especially during infancy, which did not serve legal or administrative purposes, was not seen to be necessary.

The under-registration of infant deaths is widely believed to be high in Thailand. The infant mortality rate computed from registration data had been less than 10 per 1,000 live births per year for several decades. In fact, it seems reasonable for people not to register deaths of infants whose births were not yet registered. Thus, registration is not a reliable source of mortality data for this very young age group.

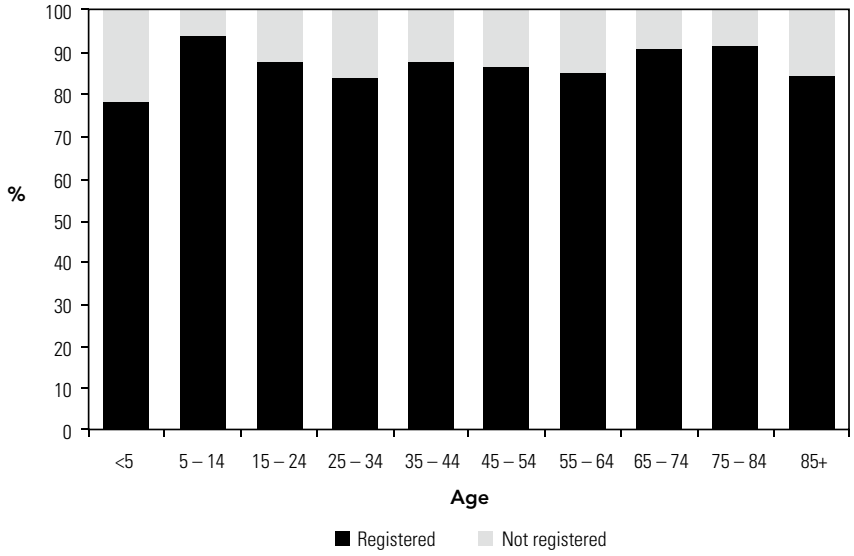
In the Kanchanaburi Survey, the question "whether the death was registered or not" was asked. Among 1,024 deaths in the four-year period, 1,008 cases or 98.4% had positive responses. There was a gap between the answers indicating that the deaths were already registered (98.4%) and those completely registered (87.5%). The difference of 10.9% might represent the gap between the two stages of registration. It was possible that most people completed the first step, which involved such actions as notifying the village headman or a policeman of the death, or receiving the death

certificate form from the hospital. It was also possible that they did not take the further action of registration at the district or municipality office. People did not register the death or ended the registration process just at the first step either because of misunderstanding, inconvenience, lack of incentive or other reasons. Whatever the reason was, those deaths did not enter into the registration system and decreased the completeness of mortality data in Thailand.

Table 4. Percentage distribution of deaths from Kanchanaburi Survey that were registered by age and sex

Age	Male		Female		Both sexes	
	Registered	Not registered	Registered	Not registered	Registered	Not registered
<5	93.3	6.7	55.6	44.4	79.2	20.8
5–14	100.0	0.0	80.0	20.0	94.1	5.9
15–24	81.8	18.2	100.0	0.0	87.5	12.5
25–34	83.3	16.7	85.4	14.6	84.0	16.0
35–44	87.0	13.0	89.7	10.3	87.7	12.3
45–54	83.8	16.2	91.9	8.1	86.7	13.3
55–64	87.9	12.1	80.4	19.6	85.3	14.7
65–74	91.8	8.2	89.3	10.7	90.8	9.2
75–84	92.7	7.3	90.1	9.9	91.4	8.6
85+	86.5	13.5	82.8	17.2	84.2	15.8
All ages	**88.0**	**12.0**	**86.7**	**13.3**	**87.5**	**12.5**

Figure 3. Percentage distribution of deaths from Kanchanaburi Survey that were registered by age and sex



Conclusion

This study aims to assess the quality of mortality data from the registration system of Thailand. The study takes advantage of the Kanchanaburi Project by comparing the deaths found in the annual censuses to those recorded in the civil registration system. The names of deceased persons from the two data sources were matched in order to measure the level of under-registration. Although the study was limited to specific areas in a province in the Central Region, the comparison of data from these two sources yielded some ideas on level of completeness of death registration for the whole country. The quality of mortality data might be different from one administrative area or region to another, but those differentials should be issues for further investigation.

The study also analyzed the completeness of death registration by age and sex. The age and sex pattern of death registration found in this study might be useful information in adjusting the data from this source. The mortality data by age and sex essential for calculating age-sex specific death rates and constructing life tables are increasingly needed in the study of burden of diseases. The data from the existing registration system should be used after adjustment by correction factors derived from studies such as this one.

This study also pointed out a possible gap between the multiple steps of death registration, from notifying the death to officially registering it. This finding suggested a hypothesis to be further tested. At the same time, there should be some strategies to improve the quality of death registration data, such as to reduce multiple steps of registration to one single data entry, to facilitate the registration process or to disseminate knowledge about vital registration to the public. The improved quality of mortality data would help in more effective formulation of policies and programs concerning people's health and quality of life.

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Visual Outcomes of Cataract Surgery in a Rural Population of South India: Results from a Population-Based Survey

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Abstract

We aimed to assess the outcomes of cataract surgery in a rural population of south India. A house-to-house survey was carried out in 15 villages. Out of the 156 eyes operated on for cataract, the outcome was good, borderline and poor in 49.3%, 35.2% and 14.1% of the eyes respectively. There is a need to focus on the quality of cataract surgical services rather than just the number of cataract surgeries to reduce the burden of cataract blindness.

Introduction

The data generated by two nationwide surveys have shown that the single largest cause for blindness in India is cataract related (Mohan 1987, 1992). Recent surveys carried out in India and elsewhere have demonstrated that cataract blindness continues to be the leading cause of blindness in developing countries (Murthy et al. 2001; Dandona et al. 2001; Limburg and Kumar 1998; Thulasiraj et al. 2002; Pokharel et al. 1998; Zhao et al. 1998; Li et al. 1999).

The National Program for Control of Blindness (NPCB) has focused on increasing the number of cataract surgeries performed to reduce the "backlog" of cataract blindness with an emphasis on the quality of surgical services as well. In 1994, the World Bank Assisted Cataract Blindness Control Project was launched by the Government of India (Jose and Bachani 1995). The performance of such cataract intervention programmes is assessed by the total number of cataract surgeries performed each year. These statistics have a limited value, because it is not only the number of surgeries performed that is of significance, but also the number of individuals benefiting and the extent of that benefit (Foster 1992). The indicator commonly used to measure the qualitative output is the success rate (i.e., the percentage of eye operations that result in restoration of sight in one year) (Limburg et al. 1996). An examination of visual acuity with available correction in cataract-operated eyes during population-based surveys can assess the long-term visual outcomes of cataract surgery.

Recent reports from well-designed population-based surveys in Nepal (Pokharel et al. 1999), China (Zhao et al. 1998; He et al. 1999) and a few population-based surveys from India have underscored the need for improving visual outcomes among the cataract-operated patients (Dandona et al. 1999; Murthy et al. 2001; Thulasiraj et al. 2002). A population-based survey was conducted in a rural population of Karkala taluk (taluk is an administrative unit), Karnataka state, south India, to estimate the prevalence and causes of blindness among people aged 50 years and above. The rural Karkala taluk has a land area of 1,091 square kilometres, and its population is 1,080,453, living in 50 villages. Most of these villages are located at the foothills of Western Ghats. The striking feature of this area is a high level of socio-economic development, which is reflected by high literacy rate of 81.4%, birth rate of 16.9 per 1,000 population and a favourable sex ratio of 1,155 females per 1,000 males. The infant mortality rate was 28 per 1,000 live births according to the 2001 census, but the same for India was 60 per 1,000 live births (Registrar General and Census Commissioner 2002). Prevalence and causes of blindness are reported elsewhere (Chandrashekhar et al. in press). In the present article, we are reporting the visual outcomes of the cataract-operated patients.

Materials and Methods

Sample Size Estimation

A previous study conducted by DANPCB (Danish Assisted National Program for Control of Blindness 1995) estimated that the prevalence of all blindness (Visual Acuity <6/60) among persons aged 50 years and above in Dakshina Kannada district (the district was divided into Udupi and Mangalore districts in the year 2000) was 9.19%. The required sample size was calculated for 95% confidence limits, allowable error of 20% and a design effect of 1.5 for cluster sampling. The sample size thus obtained was 1,439. We assumed a non-response rate of 5% and a final sample size of 1,505 was chosen.

Sampling Method

A cluster sampling method was followed. Each village was considered as a cluster. For logistical reasons, it was arbitrarily decided that 15 clusters would be selected from the list of 50 villages in rural Karkala taluk. The cumulative population was calculated for each village in the list. The sampling interval was calculated by dividing the total population of the taluk by the number of villages to be selected (i.e., 15). A random number was chosen between one and the sampling interval using a random number table. The random number thus chosen had the same number of digits as the sampling interval. The first cluster selected from the list was the village whose cumulative population was equal to or more than the initial random number. The initial random number was added to the sampling interval. The number obtained selected the second cluster as explained above. The number that selected the second cluster was added to the sampling interval. The number thus obtained selected the third cluster and so on. One hundred eligible subjects were to be randomly selected from each cluster (Anker 1991).

Field Procedure

Data collection was done between January and October 2002. The investigators obtained permission from the Panchayat Office (a local governing body) to conduct the survey. On reaching the centre of the village, a random direction (east, west, south or north) was chosen to conduct the survey. All the consecutive houses in the chosen direction were visited until the required cluster size of 100 people was reached. If there were not 100 eligible people, the investigator returned to the centre of the village and moved in another randomly chosen direction until a total of 100 eligible people were examined. If 100 people were not covered in the same village, the investigator moved on to the adjacent village to cover the remaining number of subjects required.

On reaching the house, the nature and purpose of the study was explained to the head of the family. The investigator explained the details of the procedures to be carried out on each eligible person and sought verbal consent to perform visual acuity and eye examination.

Testing of Visual Acuity

Visual acuity was tested using a modified Snellen's chart in a shaded area near the subject's house. All persons who were currently using corrective glasses had their visual acuity tested with the glasses. The respondents were shown two E cards; one having the optotype corresponding to 6/18 on the standard Snellen's chart, and the other having the optotype corresponding to 6/60 on the standard Snellen's chart. The respondents were instructed about indicating the direction of E. To facilitate the subject's understanding, E was compared to a table with three legs, and the subject had to indicate the direction in which the legs were pointing.

Examination of Eyes

The eyes were examined inside the subject's house by oblique focal illumination using a penlight. The condition of the lens and the pathology in the anterior chamber were recorded. All individuals with visual acuity less than 6/60 in one or both eyes were referred to Dr. T.M.A. Pai, at the Rotary Hospital (a constituent hospital of Kasturba Medical College, Manipal) in Karkala town. An ophthalmologist evaluated them to ascertain the cause of blindness. Pupillary dilatation for fundal examination was done in all individuals who were referred for ascertaining the cause of blindness. Cause of blindness was ascertained based on the findings of fundal examination. The blind individuals who did not come for the follow-up appointment were visited in their houses along with an ophthalmologist to evaluate the cause of blindness.

Data Collection

Information on demographic profile, socio-economic status, visual acuity and examination of eyes was collected on a specially designed proforma. Patients who had undergone cataract surgery in the past in either one or both eyes were interviewed. The details of duration since surgery, place of surgery, type of surgery were recorded. The place of surgery was classified as private hospital, voluntary/charitable hospital, eye camp or government hospital. The type of surgery was decided on the basis of eye examination and the status of lens as aphakia or pseudophakia. Presence of aphakia was considered as conventional intracapsular cataract extraction (ICCE) and pseudophakia as extracapsular extraction (ECCE) with intraocular lens implantation. Based on the visual acuity, the outcome of cataract surgery was classified as follows (Limburg et al. 1999).

1. good outcome (visual acuity ≥ 6/18)
2. borderline outcome (visual acuity 6/18–6/60)
3. poor outcome (visual acuity > 6/60)

If an operated eye did not present with visual acuity of 6/60 or better, the patient was referred for evaluation of the cause of the poor outcome, and the procedures followed were as explained earlier.

Data Analysis

Data were entered in the SPSS- version 7.5 (Statistical Package for Social Sciences) for Windows and analyzed. Outcomes of cataract surgery were expressed as proportions according to type of surgery and the principal cause of the poor outcome. Chi square test was used to test the statistical significance in the difference in outcomes according to type of surgery. First operated eyes were defined as either those patients who had received uniocular surgery or the first eye to be operated on among those who had cataract surgery in both eyes. Univariate and multivariate logistic regression analysis was done for the good outcomes in first operated eyes with socio-demographic factors, type of surgery, place of surgery and duration since surgery. Odds ratios and 95% confidence intervals were calculated. P value less than 0.05 was considered as significant.

Results

There was a cross-sectional sample of 109 cataract patients who were operated on either one or both eyes, of whom 65 were females and 44 males. There were 156 cataract-operated eyes out of which 64 (41%) were operated by conventional intracapsular cataract extraction and 92 (59%) eyes by extracapsular extraction with intraocular lens implantation. Sixty out of 109 cataract-operated patients (55%) were in the age group ≥70 years. Fifty-nine patients were operated on one eye and 47 on both eyes. Both eyes had pseudophakia in 18 patients and 21 patients had aphakia in both eyes. Eight patients had aphakia in one eye and pseudophakia in the other eye (data not shown). The lens could not be examined in one eye of each of three cataract-operated patients due to disorders of the globe or cornea (central corneal opacity, phthisis bulbi and disorganized globe). However, these patients gave details of the cataract surgery they had undergone in the past. Visual acuity could not be tested in two cataract-operated patients due to non-comprehension of the instructions. The majority (79.6%) (51 out of 64) aphakic eyes had aphakic correction. Since eight patients had aphakia in one eye and pseudophakia in the other eye, they were not using aphakic spectacles. The remaining five eyes had either broken spectacles, lost their spectacles or were not wearing spectacles (data not shown).

Table. 1 Visual outcome of cataract-operated eyes

Category	Aphakia (%)	Pseudophakia (%)	Total (%)
Good	19 (29.6%)	58 (63.04%)	77 (49.3%)
Borderline	25 (39.1%)	30 (32.6%)	55 (35.2%)
Poor	18 (28.1%)	4 (4.3%)	22 (14.15)
VA not done	2 (3.1%)	-	2 (1.2%)
Total	64 (100%)	92 (100%)	156 (100%)

Chi square = 24.19, $p < 0.001$

Of all the operated eyes, the outcome was good in 49.3%, borderline in 35.2% and poor in 14.1%. On further analysis done separately for aphakia and pseudophakia, the outcome was good in 63% of pseudophakic eyes compared to 29.6% in aphakic eyes, whereas the outcome was poor in only 4.3% of the pseudophakic eyes compared to 28.1% of the aphakic eyes (Table 1). Refractive errors or uncorrected aphakia accounted for one-third (7 out of 22) of all causes of poor outcomes. The category of surgical complications was the cause in four eyes, and the remaining 11 eyes had co-

existing eye diseases. The co-existing eye diseases were age-related macular degeneration, glaucoma, diabetic retinopathy and optic atrophy. Posterior capsule opacification was present in one pseudophakic eye (Table 2). There were 105 first operated eyes. The first operated eyes included eyes of those patients who received uniocular surgery and also the first eye to be operated on among those who received cataract surgery in both eyes. By univariate analysis, type of surgery and duration since surgery were associated with good outcome in the first operated eyes, whereas on multivariate regression analysis, only type of surgery was associated with the outcome of cataract surgery (Table 3).

Table 2. Principal cause of poor outcome in cataract-operated eyes

Cause	Aphakia	Pseudophakia	Total (%)
Refractive error/uncorrected aphakia	6	1	7 (31.8%)
Surgical complications	3	1	4 (18.2%)
Age-related macular degeneration	2	-	2 (9.1%)
Glaucoma	1	1	2 (9.1%)
Diabetic retinopathy	2		2 (9.1%)
Posterior capsule opacification	-	1	1 (4.5%)
Optic atrophy	1	-	1 (4.5%)
Phthisical/disorganized globe	1	-	1 (4.5%)
Central corneal opacity	1	-	1 (4.5%)
Other	1	-	1 (4.5%)
Total	18	4	22 (100%)

Discussion

In 1976, India was one of the first countries to embark on a National Program for Control of Blindness (NPCB). Under the NPCB cataract surgical services are provided through outreach camps provided by non-governmental organizations (NGOs) and district mobile units (DMUs) from the government sector. Blindness control programs are implemented at the district level by the District Blindness Control Society (DBCS). The DBCS coordinates the blindness control activities with the NGOs and eye hospitals. The voluntary/charity eye hospitals provide cataract surgical services by outreach screening camps. The patients are escorted to the hospital and cataract surgery is performed free of cost. A few NGOs are also providing intraocular lenses free of cost or at subsidized rates. Traditionally, cataract intervention programs have been evaluated by the number of cataract operations performed each year. In India, this has increased from 1.2 million operations in 1989 to 2.7 million in 1996. At present, the number of cataract operations has reached about four million.

The importance of reducing the cataract blindness has increased in India since the World Bank Assisted Cataract Blindness Control Project was started in 1994. We took this opportunity to assess the performance of the cataract surgical services and analyzed the data on visual outcomes of the cataract operations from a population-based survey on prevalence of blindness among older adults. Overall, the visual outcome was below the acceptable levels, but outcomes were better in pseudophakic eyes than in aphakic eyes. Though a majority of the patients with aphakia were using spectacles, the outcomes were good in only a small proportion of patients.

Table 3. Multivariate analysis for good outcome in the first operated eyes with socio-demographic factors, type of surgery, duration since surgery and place of surgery

Category	No of eyes	Crude OR (95% CI)	Adjusted OR (95% CI)
Age			
50–59	17	1	1
60–69	30	1.24 (0.43–3.57)	0.96 (0.28–3.30)
70–79	34	0.27 (0.07–1.01)	0.25 (0.06–1.06)
³80	24	0.38 (0.13–1.06)	0.65 (0.20–2.13)
Gender			
Female	63	1	1
Male	42	1.0 (0.45–2.20)	1.44 (0.50–4.17)
Literacy			
Literate	44	1	1
Illiterate	61	0.53 (0.24–1.19)	0.58 (0.17–1.94)
Socio-economic status †			
Middle	47	1	1
Lower	58	0.83 (0.38–1.82)	1.56 (0.52–4.69)
Type of surgery			
ICCE (Aphakia)	40	1	1
ECCE (Pseudophakia)	65	3.75 (1.63–8.59)	3.35 (1.01–11.14)
Duration since operation			
≤1 year	20	1	1
1–5 years	42	3.05 (1.26–7.42)	2.29 (0.71–7.32)
≥5 years	43	0.66 (0.20–2.20)	0.60 (0.15–2.31)
Place of operation			
Private hospital	55	1	1
Voluntary/charity hospital	34	0.84 (0.35–2.00)	0.74 (0.25–2.22)
Government hospital	5	1.52 (0.38–5.95)	0.29 (0.05–1.70)
Eye camp	11	0.84 (0.12–5.71)	0.31 (0.03–3.07)

† Socio-economic status was assessed by modified IDRC scale (International Development and Research Center)

Good outcomes of the cataract surgery in 49.3% of the eyes in the present study is comparable to the results of the earlier studies in other parts of India: Andhra Pradesh, rural Punjab and an urban district of Gujarat (Dandona et al. 1999; Anand et al. 2000; Limburg et al. 1999). But a study from a rural district of Rajasthan reported that a lesser proportion (31.5%) of eyes had presented a visual

acuity of ≥6/18, and the same visual acuity was found in 64.2% of eyes in Sivaganga of Tamilnadu and 63.9% of eyes in Thirunelveli district (Murthy et al. 2001; Thulasiraj et al. 2002; Nirmalan et al. 2002). Reports from two population-based surveys of Doumen County and Shunyi County in China have shown a lesser proportion of operated eyes with a visual acuity of ≥6/18 than the present study. In Doumen county 26.4% of 152 operated eyes and in Shunyi county 25% of 116 operated eyes presented a visual acuity of ≥6/18 (Zhao et al. 1998; He et al. 1999). Results of the present study are comparable to those reported from neighbouring countries Nepal and Bangladesh. In Nepal, 42.6% of 216 cataract-operated eyes presented a visual acuity of ≥6/18, and in Bangladesh, the corresponding rate was 47.3% (Pokharel et al. 1999; Bourne et al. 2003). But such results should be interpreted with caution, because a small proportion of eyes had pseudophakia in the sample of operated eyes in Nepal, Rajasthan and Bangladesh (Pokharel et al. 1999; Murthy et al. 2001; Bourne et al. 2003).

Approximately 30% of aphakic eyes in the present study presented a visual acuity of <6/60. Similar results were reported from an urban sample from the Andhra Pradesh survey, Bharathpur and Sivaganga (Dandona et al. 1999; Murthy et al. 2001; Thulasiraj et al. 2002). But in these studies, the principal cause of poor visual outcome was lack of refractive correction. Patients who were not using aphakic spectacles responded that the spectacles were broken, lost or not provided at all. However, we could not investigate the reasons for not using spectacles or replacing lost/broken spectacles. In the present study, only 4.3% of the pseudophakic eyes had vision <6/60. This is comparable to the earlier studies where a small percentage of pseudophakic eyes presented with vision <6/60: 5.6% in Andhra Pradesh, 4.2% in Sivaganga and 5.1% in Tirunelveli (Dandona et al. 1999; Thulasiraj et al. 2002; Nirmalan et al. 2002). It is important to note that in the present study, as well as the studies cited above, the outcomes were better for pseudophakic eyes compared to aphakic eyes.

In the present study, uncorrected aphakia/refractive error accounted for 31% of poor outcomes. Population-based studies from other parts of India reported that uncorrected aphakia/refractive error was the cause of poor outcomes in a higher proportion of the operated eyes (Dandona et al. 1999; Murthy et al. 2001; Thulasiraj et al. 2002; Nirmalan et al. 2002). But in these studies, a higher proportion of operated eyes were aphakic. In India, there is a trend towards increasing the proportion of ECCE with IOL implantation, which is known to have a better outcome. Therefore, it can be expected that there could be a decrease in occurrence of poor outcomes in cataract-operated eyes.

The principal cause of poor outcomes in the present study was co-existing eye diseases at the time of surgery (i.e., age-related macular degeneration, diabetic retinopathy and optic atrophy). Such co-existing diseases could have been present before surgery or developed after cataract surgery. Such a distinction was not possible in our study. Poor outcomes due to co-existing diseases is often a consequence of poor patient selection. In India, blindness due to non-cataract causes is overlooked, and often patients remain blind even after surgery (Dandona et al. 1998). Moreover, surgeons often operate even in the presence of other pathology to improve the vision to some extent. Vision deteriorates with the progression of co-existing pathology after the cataract surgery. Such strategy may make cataract surgery less popular among the cataract patients. Hence, more meticulous screening camps are required to select cataract patients for whom surgery is more likely to improve vision.

Another important cause of poor outcomes was posterior capsule opacification (PCO) for which treatment with laser capsulotomy is readily available. There was only one patient operated on by ECCE with IOL where PCO was the cause for a poor outcome. As the number of ECCE with IOL is increasing in India, PCO might become an important cause of poor outcomes in the future. Another cause for poor outcomes was surgical complications (18.2%), which could probably be due to the surgeries conducted in the eye camps or even for those conducted in the base camp hospitals where the facilities were inadequate. However, we could not assess such details in our study.

On univariate analysis, good outcomes in the first operated eyes were significantly associated with type of surgery and duration since the surgery was performed. To control the effect of potential confounding factors, a multivariate regression analysis was done and only type of surgery had association with the outcome (OR 3.35, 95% CI: 1.01-11.14). There was a significant drop off in

the probability of a good outcome in the eyes operated on more than five years prior to the survey. This could be due to the disadvantage of these subjects having been operated on more than five years ago and who might have subsequently developed other blinding pathoses. These conditions could be primarily age-related ocular pathoses such as age-related macular degeneration or related comorbid conditions such as diabetic/hypertensive retinopathy. The association between type of surgery and outcome cannot be explained because a higher proportion (79.6%) of aphakic eyes had aphakic correction. There could be other factors such as place of operation, pre-existing blinding ocular pathoses, skill of the surgeon, regularity of follow-up, etc., which possibly influenced the outcome of surgery. The present analysis was done on data from a cross-sectional survey where the groups were not matched; the differences in the subgroups could be influenced by unidentified confounding factors. Moreover, the sample of cataract-operated eyes was small as evidenced by wider confidence intervals. Hence, the results should be interpreted with caution.

To improve the outcomes of cataract surgery, it is necessary to gradually adopt IOL surgeries for all cataract patients, unless it is clinically inappropriate. But there are some issues regarding adoption of IOL surgeries that need to be addressed in India and other developing countries. These issues are the creation of permanent infrastructure (i.e., slit lamp, operating microscope and reasonable operating room environment consistent with principles of sterility), training of adequate number of ophthalmic surgeons in IOL surgery and cost of IOL. At present the IOL are provided through the NPCB at subsidized rates. But the cost may also be a deterrent to adoption of IOL surgeries. But the scenario is changing as more IOL surgeries are being conducted by providing IOL free or at a highly subsidized rate.

The proportion of operated eyes with a poor outcome (post-operative visual acuity of <6/60 with available correction) is proposed as the initial indicator for monitoring visual outcome of the cataract surgical intervention (Limburg et al. 1996). But well-designed population-based studies can yield such data. Outcomes of cataract surgery can be measured as the visual acuity in the operated eye/patient or in terms of ability to function, quality of life and economic rehabilitation. But the last three parameters can only be assessed by time-consuming studies (Limburg et al. 1996). Studies that have made such assessment have been reported from Nepal and China (Pokharel et al. 1999; Zhao et al. 1998; He et al. 1999). Such an attempt could not be made in the present study, and such studies are necessary in India as well.

The results of this study indicate that co-existing eye diseases and uncorrected aphakia/refractive errors are the main causes of poor outcomes. This study also indicates that outcomes might improve with an increase in the number of surgeries by ECCE with IOL implantation. Since surgical complications were also an important cause of poor outcomes, issues such as adequate permanent infrastructure and training an adequate number of surgeons need to be addressed in India as well as in other parts of the developing world.

Conclusions

Visual outcomes are still poor in a large proportion of cataract-operated eyes. Co-existing eye diseases and uncorrected aphakia/refractive errors were the main causes of poor outcomes. This reiterates the need for proper case selection, adequate refractive correction, quality of the cataract surgery and regular follow-up instead of high volume cataract surgery to clear the "backlog" of cataract-related blindness.

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Annexure-1

PROFORMA SERIAL NO_____

Identification and related details

1) Village _____
2) Date of examination _____
3) Name _____
4) Age (years) _____
5) Sex: ☐ Male ☐ Female
6) Address _____ Phone no _____

7) Marital status: (a) Married (b) Widowed (c) Separated (d) Divorced (e) Single

8) Religion: (a) Hindu (b) Muslim (c) Christian (d) Others

9) Occupation:

• Manager/ administrator/ professional	20
• Semi-professional/office workers	16
• Retired	14
• Skilled worker	12
• Housewife	10
• Semi-skilled	08
• Farmers	06
• Petty business	04
• Unskilled/service worker	02
• Unemployed	00

10) Literacy:

• More than graduation	20
• 11th standard to graduation	15
• 5 to 10 years of schooling	10
• Can read write or upto 4th std	05
• Illiterate	00

11) Family member working abroad:	yes	2
	No	0
12) Live stock:	Nil	0
	goat/cow/buffalo	1

13) Type of houses:	Kuccha	0
	Mixed	1
	Pukka	2
14) Ownership:	own	2
	rented	1
	free	0
15) Land holding:	Nil	0
	up to 1 acre	1
	1–5 acres	2
	more than 5 acres	3
16) Getting newspaper/daily:	Nil	0
	daily/weekly	1
17) Possession of vehicles:	Nil	0
	bicycle	1
	two-wheeler	2
	three-wheeler	3
	four-wheeler other than car	4
	car	5
18) Household belongings:	Nil	0
	radio	1
	telephone	2
	television	3
	fridge/VCR	4

Assessment of socio-economic status:	upper	≥40
	middle	21-39
	lower	<20

Annexure-2

HISTORY

1) COMPLAINTS RELATED TO CATARACT
   a) Seeing spots before eyes yes/no
   b) Polyopia (uniocular) yes/ no
   c) Coloured haloes yes/no
   d) Gradual diminution of vision yes/no
   e) Sudden diminution of vision yes/no

2) OTHER COMPLAINTS RELATED TO EYES
   a) Photophobia yes/no
   b) Watering yes/no
   c) Redness yes/no
   d) Headache yes/no
   e) Others yes/no

EXAMINATION OF EYES

TESTING OF VISUAL ACUITY

Visual Acuity	Right Eye	Left Eye
Can see 6/18		
Cannot see 6/18 but can see 6/60		
Cannot see 6/60 but can see 3/60		
Finger counting at 1 metre 1/60		
Perception of light		

EXAMINATION OF LENS

Status of Lens	Right Eye	Left Eye
Normal		
Immature cataract		
Mature cataract		
Hyper mature cataract		
Aphakia		
Pseudophakia		

Annexure-3

PROFORMA FOR RISK FACTORS OF CATARACT

1) History of medical illness: a) Diabetes yes/no
b) Hypertension yes/no

2) Do you smoke now? Yes / No

If Yes
a) Regularly / Occasionally (< 1 cigg. per day)
b) What form? cigarette / bidi / others _____
c) How many cigarettes do you smoke in a day? _____
d) How many cigarettes did you smoke per day a year ago? _____
e) How old were you when you began smoking? _____

If No
a) Did you ever smoke? Yes (regularly / occasionally) No
b) How many cigarettes did you smoke per day ? _____
c) When did you start? _____
d) When did you stop? _____Why? _____

3) Do you consume alcohol now? YES / NO
If yes:
a) What form? Local made / Whisky / Beer / Others _____
b) How much you consume at one time? _____
c) How many times in a day? _____
d) How many times in a week? _____
e) When did you start? _____

If No:
a) Did you ever consume? Yes / No
b) What form? _____
c) How much you used to take per day? _____ml
d) When did you stop? _____
e) Why? _____

4) Do you work in sunlight? Yes/no
If yes number of hours/day _____

5) History of drug intake Name _____
Dosage _____
Duration _____

Annexure-4

Details of cataract surgery

1) Years since operation

Years since operation	Right Eye	Left Eye
> 5 years		
1–-5 years		
<1 years		

2) Place of operation

Place	Right Eye	Left Eye
Eyecamp		
Government hospital		
Voluntary/charity hospital		
Private hospital		

3) Provision of service

Provision of service	Right Eye	Left Eye
Totally free		
Partially free		
Paid		

4) Provision of spectacles
   1) Provided and in use
   2) Provided and broken
   3) Purchased and in use
   4) Never provided or purchased

WORLD HEALTH & POPULATION

Public Health Implication of Bacteriuria and Antibiotic Susceptibility of Bacteria Isolates in Schistosoma haematobium-Infected School Pupils in Southeast Nigeria

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Abstract

Schistosoma haematobium infection prevalence of 57% was observed among primary school pupils, with males more infected than females (60.3% vs. 49.5%). Light infection (78.9%) was higher than heavy infection (21.1%). Prevalence of bacteriuria was 88.4% in infected individuals. *Escherichia coli* (20.5%), *Salmonella* spp (16.1%), and *Staphylococcus aureus* (16.1%) were major isolates. A 100% bacterial susceptibility to ciprofloxacin and taravid, was observed and up to 100% resistance with tetracycline, cotrimoxazole and nitrofuratoin. Systematic schistosomicidal/antimicrobial treatment advocated.

Introduction

Urinary tract infection (UTI) is one of the most common diseases, occurring from the neonate up to geriatric age groups throughout the world. UTI defines a condition in which the urinary tract is infected with a pathogen causing inflammation (Franz and Horl 1999). Though the etiology and clinical presentation of infections are similar in industrialized and developing countries, it is evident that persons with these infections in resource-constrained tropical areas of the world often present for care with more severe illness and often only after complications have developed (Latif 2004).

Urinary schistosomiasis caused by *Schistosoma haematobium* and transmitted by bulinid water snails is a very important parasitic UTI, which constitutes a major public health problem in many tropical and sub-tropical countries (Michaud et al. 2003). *S. haematobium* is reportedly endemic in 53 countries in the Middle East and most of the African continent (Chitsulo et al. 2000). Although infection with schistosomes does not always result in clinical disease, and many infections are asymptomatic, *S. haematobium* infection, however, could cause haematuria, dysuria, nutritional deficiencies, lesion of the bladder, kidney failure, an elevated risk of bladder cancer and – in children – growth retardation (Mostafa et al. 1999; Vennervald 2000). Accordingly, the estimates for morbidity and mortality in affected populations are high, with school-aged children usually presenting with the highest prevalence and intensity of infection (WHO 2002; Saathoff et al. 2004).

Studies in Nigeria among school aged children in various parts of the country and in both rural and urban environments have shown that *S. haematobium* is clearly a problem of this age group. Prevalence among school-aged children ranges from 20–40% in typical communities (Okoli and Odaibo 1999; Odaibo et al. 2004; Okoli and Iwuala 2004; Umar and Parakoyi 2005), but can be as high as 50–70% in areas where environmental changes occur due to constructions such as human-made dams and quarries (Mafiana et al. 2003; Nduka et al. 2006).

The prevalence of bacteria infection as a consequence of urinary schistosomiasis has been assessed in different epidemiological, clinical and experimental studies to determine if there is a link between the two conditions (Laughlin et al. 1978; El-Hawey et al. 1989; Adeyeba and Ojeaga 2002). Although bacteria prevalence values vary from one area to another, and even from one report to another in the same country, they are generally much higher than those documented in the area with no *S. haematobium* endemic infection (Laughlin et al. 1978; Pugh and Gilles 1979). With high levels of bacterial and *S. haematobium* infection, it seems most probable that children who are regularly exposed to contaminated water are occasionally infected simultaneously with the schistosome parasite and pathogenic bacteria. This is of great importance in the health of many populations in developing countries where the frequency of infection is a general indication of the local level of hygiene and sanitation (WHO 2002).

Information is very scanty on the bacteria/schistosoma co-infection in many endemic areas of sub-Saharan Africa, including Nigeria. Although Ejezie et al. (1989) claimed that schistosomiasis is not associated with bacteriuria in Nigeria, Kassim (1989) documented in Epe, Lagos State, that bacteriuria was found in 8.5% of schistosoma-infected children, compared with 5.2% of the control group. *Streptococcus faecalis* and *E. coli* were the two bacteria isolated from the urine specimens. This dearth of information has adversely affected adequate patient evaluation and management, control programs and identification of drug resistance in many rural communities (Gibodat and Bergquist 2000; WHO 1998). This study was therefore necessitated by the enormous medical and socio-economic implication of the concomitant infection with bacteriuria and urinary schistosomiasis in the face of the unprecedented upsurge in drug failure of both antibacterial and antischistosomal drugs in use in this part of the world (WHO 2000; Brindley 1994).

The objectives of this study were twofold; first, to determine the prevalence and intensity of urinary schistosomiasis in primary school pupils; second, the assessment of bacteriuria and antibiotic susceptibility patterns of bacteria isolates among pupils with urinary schistosomiasis. The overall goal of the study was to highlight the public health implications of bacteriuria and *S. haematobium* co-infection. This study constituted part of the preliminary investigations that contributed scientific data for development of community-based effective control and management strategies for schistosomiasis and other UTIs in Southeast Nigeria.

Materials and Methods

Study Area

This study was conducted from May 2004 through June 2005 in the rural district of Ikwo Local Government Area (LGA) in Ebonyi State, Southeast Nigeria. The climate is tropical and the vegetation characteristic is predominantly the rain forest with an average annual rainfall of about 1600 mm and average atmospheric temperature of 30°C. There are two distinct seasons: the wet season and the dry season. The former takes place between April and October; the latter occurs from November to March. The area is traversed by a number of streams and rivers, which constitute the major source of water supply to all the communities in the area. Agriculture, especially swamp rice cultivation and fishing are the mainstay of the economy. The educational status of most of the inhabitants is generally very low. Systematic schistosomicidal treatment had never been applied in the area.

Study Population

The study population comprised of 300 primary school pupils aged 5–20 years, the majority of whom were in the fourth, fifth, or sixth grade. Of interest is the fact that individuals up to 20 years of age are often in primary schools as pupils in the area because of the current free basic education policy of the state government; hence, individuals who could not afford basic education in their early life took advantage of the policy to gain basic education. The major primary schools in the area (Community Primary School, CPS, Ndiagu-Echara and Community Central School, CCS, Enyibichiri) were selected for the study, with 150 individuals enrolled from each school. Primary school pupils were selected for this study because: (1) schools are accessible without much difficulty, (2) the peak of prevalence of schistosomiasis is to be found in this group (Bundy et al. 1992) and (3) experience shows that there is general good compliance from children and parents (Montresor et al. 1998).

Ethical Consideration

Ethical clearance was obtained from the Ethical Committee of the Faculty of Clinical Medicine (Infection Disease Research), Ebonyi State University. The study was also approved by the Ikwo Local Government Council, the Local Government Health Department and the Parent-Teachers Association (PTA) of each of the schools studied. Informed consent was obtained from each of the pupils before inclusion in the study. In the course of the study, 11 pupils declined participation and were excluded from the study. Demographic information such as age and water contact activities was obtained through interviews with each participant.

Sampling Technique

About 20 ml of clean-catch, midstream urine samples were collected in 50 ml capacity, autoclaved, wide-mouthed, leak-proof universal containers by subjects themselves, who were previously carefully instructed with illustration aids. This was to avoid any possible contamination during collection. Samples were obtained between 10:00hrs and 14:00hrs (WHO 2003a) from pupils whose last micturation was at least two hours old (Engbaek et al. 1995) to accommodate bacteria analysis. Samples with visible haematuria were noted. Each sample collected was divided into two fractions. About 10 ml of each urine sample (fraction A) was investigated for the presence of *S. haematobium* ova. The remaining 10 ml (fraction B) was investigated for bacteriuria for cases with presence of *S. haematobium* ova. The specimens were appropriately labeled with identification numbers and placed in a cold box with ice packs, immediately after collection. They were processed within two to three hours of collection. In situations where delay in transportation of specimens to the laboratory was inevitable, 0.2 ml of household bleach was added to each fraction A (10 ml urine) (to preserve any schistosome ova present), while 0.1 g of boric acid was added to each fraction B (10 ml urine) (to arrest bacteria multiplication) (WHO 2003a; Cheesbrough 1998).

Laboratory Investigations

The urine sedimentation technique described previously (Cheesbrough 1998) was used to detect the presence of *S. haematobium* ova in the urine samples and to determine the intensity of the infection in each case. Intensity was reported as the number of ova/10 ml of urine and was categorized as light (≤ 50 ova/10 ml of urine) and heavy (≥50 ova/10 ml of urine). A few drops of saponin solution were added to samples with visible haematuria to enhance clarity in microscopy (Cheesbrough 1998).

Fraction B of the urine samples that contained *S. haematobium* ova were aseptically cultured (as soon as they were identified) on blood agar (BA) medium and cystine lactose electrolyte deficiency (CLED) medium according to standard protocol described by Cheesbrough (2000). The pairs of culture plates were incubated aerobically at 37°C for 24 hours. Colonial characteristics, gram reaction, catalase and coagulase tests, haemolysis on BA medium, lactose fermentation on CLED medium and other biochemical tests, such as indole production, citrate utilization, urase activity, triple sugar iron (TSI) agar test (for glucose, sucrose and lactose fermentation), gas and hydrogen sulphide production and oxidase test, were conducted as described by Cheesbrough (2000) for bacterial isolation.

The bacteria isolates made were subjected to antibiotic susceptibility analysis using disc diffusion method (Cheesbrough 2000; WHO 2003b). Known local strains of *E. coli* and *S. aureus* obtained from the bacteriology laboratory of Ebonyi State University Teaching Hospital (EBSUTH), were used as the control organisms.

The following antibiotics were employed for the sensitivity analysis: ampicillin, augmentin, chloramphenicol, ciprofloxacin, cloxacillin, cotrimoxazole, erythromycin, gentamycin, nalidixin acid, nitrofuratoin, penicillin, streptomycin, taravid and tetracycline. Their selection was based on local prescribing policies and availability. They were sourced from government approved pharmacies.

Statistical Analysis

Differences in proportion were evaluated using the Chi-square test. Statistical significance was achieved at $P < 0.05$.

Results

Of the 300 pupils examined, 171 (57.0%, 95% CI., 49.58–68.42) were infected with S. haematobium, with the males more infected than the females (60.3% vs. 49.5%). The prevalence of *S. haematobium* was significantly higher in the Community Central School (CCS) (51.3%, 95% CI., 40.10–62.50) ($\chi^2 = 3.930$, $P< 0.05$). Individuals of age group 16–20 years were significantly more infected (84.3%, 95% CI., 74.65–93.35) than those of age groups 11–15 years (60.8%, 95% CI., 52.24–69.36) and 5–10 years (34.3%, 95% CI., 25.22–43.38) ($\chi^2 = 44.102$, $P< 0.05$) (see Table 1).

Out of the 171 individuals with *S. haematobium* infection, 135 (78.9%) had light infection, while 36 (21.1%) had heavy infection. The prevalence of heavy infection was higher among the males (18.1%) than the females (2.9%), and heavy infection was highest among individuals of 11–15 years age group (9.4%). No significant difference was observed in the association between intensity and sex ($\chi^2 = 3.67$, $P<0.05$), or intensity and age ($\chi^2 = 0.906$, $P<0.05$) (see Table 2). A total of nine haematuric cases comprising seven males and two females were observed, and all cases were found to have heavy infection. Prevalence of heavy infection was however significantly higher in CPS (15.2%) than in CCS (5.8%) ($\chi^2 = 5.464$, $P< 0.05$) (Table 2).

Analysis for bacteria was done on the first 112 urine samples out of the 171 identified with *S. haematobium* infection. The remaining 59 samples could not be analyzed due to logistical problems. Ninety-nine isolates (88.4%, 95% CI., 82.47–94.33) were made comprising of 10 different bacteria species (Table 3). The highest number of isolates was *E. coli* (20.5%), *Salmonella* species (16.1%) and *S. aureus* (16.1%); the least isolates were *Proteus* species (4.5%), *Pseudomonas*, *aeruginosa* (3.6%) and *Enterococcus faecalis* (2.7%). Other bacteria isolated included *Klebsiella pneumoniae* (8.0%), *Citrobacter* species (6.3%), *Enterobacter* species (5.4%) and *Staphylococcus saprophy- ticus* (5.4%).

The antibiotic susceptibility patterns of the bacterial isolates are shown in Table 4. Results indicated that *Citrobacter* species *E. coli*, *Enterobacter* species and *S. aureus* exhibited 100% susceptibility to ciprofloxacin and taravid. *Proteus* species and *Pseudomonas aeruginosa* exhibited the highest antibiotic resistance to up to five of the antibiotics tested, including cotrimoxazole, nitrofuratoin and tetracycline. Highest antibiotic resistance was observed with tetracycline, where *Enterobacter* species, *Klebsiella pneumoniae*, *Proteus* species, *Pseudomonas aeruginosa* and *S. aureus* exhibited 100% resistance to it.

Table 1. Prevalence of *S. haematobium* infection among school pupils in Ikwo LGA, Ebonyi State, Southeast Nigeria

Parameter	Male		Female		Overall Total		
	Number Examined.	Number (%) Infected	Number Examined	Number (%) Infected	Number Examined.	Number (%) Infected	95 (%) Confidence Interval
Age							
5–10	79	31 (39.2)	26	5 (19.2)	105	36 (34.3)	25.22–43.38
11–15	91	62 (68.1)	34	14 (41.2)	125	76 (60.8)	52.24–69.36
16–20	39	33 (84.6)	31	26 (83.9)	70	59 (84.3)	74.65–93.35
Total	209	126 (60.3)	91	45 (49.5)	300	171 (57.0)	49.59–64.42
School							
CPS Ndiagu-Echara	108	73 (67.6)	42	12 (50.0)	150	94 (62.7)	52.92–72.48
CCS Enyibichiri	101	53 (52.5)	49	24 (49.0)	150	77 (51.3)	40.10–62.50
Total	209	126 (60.3)	91	45 (49.5)	300	171 (57.0)	49.58–46.42

Table 2. Intensity of *S. haematobium* infection among school pupils in Ikwo LGA, Ebonyi State, Southeast Nigeria

Parameter	Light Infection (<50 eggs/ 10 ml urine) Number (%)	Heavy Infection (≥50 eggs/ 10 ml urine) Number (%)	Overall Total Number (%)	95 (%) Confidence Interval
Sex				
Male	95 (55.6)	31 (18.1)	126 (73.7)	67.10–80.3
Female	40 (23.4)	5 (2.9)	45 (26.3)	19.70–32.90
Total	135 (78.9)	36(21.1)	171(57.0)	49.59–64.42
Age				
5–10	27 (15.8)	9 (5.3)	36 (21.1)	14.98–27.22
11–15	60 (35.1)	16 (9.4)	76 (44.4)	36.95–51.85
16–20	48 (28.1)	11 (6.4)	59 (34.5)	27.38 –41.62
Total	135 (78.9)	36 (21.1)	171 (57.0)	49.59–64.42
School				
CPS Ndiagu-Echara	68 (39.8)	26 (15.2)	94 (55.0)	47.54–62.46
CCS Enyibichiri	67 (39.2)	10 (5.8)	77 (45.0)	37.54–52.46
Total	135 (78.9)	36 (21.1)	171 (57.0)	49.59–64.42

Table 3. Prevalence of bacteriuria in *S. haematobium*-infected school pupils in Ikwo LGA, Ebonyi State, Southeast Nigeria (N=112)

Bacteria agents	Number of Isolates	Percentage	95% Confidence Interval
Citrobacter species	7	6.3	1.80–10.80
Enterobacter species	6	5.4	1.20–9.60
Enterococcus faecalis	3	2.7	0.30–5.70
Escherichia coli	23	8.0	2.98–13.02
Klebsiella pneumoniae	9	8.0	2.98–13.02
Proteus species	5	4.5	0.66–8.34
Pseudomonas aeruginosa	4	3.6	0.15–7.05
Salmonella species	18	16.1	9.29–22.91
Staphylococcus aureus	18	16.1	9.29–22.91
Staphylococcus saprophitics	3	5.4	1.20–9.60
Total	99	88.4	82.47–94.33

Table 4. Antibiotic susceptibility patterns of bacterial isolates from *S. haematobium*-infected school pupils in Ikwo LGA, Ebonyi State, Southeast Nigeria

	Percentage Susceptibility									
Antibiotics *Tested*	*Citrobacter* species	*Enterobacter* species	*Escherichia coli*	*Klebsiella pneumoniae*	*Proteus* species	*Pseudomonas aeruginosa*	*Salmonella* species	*Staphylococcus aureus*	*Enterococcus faecalis*	*Staphylococcus saprophyticus*
Ampicillin	0	66.7	20.0	60.0	0	faNA	77.8	27.3	72.7	50.0
Augmentin	0	66.7	0	100.0	100.0	0	NA	80.0	NA	NA
Chlorampheric ol	0	0	35.3	25.0	0	100.0	85.7	27.3	41.7	58.3
Ciprofloxacin	100.0	100.0	100.0	100.0	50.0	NA	71.4	100.0	90.9	92.3
Cloxacillin	NA	NA	NA	NA	NA	NA	NA	75.0	81.8	33.3
Co-trimoxazole	80.0	0	28.6	25.0	0	0	40.0	28.6	64.3	73.3
Erytenomycin	NA	NA	NA	NA	NA	NA	NA	61.5	100.0	83.3
Gentamicin	75.0	0	92.9	83.3	50.0	0	63.6	81.8	54.4	88.9
Nalidixin acid	NA	100.0	NA	100.0	NA	NA	25.0	NA	NA	NA
Nitroturatoin	100.0	33.3	60.0	NA	0	0	0	NA	NA	NA
Penicillin	NA	NA	NA	NA	NA	NA	NA	0	0	66.7
Streptomycin	75.0	33.3	71.4	66.7	50.0	50.0	NA	0	30.0	28.6
Taravid	100.0	100.0	100.0	20.0	100.0	100.0	20.4	100.0	50.0	30.0
Tetracycline	20.0	0	28.6	0	0	0	40.0	0	50.0	33.3

NA= Antibiotics not applied (not available at time of testing)

Discussion

The prevalence of infection due to *S. haematobium* (57%) observed in this study falls within the WHO classification as endemic (WHO 2002). This is in conformity with a number of other findings that showed that *S. haematobium* is endemic in many parts of Nigeria particularly among school children (Attah et al. 2002; Mafe et al. 2005). This finding supports reports that, of the world's serious parasitic diseases, schistosomiasis still ranks second only to malaria in the number of people infected and the extent of areas where the disease is endemic (Chitsulo et al.2000). It is well established that the chronic character and steady increase in morbidity in infected individuals in such endemic areas result in diminished working capacity and prolonged suffering. Morel (2000) indicated that lifelong disability looms if treatment with anti-schistosomal drug, such as praziquantel, cannot be provided and more so early on when the pathology is still reversible. This is perhaps one of major reasons why urinary schistosomiasis remains a matter of public health concern in many parts of developing tropical countries including Nigeria.

Our results showed that the males were more infected and with higher intensity than the females, with the older pupils significantly more infected ($P < 0.05$). This is presumably due to higher water contact activities by male pupils of the older age group who were particularly more into swamp rice farming and fishing as well as swimming and bathing in cercariae-infested rivers. In addition, females are generally restricted from swimming and bathing in the rivers on religious and socio-cultural grounds. This is similar to the observations made by Ndyomugyenyi and Minjas (2001) in Tanzania, Okoli and Odaibo (1999) in Southwest Nigeria, as well as Nduka et al. (1995) in another part of Southeast Nigeria. These factors not only make the males the more vulnerable group to urinary schistosomiasis but also powerful amplifiers of the infection in the area as indiscriminate passing out of urine (containing *S. haematobium* ova by infected individuals) during swimming or bathing in the rivers is a common phenomenon, thus increasing the availability of miracidia hatched from the ova and enhancing the infectivity of the snail intermediate hosts within which they transform into the infective cercariae. Sturrock (1987) had, however, demonstrated that the infectivity of a cercariae-infested water body in an endemic area is largely influenced by the dynamics of snail infections at any one time period and also by the volume of the water body. The implication of this is that snail vector control must be appreciated and made an indispensable component of the disease-control efforts because of the central role that the vectors play in the epidemiology of urinary schistosomiasis (Gibodat and Bergquist 2000).

We observed from this study that the percentage of pupils with heavy infection was considerably lower than those with light infection (21.1% vs. 78.9%). Mahmoud (2000) had earlier noted that the distribution of schistosomiasis in endemic communities fits a negative binomial curve, with most infected persons harboring low worm burdens and only a small proportion having heavy infections. This may explain the trend we have observed. However, the aggregation of worm burden in a small proportion of infected individuals may have multiple explanations including genetic susceptibility (Secor et al. 1996).

The prevalence of bacteria among the pupils with proven *S. haematobium* infection in this study appeared very high (88.4%). Reports from other community-based epidemiological surveys revealed bacteria prevalence of 25.8% in Egypt (Mostafa et al. 1999), 10.0% in Tanzania (Forsyth and Bradley 1966), 6.6% in Gambia (Wilkins 1977) and up to 75.4% in Southwest Nigeria (Adeyeba and Ojeaga 2002) among persons with *S. haematobium*. The relatively higher levels of bacteria and *S. haematobium* co-infection observed in this study, seemed to have resulted from the swamp rice farming, fishing and other water contact activities by the pupils, which regularly exposed them simultaneously to cercariae-infested and bacteria-contaminated water. It is probable that, at this juncture, the speculated association between bacteria and schistosome infection is enhanced. Penaud et al. (1983) and LoVerde et al. (1980) had earlier indicated that infection with schistosomes in endemic areas could bring about increased susceptibility to urinary tract bacterial infection. This is in addition to an earlier finding by Pugh and Gilles (1979) in a urinary schistosomiasis low endemic area of Malumfashi, Northwest Nigeria, where they concluded that the lack of association between urinary bacterial infection and schistosomiasis in their study probably reflects the low intensity of *S. haematobium* in the area. The public health significance of this finding cannot be overstated as it strengthens the argument that, by adequately controlling urinary schistosomiasis, a considerable reduction in bacteria-associated UTIs may be achieved.

Up to 10 different bacterial agents were identified in association with *S. haematobium* infection in this study. The majority of the isolates being *E. coli*, *Salmonella* spp, *S. aureus* and *Klebsiella pneumoniae*. Similar isolates were earlier made in related studies by Arinola and Salimonu (1999), El-Aaser et al. (1982) and Hicks et al. (1982). The health implications of this bacterio-schistosomal interaction have been established. Some of these organisms isolated particularly *S. aureus*, *Klebsiella pneumoniae*, *Proteus spp* and *E. coli* are nitrate-reducing bacteria (Mostafa et al. 1994) and are thought to play a significant role in the endogenous formation of carcinogenic alkylating agents (e.g., N-nitrosamines), which greatly increase the risk of urinary bladder cancer and other cancers (Mostafa et al. 1999). Adding to this, bacterial infection in urinary schistosomiasis has been

suggested in being responsible for an increased transport into the urogenital tract of cells harboring HIV-1 (e.g., mononuclear cells) and to enhance the rate of viral replication and release into semen (Leutschet et al. 2000). Bouree et al. (2002) also noted that a decreased host immune response following schistosomiasis enhances a delayed or prolonged infection with *Salmonella*. These discoveries underscore the necessity for the integration of antimicrobial agents as important components of chemotherapy in communities endemic for urinary schistosomiasis (Stamm and Hooton 1993).

It is worth noting that one outcome of the increased availability and usage of antimicrobial agents for symptomatic treatment of illness has been the emergence of antimicrobial resistance. This was clearly evident from this study. Up to 100% resistance was observed in three to five antibiotics by *Citrobacter* spp, *S. aureus* and *Klebsiella pneumoniae*, *Enterobacter* spp, *Proteus* spp and *Pseudomonas aeruginosa*, particularly tetracycline, cotrimoxazole and nitrofurantoin. A similar finding was made by Obi et al. (1996) in Zimbabwe. This is of particular concern in the developing world, including Nigeria, because fewer affordable, appropriate and effective treatment options, such as ciprofloxacin and tarvid, are readily available in most rural communities where scistosomiasis is endemic. It has become increasingly important to monitor patterns of resistance as the antimicrobial susceptibility of bacterial pathogens, which contributes significantly to the burden of *S. haematobium* infection and other UTIs, has declined. Because antimicrobial susceptibility testing is resource-intensive and is not easily afforded in many developing countries, the WHO recommends that only one or two reference laboratories in a country perform these tests (WHO 2003b). Many wealthy developed countries have exclusively focused efforts on fighting diseases within their own borders, while failing to help eliminate them globally. Proliferating elsewhere, many bacteria, viruses and parasites mutate, become drug resistant and venture back to wealthy countries via modern transportation (WHO 2000). The importance of continuous concerted global efforts in the control of infections can not be overstated. The sustainability of such control programs depends to a large extent on grant supports to resource-poor endemic tropical regions to strengthen the efforts to reduce morbidity due to diseases of major public health significance as schistosomiasis. The success of schistosomiasis control and prevention programs in endemic communities also depends to a large extent on the level of commitment of the governments of affected countries and other stakeholders in public health. It should be seen as a component part of the entire health system but with a nucleus of professional expertise.

In conclusion, this study highlights the importance of *S. haematobium* infection and its endemicity in Southeast Nigeria as well as the possible potential for interaction between urinary schistosomiasis and bacteruria. It advocates an urgent systematic schistosomicidal/antimicrobial treatment in the area. The control of urinary schistosomiasis among school aged children in the rural areas in an integrated and inter-sectoral manner is advocated. Regular antibiotic sensitivity surveillance and public health interventions, such as access to safe water, improved sanitation, immunizations, education, health communication and access to acute medical care with appropriate case management, would contribute to improvement in public health in schistosomiasis-endemic resource-scarce settings of the tropics.

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A Prescription for Improvement: A Short Survey to Identify Reasons behind Public Sector Pharmacists' Migration

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Abstract
In Sudan, there is a mismatch between the numbers of pharmacists and where they worked, and the demand for pharmacy services. The public sector, where the majority of the population is served, suffered heavily from the pharmacists' migration to the private sector. In order to stem the "brain drain" of pharmacists, it is, however, necessary to have accurate and evidence-based information regarding the reasons that make the pharmacists emigrate to the private sector.

Introduction

Sudan is geopolitically well located, bridging the Arab world to Africa. Its large size and extension from south to north provides for several agro-ecological zones with a variety of climatic conditions, rainfall, soils and vegetation (Appendix 1). Sudan is one of the most diverse countries in Africa, home to deserts, mountain ranges, swamps and rain forests. The present policy of the national healthcare system in Sudan is based on ensuring the welfare of the Sudanese inhabitants through increasing national production and upgrading the productivity of individuals. A health-development strategy has been formulated in a way that realizes the relevancy of health objectives to the main goals of the national development plans. The strategy of Sudan at the national level aims at developing the Primary Health Care (PHC) services in the rural areas as well as urban areas (GOS 2002). Methods of preventing and controlling health problems follow:

- Promotion of food supply and proper nutrition
- An adequate supply of safe water and basic sanitation
- Maternal and child healthcare
- Immunization against major infectious diseases
- Prevention and control of locally endemic diseases
- Provision of essential drugs

This will be achieved through a health system consisting of three levels (central, state and localities), including the referral system to secondary and tertiary levels.

Poverty and the accompanying ignorance (lacking knowledge, generally without options other than exploiting their local environment) of natural resource degradation present major obstacles to sustainable development. In Sudan, about 75% of the population lives in poor conditions (scarcity of food, water, clothes, health services, education, etc.), while 20% lives in abject poverty. Small holders and pastoral groups have intensified exploitation of the land, contributing to widespread soil erosion (Omer 1994). The economic dividend of a full peace settlement could be great. Sudan has large areas of arable land, as well as gold and cotton. Its oil reserves are ripe for further exploitation.

The health system in Sudan is characterized by heavy reliance on charging users at the point of access (private expenditure on health is 79.1% (WHO 2004)), with less use of prepayment systems such as health insurance. The way the health system is funded, organized, managed and regulated affects health workers' supply, retention and performance. The contested policies of public health sector reform can be construed as attempts to craft the incentive environment to produce improved performance (Hongoro and McPake 2004). The migration of doctors to Gulf states and more recently to the UK leaves easily noticeable gaps in the healthcare system in Sudan. The loss of pharmacists from the public sector mainly to the private sector could be equally detrimental.

The 25-year pharmacy strategy aims to help people maintain their health, manage common ailments, make the best use of prescribed medicines and manage long-term medication needs by providing a service that is easily accessible to all, tailored to individual needs, efficient, co-coordinated with other professionals and of a quality that satisfies customers (MOH 2003). The ability of the pharmacy profession to provide patients with more support in using medicines and to make them more confident in advice they are given depend entirely on the quality and quantity of Pharmacy Human Resources (PHRs) available to do the job. PHRs in the public sector are a critical component in the National Drug Policy (NDP) and the 25-year pharmacy strategy. Implementing the pharmacy strategy and achieving its objectives depend upon people. It requires high-qualified and experienced professionals, including policy-makers, pharmacists, doctors, pharmacy technicians and paramedical staff, economists and researchers. The goals of the 25-year pharmacy strategy will not be achieved without increasing the number and quality of pharmacists working in the public sector. The brain drain will affect the pharmacists' key role in the implementation of NDP and the 25-year pharmacy strategy (MOH 1997). Pharmacists will implement the strategy only if they understand its rationale and objectives, when they are trained to do their jobs well, paid adequate wages and motivated to maintain high standards. Lack of appropriate expertise has been a decisive factor in the failure of some countries to achieve the objectives of national drug policy. In the last decades the number of government hospitals increased from 240 in 1989 to 334 in 2003. Most of these hospitals are without pharmacists. Of 170 hospitals' pharmacists, 80 pharmacists are employed by only 10 hospitals in Khartoum State. The remaining 90 pharmacists are supposed to cover the remaining 324 hospitals. This situation suggests maldistribution of the available pharmacists between different public hospitals and a high need for recruitment of pharmacists to fill the gap.

Although substantial new resources such as oil production, the peace agreement and increased Revolving Drug Funds (RDFs) coverage are promised to the health system, many of the constraints cannot be easily resolved by money alone (Appendix 2). Worldwide there are different systems for providing pharmacy services. However, viewed across a variety of characteristics, the pharmacists' profession is clearly in transition. Where this evolution is leading is not clear. Increased numbers

of drug therapies, an aging but more knowledgeable and demanding population, and deficiencies in other areas of the healthcare system seem to be driving increased demand for the clinical counselling skills of the pharmacists. Given the growing evidence of drug-related complications, however, and the well-documented ability of pharmacists to anticipate and forestall many of these problems, a more likely scenario is that pharmacists will be increasingly valued and demanded for their knowledge, skills and cost-effective contribution to the healthcare system (CPA 2001). The shortage of pharmacists at points of drug dispensing deprives the population of vital expertise in the management of medicine-related problems in both community and hospital settings (Matowe et al. 2004).

The drug distribution network in Sudan consists of open market, drug vendors (known as home drug store), community (private) pharmacies, people's pharmacies, private and public hospitals, doctors' private clinics, NGO clinics, private medicine importers (wholesalers), public wholesalers (i.e., Central Medical Supplies and Khartoum State Revolving Drug Fund) and local pharmaceutical manufacturers. The states' departments of pharmacy statutorily license community and Peoples' pharmacies. A superintending pharmacist, who is permanently registered with Sudan Medical Council and licensed, oversees the pharmacy any time it is opened for business (The Act 2001). With such pharmacies there should not be any serious issues of the sale of fake drugs. Unfortunately, however, there are many pharmacies working without qualified pharmacists (MOH 2003). The prevalence of counterfeit medicines is thought to represent 10% of the global medicines trade (WHO 2006). Seventy percent of the reported cases were from developing countries. Hence, they required well-equipped departments of pharmacy to enforce the legislations and to increase the frequency of pharmacy inspections in order to combat the problem of counterfeit medicines. In Sudan, there are 26 departments of pharmacy at state level. These departments are legally responsible for licensing of pharmacy premises (i.e., pharmacies, wholesalers and manufacturers), and their inspection to safeguard against marketing of low quality medicines. According to the Act, 2001, these tasks should be done by well-trained governmental pharmacists. Currently only 50 pharmacists are working in these departments in only 10 out of 26 states.

During the last decade, the pharmacy workforces have witnessed a significant increase in the number of pharmacies, drug-importing companies and pharmaceutical manufacturers as shown in Table 1. In the public sector, adoption of a cost-sharing policy as a mechanism of financing essential medicines at full price cost requires far more expertise than simply distributing free medicines. This policy increases the demand for pharmacists in hospitals. The new concept of pharmaceutical care and recognition of pharmacists as healthcare team members will boost the demand for the skilled PHRs. The problem is exacerbated by the pharmacists' migration to the private sector. Despite – as in many parts of Africa – the public health sectors spending huge resources training their manpower, inadequate attention is paid to the motivation and retention of these workforces. The net impact of this is a high attrition rate in many countries including emigration and drop-out to private sector (Knippenberg et al. 1997). Thus, the Federal Ministry of Health (MOH) faces two major challenges with the PHRs: first, the current shortage of pharmacists in the public sector and second, the future role of pharmacists within the healthcare system.

As well as involving several of Sudan's neighbours, the civil war has proved costly, with the result many Sudanese have seen a fall in living standards. The political upheaval and economic meltdown in the public sector play an important role in driving pharmacists out. This renders the public sector unattractive compared with elsewhere, and the private sector will continue to suck in qualified pharmacists in increasing numbers, and the public sector will continue to finance it.

There are considerable published works about the brain drain of health professionals (mainly doctors and nurses) from developing countries to the developed ones (e.g., Lerberghe et al. 2002; Hongoro and McPake 2004). But, there are not many empirical studies that examine the same questions about the brain drain of pharmacists from government institutions to the private sector. This is the first study about Pharmacy Human Resources in Sudan in general, and public to private migration, in particular. This research was motivated by the interest of the Federal Ministry of

Health to draw a new action plan to stem pharmacists' brain drain and to attract more pharmacists to the public sector to reduce currently severe shortage of pharmacists in public organisations. The findings of this article will demonstrate factors and explain the reasons behind the brain drain of pharmacists. The data are meant to provide health officials with evidence-based information about the causes of the pharmacists' attrition. Such information is necessary for formulating appropriate policies for the retention of pharmacists in the Sudanese public sector. The study can benefit other developing countries with similar situations especially in sub-Saharan Africa. It will also encourage human resources (planners and policy-makers) to be open to the application of business instruments when dealing with pharmacy manpower within the public sector.

Table 1. Pharmacist labour market

Institutions	1989	2003	Increase in (%)
Faculties of pharmacy	1	7	600%
Registered pharmacists	1,505	2,992	99%
Public sector pharmacists	162	300	85%
Hospital pharmacies	205	334	48%
Community pharmacies	551	779	41%
Drug importing companies	77	175	127%
Drug manufacturers	5	14	180%

Source: MOH 2003

Aims and Objectives

The main purpose of this research is to explore and analyze the reasons for the pharmacist brain drain from public to private sectors in Sudan and to set a recommendation to remedy this situation.

The specific objectives are to answer the following questions:

- Why do pharmacists leave the public sector, and what are the most important reasons that encourage them to join the private sector?
- What are the main reasons that cause public sector pharmacists to quit civil service?
- What factors would encourage pharmacists to remain in the public sector?

Method

The logical target was a small sample that can describe a population group; however, the survey did not attempt to characterize all pharmacists working in Sudan. Thus, the objective of this study is not to generate statistically significant findings, but to explore the reasons for the brain drain of pharmacists from the public to the private sectors; the study was also sized to be feasible in the time and resources available. The information necessary to explore the reasons for the brain drain of pharmacists from the public to private sectors was collected from 54 pharmacists working for in the private sector (32 community pharmacies and 22 from drug importing companies) and 26 working with in the public sector. All the above pharmacies were registered with Sudan Medical Council. These samples were obtained from registered pharmacists. The samples are, nevertheless, thought to be sufficient to validate the conclusion drawn from this research.

Data were collected through the use of two self-completing questionnaires: one addressed to pharmacists working with government institutions (Appendix 3) and the other from those who work with the private sector (Appendix 4). The questionnaires using close-ended questions were phrased

in such a way that a limited range of response was obtained and to get reliable and consistent information. The questionnaires were then pre-coded. The questionnaires were translated back into clear Arabic language, since ambiguously worded questions would lead to responses that do not accurately capture respondents' views or not to respond at all (Boynton et al. 2004).

Each questionnaire was tested in the field to make sure that all relevant issues were covered and that the pre-codes were correct. Four pharmacists working with the private sector (two from community pharmacies and the other two from drug importing companies) were asked to complete the questionnaire and provide feedback to the authors (e.g., "How long did it take them to answer the questions and were there unclear question(s)?). The same scenario was repeated with two public sector pharmacists to test the questionnaire designed to address those working with the government institutions. The pilot survey participants were not in the selected study samples. The responses were positive, though minor changes were made to both questionnaires (mainly in formatting). A category "Others (please specify)" was added after certain questions to accommodate any response were not listed. The questionnaires took the respondents from six to eight minutes to be answered carefully.

The participants from drug importing companies were selected by using systematic sampling methods. The authors agreed to select the first name appearing in the list of the medicine-importing companies' responsible pharmacists after sorting them in ascending order. Thereafter, every eighth pharmacist (the total number of drug companies is 175) on the list was used to complete the sample size of 22. The respondents from community pharmacies were selected from the list of the licensed community pharmacies' responsible pharmacists using the same procedure as in the case of drug importing companies. After the selection of the first name, every twenty-fifth pharmacist (the total number is 779 pharmacies) on the list was selected to complete the sample of 32 participants. The electronic lists were obtained from the General Directorate of Pharmacy, Federal Ministry of Health – Khartoum.

Member of supportive staff within the Directorate of Pharmacy distributed the questionnaire to the pharmacies and drug companies at Khartoum State. After one week, all questionnaires were collected with 100% response rate. Those who work with the Federal and Khartoum State Department of Pharmacies were asked to fill in a questionnaire specially designed for those who work with the government. The questionnaire was distributed to pharmacists using internal mail system (i.e., cirque). Twenty-six responses representing 87% of the study population were received. This study was carried out between September 10–15, 2004. The questionnaire was translated back into English in order to ensure no loss or change in meanings. Data gathered by the questionnaires were electronically analysed using Statistical Package for Social Sciences (SPSS) version 12.0 for Windows.

Results

In this section, the reasons that affect the pharmacists' decisions about where to work will be presented. Appendix 5 gives definitions for some reasons.

Public Sector Pharmacists

The total number of respondents from the public sector was 26 pharmacists, 53.8% of whom were males. The majority (73%) of respondents graduated in or after 1991. Most (69%) of them had studied in Sudan. Surprisingly, 57% of the pharmacists (male) were employed in the private sector at some time in the past before joining the public sector. This is due to the fact some of the current pharmacy managers in Federal and Khartoum State Departments of Pharmacy had private sector experience. The top three reasons that demotivated pharmacists who had experience with the private sector were a feeling of lack of ownership (21.4%), a sense of working for a specific person (21.4%) and job dissatisfaction (14.3%). Most (80.8%) of the respondents who joined the public sector indicated job satisfaction and feelings of ownership (65.4%) as illustrated in Table 2. In answering the question: "Do you have intention to leave the public sector at some time in the future?" 61.5%

of respondents answered "Yes." The vast majority (87.5%) left for better benefits in the private sector compared with the public sector as given in Table 3. Table 4 shows that 69.2% of respondents mentioned monetary issues as one of the reasons they were discouraged from continuing with the public sector.

Table 2. Reasons for choosing public sector (N = 26)

Reasons	Percent
Job satisfaction	80.8
Sense of ownership	65.4
Training program	46.2
Feeling of doing a public job	38.5
Pensions and other benefits	7.7

Table 3. "Why are you intending to leave the public sector?" (N= 16)

Reasons	Percent
High wages and incentives in the private sector	87.5
Private sector offers vehicles	56.3
Private sector gives full treatment when feeling ill	50.0
Job satisfaction in the private sector	6.3

Table 4. Reasons discouraging you from continuing with public sector (N = 26)

Reasons	Percent
Monetary issues	69.2
Lack of recognition of what I have done	57.7
Dim vision	53.8
Sense of instability	53.8
Those who work and those who don't are equal	53.8
Policy-makers don't care about pharmacy	53.8
Lack of job satisfaction	34.6
Political issues	15.4

The respondents recommended continuing pharmacy professionals' development to assure the role of the pharmacist in healthcare, creation of new jobs, increase the salaries of public sector pharmacists and activation of a federal pharmacy and poisons board.

Private Sector Pharmacists

The number of respondents from the private sector was 54; 80% of them were male. The majority (74%) graduated during or after 1991, and 77.8% had studied in Sudan. Thirty-two (59.3%) of the respondents worked with community pharmacies, whereas 22 (40.7%) were drug companies employees. Salaries in the private sector ranged from 500,000 to 2,500,000 Sudanese pounds (LS) or more (1 US$ = LS 2500). Thirty-five (65%) pharmacists had previous public sector experience. In answering the question "Why did you leave the public sector?" 51.4% of respondents had left the public sector because policy-makers did not care about pharmacy (Table 5). The main reasons for choosing the private sector mentioned by respondents are the salaries (61.8%), job satisfaction (52.9%) and the vehicle (26.5%), as shown in Table 6.

A substantial percentage (78.4%) of the respondents answered "yes" to the question "Thinking about your own job, could you leave the private and join the public sector at some time in the future?" Table 7 shows the reasons that would encourage pharmacists who were in the private sector (at the time of the study) to consider joining the public sector. Percentages reported in Tables 2 to 8 showed reasons as ranked by respondents. The percentages, therefore, reflect the importance of specific reasons from the respondents' perspectives. Since this is an exploratory study only, we did not test for statistical significances between differences in responses.

Table 5. "Why did you leave the public sector?" (N = 35)

Reasons	Percent
Policy-makers don't care about pharmacy	51.4
Those who work and those who don't are equal	42.9
Low salaries and incentives	42.9
Lack of recognition of what I had done	31.4
Feeling of instability	28.6
Lack of job satisfaction	28.6
Dim vision	25.7
Political issues	17.1
Others*	28.6

*No training; hospitals are without medicines; and domination of doctors.

Table 6. Reasons for choosing the private sector (N = 34)

No.	Reasons	Percent
1	Salaries are better than public sector	61.8
2	Job satisfaction	52.9
3	Private sector offers vehicles	26.5
4	Full treatment when feeling ill	14.7
5	Others*	23.5

*No jobs available in the public sector and mismanagement; it is easy to find a job to increase the income and flexible working conditions in private sector.

Table 7. "What encourages you to join the public sector?" (N = 43)

Reasons	Percent
Job satisfaction	69.8
No feeling of working for specific person	62.8
Overseas training	62.8
Local training	55.8
Feeling of ownership	48.8
Better salaries	27.9
Others*	18.6

*Public sector reserves rights when ill; job satisfaction; stability and fair competition.

The most significant reasons pharmacists who were in the private sector during the study period feel discouraged from joining the public sector are presented in Table 8.

Table 8. "Why some private-sector pharmacists didn't like to join the public sector?" (N = 31)

Reasons	Percent
Monetary issues	64.5
Dim vision	51.6
Instability feeling	38.7
Lack of job satisfaction	19.4
Political issues	12.9
Others*	1.5

*Government neglects pharmacists; the domination of doctors.

Discussion

Public Sector Pharmacy Workforces

The public health sector reform seems to have undermined pharmacy human resources in the health sector as often as it has made a positive contribution. Without motivated, competent and well-funded pharmacy workforces, there is a danger that the infusion of money for establishing drugs revolving funds in different states to address the national problem of access to essential medicines will be either misused or wasted, or both.

Challenges with respect to pharmacy human resources vary greatly between and within states and are associated with the political commitment of the states' government and their ministers of health. The public sectors' pharmacists in many states are adversely affected by severe under-investment from the states and national funds, as well as external sources. For example, the pharmacy budget from the World Health Organization (WHO) was reduced from US$200,000 in 2003 to only US$93,000 in 2004 (FGDP 2004). Driven by financial limitations, pharmacy workforce planning at federal and states' ministries of health has been unable to match requirements of pharmacists, the needs of the community and the health system as a whole.

It has been quite evident the civil service management system is detrimental to the retention of skilled pharmacists. Like other disciplines, the service affair authority determines the number of pharmacists' jobs in the public sector. It also sets salary scale and other incentive schemes in coordination with the Federal Ministry of Finance and Economic Planning. Although health professionals in hospitals tend to work in shifts and have to face different working conditions, the incentive system is not flexible enough to cope with differences between health professionals and other civil servants. Notably, the gap in the pharmacy workforces don't generally relate to pharmacists, but to pharmacy assistants who constitute the bulk of the workforces. The difficulties caused by low pharmacy staff numbers are compounded by morale problems, skill balances and geographical mal-distribution, most of which are related to poor human resources management (Narasimhan et al. 2004). How can the ministry of health grapple successfully with the demands of pharmaceutical care crises and the requirements of transformed pharmacy profession, if it lacks the very foundation of pharmacy care – motivated, trained and supported pharmacists?

Maldistribution

Around 3,000 pharmacists are registered in Sudan. Only 300 (10%) works with the public sector. Twenty-five, twenty-five and twenty pharmacists were employed in Khartoum, Khartoum North and Omdurman hospitals respectively. Some states (e.g., southern states, which have only two pharmacists) were not included in Table 9. This anomaly seems to imply the number of pharmacists in the public sector has not only been insufficient in absolute terms, but also been inefficient in its distribution. This number will be depleted and the situation may be getting worse. One reason is migration to the private sector.

Working Conditions

In Sudan, like in many developing countries, the essential working conditions are not met. Social or personal development opportunities are limited. Pharmacists have no idea of the future plans of the government. Their involvement in policy-making does not exist. They are feeling very marginalized. Therefore, it is difficult for health professionals in general and pharmacists in particular to remain satisfied. The poor working conditions, remuneration and other factors pushed pharmacists out of the public sector.

Incentives and Remuneration

The question "Why are public sector pharmacists intending to leave?" showed that the issues of salary and remuneration dominated. Of the pharmacists surveyed in the Khartoum area, 87.5% stated high wages and incentives in the private sector; 56.3% of respondents stated vehicle as the reason for intending to leave the public sector. The study revealed that the salaries of the majority (78%) of private sector pharmacists are more than three times the salaries of the public sector pharmacists. On average, the private pharmacists earn LS 2 million compared with around LS 600,000 for the public sector pharmacists. It is not uncommon for public pharmacists to engage in dual practice (such as nightshifts or working full time with a drug company at the same time) or to solicit informal payments (such as registration of a pharmacy or a drug company without even visiting it) to supplement their income. Hence, this causes various further difficulties in accountability and equity of access.

There is some reported evidence for using incentives and enablers to improve performance under specific circumstances. For example, Eichler and colleagues (2001) showed that indicators of achievement used to establish bonus payments improved when a bonus system was introduced in Haiti. The use of financial incentives was also reported positively to change health workers' behaviour in terms of heightened productivity in Cambodia (Van Damme et al. 2001). The findings consolidate strategies implemented by Abdullah Seedahmed at Khartoum State (Federal Ministry of Health; Minister of Health, Khartoum State during 1993–2001) and Elsadig Gasmalla at Red Sea, Northern, Algadarif and Al Gezira States (Minister of Health, Gezira State; Minister of Health

during 1996–2000) in attracting pharmacists to work in the public sector, especially at the Ministry of Health during their time. These strategies comprised, in addition to financial incentives, the full delegation of power to the pharmacy managers, political support and motivation.

Table 9. Pharmacist distribution at state levels

State	Number of pharmacists
Department of Pharmacy (DOP) Khartoum State*	8
DOP-North Darfur	7
DOP-Sennar	2
DOP-North Kordofan	5
DOP-South Kordofan	7
DOP-White Nile	2
DOP-Kassala	7
DOP-River Nile	3
DOP-Northern State	3
DOP-Al Gezira*	6
Total**	50

*The pharmacists who work with Revolving Drug Funds are not included.
**Information about other States is not available (Ten Southern states, two Darfur states, two Eastern states, one Blue Nile state, and one West Kordofan state).

Job Satisfaction

Without professional or personal job satisfaction and the ability to carry out a job as well as possible, the staff can become disillusioned and leave, creating a vacancy (Hughes 2004). In pharmacy, where practice only remotely resembles what students are taught, this makes students frustrated and disgruntled on qualification (Matowe et al. 2004). Thus, it is not surprising that young pharmacists (74%) of the private-sector pharmacists in the study and who graduated during or after 1991 seek better career opportunities in the private sector, where they are offered at least better remuneration. The study revealed 69.8% of the respondents might be encouraged to join the public service, due to job satisfaction, if other obstacles are solved.

Job satisfaction in our research instruments led to confusions; however, whatever interpretation by respondents, the study's results ultimately gives hints about the reasons that could cause movement between public and private sectors. The confusion of job satisfaction emerges from the fact that, in Sudan, pharmacists' roles are not clearly identified. For example, they play roles of storekeepers in medicines supply agencies in both public and private sectors. They also dispense medicines, which assistant pharmacists do. In hospitals, most of the time, pharmacists' tasks are carried out by assistant pharmacists. There is a feeling among users that there are no differences between a graduated pharmacist and other pharmacy staff.

In private companies, the pharmacists work as salesmen or do promotion for certain medicines. The lack of clear job definition renders those who are currently in the public sector intending to join the private sector and vice versa. The private sector pharmacists are reluctant to join the public sector because they are worried about the issues listed in Table 8. The government, in its plans for

attracting more pharmacists to the public sector, needs to address the monetary issues, instability feelings, job satisfactions and political issues.

Training Strategies

A lack of professional development can result in low staff morale (Shepherd 1995). Training strategies that fail to emphasize continued pharmacy professional development, in addition to poor job satisfaction, working conditions and remuneration, affect not only the numbers of pharmacists in the public sector, as shown in Table 8, but also their quality and performance. These dimensions are not captured in the data to enable international comparison, but are widely understood to be at least as important as more quantifiable factors in explaining the performance of the healthcare (Hongoro and McPake 2004).

Although there is an imperative to retain staff, and there is a link between increased retention, personal development plan and appraisal (Gould 2004), the strategy of bonding pharmacists to government after pre-registration training has largely failed because pharmacists easily find ways to quit from the public sector (one-year houseman-ship strategy was adopted in early 1990s). This failure is partly explained in the absence of punitive action and capacity to enforce penalties (if any) and availability of buy-out options (such as attractive drug companies).

Pharmaceuticals Financing Reforms

In developing countries, pharmaceuticals generally account for a more significant share of overall health expenditures than in developed countries (15%). In several African countries, it is believed to exceed 50%. In developing countries 50–90% of the overall pharmaceuticals expenditures are privately financed, which is considerably higher than in developed countries (median is 34%) (Velasquez et al. 1998).

Financing of pharmaceuticals is a crucial issue for several reasons. First, because drugs can save lives and improve health, it is important that drug financing ensures access to essential drugs for all segments of the population. Second, drugs are costly. For most ministries of health, drugs represent the largest expenditure after staff salaries. In some countries, up to 80% of a household's health-related spending is on drugs. In developing countries, drugs commonly represent from 25–50% of total public and private health expenditures (Quick et al. 1997). Third, inadequate funding for drugs means expenditures for staff salaries and other care costs may be used inefficiently or simply wasted. Fourth, the availability and effectiveness of drugs are key factors in generating and maintaining public interest and participation in health-related activities (Show and Griffin 1995).

To be successful, user fee mechanisms must generally be accompanied by perceived quality improvements in services. The World Bank suggests the improvement in the quality of services would compensate the negative impact of prices. This implies that improved supply mechanisms for drugs are both prerequisites and outputs of successful programs. The properly designed cost-recovery programs can encourage higher demand for modern healthcare and, as a result, higher level of utilization (Hotchkiss 1998). If all are true, it is unsurprising the utilization of Sudan health services in the public sector was low during the 1980s and personnel, especially in peripheral health facilities, were idle most of the time. In 1992, Sudan introduced cost-recovery measures as a part of its program of economic reforms, following a course taken by many developing countries. During the 1990s, Sudan initiated a number of initiatives to establish medicine financing mechanisms as part of its health reform process and decentralized decision-making at state level. In 1992, the government abolished the constitutional right of free healthcare. There is interest by the states to introduce a medicine financing mechanism based on the Revolving Drug Fund (RDF) experience of Khartoum State (KS).

Given the fact that less than 50% of the population has regular access to essential medicines (Quick et al. 1997) and the highest availability of essential medicines at affordable prices in Khartoum state, the government decided to replicate the RDF to other states. Since 2001 the Central Medical

Supplies Public Corporation (CMSPC) is involved in the development of RDF in 17 states. The RDF has the highest level of political support as the president of Sudan himself inaugurated it.

Recommendations

The public sector has bureaucratic personnel management and rigid procedures, low incentives, poor job satisfaction and unsupportive work environment compared to the private sector. Such a situation demoralizes pharmacists and encourages them to join the private sector. Many (65%) of surveyed private-sector pharmacists claimed they were public-sector pharmacists who had migrated to the private sector. Although information on migration is sparse, anecdotal evidence persuasively underscores the problem. An internal flow of pharmacists plagues all states, since pharmacists move from poorer states to wealthier ones and from the public sector to the private. Strategies to meet current and future challenges in pharmacy human resources are urgently needed. Approaches that focus on the training of individuals that do not take into account job satisfaction (i.e., the nature of the work itself) and pharmacists' mobility can enjoy only limited success. Increased production alone cannot compensate for weak motivation, high attrition and increasing mobility. To reverse decades of neglect, policy-makers at both state and federal level should begin now, first by recognizing the problem and secondly by fixing it through the immediate implementation of potentially effective strategies. Although we do not advocate the creation of new barriers to the movement of pharmacists between private and public sectors, steps should be taken to redress the unbalanced situation. Ten immediate steps are recommended:

1. Large-scale advocacy is needed to achieve heightened political awareness within states and at the federal level. One potential outcome of large-scale movement would be to introduce the pharmacy care concept, which would reshape pharmacy services around the patients in hospitals and community pharmacies. This concept would benefit healthcare system users and motivate pharmacists to do a good job for their clients and employers. The employers would need to foster an organizational culture that recognizes and values staff contribution. Central to the delivery of effective recognition are employees' immediate bosses, where a participative and considerate management style is shown as a major predictive factor of retention.
2. The Federal Ministry of Health (FMOH) needs to learn from the past experience of Khartoum, Red Sea, Northern and Algadarif States and current Gezira State, then identify success stories. Pharmacists, their organizations and Ministries of Health have not remained passive in confronting the crisis in pharmacy workforces. The goodwill and commitment of public sector pharmacists to provide quality care despite low wages (30% of the average private salary) and supply shortages of medicines in times of appalling conditions should not be overlooked.
3. Pharmacist job satisfaction: Job satisfaction is how people feel about their jobs. Experiencing job dissatisfaction leads to withdrawal and employee turnover. Job dissatisfaction can be caused in many ways, including high centralization, routinization, low integration, low communication and policy knowledge. Pharmacy education has a key role to prepare pharmacy student for practice and must anticipate the changing professional role. New strategies need to be developed with the participation of pharmacy professionals' associations, unions, universities and ministries of health and higher education representatives to meet both the short-term and long-term needs of pharmacists as pharmacy care providers. Technology will, no doubt, give opportunity to join postgraduate studies (e.g., P.G. diploma or master's degree courses) from overseas via e-learning or continuing pharmacy professional development programs.
4. Salaries and incentives structure: This includes the process of creating new jobs, addressing low wages, as well as developing an incentives structure that supports pharmacists over the course of their working lives. In order to stem the flow of pharmacists to the private sector and increase their performance, the Ministry of Health needs to pay incentives to its pharmacy staff on a semi-private basis. Introduction of the employment contract and the application of the incentive budget line opposite performance proved to be effective in the Khartoum State

experience (Mohamed 2000). The obligations of each part (employer and employee) should be written in non-ambiguous language and a transparent reward system should be in place. When transparency of reward system is poor, its credibility will be questioned and pharmacists might not respond to the explicit incentive system at all. IDS (2000) pointed to the lack of training and potential career development as particularly important contributors to voluntary resignations. Uncompetitive pay is often debated as a reason for employee turnover (IDS 2000). The perception of receiving a fair salary is a determinant of retention. The perception that employees are receiving a fair salary seems to be important both at the recruitment stage and subsequently as a determinant of retention rates. It is important to note this doesn't necessarily equate to a large salary, since people often compare themselves with peers in the same occupations or with friends and family rather than with better paid or higher skilled workers. Also, when promises are broken and expectations are perceived to have been unmet, employees take actions to withdraw from the organization, which may include actually quitting jobs.

5. Pharmacy staff motivation: In addition to financial incentives, Ministry of Health should continue to invest in improving the working conditions to ensure that suitable qualified and skilled pharmacists are retained for longer periods. Recruitment of qualified pharmacists (which may include looking outside the public services), a clear definition of job assignments (staff at hospitals' level enter into written contracts to perform according to MOH guidelines) and regular supervision will assist MOH to achieve a good staff performance. MOH should provide transport to pharmacists (senior and specialized pharmacists could be offered private vehicles) from their residence to the place of work to increase their motivation. Company-paid private medical insurance and a company car for senior staff, child daycare facilities, pension and retirement plans are the most desired and lead to employee retention.
6. Redistribution of pharmacy workforces: To address the problems of the pharmacy profession in Sudan, an increase in access to essential medicines, although positive, is insufficient. Far more important is the need to strengthen the pharmacy workforce in localities, states and federal health institutions to address the challenges and to use the resources and interventions for provision of effective pharmaceutical services.
7. Small staff and efficient teamwork: The advantages of small staff can be easily managed, trained and financed, and teamwork could be developed. This also improves the performance and productivity of the public sector pharmacists and thereby reduces the number of PHRs needed to provide satisfactory pharmaceutical services in the public sector institutions. The best indicators of staff retention are the fostering of friendships at work, and managers in healthcare should take time to get to know people and foster opportunities for friendship and socializing.

   The pharmacy workforces are divided into two levels: (1) Department of Pharmacies at Ministry of Health and (2) hospitals. The Department of Pharmacy at state level should consist of six pharmacists at maximum and 25 at the federal Department of Pharmacy including drug analysis laboratory. The hospitals' department of pharmacies should be classified as follows:

   (i) Group A includes big hospitals (e.g., Khartoum and Omdurman hospitals). Group A hospitals have 13 pharmacists in addition to pharmacy assistants and other supportive staff to cover all shifts: one manager, three pharmacists work in the Drug Information Centre, three for internal hospital pharmacy, two in outpatient pharmacy, three in people pharmacy and one clinical pharmacist.
   (ii) Group B includes medium hospitals and capital cities hospitals (e.g., Ibrahim Malik and Medani Hospitals). The Hospital Pharmacy Department (HPD) in this group could be managed by four to six pharmacists.
   (iii) Group C includes small and rural hospitals. Two pharmacists could run the HPD in these hospitals. Paying attention to create more a flexible and efficient system for PHRs management in the government institutions might help improve the condition of shortages of pharmacists in the public sector.

8. National leadership at the highest level is essential and will only come with heightened awareness of the fundamental importance of pharmacists in healthcare in general and in the pharmaceutical care in particular, and in the development of new methods and strategies for provision of pharmaceutical services in public sector as well as in the private sector.
9. Continuing pharmacy professional development: The most important element of National Drug Policy (NDP) and the 25-year pharmacy strategy – the people that make them work – has yet to be tackled. MOH should fully recognize its 25-year pharmacy strategy goals could be achieved through people's (especially pharmacists) expertise. Appropriate training and development is the key to reaching those goals and making strategy visions become a reality. A wide variety of external (e.g., distance or e-learning in the developed world) and internal training and development programs for pharmacists should be introduced. A pharmacist's career or pathway should be developed. A policy for active selection of training fields should be formulated according to the priorities of healthcare needs. Career development relies on individual training and development to enable employees to move into more challenging roles and can provide enhanced rewards for those who are promoted.
10. Pharmacy staff discipline and accountability system: Disciplinary procedures, which provide a range of possible responses (from warnings through dismissal, depending on the severity and frequency of the offence) should be clearly stated in the new work contracts. Pharmacy managers and team leaders in different settings (administration or care providing, at both state and federal levels) should be trained to invoke disciplinary procedures and to bring criminal charges when necessary.

Further Research

The current analysis does not support the above-mentioned substantive recommendations, which are also drawn from the authors' own experience and situations in other developing neighbour countries. However, further research is needed to find out if such recommendations might be effective. Research is also needed to provide in-depth understanding of main factors that lead to migration of pharmacists to the private sector. The key elements of pharmacists' motivation should be further studied to test if there is any statistically significant difference between impacts of different elements of motivation on pharmacists (i.e., public and private pharmacists). Such analysis will help in prioritizing resources by addressing the main issues, which lead to pharmacists' demotivation. The future research will stratify pharmacists in both public and private sectors into different groups according to their previous experiences. It will, therefore, include those who are currently in the public sector but have no previous private sector experience, and those who are currently in the public sector but have worked in the private sector some time in the past. The same scenarios will be applied to the private pharmacists. Finally, research should be carried out to understand the scope, magnitude, directions of the migratory flows, within and outside the country, as well as the characteristics and skills of the emigrated pharmacists.

Conclusions

Improving effectiveness of the public pharmaceutical services could be achieved by switching resources towards areas of need, reducing inequalities and promoting better health. Unless there are clear incentives for pharmacists, they will move away from public sector. Finding innovative approaches to stop brain drain of the pharmacists from the public sector and to increase their productivity and performance might be more appropriate strategies to solve the problem in Sudan. These strategies comprise, for instance, monitoring incentives, continuing professional development and improving working condition and job satisfaction of civil service PHRs. The study may help the Ministry of Health to better look at the real issues of PHRs in the public sector and to formulate more relevant and useful policies and plans to retain qualified and skilled pharmacists in the public sector on a solid evidence base. The study revealed low salaries, job dissatisfaction in relation to the pharmacy practice and bureaucracy, working conditions, lack of recognition for contribution at

work and lack of professional development training programs as the main factors influencing the brain drain of the PHRs. These factors affect PHRs' immigration and retention concurrently rather than in isolation. Given the time constraints required to get the new contracting arrangements in place, there is a risk that good practice developments in options for change for change field sites may not be used effectively (continue to evaluate and disseminate the lessons that emerge from these sites).

Ethical Clearance and Data Protection Consent

The ethical clearance has been obtained from the Federal Ministry of Health Research Ethics Committee. The respondents were informed that all the data would be used for academic research purposes only and that data processing would not be used to support decision-making about them and would not cause any damage or distress to the participants.

Research Limitations

This short survey of pharmacists working within both the public and private sectors in Sudan was meant to explore the factors that discourage or shorten pharmacists' stays in the public sector and their reasons for transferring to the private sector. The design of the research itself may be considered inadequate with regard to size and selection process. However, the researchers believe it provides enough information about why pharmacists leave the public sector.

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Appendix 1. Facts about Sudan

Full country name	Republic of the Sudan
Total area	One million square miles (2.5×10^6 square kilometres). Land 2.376×10^6 square kilometres
Population	34.3×10^6 inhabitants (UN 2004)
Capital city	Khartoum (population 5 million)
Language	Arabic (official), English, Nubian, Ta Bedawie, diverse dialects of Nilotic, Nilo – Hamitic, Sudanic languages
Religions	Sunni Muslim 70% (in north), indigenous beliefs 25%, Christian 5% (mostly in south and Khartoum)
GDP per head	US $460 (World Bank 2003)
Annual growth	4% (1997 est.)
Inflation	23% (1998 est.)
Monetary unit	1 Dinar = 10 Sudanese pounds (1 US $ = 250 Dinar)
Ethnic groups	Black 52%, Arab 39%, Beja 6%, Foreigners 2%, others 1%
Life expectancy	54 years (men), 57 years (women) (UN)
Main exports	Oil, cotton, sesame, livestock and hides, gum Arabic
Agricultures	Agriculture is the backbone of economic and social development. 62% of the populations are employed in agriculture. Agriculture contributes 33% of the gross national products (GNP) and 95% of all earnings.
Animal wealth	35×10^6 head of cattle 35×10^6 head of sheep 35×10^6 head of goats 3×10^6 head of camels 0.6×10^6 head of horses and donkeys Fish wealth 0.2×10^6 tonnes of food annually Wildlife, birds and reptiles
Population access to safe water (%) **Population access to adequate sanitation (%)** **Population access to health services (%)**	73% (UNICEF 1999) 51% (UNICEF 1999) 51% (UNICEF 1999)
Under five mortality rate	115 (per 1000 live births) (UNICEF 1999)
Environment	Inadequate supplies of potable water, wildlife populations threatened by excessive hunting, soil erosion, and desertification.
International agreements	Party to: biodiversity, climate change, desertification, endangered species, law of the sea, nuclear test ban, ozone layer protection.

Appendix 2. Summary of inherited problems for health services in Sudan

Health services	Personnel
• Absence of referral systems • Lack of means of patient transport and ambulances • Lack of work standards • Service is not based on the concept of client satisfaction • Weak infrastructure and distribution • Lack of clear vision, mission and plans • Many health facilities are not constructed according to the recommended standards for its location, buildings, etc. • Low quality of tertiary services leading to patients seeking treatment abroad	• Imbalance in training of different healthcare especially technical and nursing • Shortage in certain specializations such as surgery, pathology, general practitioners and family physician • High attrition rate • Lack of continuing education programmes • Poor distribution of health manpower • The standard of auxiliary workers does not meet the required level • Low personnel morale, satisfaction, ownership feelings, motivation, respect to work values and attitude towards patients and colleagues • Poor culture of evidence-based practice • Absence of clear guidelines for medical practice and service protocols

Appendix 3. Public sector pharmacists brain drain questionnaire

Public Sector Pharmacists' Questionnaire

Date _____ Department _____
Serial No _____

Please mark the best answer with an X

1. Are you: ☐ Male ☐ Female

2. When did you graduate?

During or before 1965		1
During 1966–1970		2
During 1971–1975		3
During 1976–1980		4
During 1981–1985		5
During 1986–1990		6
During 1991–1995		7
During 1996–2000		8
After 2000		9

3. Country of graduation _____

4. Did you experience any private job at some time in the past before joining the public sector?

☐ Yes (Go to question 5) ☐ No (Go to question 6)

5. Why did you decide to leave the private sector?
Please rate each of the following reasons BY CIRCLING ONE NUMBER ON EACH LINE.
1= most important, 5 = least important

Job dissatisfaction	1	2	3	4	5
Feeling of working for specific person	1	2	3	4	5
Low salaries and incentives	1	2	3	4	5
Lack of ownership	1	2	3	4	5

Others (Please specify) _____

_____

6. Why did you choose the public sector?
Please rate each of the following reasons BY CIRCLING ONE NUMBER ON EACH LINE.
1= most important, 5 = least important

Job satisfaction	1	2	3	4	5
Feeling of doing a public job	1	2	3	4	5
Salaries are better than the private	1	2	3	4	5
Feeling of ownership	1	2	3	4	5
Locally short and long training courses	1	2	3	4	5
Short and long training abroad	1	2	3	4	5

Others (Please specify) _____

_____

7. What are the reasons that encourage you to work with public sector?
Please rate each of the following reasons BY CIRCLING ONE NUMBER ON EACH LINE.
1= most important, 5 = least important

Job satisfaction	1	2	3	4	5
Feeling of doing a public job	1	2	3	4	5
Salaries are better than the private	1	2	3	4	5
Feeling of ownership	1	2	3	4	5
Pensions and other benefits	1	2	3	4	5
Short and long training abroad	1	2	3	4	5

Others (Please specify) _____

_____

8. Do you have intention to leave the public sector at some time in the future?

☐ Yes (Go to questions 9, 10, 11) ☐ No (Go to question 11)

9. Why are you intending to leave the public sector?
Please rate each of the following reasons BY CIRCLING ONE NUMBER ON EACH LINE.
1= most important, 5 = least important

Job satisfaction in the private sector	1	2	3	4	5
Private salaries are better than the public	1	2	3	4	5
Private sector offers me vehicle	1	2	3	4	5
The private gives me full treatment when feeling ill	1	2	3	4	5

Others (Please specify) _____

_____

10. What are the reasons that discourage you to continue with public sector?
Please rate each of the following reasons BY CIRCLING ONE NUMBER ON EACH LINE.
1= most important, 5 = least important

Lack of recognition of what I have done	1	2	3	4	5
Monetary issues	1	2	3	4	5
Dim vision	1	2	3	4	5
Sense of instability	1	2	3	4	5
Lack of job satisfaction	1	2	3	4	5
Those who work and those who don't are equal	1	2	3	4	5
Policy-makers don't care about pharmacy	1	2	3	4	5
Political issues	1	2	3	4	5

Others (Please specify) _____

_____

11. If you have any other comments concerning the retention of public sector pharmacy human resources, please do not hesitate to report them.

_____

_____

_____

We would like to thank you very much for your participation in our research. If you do not mind, we might need your telephone number to contact you for further clarification.

Telephone Number: _____

Appendix 4. Public Sector Pharmacists Brain Drain Questionnaire

Private Sector Pharmacists' Questionnaire
Date _____ Serial No _____

Please mark the best answer with an X
1. Are you: ☐ Male ☐ Female

2. When did you graduate?

During or before 1965		1
During 1966–1970		2
During 1971–1975		3
During 1976–1980		4
During 1981–1985		5
During 1986–1990		6
During 1991–1995		7
During 1996–2000		8
After 2000		9

3. Country of graduation _____

4. What is your current employer within the private sector?

Medical representative in a drug company		1
Drug information pharmacist in a drug company		2
Community pharmacy pharmacists		3
Non-Governmental organization		4

Others (please specify) _____

_____

5. What is your approximate monthly salary *(IN SUDANESE POUNDS)*?

Less than 500,000		1
500,000–999,999		2
1,000,000–1,499,999		3
1,500,000–1,999,999		4
2,000,000–2,499,999		5
2,500,000–2,999,999		6
3,000,000 or more		7

6. Did you work with public sector at some time in the past before joining the private sector?

☐ Yes (Go to questions 7) ☐ No (Go to question 8)

7. Why did you decide to leave the public sector?
Please rate each of the following reasons BY CIRCLING ONE NUMBER ON EACH LINE.
1= most important, 5 = least important

Lack of recognition of what I had done	1	2	3	4	5
Low salaries and incentives	1	2	3	4	5
Dim vision	1	2	3	4	5
Feeling of instability	1	2	3	4	5
Lack of job satisfaction	1	2	3	4	5
Those who work harder and those who don't are equal	1	2	3	4	5
Policy-makers don't care about pharmacy	1	2	3	4	5
Political issues	1	2	3	4	5

Others (Please specify) _____

_____

8. Why did you choose the private sector?
Please rate each of the following reasons BY CIRCLING ONE NUMBER ON EACH LINE.
1= most important, 5 = least important

Job satisfaction in the private sector	1	2	3	4	5
Private salaries are better than the public	1	2	3	4	5
Private sector offers me vehicle	1	2	3	4	5
The private gives me full treatment when feeling ill	1	2	3	4	5

Others (Please specify) _____

_____

9. Do you have any intention to leave the private sector at some time in the future?

☐ Yes (Go to questions 10) ☐ No (Go to question 11)

10. What are the reasons that encourage you to join the public sector?
Please rate each of the following reasons BY CIRCLING ONE NUMBER ON EACH LINE.
1= most important, 5 = least important

Job satisfaction in the public sector	1	2	3	4	5
No feeling of working for specific person	1	2	3	4	5
Better salaries	1	2	3	4	5
Feeling of ownership	1	2	3	4	5
Overseas training	1	2	3	4	5
Local training	1	2	3	4	5

Others (Please specify) _____

_____

11. What are the most important reasons that discourage you from joining the public sector at some time in the future?
Please rate each of the following reasons BY CIRCLING ONE NUMBER ON EACH LINE.
1= most important, 5 = least important

Monetary issues	1	2	3	4	5
Dim vision	1	2	3	4	5
Sense of instability	1	2	3	4	5
Lack of job satisfaction	1	2	3	4	5
Political issues	1	2	3	4	5

Others (Please specify) _____

_____

12. If you can move to the public sector, which of the following areas you are interested in?
Please rate each of the following reasons BY CIRCLING ONE NUMBER ON EACH LINE.
1= most important, 5 = least important

Hospitals	1	2	3	4	5
Inspection department	1	2	3	4	5
Drug supply department	1	2	3	4	5
Drug information centre	1	2	3	4	5

Others (Please specify) _____

_____

13. If you have any other comments concerning the retention of public sector pharmacy human resources, please do not hesitate to report them.

_____

_____

_____

We would like to thank you very much for your participation in our research. If you do not mind, we might need your telephone number to contact you for further clarification.

Telephone Number: _____

Appendix 5. Definition of some reasons mentioned in Tables 2 to 8

Job satisfaction can be influenced by a variety of factors, for instance, the quality of ones' relationship with one's supervisor, the quality of the physical environment in which they work, degree of fulfilment in their work, and so on. The instruments of this research asked respondents to choose what factors that dissatisfied them, to find out what are the most important factors that are causing pharmacists to move to the private sector. Below, we provide definitions for some of the reasons chosen by the respondents and presented in Tables 2 to 8 in this study including the term "job satisfaction" in this context.

Reason	Definition
Job satisfaction	Job satisfaction is in regard to pharmacists' feelings or state-of-mind regarding the nature and characteristics of tasks to be done (i.e. self-perception of quality of work). Role of pharmacists in Sudan, like in many developing countries, are of managerial and dispensatory nature. For example, in departments of pharmacy, the main roles of pharmacists include issuing of licences to and inspection of pharmacy premises.
Sense of ownership	Work experience where employees can gain valuable skill sets in a closer knit environment and feel a real sense of ownership in the company's success.
Dim vision	Visions and objectives in the place of work do not exist or are not so clear.
Sense of instability	Pharmacists feel unstable and lose motivation for a number of reasons, for instance, if they do not show commitment and loyalty to the ruling parties in developing countries.
Those who work and those who don't are equal	The motivated pharmacists who devoted considerable time to their work and those who make great contributions to their organizations are not rewarded and promoted for their performance (i.e., lack of pay for performance system in the public sector).
Policy-makers don't care about pharmacy	Pharmacy services is considered by many policy-makers in public sector as a supportive service and is not considered as a major profession in health-care system. As a result, the main focus is on medical doctors.
Political issues	Promotion depends not on the objective criteria, but on the personal choices of administrators who are most likely influenced by their political ideologies.
Lack of recognition of what I had done	Senior staff at public sector do not recognize motivated pharmacists who have done good jobs in their organizations, and do not promote their upward mobility. They also don't show a sense of commitment to what has been achieved.
Feeling of working for specific person	Unlike public sector, where employees have sense of doing a public work, in private pharmacy business (which is more or less owned by individuals and families) pharmacists suffer from the lack of obtaining full authority and responsibility.

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