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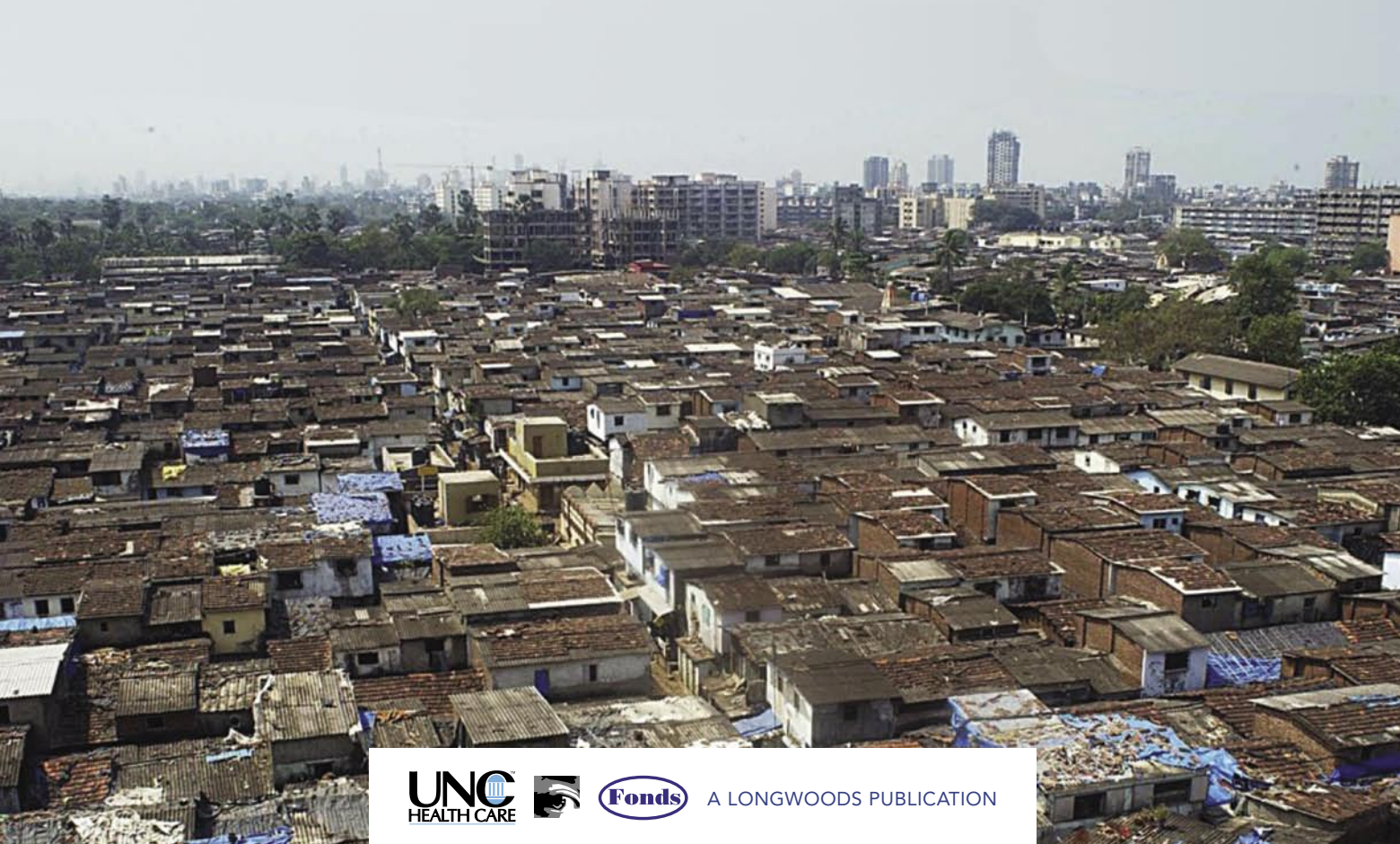
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Analysis of Breastfeeding Behaviour in Malawi

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E-mail: dkent@longwoods.com

Managing Editor

Rebecca Hart
E-mail: rhart@longwoods.com

Publisher

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Associate Publisher/Media

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Director, Design and Production

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Graphic Designer, Design and Production

Jonathan Whitehead
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From the Editor-in-Chief

This volume of *World Health & Population* presents papers which have been published online by *WHP* and are selected here as representative of recent contributions accepted for publication by the journal. The papers in this issue include a research paper on the impact of nurse migration and the worldwide shortage of nurses, and four papers from African settings, three regarding the ongoing HIV/AIDS crisis, and one looking at breastfeeding behaviors.

In the first paper in this issue, Chapman, Kipp, and Rubaale use robust qualitative methods in the form of 68 interviews and eight focus groups to gain understanding of the public's perception around the declining HIV prevalence and the so-called "Ugandan success story." Certainly Uganda has been subjected to a great deal of external study and press coverage regarding the country's progress combating the HIV/AIDS epidemic. Data collected in Fort Portal, Kabarole, western Uganda present an internal view of the country's progress from the perspective of the people most directly involved. The authors advocate consulting local people (those most impacted) in the interpretation of research results, and not just accept the interpretation of external scientific or policy experts.

Epidemiologist Lawrence Kazembe of the University of Malawi uses spatial modeling in our second paper to explicate the breastfeeding behavior in terms of (1) initiation and (2) duration. Working with data from the 2000 Malawi Demographic and Health Survey, Kazembe's study simultaneously modeled the effects of individual factors and geographic location on these two breastfeeding behaviors. The results are useful both for helping target interventions as well as directing further epidemiologic and geographic studies of behaviors. A subsequent paper is proposed by Kazembe to examine the spatial attributes of two other important breastfeeding behaviors: exclusivity and intensity. It will be interesting to see if these characteristics also exhibit geographic sensitivity, and in the same direction as initiation and duration behaviors.

For the third paper John Owiti's research, supported through an IDRC (Canada) grant, presents results from his doctoral thesis on knowledge of the link between tuberculosis and HIV/AIDS in rural Kenya. Tuberculosis and HIV/AIDS co-infection has long been recognized as an extremely serious health problem, particularly in resource-constrained and low income countries. The biomedical link between the two diseases is well established. Owiti's paper examines factors linking HIV/AIDS and TB from the "ecosystem" perspective. The ecosystem is defined as "the relationship between human populations and the physical, biological, and socio-cultural environments." Data were collected through interviews and focus groups with the rural Turkana people living in Lodwar Township, northwestern Kenya. Owiti identifies socio-cultural factors that affect both beliefs and behavior, some which are supportive of the biomedical model, e.g. in a focus group quote: "TB and HIV/AIDS are like brothers." Owiti proposes that prevention and management of both diseases should be integrated, and take into account the full range of ecosystem interactions.

The fourth paper in this issue, by Ndiaye and colleagues, examines gender-related factors and the critical issue of HIV serostatus disclosure. Informing one's partner regarding serostatus remains one of the critical means for initiating action to prevent new HIV infections. It also may initiate testing interest on the part of the partner, facilitate earlier access to needed medical care and therapies, and reduce stigmatization/increase awareness more broadly. As access to important and effective therapies (i.e. "HAART") continues to expand, and the prevalence of HIV-positive individuals therefore continues to rise, the need to reinforce behavioral interventions to prevent new infections is critically important. Ndiaye et al. describe the different priorities and motivations for men and women that would facilitate disclosure of one's serostatus.

Finally, this issue concludes with a “white paper” on issues around global migration of trained nurses prepared by *WHP* Associate Editor Amir Khaliq, along with colleagues from the University of Oklahoma Health Sciences Center. Khaliq et al. give a comprehensive, informative and sobering country-by-country analysis of demand for nurses by the more economically developed nations, and the supply being pulled from developing nation training programs in the Philippines, the Caribbean region, Africa, India, and China. The impacts on the developing countries in terms of economic flows (both positive and negative), and the negative impact on local healthcare delivery, are described. Given the levels of training of nurses in these countries, shortages could certainly be avoided, but are not. The resulting nursing shortages in developing countries threaten achievement of critical Millennium Development Goals (MDGs). The authors conclude with recommendations for multilateral agreements between the source and the destination countries.

In summary, we hope that you find these articles and the white paper of interest and value, and that you will additionally consult other papers recently released online at www.worldhealthand-population.com. *WHP* remains committed to its mission to provide a forum for researchers and policy makers worldwide to publish and disseminate health- and population-related research, and to encourage applied research and policy analysis from diverse international settings. Note also that *WHP* is indexed on MEDLINE and accessible through PubMed. We look forward to continued enthusiastic submission of manuscripts for consideration, peer-review, and publishing. Finally, the editors and publishers of *WHP* are always interested in any comments or suggestions you might have on the articles or journal. Please feel free to write or e-mail us.

John E. Paul, PhD
Editor-in-Chief, World Health and Population
paulj@email.unc.edu

“...No Stone Left Unturned:” How the Public Explains the Ugandan Success Story

Elizabeth Chapman, MSc, Department Public Health Sciences, University of Alberta, Edmonton, Alberta, Canada; Dalhousie Medical School, Halifax, Nova Scotia, Canada

Walter Kipp, MD, PhD, Department Public Health Sciences, University of Alberta, Edmonton, Alberta, Canada

Tom Rubaale, MSc, Health Department, Kabarole District, P.O. Box 75, Fort Portal, Uganda

Dr. Walter Kipp, Professor for Global Health, Public Health Sciences Department, School of Public Health, 13-103 Clinical Sciences Building, University of Alberta, Edmonton, Alberta, Canada, Tel: 780-492-8643, Fax: 780-492-0364, email: walter.kipp@ualberta.ca

Abstract

We conducted a public poll to assess the public's perception about changes in HIV prevalence and its causes in a township in western Uganda. The main questions related to the declining HIV prevalence and its interpretation, as well as to the “Ugandan success story.” The study used a qualitative methodology; we interviewed 68 citizens in eight focus group discussions. The majority stated that the HIV prevalence had declined in their town. Of those respondents, most cited behaviour changes related to Uganda's ABC strategy as their explanation of the declining trends. Those who said that a decline in HIV had taken place also stated that they believed in the Ugandan success story. Our study concludes that it is important to involve the public on important health issues such as HIV/AIDS in order to obtain more valid results by combining scientific findings with public/indigenous knowledge.

Introduction

Trends in the transmission of the Human Immunodeficiency Virus (HIV) in Uganda have been established mainly through HIV incidence assessments in two major cohort studies: in Masaka district, implemented by the United Kingdom-based Medical Research Council (MRC), and in Rakai district, implemented by the Johns Hopkins University, USA, and Makerere University,

Uganda. There is overall agreement that HIV transmission has decreased in Uganda, especially in the 1990s, and professionals and scientists no longer debate this point. In contrast, however, is an ongoing debate on which of the interventions or intervention components have been responsible for the decline. There is currently no consensus in the literature on precisely what kind of sexual behaviour change has occurred over what time period and how it has impacted HIV prevalence trends.

Many health professionals think that the most common behaviour changes to influence the decline in HIV infections in Uganda relate to the ABC (Abstinence, Be faithful and Condom use) strategy. Numerous studies in the literature have investigated behaviour changes, including abstinence, later age of sexual debut, increased condom use and reduced number of sexual partners (faithfulness), and have appraised them all as public health approaches with proven effectiveness (Low-Beer et al. 2002; Hankins 1998; Mulder et al. 1994). However, a more recent study by the authors of the Rakai cohort studies (Wawer et al. 2005) has indicated that from the mid-1990s to the present, the main reasons for declining HIV prevalence in Rakai district have been increased condom use with casual partners and HIV-related mortality. Another explanation was provided by Green et al. (2006). They postulate that a high level of fear, combined with the public's knowledge that they could do something to avoid being infected (achieved through education on the ABC strategy), resulted in optimal conditions for behaviour change. “Fear appeals,” according to these authors, were strongest during the early stages of the national response (1986–1991), which coincided with a major decline in HIV prevalence.

Several other authors recognize that personal experiences, stories and social networks are important in traditional societies such as Uganda to disseminate knowledge (Parkhurst 2002; Macintyre et al. 2001; Whitworth et al. 2002; Okware et al. 2001). These authors have stated that sexual behaviour change can be the consequence of reasons other than intervention programs – for example, as a consequence of friends and relatives dying of HIV/AIDS, something experienced by virtually every Ugandan. Allen (2006) argues for further investigation into such phenomena, stating that since much of the information presented to explain HIV trends is quantitative, data based on qualitative “anecdotes” often go unrecognized by the scientific community. He further states that scientific discussions are very valuable but not complete and comprehensive if one source of information, for example, the public's opinion, is missed (Allen 2006).

The discussions about the Ugandan success story in HIV/AIDS prevention took place almost exclusively in the scientific and professional community, with little interaction with and input from HIV patients, their families and the public at large. A MEDLINE search for articles where patient or public input was systematically sought to help interpret HIV/AIDS-related study findings and phenomena (such as trends in HIV prevalence) revealed no published information from Uganda. The only publication we found in our literature review was a study from the Rakai project, where the target population was asked how they perceived the benefits of the research results to their welfare and local development (Thiessen et al. 2007).

Background Information

Fort Portal is a township and the district capital of Kabarole district, located in western Uganda. Its population is around 40,000. The town's economy has increased substantially over the past years. Fort Portal has three hospitals and is home to the Kabarole District Health Department. There are five primary and three secondary schools, providing schooling from primary one level to secondary six. The main trading goods are agricultural produce, including tea. Data from Fort Portal showed that HIV-1 prevalence declined significantly in young pregnant women, from 33% in 1991, to 9% in 1997, and then to 6% in 2004 (Kilian et al. 1999). HIV prevalence in Kabarole district is currently 11.6% in the sexually active population (Uganda Communication Commission 2003) and is higher than the national average of 6.3% (Uganda Ministry of Health 2006).

Research Questions

The study aimed to answer these three questions:

What are the public perceptions of the trends in HIV prevalence in Fort Portal town over the period 1991–2004?

Is the public in Fort Portal town aware of a declining trend in HIV prevalence, and how does it explain this trend?

Does the public know about the "Ugandan success story," and what does it think about it?

The study was conducted from September to December 2005 in Fort Portal. It was part of a larger investigation of HIV prevalence trends over 14 years, using quantitative and qualitative methodologies. Both components were part of an MSc thesis research project by the first author. The quantitative part consisted mainly of analyzing trends in HIV-1 prevalence surveillance data of pregnant women attending antenatal clinics over a 14-year period (Kipp et al. in press). The component presented here is the qualitative part of the study. The study was financed through the Fund for Support of International Development Activities (FSIDA), University of Alberta, Edmonton, Canada.

Methods

Sample Selection

Participants for the focus group discussions (FGDs) were chosen based on their potential to provide insightful thoughts, comments and opinions on HIV prevalence trends. Participants were selected from several groups: (a) professionals (working in areas of civil service, education, police, etc.), (b) citizens of middle socio-economic and educational status, (c) traditional healers, (d) health professionals, (e) youth, and (f) members of the HIV Post Test Club of Fort Portal, a support group for persons with HIV. Eight FGDs were conducted, each with an average of 7 to 12 participants, with a total of 68 participants. Women and men were equally represented. FGDs ranged from 45 to 90 minutes in duration and were held in a conference room in Fort Portal. The site was chosen for its neutrality, for ease of access by participants and for a private, quiet atmosphere conducive to discussion. As remuneration, participants were given drinks and snacks at the conclusion of the discussion and a small stipend (around US\$ 5,000, or US 2 dollars) to cover transportation and other related expenses.

Study Instrument

A list of topics with questions relevant to the research themes was developed with input from local researchers and health officials. A funnel method was used to develop questions, beginning with general questions and leading to a more specific discussion to achieve a balance between obtaining information that suited the researcher's interests and allowing respondents to influence the flow of discussion. Each group was asked a common set of questions about Uganda's HIV trends, its HIV/AIDS success story and reasons for HIV trends. Examples of these questions include, "What do you think are the trends of HIV infection in Fort Portal?" "What type of behaviour change do you think was responsible for these trends?" "Have you heard of the Uganda success story and what does it mean?" "Where have you heard this?" "What is your definition of the Ugandan success story?" (For example, fewer people are dying, anti-retroviral drugs are freely available, people are living longer, new infections are occurring less frequently, people are widely aware of HIV/AIDS.) "Do you agree that Uganda is a success story? Why or why not?" "Are you satisfied with your information on HIV/AIDS including prevalence trends?"

Data Collection and Analysis

FGDs were conducted by the principal researcher and two research assistants fluent in Rutooro, the local language. All FGDs were audiotaped using both digital and analog tape-recorders. In addition, a research assistant manually recorded notes. The facilitator introduced the main themes to be discussed and the purpose of the discussion. Following this, participants were asked to discuss

the themes. Probing was used throughout to encourage participants to elaborate, in order to follow up on statements and to achieve a suitable depth of knowledge and insight.

Transcription took place after completion of each FGD. When FGDs were conducted in English, the principal researcher completed the transcription. When they were conducted in Rutooro, the primary investigator worked with a translator who transcribed a verbatim account of the group discussions directly into English. Data from FGDs were verified in several ways: Firstly, we used probing and verification questions during discussions to ensure participants' words and meanings were understood correctly. For example, a verification question could consist of the researcher repeating a participant's comment back to him or her in the form of a question requiring a yes/no answer. This kind of probing helped clarify participants' opinions or attitudes on the issues being discussed. Secondly, the audio recordings and the notes taken during the FGDs were cross-checked to fill gaps in the discussion. Finally, during transcription, culture-specific wording and meanings were defined and explained to the primary investigator by the transcriber.

Data analysis of FGDs followed guidelines set out by Rothe (2000). After transcription, an overall reading and surface analysis of the transcript was completed. During this first reading, general themes and possible sub-themes were identified. Following this initial reading, themes and sub-themes were arranged into groups whereby related concepts were placed together under overarching themes. Codes were assigned for each theme and sub-theme. Transcriptions were then organized into Word tables by question and response sets. The coded statements were divided up according to theme of answer, group and gender responses to each question. Frequency of responses for each applicable question was obtained, as well as frequency of themes given in responses.

Ethical approval

The study was cleared by the Ethical Review Board (Panel B) of the University of Alberta. Approval in Uganda was sought from the Uganda National Council for Science and Technology and from the District Health Officer, Kabarole district. We obtained informed consent from all study participants prior to the interview. For this purpose, participants were given or read an information letter outlining the purposes and implications of the study and clarifying the voluntary nature of their participation. They gave consent either by signing or thumb-printing the consent form prior to the interview. No names of interviewees were recorded. Before beginning the discussion, we ensured that participants understood their statements were to be audiotaped.

Study results revealed that several overarching themes had emerged from the questions asked during the discussions. Each theme and linkages between themes were found, reflecting the interdependence of issues. These themes are presented as the headings in this section.

Awareness of Declining HIV Trend Is High

In general, participants felt that HIV prevalence had decreased in Uganda since the early 1990s. However, some participants, especially females, felt that it had increased or stayed the same. Explanations for decreasing HIV trends ranged from citing the government of Uganda's strong political response to AIDS, which included a multi-sectoral AIDS control strategy to HIV programs organized by non-governmental organizations. This is apparent in the following quotes:

(Male Citizen): "...because the government and churches and education institutions have done a big job to see that they bring awareness among the communities. This has been a big step forward. You heard about the Catholic Church Bishops from all over Africa [holding] a two-week conference in Uganda to fight against this thing."

(Male Professional): "Because, uh, the government policy is very clear on AIDS, to an extent of making a secretariat in Kampala, fully funded, up to...the District level."

(Female Professional): "For instance, there are even policies, the government has come in to

enforce in schools...when we are going with the...sports women and men together...the girls should go with senior women, a lady, there must be a lady to accompany them.”

Behaviour change, usually in the context of the ABC strategy, was cited emphatically by participants who said that HIV prevalence had declined, as shown in the following statements:

(Male Professional): “At the end of the day, people were aware that AIDS is there, and they have tried how to control themselves, at least, those one who are reckless, they go they use condoms. Others, I think in the schools they are encouraging abstinence, they are doing that one, and they are seeing good results so far.”

(Male Youth): “This disease has gone down because they have tried to fight against it in different ways. Because we hear them encouraging us, saying that you as youth when you want to involve yourselves in such activities, you should use condoms or you should abstain.”

Positive Sexual Behaviour Changes Have Taken Place in Youth

Despite the challenges of changing youth behaviour raised in the FGDs, many participants (both youth and adults) felt that youth were changing their sexual behaviours in a positive way. The dominant behaviour changes that participants reported were related to Uganda’s ABC strategy. Others included postponing first sex and increased uptake of voluntary counselling and testing for HIV (VCT), as documented in the following responses:

(Female Youth): “If the boy is not faithful to me then I can decide to abstain or if I get another one I will tell him to use a condom.”

(Female Professional): “...the youth are really moving on a positive trend, because these are the virgin people who have been, who are aware...of the causes, eh? And these are the very people who are using the condoms.”

(Male Health Professional): “...in that the youth still have play [inaudible] sexual relationships but then, they do it in a safer way by using condoms. And they think with the [inaudible], most of the condoms that are being consumed are being used by youth.”

(Male Professional): “Most cases the girls thought that to make a boy happy, a man happy is through sex intercourse. But today, they say no. They are assertive. And that’s a real achievement at best.”

Peer groups were also seen as a potentially positive influence on behaviour change:

(Female Professional): [Regarding VCT uptake] “Because the youth, they are vigilant, they are energetic, they are inquisitive, and they are determined. And because of that, once you have told them something, they want to go in and find out, are determined to do that thing. And when they go, they disseminate the information to their peer groups, the youth. The other youth, because of the vigilance they have, they feel they are determined to go and teach others.”

The “Ugandan HIV/AIDS Success Story” Is Known

A definition of the Ugandan “success story” (that Uganda has successfully lowered its HIV prevalence) was given to all participants prior to discussing this topic. Virtually all had heard of and agreed with the story. Participants were then asked how they themselves defined the success story. Elements of Uganda’s AIDS control program dominated participants’ definitions:

(Male Citizen): “Another one, I can see that the success is there, there is a provision of getting these anti-retroviral drugs which can reduce the disease up to a certain period where people can buy it at [a] manageable price.”

(Female Citizen): “For me the success story I am seeing in the fight against this disease is that the government has provided many free drugs and they have told everybody to go for [a] check-up in order to know their HIV status, and in many cases patients are provided with some free things to assist them and to assist orphans.”

(Female Professional): “It is a cutting, a cross-cutting issue. And, multi sectors, so it is called a multisectoral, cross-cutting issue. So there is no way we shall leave stones unturned, which Uganda has done... and that one has brought success.”

Challenges to the Success Story

Although virtually all participants agreed that Uganda has been “successful,” most felt there was still a lot of work to do to reduce HIV/AIDS. Participants’ view was that behaviour change had occurred slowly, despite the efforts of the Ugandan government and its partners in HIV/AIDS control. Social issues such as poverty, polygamy, prostitution and stigma were also cited as challenges to Uganda’s continuing success in lowering its HIV prevalence.

(Female Citizen): “Therefore Uganda as a country has played its part in informing the public on preventive measures, except the problem is still that people are ignorant.”

(Female Citizen): “...it has provided assistance to almost everybody, except that the people have refused to make a choice on what to do, and [there] are still many who have refused to go for [a] check-up, up to now.”

(Male Health Professional): “I think also that it is one thing to give information, because we have reached many people, and it’s quite another to change behaviour. You know AIDS is very much around here. So many people might have that information, but have not yet all taken [inaudible]. It’s dreadful.”

One respondent raised an interesting point on the dilemma of informing the public about the positive changes in HIV prevalence trends:

(Male Health Professional): “And it has not been actually culture to disseminate [to] a group and say, ‘look, HIV problem is becoming less,’ because that would make people reckless. So [inaudible], we have to keep saying the problem is big, and we must keep alert, so that you’re not caught.”

This statement was reiterated by a few health officials, who found it “dangerous” to communicate the “true” declining trend of the HIV prevalence to the public.

Discussion

Involving the public in the research process and the interpretation of research results is not new. In 1999, Popay et al. advocated that lay knowledge should be recognized more and that the understanding of research results is more robust and holistic if lay knowledge is considered (Popay et al. 1999). Involving aboriginal populations in research has become standard practice in Canada, where local people are consulted in research design and the interpretation of results (Stevenson 1996). Yet public involvement in public health research has been rarely undertaken in many developing

countries. To the best of our knowledge, no attempts to capture public knowledge on the interpretation of HIV/AIDS issues have been made in Uganda.

One important finding of our study was that the majority of respondents believed HIV prevalence had declined in Fort Portal and that the decline was most likely a result of sexual behaviour changes. This corresponds very well with two of our previous studies from the same area: the first described the declining HIV prevalence as a consequence of increased safe-sex behaviour (Kilian et al. 1999); the second described the change in sexual behaviour as largely due to increased condom use, and to a lesser extent to increased abstinence and a reduction in numbers of sexual partners (Kilian et al. 2007). Our study indicates that the majority of participants who recognized the importance of HIV infection rates were in the young population, a finding that reflects and confirms research from this area that young people had the highest HIV infection rates.

The most important result of this study was that the majority of respondents thought the sexual behaviour change which they observed was best explained by a multi-method approach to HIV prevention such as ABC and not by an approach emphasizing abstinence as a particular method over other methods such as condom use. The exact mechanism on what caused the declining HIV infection rates (and the Ugandan success story) has been controversial in the scientific community. While some authors advocated for abstinence only programs, others opted for a multi-method approach to HIV prevention programs (Singh et al. 2003; Cohen 2004; Wilson 2006). These authors claim the decline in HIV prevalence in Uganda is best explained as a result of the "full ABC" approach versus just the "A" approach. This strongly reinforces that abstinence alone is not a satisfactory explanation for a declining HIV prevalence. Participants' responses to this question disagreed with the assertion that an abstinence-only message is required.

One participant commented on the danger of informing the public about improvements in the HIV/AIDS situation. He feared that people hearing the success story would fall back into unsafe sex and may cause a new spread of HIV. We heard this argument informally several times during our study, mainly from health professionals. In our opinion nothing can be more wrong: Firstly, there is no scientific evidence at all to suggest that this would happen, and secondly, healthcare professionals have a moral obligation to tell their clients and the public the truth about changing trends relevant to important infections, including HIV/AIDS. The main concern is that if the public is not aware of improvements in the HIV/AIDS situation as a consequence of health-team interventions, it may view the interventions as not effective and therefore not credible. This could undermine the work of the health teams and could result in their losing the trust of the population, which in turn may lead to their health messages being rejecting or ignoring.

Limitations

(1) This was a qualitative study; therefore the generalizability of the study to a larger urban population is not possible; (2) As sensitive issues were discussed, we cannot exclude that a social desirability bias may have occurred; and (3) We also cannot exclude that small errors due to language barriers occurred in spite of careful translations from English to the local language Rutooro and vice versa.

Conclusions

Our study highlights that there is merit in validating scientific findings of studies with knowledge from the public to help clarify the divisive controversy that surrounds the interpretation of the Ugandan success story. The ongoing controversial discussion by some professionals and scientists on what constitutes the Ugandan success story emphasizes the need to learn more about all pieces of the puzzle. Our study data from the opinions of the public support what informed professionals have said all along: the declining HIV prevalence in Uganda is likely explained best by multiple changes in sexual behaviour (ABC) and not by abstinence only. Public knowledge and perceptions of these trend changes in the HIV/AIDS epidemic are an important contribution to the overall interpretation of the Ugandan success story. The Kabarole Health Department needs to endorse

public information about their HIV/AIDS control program and disseminate the epidemiological situation of the HIV/AIDS epidemic regularly. Perceptions by a few health officials that providing the correct HIV/AIDS trend data to the public is "dangerous" because they believe it may stimulate high-risk sexual behaviour is not warranted and ethically not defensible. We believe that withholding information of such importance may backfire on the long run in such a way that the public will lose trust in their healthcare system, with negative consequences.

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Spatial Modelling of Initiation and Duration of Breastfeeding: Analysis of Breastfeeding Behaviour in Malawi – I

Lawrence N. Kazembe, Applied Statistics and Epidemiology Research Group,
Mathematical Sciences Department, Chancellor College, University of Malawi, PO Box 280,
Zomba, MALAWI

Corresponding author: Dr Lawrence Kazembe, PO Box 280, Zomba, Malawi, Tel: +265 1 524 222,
Fax: +265 1 524 046, E-mail: lkazembe@chanco.unima.mw

Abstract

Background and aim: The benefits of breastfeeding for child health are well recognized. Appropriate health promotion strategies must recognize the interplay between neighbourhood factors and breastfeeding patterns that may lead to spatial clustering in the health outcome. We developed spatial models to study factors associated with breastfeeding behaviour in Malawi by introducing random effects that allowed for unobserved influences on breastfeeding behaviour.

Methods: Using the 2000 Malawi Demographic and Health Survey, we studied two breastfeeding behaviours: initiation of breastfeeding and duration of breastfeeding. We fitted an ordinal model to estimate the initiation of breastfeeding, and a discrete-time duration model to analyze the duration of breastfeeding. Each model incorporated two spatial random effects at the subdistrict level, one component to capture spatial similarities across neighbouring areas and the other to permit spatial heterogeneity.

Results: Findings indicate a breastfeeding initiation rate of 60% immediately after birth, and a further 37% within 1 hour of birth. Timing of breastfeeding initiation within 1 hour was associated with maternal education; ethnicity; wealth ranking; access to media such as newspapers, radio or TV; and health-

sector variables such as place of birth, prenatal care assistance and support at delivery. The mean duration time for breastfeeding was 17.6 months. Again, a range of socio-economic, demographic and health sector factors were identified as influential on breastfeeding duration. The mapped sub-district-specific effects showed delayed initiation of breastfeeding in the north of the country, while early initiation was displayed in the south-eastern region. Shorter duration of breastfeeding was found in the southern region, whereas protracted breastfeeding was observed in the northern region.

Conclusion: This study offers important insight on the relative importance of both spatial effects and individual characteristics on breastfeeding behaviour in Malawi. This has potential implications for health policy planning and further research.

Introduction

The benefits of breastfeeding for child health are well recognized and undisputed (World Health Organisation 2000, 2001). For instance, breastfeeding offers infants a protective effect against infections such as gastro-intestinal and respiratory diseases (Howie et al. 1990; Oddy et al 2003), and in developing countries it is related to reduced infant mortality (Manda 1999). It is also associated with children's cognitive development and growth, and the benefits increase with duration of feeding (Anderson et al. 1999). Good breastfeeding behaviour is important to realize maximum gains for infants. The United Nations Children's Fund (UNICEF) and World Health Organisation (WHO) promote early initiation of breastfeeding, exclusive breastfeeding and sustained breastfeeding as some of the good practices necessary to achieve the full benefits of breastfeeding (WHO 2000, 2001). It is recommended that breastfeeding start immediately or within an hour of birth, that exclusive breastfeeding continue for 4–6 months and that breastfeeding be sustained for 2 or more years.

Breastfeeding is widely practised in Malawi (National Statistical Office 2000), yet many challenges compromise adherence to the recommended practice. Among them are morbidity, early introduction of complementary foods, insufficient milk, diseases such as HIV/AIDS, and socio-economic, traditional or cultural factors (Brennan et al. 2004). In 2006, UNICEF described Malawi's humanitarian crisis as a deadly combination of chronic poverty, bad weather conditions, bad harvest, a high prevalence of HIV/AIDS and an outbreak of cholera (UNICEF 2006). The humanitarian situation is particularly serious for the rural population. The factors that influence breastfeeding – the humanitarian situation, socio-economic inequalities, and unobserved community and family determinants – may cause geographically structured variations in breastfeeding behaviour. It is therefore worthwhile to quantify the influence of spatial factors on breastfeeding behaviour. Moreover, maternal sickness and lack of adequate food may lead to early weaning (WHO 2000, 2001). Indeed, patterns of breastfeeding initiation, total duration of breastfeeding and exclusive breastfeeding have not been investigated in detail, and at present, few studies have considered geographic variations and inequalities (Adebayo 2004).

In this study, we examined in detail the geographic variation in breastfeeding patterns in Malawi. We considered two indicators: (1) when was breastfeeding initiated (immediately, within 1 hour of birth or 24 hours of birth); and (2) duration of breastfeeding. Specifically, we applied spatial models that simultaneously estimated the effects of individual and location effects. Two other indicators, exclusive breastfeeding and intensity of breastfeeding, will be considered in accompanying papers (in preparation). Initiation and duration of breastfeeding have been studied together because in most countries these are highly correlated. Where duration is high, the incidence of initiation is high (Huffman 1984).

Applications of spatial models in human ecology or biology have increased in recent years. They have been enhanced by advances in statistical methodology that can deal with complex data structures often encountered in the field. For example, data often have a spatial and temporal dimension, and may include nonlinear variables that have to be jointly estimated. Such high dimensional data cause tremendous estimation problems. Furthermore, availability of geo-referenced bio-ecological data have generated interest in exploring the spatial aspects of these data. Recent developments in software that can handle geographic data, such as the geographical information system (GIS),

accompanied by advances in statistical software that can implement such models, for example BayesX (Brezger et al. 2005), have seen an increase in literature detailing applications of spatial models.

Moreover, mapping of health indicators is an essential tool for policy decision making because “hotspot” areas can be highlighted, thereby could form the basis for distributing and targeting interventions across geographical zones (Carter et al. 2000; Benach et al. 2003). This is true in developing countries where resources are scarce, and implementing interventions requires selective strategies. Mapping can be achieved using GIS or spatial models. Here, we used spatial models. The advantage of spatial modelling is that, unlike GIS, spatial autocorrelation can be simultaneously adjusted for in the model, leading to more plausible estimates. We used the 2000 Malawi Demographic and Health Survey (MDHS) data, with subdistricts as location variables. We adopted the methodology developed by Fahrmeir and Lang (2001) to explore spatial patterns of breastfeeding. The two response variables (initiation of breastfeeding and duration of breastfeeding) were recast into a unified, generalized linear/additive model where both responses fall within an exponential family of response models (Fahrmeir and Lang 2001; Palmgren and Ripatti 2002).

Methods

Data

We used data collected as part of the 2000 MDHS (National Statistical Office 2000). The MDHS was designed to provide estimates of health and demographic indicators at the national and regional levels, and to allow for regional and urban–rural comparisons. A two-stage stratified sampling design was implemented to collect the data. A total of 560 enumeration areas (EAs) as defined in the Malawi Population and Housing Census of 1998 were selected, stratified by urban–rural status with sampling probability proportional to the population of the EA. Each EA was geo-referenced.

A fixed number of households were randomly selected in each EA. All women aged 15–49 years were eligible for interview. A total of 13,220 women were interviewed, with a response rate of 98%; however, due to missing responses in the data, this analysis is based on a complete set of 11,927 cases. The data were realized through an interviewer-administered questionnaire, which included questions on complete birth histories, child nutrition and feeding practices. The DHS breastfeeding data were restricted to women who had a child under 5 years of age to avoid recall problems. This analysis is based on the last child data.

Dependent Variables

We considered two dependent variables: (1) breastfeeding initiation and (2) breastfeeding duration. Breastfeeding initiation is measured as an ordinal categorical variable (0: immediately after birth; 1: within 1 hour; or 2: within 24 hours after birth), while duration of breastfeeding is reported in months.

Independent Variables

Three types of covariates were considered: socio-economic and demographic variables, and health-sector variables (Table 1). *Socio-economic and demographic variables* include place of residence; maternal age; maternal education; maternal occupation; husband’s education; husband’s occupation; wealth index; ethnicity; access to media such as TV, radio or newspapers; and birth order of the child. Place of residence, given as rural or urban, captures the effect of urbanization and modernization. Urbanization is usually associated with lower breastfeeding rates and shorter breastfeeding duration than in rural areas. In the rural environment, breastfeeding calls for little change in lifestyle (Abada et al. 2001). Maternal age affects the initiation and duration of breastfeeding, with older mothers likely to follow established norms. Moreover, older women have a strong attachment, thus prolonging breastfeeding. On the other hand, older women may also have a high parity, leading to early termination of breastfeeding (Akin et al. 1986). Adebayo (2004) showed that mother’s age has a nonlinear effect on breastfeeding initiation and therefore provides a better model than dummy fixed effects. Level of education is another factor that should be related to breastfeeding practices because it affects

Table 1. Descriptive summaries of individual explanatory variables used in the model

Variable	Breastfeeding initiation Immediate ^a	1 hr	24 hrs	Duration Mean (Stdev)	Total (n)
Mother's age ^b	27.7 (7.0)				11,927
<i>Residence</i>					
Urban	58.2	39.2	2.6	17.8 (8.2)	2058
Rural	60.4	37.0	2.6	13.6 (5.0)	9631
<i>Mother's education</i>					
None	58.9	38.6	2.5	16.0 (9.0)	3476
Primary	61.0	36.5	2.5	15.6 (8.8)	7358
Secondary or higher	56.4	40.0	3.5	14.5 (7.5)	849
<i>Husband's education</i>					
None	57.5	39.5	2.9	14.2 (6.9)	1750
Primary	60.6	37.0	2.4	14.9 (6.7)	7472
Secondary or higher	60.3	37.0	2.7	16.1 (8.9)	2214
<i>Mother's occupation</i>					
Not working	58.0	39.5	2.5	17.5 (8.8)	4351
Household/domestic/agricultural	62.3	35.4	2.3	16.8 (8.9)	2262
Professional/admin/clerical	60.8	36.4	2.8	14.4 (6.0)	5070
<i>Husband's occupation</i>					
Household/domestic/agricultural	59.3	38.2	2.5	15.9 (7.9)	5115
Professional/admin/clerical	60.6	6.8	2.6	15.6 (7.5)	6331
<i>Wealth index</i>					
Poorest	57.1	39.6	3.2	15.4 (9.0)	2256
Poor	60.5	36.3	3.2	15.3 (8.9)	2394
Middle	60.4	38.2	1.5	15.8 (9.0)	2623
Richer	62.1	35.2	2.7	16.0 (8.8)	1804
Richest	60.3	37.1	2.6	15.9 (8.4)	2237
<i>Ethnicity</i>					
Chewa	56.8	39.8	3.5	15.5 (8.8)	3292
Tumbuka	65.5	31.2	3.4	15.2 (8.8)	1101
Lomwe	59.2	39.5	1.3	16.7 (7.7)	2157
Yao	54.5	42.9	2.6	15.4 (8.1)	1700
Ngoni	61.5	36.0	2.5	15.3 (8.3)	1258
Others	66.6	31.2	2.2	14.8 (7.9)	2181
<i>Reading newspaper</i>					
Not at all	60.1	37.2	2.8	16.7 (8.9)	8505
Less than once a week	58.6	39.4	2.0	15.3 (7.8)	2254
At least once a week	63.9	33.6	2.4	14.7 (6.9)	907
<i>Listening to radio</i>					
Not at all	63.2	33.6	3.2	17.5 (8.7)	2911
Less than once a week	57.1	40.4	2.5	15.6 (6.8)	2847
At least once a week	56.8	40.1	3.0	14.8 (5.0)	952
Almost daily	60.5	37.3	2.2	15.4 (6.9)	4969
<i>Watching TV</i>					
Not at all	60.6	36.9	2.5	16.4 (9.1)	10632
Less than once a week	53.7	42.1	4.2	14.8 (6.8)	756
At least once a week	56.4	42.6	1.1	14.4 (5.9)	282
<i>Place of delivery</i>					
Home	58.6	38.9	2.6	15.2 (5.8)	4941
Public hospital	62.8	34.7	2.5	15.9 (5.7)	4896
Private hospital	57.2	39.8	2.9	17.1 (8.6)	1745
<i>Prenatal support</i>					
No doctor	59.9	37.7	2.4	14.9 (6.1)	7166
Seen by doctor	52.9	42.8	4.3	16.1 (7.1)	652
No nurse	51.3	43.2	5.5	14.7 (5.2)	818
Seen by nurse	60.2	37.5	2.3	16.5 (8.1)	7000
No ward attendant (WA)	59.6	37.7	2.6	14.5 (5.1)	7155
Seen by WA	55.4	42.2	2.4	16.9 (7.8)	663
No traditional birth attendant (TBA)	59.4	38.1	2.5	15.3 (8.2)	7538
Seen by TBA	55.4	38.2	6.4	16.8 (8.4)	280
<i>Support at delivery</i>					
No doctor	60.9	36.7	2.4	15.9 (8.8)	10997
Doctor available	45.9	48.0	6.1	15.7 (5.9)	689
No nurse	57.0	40.2	2.7	15.2 (8.4)	5480

Nurse available	62.7	34.8	2.5	17.8 (8.8)	6206
No WA	60.3	37.0	2.7	15.1 (6.4)	10952
WA available	55.6	42.8	1.6	15.8 (5.8)	734
No TBA	60.2	37.2	2.6	15.1 (8.2)	9118
TBA support	59.4	38.0	2.6	15.0 (5.8)	2568
No relative	60.9	36.5	2.7	15.4 (6.6)	9086
Relative's support	57.2	40.4	2.4	17.6 (9.9)	2600
<i>Sex of child</i>					
Girl	60.0	37.4	2.6	15.8 (8.3)	5869
Boy	60.1	37.3	2.6	15.2 (8.5)	5820
<i>Birth order</i>					
1st born	60.1	36.9	3.0	15.6 (8.9)	2814
2nd–3rd born	61.2	36.5	2.4	14.5 (6.6)	4132
4th born or higher	59.0	38.4	2.6	15.7 (6.5)	4743

Note. (1) Sample for analysis was 11,927 with 1193 missing responses; (2) The “never-breastfed” category (0.5%) is not considered in the breastfeeding initiation as data is missing. ^aRow percentages. ^bMean (standard deviation) for mother's age for whole sample.

knowledge and awareness of good breastfeeding practices and other nutrition needs.

Women in professional, administrative or clerical occupations are likely to spend less time breastfeeding because of work demands than those working at home or in the agricultural sector (Ryan et al. 2006). The husband's support of breastfeeding is an important predictor, with husbands having secondary or higher education and working as professionals, administrators or clerks being the most supportive (Houghton and Graybeal 1999). Ethnic differences in breastfeeding decisions are also well established. Patterns of breastfeeding vary considerably across different racial/ethnic groups because of socio-cultural differences (Kelly et al. 2006). Social determinants of breastfeeding initiation and duration also include wealth ranking or access to media (Akin et al. 1986; Adair et al. 1993; Abada et al. 2001), and these were equally examined in this study.

The *health sector variables* in the model are prenatal assistance through a doctor, nurse, ward attendant or traditional birth attendant; place of delivery, either at home, in a public facility or in a private/mission hospital; and support at delivery by a doctor, nurse, ward attendant, traditional birth attendant or with a relative's assistance. These variables measure advice given to mothers and may promote certain breastfeeding patterns (Akin et al. 1986). The presence of additional family members in the household, in particular mothers-in-law, provides positive support for breastfeeding practices, encouraging mothers to breastfeed for a longer period of time (Abada et al. 2001). All variables except mother's age are entered as fixed categorical effects.

Since the data were geo-referenced, each observation was linked to 364 subdistricts. This permitted inclusion of spatial correlation effects which captured residual or unobserved factors that may influence the pattern of the response.

Statistical Methods

The most basic approach to analyze observation data such as duration responses – “the number of month of breastfeeding,” or ordinal responses – “when breastfeeding was initiated,” is to use generalized linear models (GLMs) (McCullagh and Nelder 1989; Palmgren and Ripatti 2002). However, because of the random effects introduced due to the geographical nature of our data, a strictly linear approach may not have been appropriate. Instead, a flexible semi-parametric model that allows both parametric and nonparametric data structures was most appealing (Palmgren and Ripatti 2002; Fahrmeir and Lang 2001).

Given a set of observations (y_i, w_i, x_i, s_i) , then y_i denotes the response connected to woman i and w_i, x_i, s_i represent vectors of covariates. These covariates may exhibit spatial correlation s_i , or nonlinear effects x_i , in addition to the fixed effects w_i . Assuming that the conditional density of y_i given the explanatory variables is of the exponential family type, then the conditional expectation $\mu_i = h(\eta_i | w_i, x_i, s_i)$, for some known link function (h) and predictor (η_i), can be expressed as an additive semi-parametric regression model

$$\eta_i = w_i\beta + f_i(x_i) + f_{spat}(s_i) \quad (1)$$

where β is a vector of unknown regression parameters corresponding to the fixed effects $w_j, j = 1, \dots, K$, p are unknown smooth functions of the covariates such that $f_j(x_j)$ is the vector of possible nonlinear covariates, and $f_{spat}(s_i)$ is the spatial component of the model that captures effects of area, $s_j, j = 1, \dots, K$, S where person i lives. The component $f_{spat}(s_i)$ can be split further into two random variables (Fahrmeir and Lang 2001). The first random variable, $f_{unstr}(s_i)$, is assumed to be independent and identically distributed for all areas. This captures unstructured spatial heterogeneity of observations within a subdistrict. The second variable, the *structured component* $f_{str}(s_i)$, represents spatial autocorrelation. This captures large-scale similarities in breastfeeding behaviour across subdistricts. A rationale behind this is that a spatial effect is a surrogate of many unobserved influential factors, some of which operate at small scale, while others operate at large scale, thereby inducing greater similarities in risk pattern for neighbouring areas than for those further apart. When these are estimated and mapped, they may be compared to known spatial patterns of possible explanatory factors, or they may provide leads for further epidemiological investigation. Incorporation of spatially correlated prior also permits smoothing for increased precision of effects, which is necessary when sparse counts are observed at a small area (Crook et al. 2003). In practice, the two spatial components are both included in the model and allow the data to quantify the most dominant spatial structure.

Breastfeeding initiation, being an ordinal categorical response variable, was modelled using a cumulative probit model (Tutz and Hennevogl 1996). For breastfeeding duration, we chose a grouped discrete-time survival model, which offers an attractive approach for demographic data (Crook et al. 2003; Steele et al. 1996). Estimation of model parameters followed a hierarchical Bayesian approach, using simulation techniques. The Appendix gives full details on the two models applied and the model fitting steps taken.

Results

Descriptive Summaries

Descriptive statistics of the sample are shown in Table 1. The mean age of the women was 27.7 years (standard deviation [SD] = 7.0). Most women (60%) initiated breastfeeding immediately after birth, 37.2% initiated within 1 hour, 2.3% within 24 hours, and the rest (0.5%) never breastfed. Timing of breastfeeding initiation varied from subdistrict to subdistrict, with the highest proportion who breastfed immediately after birth found in the northern district of Karonga and the lowest in the south-eastern districts of Mangochi and Machinga. The variation in initiation across levels of individual variables suggests small differences in both socio-economic and health-sector variables; for example, initiation varied by mother's education, access to media, prenatal assistance and support at delivery.

About 58.8% of the women reported having weaned (duration time was completely observed), while 41.2% were censored because they were still breastfeeding or had never breastfed (therefore complete duration of breastfeeding was unknown at the time the survey was conducted). Mean duration of breastfeeding for the whole sample was 15.65 months ($SD = 8.83$), for those who had weaned was 18.19 months ($SD = 8.4$) and for those censored was 12.03 months ($SD = 8.12$). Geographical variation was considerable, with mean duration of breastfeeding per subdistrict ranging from 7.78 to 21.17 months. However, there was little variation in mean duration of breastfeeding across different levels of individual covariates (Table 1).

Factors for Breastfeeding Initiation

Table 2 gives estimates of factors associated with timing of breastfeeding initiation. Included in the table are estimates of threshold parameters, θ_1 and θ_2 for categories "immediately" and "1 hour later," and the last category ("24 hours later") assigned as the reference. Threshold parameters are interpreted as follows: Higher values of the threshold, i.e., ($\theta > 0$), correspond to early initiation of breastfeeding,

and lower values, i.e., ($\theta < 0$), correspond to delayed breastfeeding. For example, a lower (higher) values of θ signified a shift to the right (left) side on the latent scale, which implied a decreased (increased) probability for that category. From the table, $\theta_1 = 0:007$, implied an increased chance of initiating breastfeeding immediately after birth relative to 24 hours later. For $\theta_2 = 1:799$, it suggests that there was an increased likelihood of breastfeeding within 1 hour relative to 24 hours later.

Table 2. Posterior estimates of fixed covariates in the model – breastfeeding initiation

Variable	Posterior mean	Standard error	95% credible interval
Threshold points:			
θ_1	0.007	0.102	(-0.193, 0.203)
θ_2	1.799	0.104	(1.595, 2.004)
Fixed effects:			
<i>Residence</i>			
Urban	0		
Rural	-0.024	0.038	(-0.071, 0.026)
<i>Mother's education</i>			
None	0		
Primary	-0.156	0.056	(-0.231, -0.083)
Secondary or higher	0.329	0.115	(0.181, 0.483)
<i>Husband's education</i>			
None	0		
Primary	-0.041	0.034	(-0.084, 0.005)
Secondary or higher	0.068	0.074	(-0.030, 0.161)
<i>Mother's occupation</i>			
Not working	0		
Household/domestic/agricultural	-0.071	0.022	(-0.099, -0.044)
Professional/administrative/clerical	0.011	0.018	(-0.012, 0.035)
<i>Husband's occupation</i>			
Household/domestic/agricultural	0		
Professional/administrative/clerical	-0.010	0.014	(-0.028, 0.007)
<i>Wealth index</i>			
Poorest	0		
Poor	0.018	0.026	(-0.015, 0.051)
Middle	-0.032	0.025	(-0.065, 0.001)
Richer	-0.012	0.028	(-0.047, 0.024)
Richest	-0.061	0.031	(-0.100, -0.022)
<i>Ethnicity</i>			
Others	0		
Chewa	0.009	0.032	(-0.031, 0.050)
Tumbuka	-0.021	0.047	(-0.083, 0.040)
Lomwe	0.029	0.036	(-0.017, 0.074)
Yao	0.055	0.024	(0.010, 0.100)
Ngoni	-0.131	0.039	(-0.180, -0.082)
<i>Access to newspaper</i>			
Not at all	0		
Less than once a week	0.106	0.046	(0.035, 0.177)
At least once a week	-0.223	0.105	(-0.357, -0.096)
<i>Access to radio</i>			
Not at all	0		
Less than once a week	0.009	0.023	(-0.019, 0.039)
At least once a week	0.075	0.033	(0.032, 0.118)
Almost every day	-0.035	0.013	(-0.063, -0.005)

Table 2. Continued

<i>Access to TV</i>				
Not at all	0			
Less than once a week	0.094	0.094		(-0.028, 0.220)
At least once a week	-0.034	0.175		(-0.259, 0.194)
<i>Prenatal assistance</i>				
Doctor: No	0			
Doctor: Yes	-0.059	0.025		(-0.090, -0.027)
Nurse: No	0			
Nurse: Yes	-0.106	0.027		(-0.141, -0.070)
Ward attendant (WA): No	0			
WA: Yes	-0.039	0.014		(-0.069, -0.009)
Traditional birth attendant (TBA): No	0			
TBA: Yes	-0.015	0.032		(-0.055, 0.027)
<i>Support at delivery</i>				
No doctor	0			
Doctor available	0.123	0.030		(0.084, 0.162)
No nurse	0			
Nurse available	-0.123	0.032		(-0.164, -0.081)
No WA	0			
WA available	0.013	0.026		(-0.021, 0.045)
No TBA	0			
TBA available	-0.040	0.015		(-0.072, -0.008)
No relative	0			
Relative available	-0.028	0.024		(-0.060, 0.003)
<i>Place of birth</i>				
Home	0			
Public hospital	-0.021	0.028		(-0.058, 0.015)
Private/mission hospital	0.070	0.033		(0.029, 0.112)
<i>Sex of child</i>				
Boy	0			
Girl	0.008	0.005		(-0.002, 0.019)
<i>Birth order</i>				
1st born	0			
2nd–3rd born	-0.023	0.019		(-0.047, 0.001)
4th born or higher	0.030	0.027		(-0.006, 0.064)
<i>Spatial variance components:</i>				
Structured effects (τ^2_{str})	0.254	0.055		(0.155, 0.377)
Unstructured effects (τ^2_{unstr})	0.020	0.012		(0.002, 0.047)

Timing of breastfeeding initiation was associated with mother's education; mother's occupation; ethnicity; wealth index; access to media such as TV, newspapers or radio; health-sector variables such as prenatal assistance; availability of support at delivery and place of delivery. Compared to women with no formal education, mothers with primary education were less likely to start breastfeeding within 1 hour (coefficient [*coeff*] = -0.156, standard error [*SE*] = 0.056); however, mothers with secondary or higher education were most likely to start breastfeeding within 1 hour (*coeff* = 0.329, *SE* = 0.115). Mothers whose occupation involved domestic and agricultural activities were less likely to initiate breastfeeding within 24 hours than those who reported they did not work at all. No difference, however, was observed when comparing mothers in professional/clerical and

administrative services with those who did not work. Mothers from the richest households delayed initiation of breastfeeding compared with the those from the poorest households = (*coeff* = -0.061, *SE* = 0.031). Mothers from the Yao ethnic group were positively associated with early initiation of breastfeeding, and those from the Ngoni ethnic group were negatively associated with early initiation. A positive effect was observed between those who had access to a newspaper less than once a week (*coeff* = 0.106, *SE* = 0.046) or those who listened to a radio at least once a week (*coeff* = 0.075, *SE* = 0.033) and initiated breastfeeding within 1 hour of birth relative to those who had no access to a radio or newspaper. On the other hand, seeing a newspaper at least once a week (*coeff* = -0.223, *SE* = 0.105) or listening to a radio almost every day (*coeff* = -0.035, *SE* = 0.013) had a negative effect on early initiation.

Giving birth in a private health facility (compared to at home) had a positive effect on early initiation of breastfeeding. Having a doctor available during prenatal care or at the delivery had a positive association with initiating breastfeeding within 1 day of birth. When a nurse gave prenatal assistance, we also observed a positive effect, although a negative effect was seen if the nurse was available during delivery. Prenatal assistance from a ward attendant or support at delivery from a traditional birth attendant had a negative effect on early timing of breastfeeding.

Figure 1 shows the nonlinear effect of mother's age on breastfeeding initiation. The plot displays a departure from linearity, with an increasing effect for older women 38–45 years of age. The spatial effects described in Figure 2 are particularly interesting. The left panel map shows the total spatial effects varying smoothly from -0.99 to 0.56, while the right panel shows the probability map, which shows areas where these effects were significant. Black shows areas of significant positive effect, that is, areas where mothers were likely to begin breastfeeding earlier. White shows significant negative effect, areas where mothers were likely to delay breastfeeding. Significant positive effects are shown in the central region in Dedza and Lilongwe, in the northern region in Nkhatabay district and in the southern region in Mangochi, Machinga, Zomba and Balaka. Negative effects were observed in the northern districts of Chitipa, Karonga and parts of Mzimba. In the centre these are displayed in the areas of Mchinji and Nkhotakota, while in the south we observed negative effects in Machinga, Mulanje and Nsanje. The spatial variance components show that the structured effects were dominant compared to the unstructured effects (Table 2).

Factors for Breastfeeding Duration

Duration of breastfeeding was associated with place of residence; mother's occupation; ethnicity; access to media such as newspapers, TV or radio; prenatal assistance; support at delivery; place of birth; birth order and type of feeding (Table 3). No association was found between wealth index and duration of breastfeeding. Rural children were breastfed longer than urban children (*coeff* = 0.039, *SE* = 0.012). Mothers working in professional, clerical or administrative sectors had a higher probability of stopping breastfeeding early compared with those who did not work at all (*coeff* = -0.025, *SE* = 0.012). Our study also showed that women of the Lomwe ethnic group were most likely to breastfeed their children longer than women in other ethnic groups (*coeff* = 0.080, *SE* = 0.035). Women who had access to newspapers or magazines less than once a week were more likely to wean their young early than women who lacked this access (*coeff* = -0.079, *SE* = 0.040), while those who had access at least once a week breastfed longer than their counterparts who did not have weekly access (*coeff* = 0.208, *SE* = 0.101). In this analysis, listening to a radio less than once a week had a positive effect on the duration of breastfeeding relative to those who did not listen, but listening to a radio at least once a week had a negative effect. In contrast, women who watched TV less than once a week were most likely to stop breastfeeding earlier than those who did not watch at all (*coeff* = -0.194, *SE* = 0.091), while those who watched at least once a week were more likely to prolong breastfeeding than those who did not watch at all (*coeff* = 0.314, *SE* = 0.117).

Prenatal care advice received from doctors, nurses, ward attendants or traditional birth attendants was associated with prolonged duration of breastfeeding. Availability of support at delivery from nurses or relatives had a positive effect on the duration of breastfeeding. Mothers who gave birth at private

health centres were likely to stop breastfeeding earlier than those who gave birth at home ($coeff = -0.056$, $SE = 0.023$). On birth order, we observed a negative association with duration of breastfeeding for the second or third child compared with the fourth or higher ($coeff = -0.047$, $SE = 0.020$).

Figure 1. Nonlinear effect of mother's age on the breastfeeding initiation (centre line) with the corresponding 80% and 95% confidence lines

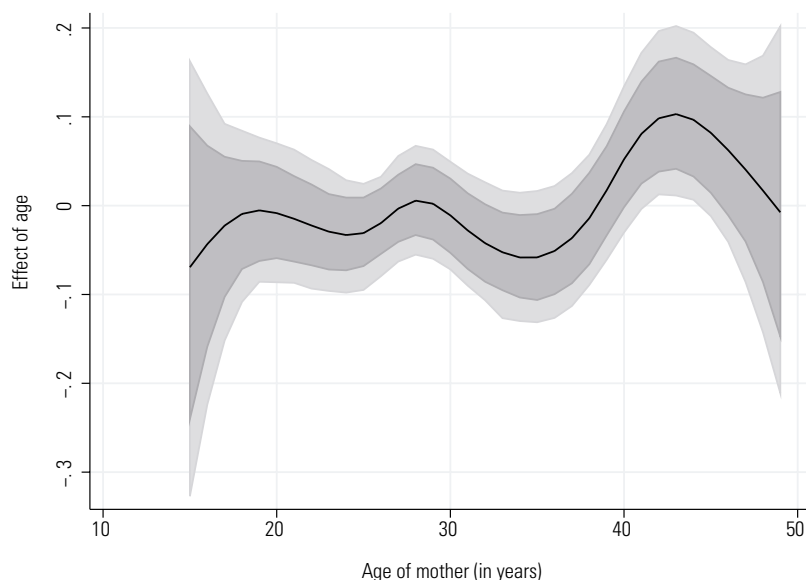


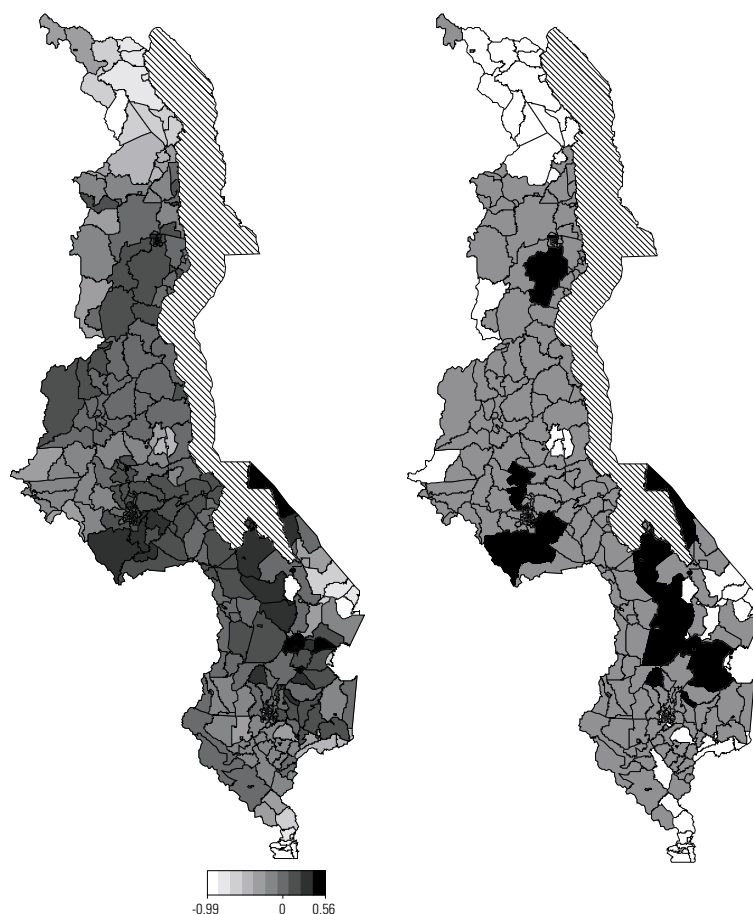
Figure 3 shows a nonlinear effect of mother's age on the duration of breastfeeding. Overall, there was a decreasing trend between mother's age and duration of breastfeeding, and the relationship clearly displayed nonlinear effects. The residual spatial effects were relatively small (Figure 4), ranging from -0.32 to 0.45 and indicating that much of the variation in the response was explained by individual variables. The probability map shows areas with significant effects at 80%. Few subdistricts showed a significant positive effect (black area) or negative effect (white area) of timing of breastfeeding initiation. While the structured spatial component was more dominant than the unstructured components as indicated by the variance component (Table 3), the structured components on average were weak, as illustrated on Figure 4.

Discussion

Breastfeeding patterns have received considerable attention, as seen in the vast literature that covers the topic. The preceding analysis adds to this body of knowledge by applying spatial models to analyze initiation and total duration time of breastfeeding in Malawi. Our approach simultaneously modelled the effects of individual factors and geographical location of breastfeeding. Although individual-level variables are often investigated, few examples account for the effect of location on breastfeeding practices or for individual-level variables and location in a single model (Adebayo 2004).

Our findings demonstrate that location is important in explaining variation in breastfeeding practices. The effect of location was more pronounced in breastfeeding initiation. Spatial effects can be interpreted as surrogates of unobserved factors. These factors are a matter of conjecture. They may be mostly defined by unmeasured ethnic or cultural differences that go beyond the major groupings used in our analysis. Childhood eating practices, traditional norms in childcare and/or inequalities in socio-economic levels are many of the attributes that explain the observed spatial

Figure 2. Residual spatial effects for breastfeeding initiation at sub-district level. Shown in the map are the posterior means (left panel) and posterior probability map at nominal level of 80% (right panel). Black areas indicate significant positive effects; white areas indicate significant negative effects and grey areas indicate no significant effects



differences in breastfeeding (Kelly et al. 2006; Brennan et al. 2004; Adebayo 2004). Socio-economic inequalities between rural and urban areas, for example in the central region, justify some of the notable geographical differences in timing of breastfeeding initiation (Akin et al. 1986; Abada et al. 2001). The influence of ethnicity may clarify the spatial differences estimated in the south-eastern region (Figure 2), where children were most likely to be breastfed within 1 hour in one section of the region, and yet further east of the region, children were less likely to be breastfed within 1 hour. Such positive and negative effects are not surprising because of ethnic differences in those two areas. Further studies are needed to find out about local breastfeeding knowledge and practices in these communities and their socio-cultural contexts. For example, the practice of not giving colostrum to newborns because of the belief that it is bad and may delay breastfeeding has been observed in many African cultures (Kelly et al. 2006; Lauer et al. 2004; Perez-Escamilla 1994). Investigating this practice in Malawian society could be worthwhile.

The nearly similar spatial patterns of breastfeeding duration (Figure 4) mean that residual variation was not spatial. We may explain this observation by the fact that traditionally, alternative methods of child feeding are not the norm for women in Malawi, as indicated in studies elsewhere (Adair et al. 1993). Therefore, under these circumstances, there is little to distinguish regional patterns. The findings also indicate that most of the variation in outcome had already been explained by individual-

Table 3. Posterior estimates of fixed covariates in the model – total number of months of breastfeeding

Variable	Posterior mean	Standard error	95% credible interval
Fixed effects			
<i>Residence</i>			
Urban	0		
Rural	0.039	0.012	(0.007, 0.071)
<i>Mother's education</i>			
None	0		
Primary	0.039	0.061	(-0.039, 0.117)
Secondary or higher	-0.069	0.127	(-0.232, 0.093)
<i>Husband's education</i>			
None	0		
Primary	-0.008	0.036	(-0.054, 0.039)
Secondary or higher	0.005	0.078	(-0.095, 0.106)
<i>Mother's occupation</i>			
Not working	0		
Household/domestic/agricultural	-0.018	0.022	(-0.046, 0.010)
Professional/administrative/clerical	-0.025	0.012	(-0.049, -0.001)
<i>Husband's occupation</i>			
Household/domestic/agricultural	0		
Professional/administrative/clerical	0.007	0.014	(-0.011, 0.024)
<i>Wealth index</i>			
Poorest	0		
Poor	-0.011	0.027	(-0.046, 0.023)
Middle	-0.008	0.026	(-0.041, 0.025)
Richer	-0.015	0.029	(-0.052, 0.022)
Richest	-0.002	0.032	(-0.042, 0.039)
<i>Ethnicity</i>			
Others	0		
Chewa	0.018	0.032	(-0.024, 0.059)
Tumbuka	-0.054	0.044	(-0.111, 0.003)
Lomwe	0.080	0.035	(0.035, 0.124)
Yao	-0.007	0.036	(-0.053, 0.040)
Ngoni	0.003	0.038	(-0.045, 0.051)
<i>Access to newspaper</i>			
Not at all	0		
Less than once a week	-0.079	0.040	(-0.148, -0.010)
At least once a week	0.208	0.101	(0.079, 0.337)
<i>Access to radio</i>			
Not at all	0		
Less than once a week	0.036	0.012	(0.006, 0.066)
At least once a week	-0.050	0.035	(-0.095, -0.005)
Almost everyday	-0.010	0.022	(-0.039, 0.018)
<i>Access to TV</i>			
Not at all	0		
Less than once a week	-0.194	0.091	(-0.311, -0.077)
At least once a week	0.314	0.117	(0.099, 0.529)
<i>Prenatal assistance</i>			
Doctor: No	0		
Doctor: Yes	0.357	0.026	(0.323, 0.391)
Nurse: No	0		
Nurse: Yes	0.052	0.023	(0.009, 0.095)
Ward attendant (WA): No	0		
WA: Yes	0.272	0.025	(0.240, 0.304)

Table 3. Continued

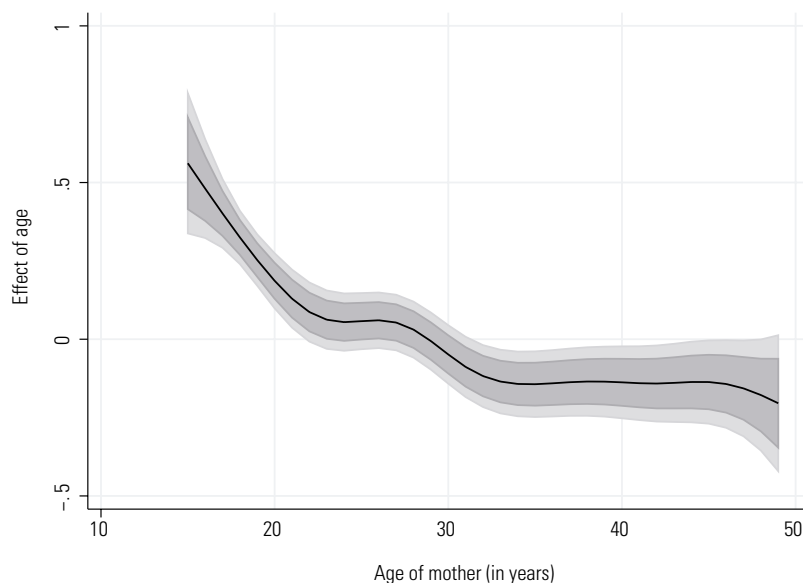
Traditional birth attendant (TBA): No	0		
TBA: Yes	0.595	0.035	(0.551, 0.639)
<i>Support at delivery</i>			
No doctor	0		
Doctor available	-0.035	0.030	(-0.074, 0.004)
No nurse	0		
Nurse available	0.077	0.034	(0.033, 0.121)
No ward attendant	0		
Ward attendant available	0.004	0.028	(-0.031, 0.040)
No TBA	0		
TBA available	-0.002	0.027	(-0.036, 0.033)
No relative	0		
Relative available	0.051	0.026	(0.018, 0.085)
<i>Place of birth</i>			
Home	0		
Public hospital	-0.036	0.030	(-0.074, 0.003)
Private/mission hospital	-0.056	0.023	(-0.099, -0.013)
<i>Sex of child</i>			
Boy	0		
Girl	0.004	0.007	(-0.009, 0.016)
<i>Birth order</i>			
1st born	0		
2nd–3rd born	-0.047	0.020	(-0.072, -0.022)
4th born or higher	0.001	0.029	(-0.037, 0.038)
<i>Spatial variance components:</i>			
Structured effects (τ^2_{str})	0.275	0.062	(0.116, 0.371)
Unstructured effects (τ^2_{unstr})	0.017	0.011	(0.002, 0.034)

level characteristics. Besides estimating for unobserved factors, by including random effects in the models, we aimed to produce reliable estimates for the parameters because of the hierarchical structure of the survey data used in our analysis. Failure to do so often leads to standard errors of the parameters being underestimated giving highly significant model estimates (Bolstad and Manda 2001).

A range of socio-economic, demographic and health-sector factors have been identified as influential on breastfeeding patterns (Tables 2 and 3). The effect of maternal age is interesting, as it is estimated to vary with increasing age. Results confirm that continuous variables such as mother's age exhibit a nonlinear relationship with breastfeeding behaviour. It suggests that categorization of continuous variables at ad hoc intervals may not be appropriate and cannot adequately model the behaviour exhibited by such factors. In fact the results may be misleading, and the model may not be the best (Lang and Brezger 2004; Adebayo 2004; Fahrmeir and Lang 2001).

The influence of old age is highly positive. The advantages of breastfeeding are well known to older women, and they initiate breastfeeding without delay. Longer and shorter duration in rural and urban areas, respectively, reflect lifestyle differences in the two settings. In urban areas, modernization factors such as demands of employment could lead to early weaning to allow mothers to resume work. While this may be the case, other studies have shown that in African countries urbanization has little impact on breastfeeding behaviour compared to the impact in Latin American countries (Perez-Escamilla 1994). Although we found no evidence of effect on initiation of the child's sex, wealth ranking, husband's education or occupation, all these factors are known to affect the decision to breastfeed (Akin et al. 1986; Hegney et al. 2003; Ford and Lobbok 1990).

Figure 3. Nonlinear effect of mother's age on the breastfeeding duration (centre line) with corresponding 80% and 95% confidence lines



The importance of access to media on breastfeeding initiation and duration emphasizes the need for mass media breastfeeding campaigns. Occasional messages through radio can reach a much larger audience than through TV or newspapers. Support from health personnel during and after birth also has an impact on the initiation and duration of breastfeeding. A number of studies provide evidence that increased knowledge of the importance of breastfeeding increases the likelihood of exclusive breastfeeding and longer duration of breastfeeding (Adair et al. 1993; Ford and Labbok 1990; Vella et al. 1992). Health education programs designed to promote initiation and continuation of breastfeeding should target women across all ethnic and socio-economic status (SES) strata and those with lower levels of SES and social support (Ford and Labbok 1990).

The relationship between duration of breastfeeding and mother's education is also well documented. The more educated the mother, the shorter the duration of breastfeeding. This relationship is indirectly associated with the woman's working status; it is expected that highly educated women are employed, hence employed women wean earlier than their non-employed counterparts (Hegney et al. 2003; Ford and Labbok 1990). However, as employment is included as a covariate in the model, education may be influenced by other factors such as availability of breast milk substitutes. These are matters of conjecture and can be unveiled in detail through focus group discussions.

Our results indicated sex made no difference in breastfeeding duration. Studies on nutritional feeding practices that included sex have reported behaviour where girls were more nourished than boys (Madise and Mpoma 1997). However, studies in South Asia indicated the contrary (Akin et al. 1986), while in others there was no association (Vella et al. 1992). From these results, it is difficult to establish evidence of sex discrimination.

Parity is another determinant of breastfeeding duration. The negative relationship of birth order is as expected in demographic findings conducted in developing countries. First-born children are breastfed for less time, mostly because mothers quickly progress to subsequent pregnancies that prompt them to stop breastfeeding the earlier infant. Similarly for the succeeding orders, children are weaned because of short birth intervals. Children spaced at adequate intervals are likely to be better nourished and survive longer (Brennan et al. 2004; Manda 1999; Bolstad and Manda 2001).

Figure 4. Residual spatial effects for the duration of breastfeeding at subdistrict level. Shown in the map are the posterior means (left panel) and posterior probability map at nominal level of 80% (right panel). Black areas indicate significant positive effects, white areas indicate significant negative effects and grey areas indicate no significant effects



Conclusion

This study is by no means exclusive. Breastfeeding has a behavioural aspect, and many factors affect breastfeeding practices, including biological, socio-demographic, the health sector and the food industry (Adair et al. 1993). However, our study offers important insight into the relative importance of both spatial location and individual characteristics on breastfeeding behaviour in Malawi. This has potential implications for further research and health policy planning purposes. First, the maps generated in our study may offer leads for in-depth epidemiologic or geographic studies that may shed light on factors contributing to such inequalities. Second, results can form the basis for distributing and targeting interventions across geographical zones (Carter et al. 2000; Benach et al. 2003).

Appendix

This section gives details on the two models used to analyze breastfeeding initiation and duration.

Modelling Breastfeeding Initiation

Breastfeeding initiation falls naturally into ordered categorical response, y_p , of delay. Cumulative threshold models are assumed for such ordered categories (Tutz and Hennevogl 1996). The response y_i is assumed to be a categorized version of the latent variable $U_i = \eta_i + \varepsilon_p$, obtained through the

threshold mechanism, where ε_i is an error term. The common choice for ε_i is the logistic or standard normal leading to cumulative logit or probit models. This naturally brings the response in the exponential family of response model that is given by the predictor (1). For identifiability, the last category threshold is set to zero and no intercept is included in the model.

Modelling Duration of Breastfeeding

The duration of breastfeeding, given in months, can be modelled using a Cox regression. However, we chose a grouped discrete-time survival model, which offers an attractive approach for demographic data (Crook et al. 2003; Steele et al. 1996). Under such models, the time scale t is segmented into m intervals: $\{I_i = [a_{r-1}, a_r): 0 < a_0 < L < a_{r-1} < a_r < L < a_m < \infty\}$, and censoring is assumed to happen at the end of the interval. The hazard function is cast as a binary regression model such that

$$P(y_{it} | \eta_{it}) = h(t | \eta_{it}) = h_0(t)\exp(\eta_{it}) \tag{2}$$

where y_{it} is a binary that records an event in the interval I_i , $h_0(t)$ is the baseline hazard, and η_{it} is the predictor linked to the covariates. Because of possible nonlinear and random effects in the data, we assume an additive predictor, which is expanded as follows:

$$\eta_{it} = f_0 + w_i\beta + f_j(x_i) + f_{spat}(s_i) \tag{3}$$

where $f_0(t) = \log(h_0(t))$ is the log-baseline effect, and the rest is as defined above (equation 1). We assumed that the time interval is partitioned into 6-month intervals: [0-6), [6-12), [12-18), [18-24), [24-30), and [30+), corresponding closely to the intervals used to describe child-feeding practices (see, MDHS: National Statistical Office [2000]). This means that a breastfeeding duration time of say, $t = 16$ months that resulted in weaning the child i can be represented as $y'_{it} = (0; 0; 1)$; $a' = (6; 6; 4)$, while another child who was not weaned at 12 months can be partitioned as $y'_{it} = (0; 0)$; $a' = (6; 6)$, where i is fitted as a baseline effect. The first 6 months allow for the period of exclusive breastfeeding, 6-12 months captures the period when complementary foods are introduced to the child, and beyond this, weaning starts. The baseline hazard is estimated non-parametrically as explained below. The augmentation of the data now allows the logistic regression model to be used for the response (Crook et al. 2003).

Analysis

Modelling the two models follows a similar hierarchical Bayesian approach. Initially prior assumptions are specified for each parameter in equation (1). For the fixed effects, diffuse priors are a suitable choice. For the spatially correlated effects, we used a conditional autoregressive (CAR) process (Besag et al. 1991). The CAR assumes that contiguous areas have similar effect patterns. The CAR has the form

$$f_{str}(s) | \{f_{str}(r), r \neq s\} \sim N(\bar{f}_{str}(r), \tau^2_{str} / N_s) \tag{4}$$

where s and r are adjacent areas, N_s is the number of adjacent areas, and str is the variance component controlling spatial smoothing. The unstructured spatial effects were assigned an exchangeable normal prior with the following properties:

$$f_{unstr} \sim N(0, \tau^2_{str}) \tag{5}$$

For the smooth functions f_j , for example the baseline hazard and mother's age, we assumed the penalized splines with second order random walk to achieve a good fit to the nonlinear function (Lang and Brezger 2004), that is, $f_j(x) = \sum_{i=1}^m \beta_i B_i(x)$, where $B_i(x)$ are cubic B-splines with 20 equidistant knots, and B_i is assumed to follow a second order random walk prior, i.e., $\beta_i = 2\beta_{i-1} - \beta_{i-2} + u_i$, such

that $u_i \sim N(0, \tau_i^2)$. The initial values β_1 and β_2 are assumed diffuse priors. To complete the Bayesian hierarchy, the hyper-parameters for the variance components (τ_{str}^2 , τ_{unstr}^2 , τ_i^2) were assigned the inverse Gamma prior, $IG(a; b)$ where $a = 0.001$ and $b = 0.001$. Sensitivity analysis of the model was carried out to assess the stability of model results on starting values.

Model estimates were derived from the posterior distribution. The posterior distribution is a product of the prior distribution and the data (the likelihood). Because of the higher dimensionality of the data, modelling relies on Markov Chain Monte Carlo (MCMC) techniques. We considered an initial burn-in of 12,000 iterations, carried out another 40,000 iterations and thinned every 20th iteration to obtain 2000 samples for parameter estimation. The two models were implemented in BayesX Version 1.4 (Brezger et al. 2005). Convergence was assisted by carrying out simulations that were block-sampled at between 50 and 80 depending on the dataset being analyzed. Convergence was visually assessed by plotting cumulative path plots for each parameter.

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Local Knowledge of the Link between Tuberculosis and HIV-1/AIDS among the Turkana of Lodwar Township: Implications for Tuberculosis and HIV-1/AIDS Prevention

John Arianda Owiti PhD, MSc, BSc (Hons), Dip (nursing), RNM

Dr. John Arianda Owiti, John Howard Centre Medium Secure Unit, East London NHS Foundation Trust, 12 Kenworthy Road, London E9 5TD, England, United Kingdom Email: John.owiti@mail.mcgill.ca

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Abstract

This study used a broad theoretical framework encompassing an ecosystem approach to HIV-1/AIDS that partly investigated the nexus between local knowledge of tuberculosis (TB) and HIV-1/AIDS. According to the Turkana of Lodwar township, Kenya, HIV-1/AIDS and TB are largely contagious and are attributed to impersonal and natural causes. In addition, in line with biomedical knowledge, the Turkana's local knowledge emphasises a conceptual link between TB and HIV-1/AIDS. The study also demonstrates that factors of the ecosystem such as *kaada*, poverty, widow inheritance, migration and other socio-cultural practices play an influential role in the vulnerability of the Turkana to the contraction and transmission of both TB and HIV-1/AIDS. The article posits an integrated approach to the prevention of TB and HIV-1 and to the management of AIDS and TB.

Introduction

This article is based on the outcome of a study that investigated local knowledge of, and responses to, HIV-1/AIDS among the Turkana of Lodwar township, Kenya. The study was guided by a broader critical theoretical framework that emphasizes the role of ecosystem factors in contracting

and transmitting infections. The study used local knowledge as an entry point into Turkana understanding of HIV-1/AIDS and tuberculosis (TB) and the relationship between the two. It allowed the exploration of forms of knowledge that represent the crucial mediating variables of the ecosystem and the experience of HIV-1/AIDS and TB. The ecosystem is defined here as the interrelationship between human populations and the physical, biological and socio-cultural environments. Relevant factors include social factors such as socio-cultural norms and practices, politics, economy, history, the process of production, conditions of poverty and famine, and environmental factors such as the weather, distribution of rainfall, incidence of drought, source and quality of water, and prevalence of disease vectors. The ecosystem is therefore considered the result of a “dialectical interaction of natural and socio-cultural forces” (Baer et al. 1996: 41).

Though the centrepiece of my study is local knowledge, it diverges from other anthropological studies that have been largely concerned with the rubric of ‘beliefs’ (theoretical knowledge) relating to religion, witchcraft, ancestral spirits, affliction and healing (Bibeau 1980; Yoder 1980; Young 1986; Green 1999; see, for example, studies by Turner 1967 and Pool 1994a, 1994b). As a result, the studies of local medical knowledge and techniques, and theories of illness causation, have ignored common sense and empirical pathogenic explanations, as well as the predominance of naturalistic and physiologic etiologies (Green 1999; see also studies by Ngubane 1977; Janzen 1978; Feierman 1981; Bibeau 1980; Davis-Roberts 1981; Swantz 1990; Johnsen 1996). They instead give prominence to personalistic and/or super-naturalistic (meta-empirical) explanations of illness causation theories that revolve around witchcraft, magic, spirits and sorcery rather than empirical explanations of illness. Green (1999) has authoritatively argued for recognition of naturalistic indigenous causation theories, especially in contagious infections, rather than undue focus on witchcraft. This study indicates that the Turkana give prominence to impersonalistic and naturalistic etiologies in the manner that they explain the link between HIV-1/AIDS and TB.

A biomedical link between HIV/AIDS and TB has already been established. However, the link between TB and HIV-1/AIDS in local knowledge and discourse has not been adequately researched.

In this article, local knowledge of the link between TB and HIV-1/AIDS is discussed. The nexus between the two infections is delineated through causality, symptoms and signs, treatment, ecosystem factors that influence the incidences, and their prevention. I have argued that prevention of HIV-1 and TB, and the treatment of those who are dually infected with TB and AIDS, would require an integrated approach that utilizes the positive aspects of local knowledge of both HIV-1/AIDS and TB and the nexus between them.

The Link between HIV-1/AIDS and TB

The World Health Organization (WHO) estimates that there were 8.8 million new TB cases in 2005, with 7.4 million in Asia and Sub-Saharan Africa (WHO 2007). In the same year, a total of 1.6 million people died of TB, including 195,000 patients infected with HIV-1. At the end of 2001, more than 13 million people had dual HIV-1 and TB infections worldwide (WHO 2007). Even though prevalence and death rates have been falling globally for several years, the total number of new TB cases continues to rise in African, east Asian and eastern Mediterranean regions. Among the 15 countries with the highest TB incidence rates, 12 are in Africa, including Kenya. The runaway rates of TB in Sub-Saharan African countries and some parts of South East Asia (e.g., Thailand) are attributed to the HIV-1 pandemic (WHO 2007). It is estimated that HIV-1 causes about a third of TB in Sub-Saharan Africa, and, globally, TB causes 11% of the deaths from AIDS (Corbett et al. 2003). Tuberculosis has become the key opportunistic infection and first manifestation of HIV-1, and the leading cause of death among HIV-1-infected individuals in Sub-Saharan Africa (Lawn 2003; Corbett et al. 2006; Zwang et al. 2007).

While Kenya, Uganda and Tanzania have TB incidence rates of 20–49% among the HIV infected, southern African countries (South Africa, Zambia, Malawi, Zimbabwe, Botswana and Swaziland) have incidence rates of 50% and above (WHO 2007). In 2006, the Kenyan TB-case notification rate

was 325/100,000, with an estimated HIV-1 prevalence among the TB infected of 52% (Wambua 2006). Since the advent of AIDS, Kenya has witnessed an annual increase of 12–16% (Wambua 2006). It is estimated that overall, about 60% of reported TB cases in Kenya are co-infections with HIV-1 (AIDSKenya.org 2006).

There is a vicious synergistic relationship between TB and HIV-1/AIDS: co-infection with TB accelerates death from HIV-1/AIDS by adversely affecting HIV-1 progression through enhancement of HIV-1 replication; infection with HIV-1 leads to increased susceptibility to the development and transmission of active TB; and HIV-1 accelerates the progression of active TB among people with latent TB. Furthermore, the increase in dual infection leads to an increased transmission of TB in the general community.

HIV-1 has also changed the clinical course of TB, making it more difficult to diagnose and more complicated to treat. Tuberculosis develops faster in HIV-1-infected people and occurs earlier in the course of HIV-1 infection than other opportunistic infections do, and infectivity continues at all levels of CD4 cell count (UNAIDS 1997; Corbett et al. 2006). Countries with the greatest increase in active TB also have the greatest number of AIDS cases. In addition, the social groups characterized by poor social living conditions who have the largest number of HIV-1/AIDS cases also have the largest number of TB cases.

Some studies have also been carried out on the influence of HIV-1 infection on *Mycobacterium bovis* (brucellosis). HIV-related cases of *M. bovis* have been reported in France (two out of 128 cases of TB in HIV-infected patients) and in southeast England (two out of 167 HIV-seropositive cases reported between 1984 and 1992) (Dupon and Regnaud 1992 cited in Garay 1996; Yates et al. 1993). In addition, a nosocomial outbreak of multi-drug-resistant *M. bovis* TB was reported among HIV-infected patients hospitalized in a special unit in Paris (Bouvet et al. 1993). This has huge implications for pastoral populations like the Turkana, who not only live in close proximity to livestock but also rely on livestock-based dietary products which predispose them to *M. bovis* infections. Local knowledge in the Turkana indicated that *M. bovis* exists, and there is an observed increase in its prevalence. Whether this is due to HIV-1/AIDS, as there is an increase in TB prevalence as well, is currently unknown.

Research Design and Methodology

The study was carried out among the Turkana, a pastoral population in northwestern Kenya numbering about 500,000, currently undergoing a process of diversification from nomadic pastoralism, which remains the main system of socio-economic production. The research location was set among the Turkana of Lodwar township, with a population of about 40,000 according to the 1999 Population and Housing Census. Lodwar is the administrative headquarters of Turkana District. The population of Lodwar township consists of former pastoralists who are either destitute or have diversified into other forms of livelihood, and those who still have a foothold in the nomadic production system through relatives, siblings and other family members.

The prevalence of HIV-1/AIDS in the township of Lodwar is more than 11.4%, whereas the national average is 5.9% (UNAIDS 2006; Wakabi 2007). This study found there are many factors that facilitate the rapid transmission and contraction of HIV-1/AIDS and other sexually transmitted infections in Lodwar township. The factors can be divided into broad categories such as those that encourage unprotected sex, those that encourage mobility, factors of social organization that encourage risky sex, and factors related to deficient healthcare and socio-economic factors. More specifically, factors that encourage unprotected sexual contact include *kaada* (a local alcohol brewed and sold in the villages and markets), video and disco halls, emerging sexual behaviour and practices, and poverty-accentuated commercial sex work. Factors of mobility that encourage the pursuit of casual sexual partnerships encompass migration and travel, refugees, urbanization, truck drivers who transport goods over long distances, the movement of military personnel, and banditry. Factors of social organization that encourage risky sex or open sexual networks include polygamy, widow inheritance and gender inequality. In addition, factors related to deficient healthcare also influence

the transmission and contraction of HIV-1; these include iatrogenic factors (unsafe medical practices and unsafe blood for transfusion), poor sexual health and the prevalence of sexually transmitted infections, and the low use of condoms. Finally, socio-economic factors, specifically the social conditions of living epitomized by poverty, play a role in the transmission and contraction of HIV-1.

Nonetheless, the response to the growing epidemic is deficient and the district continues to conjure up images of traditional and conservative pastoralists who are not exposed to modern influences, and thus their vulnerability to HIV-1 is increased. Moreover, there is a lack of research on pastoralists and HIV-1/AIDS in Africa, and only a few systematic studies have been carried out (Coast 2002, 2006; May 2003; May and McCabe, 2004). My study is the first to be carried out among the Turkana on knowledge of not only HIV-1/AIDS but also TB. Statistics from Lodwar District Hospital and the household survey indicate that TB is among the top five illnesses in Turkana, with evidence of an increase over the last 5 years.

This research was conducted from December 2000 to December 2001, with a further field visit in March 2007. The qualitative data were collected from two sets of samples. In one, a total of 20 randomly sampled adult informants, including 10 men and 10 women of various ages from Kanamkemer, Nakwamekwi, California and Napet villages, were interviewed. In the other, 26 patients with TB, some of whom were co-infected with HIV-1/AIDS, were sampled. Of these, 13 patients of various ages (nine men and four women) were interviewed at the TB Manyatta. (The TB Manyatta is in a separate compound adjacent to the main District Hospital and provides accommodation for Turkana with TB who are from outside Lodwar; they are on directly observed therapy.) All were suffering from pulmonary TB. Their prognoses were variable, as some were seriously ill while others were on the road to recovery. In addition, 13 patients (nine women and four men) were interviewed in the isolation wards. They had similar prognoses to those in the TB Manyatta.

Data were collected through semi-structured and fully structured interviews consisting of open-ended and closed structured questionnaires with the aim of gathering information on local knowledge of TB and HIV-1/AIDS. Those infected were interviewed to gather their experiential knowledge of TB and/or HIV-1/AIDS. The experiential knowledge is far from being theoretical, for it refers to personal experiences with the infections. The response rate was 100%, as those sampled were all interviewed.

Additional data came from one focus group discussion, whose composition was gender sensitive, having an equal number of men and women who were members of the community healthcare committees in Kanamkemer and California villages. The focus group session yielded invaluable insights that not only complemented other research methods, but also enabled me to unearth some of the information that I was not able to obtain via normal interviewing and participant observation. It also brought forth the nuances and contradictions in the Turkana's understanding of TB and HIV-1/AIDS, later allowing me to triangulate the results with other data from other research methods to enhance the validity of my findings.

Further to this, I held both informal and formal conversations with the District Public Health Officer, the Turkana District AIDS and STIs Control Programme Co-ordinator, indigenous healers and biomedical practitioners at the outpatient TB Clinic, TB Manyatta and isolation wards.

The research questionnaires were administered in my presence by a bilingual research assistant who was fully trained in interviewing techniques. The questionnaires were pre-tested for validity. Data were translated from Turkana into English by the research assistant. The validity of the data was also reinforced by the fact some informants could respond in Swahili, a language I am familiar with.

The research project was approved by the University Research Ethics Board-1, Faculty of Graduate Studies and Research, McGill University. The Ministry of Education of the Government of Kenya issued a research permit. Participation of informants in the project was based on informed consent. I have maintained the anonymity and confidentiality of informants and households.

The Local Knowledge of the Link between TB and HIV-1/Aids

My interest in the subject was stimulated during an interview with an indigenous healer concerning

knowledge of HIV-1/AIDS. As I was interviewing the healer, his wife, who was busy preparing the evening meal, interjected that HIV-1/AIDS is inextricably linked with TB. She likened TB and HIV-1/AIDS to two women married to one man. She indicated that many people who are HIV-1 infected hide under the umbrella of TB, as the symptoms and signs of the two infections are similar. In addition, relatives who have lost people to HIV-1/AIDS indicate that they were afflicted only with TB, which, in effect, caused their deaths. As one elder said, "Tuberculosis masks the true symptoms of AIDS. This is why in hospital...those who are HIV-1 infected are often transferred to the tuberculosis isolation wards or the TB Manyatta. *TB ndiyo ugonjwa maridadi.*" This statement means "tuberculosis is the beautiful illness," and it is made in reference to the fact that HIV-1/AIDS is more stigmatized than TB.

During a leaders' workshop in Lodwar, one participant remarked that it is popular knowledge that "Tuberculosis and HIV-1/AIDS are like brothers. When you have tuberculosis you go to the hospital and you get cured. After a short while, you go to the hospital again. The third time you go to the hospital, you do not recover, but die. This is because you are also HIV-1 infected. The chronic form of TB is HIV-1/AIDS."

A surveillance survey was conducted in the Lodwar District Hospital between February 3 and March 3, 2001, during which 12 patients (seven from the isolation wards, and five from the TB Manyatta) were tested anonymously. Eighty-five percent ($n = 6$) and 20% ($n = 1$) of the total number of tuberculosis patients in the isolation wards and TB Manyatta respectively were doubly infected with HIV-1. When data from the TB Manyatta and isolation wards are combined, we find that 58% of patients were doubly infected. According to this surveillance, more women (four of five) were doubly infected than men (three of seven). Of these doubly infected women, two were single, one was divorcee and one a widow. Generally, it was noted that nearly 40% of all smear-test-positive patients were also HIV-1-infected (personal communication with Clinical Officer, Chest and Skin Clinic, Lodwar District Hospital).

Results of the Study

Of the 13 in-patients at the TB Manyatta, seven indicated that there is no link between TB and HIV-1/AIDS, while three did not know. Only three affirmed that there is a link between TB and HIV-1/AIDS. In the same vein, of the 13 TB patients interviewed in the isolation ward, nine indicated that there was no link, three indicated that there was a link, and one did not know. Of the 20 non-infected informants, 15 indicated there was no link, two did not know and three noted a link between the two infections. Those who were not infected with TB were more likely to affirm the link than those who were infected. This is due to the stigma attached to both TB and HIV-1/AIDS, with the latter being more stigmatized than the former. It emerged that it is more acceptable to acknowledge an infection with TB than with HIV-1/AIDS.

An interviewee at the TB Manyatta indicated that there is a link between TB and HIV-1/AIDS because "When you are infected with tuberculosis, your body turns into a skeleton, and the colour of your hair changes just like somebody who is infected with HIV-1. In addition, treating tuberculosis is just as difficult as treating HIV-1/AIDS." The link between tuberculosis and HIV-1/AIDS is also demonstrated in the arena of treatment. A man on the isolation ward indicated that there is a link because "When tuberculosis and HIV-1 get into the body, they kill no matter the kind of treatment. This is why people say that tuberculosis changes to AIDS when it becomes chronic."

An HIV-1-positive man in the isolation ward concurred that though there is a link between TB and HIV-1/AIDS in terms of symptoms and signs, they differ when it comes to the efficacy of treatment, as HIV-1/AIDS has no cure. A TB/HIV-1-infected commercial sex worker indicated that there is a link because she thought that "when a doctor discovers that you have AIDS, he would tell you that you are only suffering from tuberculosis because the two illnesses have similar symptoms. In addition, in hospital, patients who are co-infected with HIV-1/AIDS are on isolation wards." Another commercial sex worker indicated that "When you have HIV-1, you will get tuberculosis," and that "If you have tuberculosis you might be HIV-1 positive."

Some informants indicated that there was no link between TB and HIV-1/AIDS as the two are different illnesses. As explained by another informant, there is no link between AIDS and TB “Because while HIV-1/AIDS is contracted and transmitted through sexual intercourse, tuberculosis is contracted through dust, water and contact with infected persons. Tuberculosis has always been there, and it affects the whole body, but after some time one would recover.” A significant proportion of the Turkana population in remote rural villages have not seen people with symptoms of HIV-1/AIDS. This is epitomized by one respondent from outside Lodwar who did not know whether there is a link between TB and HIV-1/AIDS as she was not aware of AIDS symptoms. It appears that those who had not witnessed HIV-1-infected persons, or had not been in towns where stories abound about HIV-1/AIDS, were likely to indicate that there is no link, or that they were not aware of the existence of such a link.

I have further discussed the link between TB and HIV-1/AIDS as identified by the Turkana of Lodwar township at the levels described below.

Causality

The similarity between TB and HIV-1/AIDS is identified at the level of causality. Turkana knowledge stipulates that sharing alcohol from the same cup causes or spreads TB. The local populations, while drinking *kaada*, often share a cup. It is noted that TB and HIV-1 could be contracted or transmitted when an infected person shares alcohol with a non-infected person. Moreover, when people are drinking alcohol, they sit close to one another, thus facilitating the spread of TB through breath. Drinking alcohol is also mentioned as a cause of HIV-1 because when people of different sexes drink together, they are likely thereafter to engage in risky sexual behaviours, as alcohol impairs judgment and perception of reality. Once people are drunk (especially men), they are more likely to engage in sex with either commercial sex workers or other partners. Additionally, as the Turkana point out, “Sleeping with and/or kissing person infected with tuberculosis” would spread the infection. Sexual intercourse provides the best avenue for the spread of TB, as partners are more likely to breathe directly onto each other. In the same vein, sleeping with many sexual partners leads to the contraction of HIV-1. In sum, both TB and HIV-1/AIDS can be spread through sexual intercourse if one has sex with someone infected with either TB or HIV-1/AIDS. Nyanja speakers, like the Turkana, perceive TB and HIV-1 as being transmitted mainly through sexual intercourse and alcohol. In fact they note that young men who drink too much *kachasu* (a locally brewed alcoholic drink) get the slimming illness (Green 1999).

The sharing of non-sterilized blades, needles, toothbrushes and chewed tobacco as well as food practices common among the Turkana were all mentioned as causes of TB and HIV-1/AIDS. In addition, insects (flies and mosquitoes) are mentioned as involved in the transmission of both illnesses.

At another level, TB is seen as the “cause” of HIV-1/AIDS. As one 30-year-old female healer put it, “When you are re-infected several times with tuberculosis, the result is death. After this, people would say that you are infected with HIV-1/AIDS.” A 28-year-old female said, “When a person infected with tuberculosis is not treated, people believe that the illness becomes chronic and changes to HIV-1/AIDS.” In local knowledge, frequent re-infection with tuberculosis would lead to a change in diagnosis to HIV-1/AIDS.

Symptoms and Signs

The female informant who originally drew my attention to the nexus between TB and HIV-1/AIDS indicated that “Tuberculosis is a brother of HIV-1/AIDS because of similar symptoms and signs. In addition, a tuberculosis-infected person who is not cured would die just like those infected with HIV-1/AIDS. In addition, a person who is HIV-1 infected will definitely have tuberculosis. Tuberculosis is like one man married to two wives. It is the same way that, when one man is married to two wives, if he has an infectious illness he will transmit it to [both] wives.”

The link between TB and HIV-1/AIDS is based on the similarity of their signs and symptoms.

This is made more apparent because TB frequently infects those with HIV-1/AIDS. The Turkana mentioned various symptoms and signs that are shared between HIV-1/AIDS and TB. Loss of weight is constantly mentioned as both a symptom of HIV-1/AIDS and TB. Most patients with TB who were admitted to the Lodwar District's isolation wards and the TB Manyatta were visibly thin. Similarly, according to some Nyanja speakers, tuberculosis, or *icifuba*, is a symptom of AIDS, or it might only appear to be so because of the symptom of weight loss (Green 1999).

Persistent cough is also mentioned as a symptom of TB or HIV-1/AIDS. Other symptoms and signs shared by TB and HIV-1/AIDS are white teeth, loss of appetite, loss of hair, red lips, lethargy, dry body, skin rashes, continuous vomiting, high body temperature, perennial diarrhoea and the appearance of the wounds on the body.

Treatment

In the hospital, patients suffering from both HIV-1/AIDS and TB are cared for together on the same wards. Overall, informants indicated that though TB can be treated, HIV-1/AIDS is still without a cure. However, two out of 26 respondents said that AIDS can also be cured, just like TB. During the course of this research, debate in Nairobi about antiretroviral therapy was frequently highlighted by the press. The Free Access to AIDS Drugs campaign led a significant number of people to believe that HIV-1/AIDS could be cured.

Knowledge of the Factors of the Ecosystem That Influence the Occurrence of HIV-1/AIDS and TB

According to the Turkana, various cultural and social factors influence contraction and transmission of TB and HIV-1/AIDS. As both infections are contagious, it was indicated that inheriting a widow whose husband had died of TB, HIV-1/AIDS or both could lead to one's contracting the particular infection. An additional risk factor is the practice of polygamy, which leads to the spread of either infection to all wives if the husband or one of the wives is infected with either HIV-1/AIDS or TB. Besides polygamy, other multiple sexual relationships predispose both men and women to the risk of contraction and transmission of HIV-1 or TB.

It was noted that dancing at disco halls or indigenous dance gatherings with someone infected with TB or HIV-1/AIDS increases the risk of contracting either infection. A person with TB would transmit the infection through breathing and/or sneezing while in close contact with others at the dance hall. In addition, disco halls and indigenous dance gatherings facilitate risky sexual behaviours. It was pointed out that drinking *kaada* in a group composed of both men and women increases the risk of their engaging in sexual intercourse. All informants, ranging from commercial sex workers to TB patients, noted that TB has a connection to *kaada*, an emerging problem among urban Turkana. Most informants noted that *kaada* has become the *shamba* and *ngombe ya waturkana* (*kaada* is seen as the equivalent of land and livestock for the settled and stockless Turkana). Informants noted that the consumption of *kaada* has led to the high incidence and transmission of many illnesses, including HIV-1/AIDS and TB.

Ceremonies and traditional practices also contribute to HIV-1/AIDS and/or TB transmission and are recognized as such. Most ceremonies involve rituals that incorporate drinking blood or alcohol from one cup, passed from one elder to another in order of seniority. These ceremonies are: *asapan*, an initiation ceremony for boys involves sharing of milk or blood from one cup; *nagkot na akunta* – the drinking of blood during a marriage ceremony; and *agurum*, the reconciliation ritual incorporates drinking of milk from a shared cup. Chewing food for babies or for old, toothless men and women is traditional practice. Spitting saliva or water directly on the faces of both children and adults by parents or healers as a sign of blessing is common practice in Turkana. Moreover, during naming ceremonies, a person the child is named after is expected to spit into its mouth. According to informants, spitting of water and/or saliva from the mouth could lead to the transmission of TB or HIV-1 infections. The Turkana are also known to share chewed tobacco, toothbrushes and blades

during healing, shaving and body decoration (tattooing), all of which put them at risk of contracting and transmitting the two infections.

Local knowledge indicates that travelling together in the same vehicle might predispose one to TB if one of the passengers is infected. In the same vein, if the vehicle one is travelling in is involved in an accident where bleeding occurs, someone infected with HIV-1 might transmit the virus to other passengers. Informants also noted that non-Turkana immigrants have brought TB and HIV-1/AIDS into townships. These infections are further spread into the villages by Turkana migrants.

Poverty and malnutrition lead to vulnerability to infections including HIV-1/AIDS and TB. In addition, droughts that cause protein-calorie malnutrition, social dislocation, loss of livestock, the raping of women during livestock raids, and migration are factors in transmitting and contracting both TB and HIV-1/AIDS. It was also indicated that lack of medical facilities necessitating sharing needles and delays in accessing medical care, further influencing the prevalence of the two infections in Turkana.

Informants indicated that a nomadic and semi-nomadic pattern of life predisposes the population to contracting TB and HIV-1/AIDS. In the course of moving from place to place, one might encounter a person who is infected with TB or HIV-1. The infected person would transmit the disease to many people in other places, through migration. On the other hand, when people settle they have larger sexual networks, thus increasing their vulnerability to contracting and transmitting HIV-1. Further, overcrowding occasioned by settlements would create ideal social conditions for transmission of TB and HIV-1/AIDS.

Prevention of TB and HIV-1/AIDS

Modes of preventing both TB and HIV-1/AIDS were seen as similar in several ways. Improving both personal and environmental hygiene was frequently mentioned as a means of preventing the spread of TB and HIV-1/AIDS, by not sharing utensils, toothbrushes, blades and chewed tobacco, and by using safe and sterilized medical facilities. Provision of free testing and prompt treatment of TB/HIV-1/AIDS patients were frequently mentioned by informants as ways of containing the spread of the two maladies.

Prevention through educating the masses about TB and HIV-1/AIDS was also frequently mentioned. Educating people through churches, schools and *barazas* – gatherings led by chiefs, District Officers, the District Commissioner and politicians – was also recommended.

Implications of the Conceptual Link between TB and HIV-1/AIDS for Control and Prevention of TB and HIV-1/AIDS

As demonstrated by local knowledge among the Turkana of Lodwar township, TB and HIV-1/AIDS are inextricably linked. As discussed above, biomedical science has also shown a strong nexus between TB and HIV-1/AIDS. Making the association between TB and HIV-1/AIDS is not confined to Turkana alone. In fact, residents, healers, patients and members of the general population of Nyanja speakers of southern Africa demonstrated the same (Green 1999). This association adds stigma and social rejection to an already unfortunate condition. In Turkana, before the advent of the AIDS pandemic, there was no significant stigma attached to TB. However, HIV-1/AIDS is highly stigmatized. It is socially acceptable for one to suffer from TB but not HIV-1/AIDS. As a consequence, another factor has emerged: those who have chronic TB with symptoms such as loss of weight are simply labelled as suffering from HIV-1/AIDS. The increased stigmatization of TB will hamper its control and management, as those who have the disease will simply not reveal it. Continued failure to incorporate TB and sexually transmitted infection (STI) clinics and district AIDS and STI control programs into integrated programs to control TB and HIV-1/AIDS will drive both underground.

There is a need for vigorous health education among the Turkana population of Lodwar township to dispel the myths surrounding TB and HIV-1/AIDS. Those charged with designing programs – the public health and biomedical specialists – must incorporate local knowledge of TB and HIV-

1/AIDS into their programs. Many informants including community health workers, teachers, students and local members of the public expressed concern over the lack of education and vigorous health campaigns on either TB or HIV-1/AIDS in the district.

Increased prevalence of HIV-1/AIDS and the potential outbreak of *M. bovis* TB will have huge implications for pastoral populations like the Turkana, who not only live in close proximity to livestock but also rely on livestock-based dietary products which predispose them to *M. bovis* infections. The combination of bovine and human TB in Turkana would have catastrophic implications for both livestock production and human populations.

Due to the link between TB and HIV-1/AIDS as a result of common routes of infections and risk factors, integrated interventions designed to target both illnesses might be more efficient and cost-effective than single, disjointed programs. This study demonstrates that TB care and prevention should be a priority of HIV-1/AIDS programs, and HIV-1/AIDS prevention and care should be a priority of TB programs.

Conclusion

The nexus between TB and HIV-1/AIDS is currently well established through biomedical and epidemiological data. This study has uncovered the Turkana's local knowledge of the link between HIV-1/AIDS and TB, clearly demonstrated through perceptions of vulnerability and shared routes of contraction and transmission such as *kaada*, poverty, migration, widow inheritance and other socio-cultural practices. In addition, HIV-1/AIDS is linked to TB in areas of symptoms and signs, causality, treatment and prevention; they are seen as brothers or as two wives married to one man. The Turkana imply that once you have HIV-1/AIDS, you cannot avoid contracting or "relating" to TB, as they are inextricably linked. As discussed earlier, biomedical science also demonstrates the link between TB and HIV-1/AIDS.

Moreover, the study demonstrates that prevalence of both HIV-1/AIDS and TB is influenced by the same factors of the ecosystem, and that they are largely contagious and attributed to impersonal and natural causes. Understanding the nexus between TB and HIV-1/AIDS by policy makers and interventionists would contribute greatly to prevention of TB and HIV-1/AIDS in communities where both are prevalent. This unified approach is justified because HIV-1 drives the TB epidemic and should be reflected in the development of joint intervention programs. The stigma among TB patients thought to be HIV-1 infected is fast developing in Turkana, with negative implications for the control of TB, because those infected would not seek medical treatment.

Continued failure to develop joint programs to control HIV-1/AIDS and TB together will drive both underground. In Turkana, there was no stigma attached to TB before the advent of the AIDS pandemic. However, HIV-1/AIDS is highly stigmatized. As discussed earlier, many people misrepresent the interconnectedness between TB and HIV-1/AIDS by labelling all HIV-1-infected people as suffering from TB. It is socially acceptable for one to suffer from TB but not HIV-1/AIDS. As a consequence, another factor has emerged: those who have chronic TB with symptoms such as emaciation, loss of weight and thin hair are simply labelled as suffering from HIV-1/AIDS. This means that TB is becoming stigmatized, as people infected with TB are perceived as HIV-1 infected as well. Likewise it is felt that many people infected with HIV-1 take cover under TB. This will mean that controlling TB will be hard, as those who have the disease will simply not reveal it.

There is a need for vigorous education among the Turkana population of Lodwar township to dispel the myths surrounding TB and HIV-1/AIDS. Health education aimed at HIV-1 prevention must also be aimed at TB. The illnesses must be pursued through a single strategy. Turkana local knowledge correctly recognizes some control and prevention strategies against TB and HIV-1 as similar. Those charged with the design of programs – public health and biomedical specialists – must incorporate this knowledge into their curative and preventative programs.

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Gender-Related Factors Influencing HIV Serostatus Disclosure in Patients Receiving HAART in West Africa

C. Ndiaye, Department of Social and Preventive Medicine, Université de Montréal, Canada

C. Boileau, Department of Social and Preventive Medicine, Université de Montréal, Canada
M.V. Zunzunegui, Department of Social and Preventive Medicine, Université de Montréal,
Canada

S. Koala, Association of African Solidarity, Ouagadougou, Burkina Faso

S. Ag Aboubacrine, Hôpital National du Point G, Bamako, Mali

P. Niamba, CHU Yalgado Ouédraogo, Ouagadougou, Burkina Faso

V.K. Nguyen, Department of Social and Preventive Medicine, Université de Montréal,
Canada

S. Rashed, Department of Social and Preventive Medicine, Université de Montréal, Canada

Cathy Ndiaye, 2300 Saint Mathieu # 708, Montréal, Québec H3H 2J8, Canada Tel: 1-514-578-5080, Email: cathy.ndiaye@umontreal.ca

Abstract

Disclosure of HIV serostatus remains an important tool for the prevention of new infections and early initiation of treatment for HIV-positive individuals' regular sexual partners. Our aim is to identify factors associated with disclosure to partner in patients taking antiretroviral treatment, with a gender- and sex-based approach. In this study conducted in Mali and Burkina Faso, men (154) and women (164) who reported being in a marital or cohabitating relationship were included. Sex-specific bivariate analyses and multivariate logistic regression were performed to identify determinants of disclosure. Disclosure to partner was 72.1% in men and 79.9% in women. Results of bivariate and multivariate analyses indicated that cohabiting with partner was strongly associated with disclosure in both men

and women. In men only, older age, literacy and having good communication with the treating doctor were significantly associated with disclosure. Among women, disclosure was associated with having children and high self-reported importance of religion. Future research and interventions promoting disclosure should take into account these differences reflecting the social construction of gender roles in these settings.

Introduction

One prominent public health recommendation for people with HIV/AIDS is to disclose, or tell others about, their diagnosis, especially their sexual partners (Rothenberg et al. 1995; UNAIDS 2000; Medley et al. 2004). In Africa, where the main route of transmission is heterosexual intercourse in married couples (Painter 2001; Freeman and Glynn 2004), disclosure of HIV serostatus by sexual partner prior to risky behaviours is thought to be particularly important in preventing this type of transmission (WHO 2004). As the availability of antiretroviral treatments (ART) grows, patients live longer and healthier lives but remain potential transmitters of the infection. There is a decreased risk of transmission with ART but sometimes increased sexual risk behaviour (Hoxworth et al. 2003). Therefore, risk of transmission in ART-treated patients is not null, and disclosure needs to be further examined and encouraged in this population.

Disclosure of HIV serostatus is crucial, not only for broader transmission prevention efforts, but also for the individual's health. In today's context of accelerated highly active antiretroviral treatment (HAART) use, partner disclosure may be necessary in a patient's effort to gain social and emotional support to ensure proper adherence to treatment and better therapeutic efficacy. Serostatus disclosure has been shown to initiate preventive sexual behaviour and increased care-seeking behaviour (King et al. 2008).

In African settings, partner disclosure has been extensively studied in cohorts of pregnant women who participate in voluntary counselling and testing programs in clinical settings (Medley et al. 2004). The majority of these studies have been conducted in a context of non-existent or limited access to ART. Reported rates of disclosure varied between 16.7% and 86% among women in developing countries. The lowest rates were among pregnant women tested in antenatal care and the highest in women who voluntarily got tested or attended counselling clinics. In general, the average reported rate of disclosure to steady or current partners was 49%, which is much lower than the average rate of 79% in developed countries (Medley et al. 2004). For men in Sub-Saharan Africa, there are few data on the rates of disclosure to primary sex partners, but we may hypothesize that they will be equal to or lower than rates reported for men in developed countries, which range between 67% and 88% (Sullivan 2005).

Previous studies have reported the following reasons for non-disclosure in African women: fear of discrimination or rejection, fear of divorce or violence, fear of accusations of infidelity, fear of blame and conflict with partner, and desire to protect loved ones (Hays et al. 1993; Gielen et al. 1997; Sowell et al. 1997; Levy et al. 1999; Gaillard et al. 2000; Antelman et al. 2001; Issiaka et al. 2001; Kilewo et al. 2001; Maman et al. 2002; Medley et al. 2004). These fears reflect the degree of individuals' perceptions of stigma, and the context contributing to these fears should be better comprehended. HIV/AIDS-associated stigma refers to attitudes or perceptions of shame, disgrace, blame or dishonour associated with the disease (Cock 2002) and has been reported to have a negative impact on disclosure (Pettrak et al. 2001; Chandra et al. 2003).

In addition, disclosure to spouse or cohabitating partner has been shown to be influenced by psychosocial and economic factors: demographic characteristics such as older age (Serovich and Mosack 2003), higher education (Farquhar et al. 2001), monogamous marital status (Antelman et al. 2001); economic factors such as high income (Crepaz and Marks 2003) and financial dependence (Antelman et al. 2001); and psychosocial variables such as high religiosity (Ciccarone et al. 2003) and good social support (Greene and Serovich 1996; Pettrak et al. 2001). Factors that characterize the relational context in which people live – for instance, good quality of spousal communication, and longer duration and stability of the relationship – have also been consistently found to be associated

with serostatus disclosure (King et al. 2008). It is important to note that some of these studies have been conducted in non-African settings, and findings cannot necessarily be generalized from the American to the African context.

In this study, we report on the determinants of partner disclosure specific to men and women receiving ART in Mali and Burkina Faso. This is the first report of partner disclosure in patients in settings characterized by low HIV prevalence and predominance of Muslim faith. Both these factors can be hypothesized to influence partner disclosure, which would therefore differ in settings such as Eastern Africa, where prevalence is higher, and in Southern Africa, where prevalence is also much higher and Christian faith is predominant. In these settings, access to formal employment is limited, state benefits are scarce and traditional family and religious structures play an important role as purveyors of social security (Nguyen et al. 2007). Women's social position is strongly tied to their role in the domestic sphere as mothers and providers of care, while for men it is linked to their role as breadwinner outside the home. Thus, we hypothesized that higher socio-economic status would be associated with disclosure in men, as this is a measure of male power. As a corollary, we hypothesized that women with less power would be more likely to disclose.

Because women's and men's behaviours and decision making are defined by social, cultural and religious norms, factors influencing disclosure to partner may be different for men and women. Thus, we used a gender- and sex-based analysis (GSBA) in an attempt to understand biological (sex-based) and socio-cultural (gender-based) differences between men and women, without presuming that any such differences exist (Canadian Institute of Health Research [CIHR] 2008).

The objectives of our study were to describe the prevalence and to identify the main determinants of serostatus disclosure to spouse or cohabitating partner in men and women treated with HAART in two low-prevalence West African countries.

Methods

Setting

The study was conducted in six HAART-delivery sites in the capital cities of Mali and Burkina Faso, respectively, Bamako and Ouagadougou. The two countries are neighbours, with similar cultural, economic and religious contexts, and similar epidemiological and virological profiles. According to the 2006 report on the global epidemic on AIDS, the estimated HIV prevalence rate in adults aged 15 to 49 is 1.7% in Mali and 2% in Burkina Faso (UNAIDS 2006). This multicentre cross-sectional study is part of a larger research project on the efficacy of antiretroviral therapy and assessment of adherence in resource-limited settings. The larger study, titled "Building capacity to reinforce adherence to antiretroviral therapy and sexual prevention for patients in or from resource-limited settings," was funded by the CIHR and carried out in 2004. The overall goal was to find means to maintain adherence to ART and thus sustain treatment efficacy. The specific goals were to describe (1) the immunological and clinical response to ART, (2) adherence to ART, (3) consistency of condom use and (4) serostatus disclosure to regular sexual partner.

Sampling and Recruitment

HIV-infected patients were recruited in three public hospitals and three community-based organizations that provided counselling, psychosocial support and medical care including antiretroviral therapy. We interviewed 649 men and women, using a standardized questionnaire. Only men (154) and women (164) who reported being in marital or cohabitating relationships were included in this analysis. The remaining subjects (51%) in our study were not engaged in these types of relationships and were either single or widowed. Upon visiting the physician for their regularly scheduled visits, patients who were eligible for the study were invited to participate, asked for their consent and enrolled. Patients were eligible if they had been on antiretroviral treatment for more than 6 months. Exclusion criteria were being HIV negative, being under 18 years old and refusing to give consent. Ethical approval was received from the appropriate ethics committee in each study country as well as in Canada (Université de Montréal).

Data Collection and Measures

A questionnaire was used to collect information on demographic and socio-economic status, adherence to antiretroviral treatment, and partner disclosure, as well as a set of potential determinants of these two behaviours, selected from the literature. The questionnaire was administered in face-to-face interviews by trained interviewers.

The outcome variable was serostatus disclosure. Disclosure to regular sexual partners was assessed using yes/no questions (“Have you disclosed your HIV status to your partner(s)?”). For polygamous unions, we considered that the patients had disclosed if all spouses or cohabitating partners had been notified. In our analysis, potential determinants of disclosure were identified by a review of the literature and by consultations with local caregivers and patient focus groups. These determinants were factors associated with demographic, economic, psychosocial, health status and treatment factors.

Demographic variables included (1) age, (2) literacy (the self-reported ability to read and write in French – literacy in French is a marker of educational attainment), (3) having children and (4) living with partner (the patient was asked if he/she lived under the same roof as the person identified as the regular sexual partner). The financial situation was measured by the main source of income: (1) partner, (2) family or (3) self-earned income. Psychosocial variables were (1) social support (defined as having a source of support when needed and categorized by the main source of support: spouse, other or none), (2) communication about HIV to family (defined as having discussions about HIV in general with family members), (3) quality of relationship with physician (six items measuring the availability and competence of the physician and his/her ability to counsel the patient on treatment), (4) involvement in patients-living-with-HIV (PLWHIV) support group (defined as participating in at least one type of PLWHIV activity) and (5) perception of religion in patient’s life (measured by the question “How important is religion in your life?”, for which the answer choices were high or low importance.)

As for treatment factors, there were two types of prescription sites: public hospitals or community-based organizations (CBOs). Perceived health was measured by asking the patient to rate his/her health status (good or bad). Lastly, information on time since diagnosis was collected from the patient’s medical file. Appendix 1 provides an overview of the contents of the questionnaire used to collect data for this study.

Statistical Analysis

Bivariate analyses were conducted to identify factors associated with serostatus disclosure to partner (chi-square statistics for binary or categorical independent variables, ANOVA with 1df for continuous variables). This analysis was carried out separately for men and women.

Sex-specific binary logistic regression was used to assess the association of disclosure with covariates according to the results of the bivariate analysis. We screened variables on the basis of their p-value from the results of the sex-specific bivariate analysis ($p \leq 0.25$ either in the men’s or the women’s sample). All variables were entered together and removed in a backward stepwise fashion if $p > 0.10$. For the final models, multivariable-adjusted ORs, their 95% confidence intervals and p-values were calculated separately for men and women. SPSS Version 12 was used.

Results

Demographics

In our study population, the mean age was 39 years, 51.8% were women, 75% were Muslim and 25% were Christian; 57.5% were from Mali and 42.5% from Burkina Faso. Eleven percent of our total sample was unemployed; among women, 25% were housewives; 72% of patients had been on HAART for more than 1 year; and 67.5% of patients were treated in hospital-based sites versus 32.5% in CBOs.

Sex-Specific Bivariate Analyses (Table 1)

Prevalence of disclosure to partner in our sample was frequent: 72.1% in men and 79.9% in women

($p = 0.10$). Cohabiting with partner was strongly associated with disclosure among both men and women. The number of men who were not cohabiting with their partner was small ($n = 14$), but differences in disclosure between cohabiting (75.5%) and not cohabiting (42.9%) were significant ($p = 0.009$). Disclosure was also less frequent among women not cohabiting with their partner (58.1%) as compared with women living with their partner (86.2%) ($p < 0.001$) (Table 1). As expected, women and men who felt more stigmatized were less likely to disclose their status to their partner.

Table 1. Percentage of HIV-positive men and women receiving HAART who have disclosed their serostatus to their spouse or cohabitating partner

Characteristics	Men			Women		
	n = 154	Disclosure (%)	p-value	n = 164	Disclosure (%)	p-value
Demographic and economic factors						
Age (in years)						
≤34	14	42.9	0.011	73	80.8	0.787
>34	140	75		91	79.1	
Literacy						
No	53	56.6	0.002	69	82.6	0.457
Yes	101	80.2		95	77.9	
Having children						
No	11	72.7	0.960	26	61.5	0.011
Yes	143	72.0		138	83.3	
Financial resource						
Partner	10	70.0	0.914	89	86.5	0.054
Salary	125	72.8		54	74.1	
Family/other	19	68.4		21	66.7	
Psychosocial factors						
Living with partner						
No	14	42.9	0.009	31	58.1	<0.001
Yes	139	75.5		130	86.2	
Social support						
None	80	70.0	0.223	36	77.8	0.171
From partner	23	87.0		82	85.4	
From others	51	68.6		46	71.7	
Communication about HIV with family ^b						
No	115	68.7	0.108	107	80.4	0.743
Yes	39	82.1		55	78.2	

Involvement in PLWHIV support group						
No	90	68.9	0.296	86	76.7	0.293
Yes	64	76.6		78	83.3	
Quality of patient-physician relationship						
Bad	46	58.7	0.016	44	77.5	0.210
Good	108	77.8		120	79.9	
Religiosity						
Not important	29	62.1	0.182	24	62.5	0.022
Important	125	74.4		140	82.9	
Health status and treatment factors						
Perceived health						
Bad	71	73.2	0.766	70	78.6	0.719
Good	83	71.1		94	80.9	
Prescription site						
Hospital	47	69.0	0.223	55	77.1	0.206
CBO	107	78.7		109	85.5	
Time since diagnosis (in months)						
6–11	18	66.7	0.667	24	75.0	0.407
12–23	47	70.2		40	80.0	
24–35	26	80.8		41	73.2	
≥36	54	75.9		52	86.5	

CBO = community-based organization; HAART = highly active antiretroviral treatment; PLWHIV = patients living with HIV.

a Salary including revenue from own business or by commission (services).

b Communication about HIV with family excluding partner.

There were some differences between men and women. Men aged 34 years or less had the lowest disclosure rate (42.9% vs. 75% for patients aged over 34 years, $p = 0.011$). Male patients who were illiterate disclosed less than those who could read and write in French (56.6% vs. 80.2%, $p = 0.002$). Men who communicated about HIV with a family member other than the spouse tended to disclose their serostatus more frequently than men who did not communicate (82.1% vs. 68.7%, $p = 0.108$), and patients who reported good communication with their physician were more likely to disclose than those with poor communication (77.8% vs. 58.7%, $p = 0.016$) (Table 1).

For women, disclosure was more frequent among those who had one or more children (83.3% vs. 61.5%, $p = 0.011$) compared with women who had no children; women who depended financially on their partner were also more likely to disclose than those who depended on their family or on other sources of income (86.5% vs. 66.7%, $p = 0.054$). Women who considered religion important disclosed more frequently (82.9% vs. 62.5%, $p = 0.022$) (Table 1). Social support was not significantly associated with disclosure for men or women.

Sex-Specific Multivariate Analyses (Table 2)

In multivariable-adjusted logistic models (Table 2), the association between serostatus disclosure and living with partner persisted among women. Among men, this association became non-significant, probably due to the small number of men who were not cohabiting with the spouse. However, communication about HIV with a family member other than the spouse emerged as an important factor for disclosure in both sexes (OR = 5.345; 95% CI = 2.204–12.963 in men and OR = 2.512; 95% CI = 0.887–7.117 in women). For men, the associations of disclosure with older age (OR = 0.014; 95% CI = 1.377–17.424) and with literacy (OR = 0.005; 95% CI = 1.410–6.906) were strengthened in multivariate analysis. For women, the multivariate logistic model suggested that having children (OR = 2.615; 95% CI = 0.888–7.698) and perceived importance of religion increased the likelihood of disclosing (OR = 2.644; 95% CI = 0.924–7.564). All analyses met the goodness-of-fit criterion of Hosmer-Lemeshow test ($p = 0.907$ for men and $p = 0.219$ for women).

Table 2 – Multivariable adjusted odds ratio for disclosure by selected associated factors from binary logistic regression in men and women

	Men			Women		
	OR	95 % CI	p-value	OR	95 % CI	p-value
Age (in years)						
> 34 vs. ≤ 34	4.898	1.377 – 17.424	0.014			
Literacy						
Yes vs. No	3.121	1.410 – 6.906				
Having children						
Yes vs. No				2.615	0.888-7.689	0.081
Living with partner						
Yes vs. No				4.053	1.610 – 10.206	0.003
Communication with family about HIV						
Yes vs. No	5.345	2.204-12.963	<0.001	2.512	0.887-7.117	0.083
Religiosity						
High vs. Low				2.644	0.924 – 7.564	0.070
Patient-physician relationship						
Good vs. Bad	3.095	1.272- 7.529	0.013			

Discussion

Disclosure is an important public health strategy for the prevention of new infections. First, disclosure may initiate testing of HIV-positive sexual partners, lead couples to adopt safe sexual behaviours, increase chances for social support and alleviate psychological stress and anxiety. Second, disclosure may facilitate early access to necessary medical care and antiretroviral treatment. Finally, disclosure may reduce stigmatization and increase awareness of the HIV epidemic as more individuals reveal their seropositivity.

This study explores factors associated with disclosure of HIV status to sexual partners according to sex in a sample of West African patients under antiretroviral treatment. Prevalence of disclosure was frequent for both men and women: 72.1% for men and 79.9% for women. These figures are higher than those found in developing countries among HIV-positive subjects, with or without treatment, with an overall estimate of 49% disclosure prevalence (Medley et al. 2004). In our study, 25% of patients are non-disclosers. These results are comparable to those reported in other studies in similar populations. Skogmar et al. (2006) found in a study conducted in 144 HIV-positive men and women in Johannesburg that 21% had not disclosed to their sexual partners. Olley and al. (2004) found a 22% rate of non-disclosure to partner, and Nachega et al. (2005) reported that 38% of their study subjects in Soweto did not disclose to their partner.

Living with partner was strongly associated with disclosure in women and also in men. These findings show that partnership characteristics most likely in long-term exclusive relationships explain some decisions to conceal or reveal an HIV diagnosis to partner. Cohabiting is part of the context that influences disclosure decisions, since patients may choose to disclose when they feel close to their spouse or cohabitating partner. In favour of this argument, high spousal support and the feelings of trust and confidence have been associated with disclosure (Stein et al. 1998; Klitzman 1999; Semple 1999). Therefore, efforts to reinforce the quality of the relationship between men and women and to improve communication in the couple should be encouraged.

Differences in factors associated with serostatus disclosure reflect the gender-specific role that women and men play in West African societies. Analyses revealed that being educated and older led men to disclose more. In addition, a good patient–physician relationship seemed to favour disclosure in men, but not in women. Stoicism, a value of masculinity, does not enhance disclosure: men with poor communication with their doctor may also be more likely to avoid disclosure of serostatus to their partner. These three aspects – older age, higher education and good communication with the treating physician – may be indicative of self-assurance in dealing with HIV seropositivity.

In contrast, women were more influenced by their responsibilities as mothers and wives. Taking care of children, an essentially female responsibility, and being dependent on partner for financial needs seemed to encourage women to disclose. Because women in Sub-Saharan Africa are generally expected to consult their husband for most decisions concerning daily activities, including personal health, practical reasons may push them to disclose. Hence, we suppose that women mainly report to their husband because it is difficult to conceal taking medication and making regular visits to the physician. Self-reported importance of religion was significantly associated with disclosure among women. Religiosity had been previously shown to be associated with more altruistic or socially responsible behaviours among seropositive individuals (Ciccarone et al. 2003). Individuals living with HIV often experience shame and guilt, especially women who fear leaving their children orphaned and practice religion and spirituality the most (Dozier 1998; Pargament et al. 2004). Results of the multivariate analyses support gender differences noted in the mechanisms governing decisions about partner disclosure, though communication with family members about HIV appeared to favour disclosure. But community organizations do not seem to be related to disclosure in our data.

Most patients in our study sample (86%) had known their seropositive status for longer than 1 year, and most of them had started HAART treatment because of symptoms compatible with an AIDS diagnosis. The fact that probability of disclosure did not increase significantly with time since the patient first learned of his/her serostatus may mean that decisions about disclosure are often taken at time of diagnosis. We could not capture this association because our patients were recruited after 6 months of treatment. But in our study, most of the people who had decided not to disclose their serostatus seemed to be long-term non-disclosers. This suggests that interventions to promote disclosure are either non-existent or ineffective. In addition, self-rated health is not related to disclosure, suggesting that in spite of deteriorating health, some patients are able to hide their HIV status from their family network.

Sexual partners of people infected with HIV are particularly at risk of acquiring the infection.

Effective means of reducing this risk would be to target PLWHIV and concentrate our prevention efforts on this population (Janssen et al. 2001). Antiretroviral treatment programs would be important entry points to undertake prevention with HIV-positive patients. Moreover, regular visits would allow prevention messages to be reinforced. Within a stable couple, the use of the condom is particularly difficult to promote, and disclosure is a crucial step in the negotiation process for condom use.

In Mali, a law passed in 2006 gives physicians the right to disclose patients' serostatus if patients do not notify their regular sexual partners in the 15 days following HIV diagnosis. The frequency of use and the impact of this law on disclosure rates have not been reported in any official documents. Although the goal is to reduce transmission and identify those who may need medical care, compulsory disclosure may not be an appropriate solution, as patients may not be ready to manage the potential consequences associated with status disclosure. But this suggests that disclosure may be enhanced by employing third parties to break the news. The third party need not be a health professional; a close family member or friend could be chosen instead. Finally, individual and psychosocial counselling should be provided to all patients to help in dealing with misunderstandings and stigmatization that could arise following serostatus disclosure.

There are potential limitations in this study. First, cross-sectional design has inherent limitations. We do not know how much time has elapsed between diagnosis and disclosure or what the clinical status of the patient was at the time of diagnosis. According to Medley et al. (2004), length of time since diagnosis and severity of illness are positively associated with disclosure, but in our population this was not the case. In addition, disclosure might have preceded the measurement of some explanatory factors. Second, limited sample size did not allow for further interaction tests, as cell sizes were small when stratified according to sex. Third, the study was also limited by the fact that it included only patients under treatment, and thus results cannot necessarily be applied to patients who are naïve to ART or have learned their status recently. Finally, this cohort may not be representative of all treated patients in Mali. We have only recruited patients who live in Bamako, the capital city. Determinants of disclosure may differ in those who live in more conservative towns or villages.

We need to better understand the contexts in which disclosure occurred. We have only a limited perspective on this complex behaviour, which has a preliminary phase and consequences. But the aim of the original study was not to study disclosure, and we were limited in the choice of the possible correlates of disclosure among the variables available in the data base. A longitudinal research in a similar cohort would be more appropriate to establish causality and to provide an exhaustive list of potential determinants of disclosure. Finally, self-reported behaviour is subject to reporting bias. There is a possibility that social desirability influenced patients' answers to some questions.

Conclusion

In view of the expanding access to HAART in Africa, there is a pressing need to reinforce behavioural interventions to prevent HIV transmission. Serostatus disclosure was frequent among HAART-treated patients in stable partnerships, but efforts are still needed to improve disclosure rates and prevent heterosexual transmission in this population. In low-prevalence settings, it is more difficult to target people living with HIV/AIDS for positive prevention. Possible interventions could be to target improved communication between male patients and their spouses, notably by counselling men how to bring up conversations around HIV with family members to "prepare the terrain" for disclosure later on. For women, outreach programs with religious groups should include discussion of partner disclosure. Mother-child health programs are also important entry points for discussing partner disclosure and couples communication. Since disclosure seems to have different patterns in men and women, interventions aimed at increasing disclosure rates should take these differences into account. Future research should explore identification of methods that facilitate disclosure to partners. These methods should be tailored to the cultural, social, religious and gender norms in Sub-Saharan countries.

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Appendix 1: Questionnaire Overview

Data collected	Main Variables
Sociodemographic characteristics	Sex, age, date of birth, highest level of education, occupation, marital status, number of children, religion
Financial status	Financial resources, assets, monthly revenue, financial responsibilities
Social environment	Household occupants, stressful events
Serostatus disclosure	Date of HIV diagnosis, motivations for screening, disclosure of HIV status to all sexual partners, friends and family
Openness about HIV serostatus	Communication about living with HIV with family and friends or other HIV+ individuals
Social support	Identification of providers of moral support and quality of support received
Stigmatization	12-item stigmatization scale
Perceived health status and food insecurity	Self-rated health status, description of quantity and quality of food intake, alcohol consumption
Involvement in HIV+ organizations	Participation in HIV focus and volunteer groups
Sexual behaviour	Frequency of condom use, number of sexual partners
Knowledge about HAART	Perceived HAART efficacy and knowledge of risks about non-adherence
Clinical data	Weight, height, clinical evaluation, HIV type
Laboratory results	Virological, immunological, haematological and biochemical data
Prescribed treatment	Type, dose and duration of antiretroviral treatment
Adherence to HAART	Number of missed pills and reasons for non-adherence

Global Nurse Migration: Its Impact on Developing Countries and Prospects for the Future

Amir A. Khaliq, PhD, Associate Professor, Department of Health Administration and Policy, University of Oklahoma Health Sciences Center

Robert W. Broyles, PhD, Professor, Department of Health Administration and Policy, University of Oklahoma Health Sciences Center

Ari K. Mwachofi, PhD, Assistant Professor, Department of Health Administration and Policy, University of Oklahoma Health Sciences Center

Correspondance Amir A. Khaliq, PhD, Associate Professor, Department of Health Administration and Policy, University of Oklahoma Health Sciences Center, College of Public Health, 801 N.E. 13th Street, College of Health Building, Room 346, Oklahoma City, OK 73104-5072, Email: Amir-khaliq@ouhsc.edu

Abstract:

The worldwide shortage of nurses which results from a global undersupply and high attrition rates affects developed countries in the West the same way as it affects developing countries in Asia, Africa and Latin America. The difference lies in the fact that developing countries serve as a readily available source of trained nurses for developed countries in Europe, North America and parts of Oceania. Strong “pull” and “push” factors favour wealthier nations in the West in their efforts to deal with domestic shortages through overseas recruitment. Thus, the ongoing nursing shortage in developing countries is worsened by a loss of thousands of trained nurses every year to emigration. This paper brings into focus the magnitude of the problem in terms of the number of nurses migrating to and from various countries and its impact on developing countries. The paper also examines some of the ongoing efforts in developing countries to mitigate the problem and sheds light on the prospects for improvement in the foreseeable future.

Introduction

The movement of nurses occurs within countries from rural areas to urban centres, within regions from one country to another, and internationally across continents. Starting in the second half of the 20th century, the movement of health workers from the developing countries of Asia and Africa

to the Western industrialized nations was largely for the purpose of training and subsequent repatriation (Lorenzo et al. 2007; Brush and Sochalski 2007; Mejia 1979). In more recent years, however, the intent and expectations on both sides of the geographic and economic divide have changed (Lorenzo et al. 2007; Ball 2004; Corcega et al. 2000). The social, political and economic conditions in many developing countries have not made steady progress and in some cases have deteriorated. Consequently, career opportunities with prospects of permanent settlement in developed countries of the West have become very attractive for nurses from developing countries (Brush and Sochalski 2007; Buchan 2003; Buchan et al. 2003; Buchan et al. 2006; Joint Learning Initiative [JLI] 2004).

Mainly, the developed countries in Europe and North America have benefited from the international migration of nurses, whereas developing countries have sustained a loss of investment in human capital (Khadria 2007; Denton 2006; Liese et al. 2003). In countries plagued by insufficient resources, unsatisfactory working conditions, geographic maldistribution of personnel and bureaucratic inefficiencies of public sector employment, emigration of nurses contributes to the chronic problem of a nursing deficit (Lorenzo et al. 2007; Brush and Sochalski 2007; Oulton 1998; Oulton 2006). For example, there is a shortfall of 600,000 nurses in Sub-Saharan Africa alone (Denton 2006). In Malawi, the nursing shortage has reached such critical levels that in 2003 fifty percent of available nursing posts remained unfilled (Liese et al. 2003) and in 2004 nearly two-thirds of the nursing positions in the public health sector remained vacant. More nurses left Malawi in the preceding four years than the 336 remaining in the public health sector in a country of 11.6 million people (Dugger 2004). The same report added that Lilongwe hospital with 830 beds in 2004 had only 183 nurses left to carry out the work of 532.

A large body of literature on various aspects of the international migration of nurses has appeared in the last 10–15 years. Previous studies have either focused on specific source countries such as India (Khadria 2007; Edward 2005), the Philippines (Ball 2004; Lorenzo et al. 2005 and 2007, Brush and Sochalski 2007), sub-Saharan Africa (Clemens and Pettersson 2008; Dovlo 2007; Liese et al. 2003; WHO 2004a; Padarath et al. 2003) and the Caribbean region (Salmon et al. 2007; Yan 2006), or destination countries including the US (Aiken 2007; Cooper and Aiken 2006), Canada (Little 2007; Mitchell 2003) and the UK (Buchan et al. 2006; Buchan and Seccombe 2006; Buchan et al. 2005; Buchan 2003). Some studies have examined the international patterns of nurse migration (Kingma 2006, 2007; Denton 2006; Aiken et al. 2004), while others have questioned the wisdom and ethics of overseas recruitment of nurses by countries such as the UK and the US (Mills et al. 2008; Gostin 2008; Little 2007, McElmurry et al. 2006, Denton 2006, Jeans et al. 2005; International Council of Nurses 2001). A number of researchers have commented on the impact of nurse migration on developing countries in general or have reported about the challenges posed by the current situation for specific source countries such as the Philippines and India. However, there are no studies that examine the impact of nurse migration on developing countries in a comprehensive manner. This paper looks at the impact of global nurse migration on developing countries and examine the prospects for addressing the problem in the foreseeable future through existing strategies in both developed and developing countries. It must be pointed out at the outset that there are notable discrepancies in data reported from various sources in terms of shortfalls, nursing stocks and numbers migrating from one country to another. However, these discrepancies do not materially change the overall picture or the conclusions drawn with respect to the impact of global nurse migration.

Demand in the Destination Countries

The US

Table 1 shows the estimated number of nurses in selected destination and source countries. The total number of registered nurses in the US in 2000 was estimated by the World Health Organization to be in the range of 2.7 million (Table 1). The US Health Resources and Services Administration (HRSA 2004a) reported the number of registered nurses in 2004 to be nearly 2.9 million. More importantly, the impact of the US nursing workforce labour market on global migration of nurses is very signifi-

cant because the US nursing workforce constitutes approximately 20% of the total world stock of nurses and about half of English-speaking nurses in the world (Aiken 2007; Dugger 2006).

Previous estimates of nurse shortage in the US by 2020 had placed the number at 800,000 (HRSA 2004a, 2004b). More recent estimates suggest that the US will experience a shortage of 75,000 nurses in 2010 and 340,000 by 2020 (Auerbach et al. 2007; HRSA 2004c). Since 1998, the number of newly registered foreign-trained nurses in the US has increased every year. In 1998, approximately 4000 foreign-trained nurses were registered whereas the number had risen to 15000 by 2004. According to some estimates, nearly 10% of US nursing workforce consists of foreign-trained nurses and almost 80% of those have come from developing countries (Cooper and Aiken 2006). Historically, the Philippines and the Caribbean region have been the biggest sources of foreign-trained nurses in the US (Aiken 2007; Ball 2004; Brush and Sochalski 2007; Cooper and Aiken 2006). More recently, India has become a major source. In the 1990s India ranked sixth in terms of the number of nurses applying for licensure and registration in the US, but by 2004 it ranked second after the Philippines (Aiken 2007; Khadria 2007).

Table 1. Number of nurses in selected destination and source countries.

Year	Country	Total Nurses	Nurses per 1000 Population
2000	USA	2,669,603	9.37
1997	UK	704,332	12.12
2003	Canada	309,576	9.95
2004	Saudi Arabia	74,414	2.97
2002	Kenya	37,113	1.18
2004	South Africa	184,459	4.08
2001	China	1,358,000	1.05
2004	India	865,135	0.80
2000	Philippines	127,595	1.69
2004	Malawi	7264	0.59

Source: WHO – World Health Statistics 2007 (WHO 2007).

The UK

In the UK, more than 90,000 foreign-trained nurses have registered since 1997 and approximately 42,000 are currently working in the country (Buchan et al. 2003; Buchan et al. 2005). From 2002 to 2006, approximately 40% of newly registered nurses in the UK were internationally trained, with 16,000 from developing countries (Denton 2006). In 2005 the Nursing and Midwifery Council (NMC) of the UK estimated that 37,000 foreign-trained nurses in the UK could not start work because of the unavailability of “supervised practice placement” opportunities (Buchan et al. 2005). The Philippines, Australia, India and South African have been the main source countries in recent years (Buchan 2003; Buchan et al. 2005; Buchan and Secombe 2006). For example, of the 16,000 foreign-trained nurses registered in 2004, 7235 came from the Philippines, and in 2001, more than 20% of foreign-trained nurses in the UK were from sub-Saharan Africa (Simoens et al. 2005). In 2002, one of the National Health Service (NHS) trusts in London employed nurses from 68 different countries, including 22 African countries (Buchan 2003).

Canada

In Canada, more than 240,000 nurses were in active service in 2003 (Little 2007). The year before, the Canadian Nurses Association (CNA) had projected nursing shortages to reach 78,000 in 2011 and 113,000 by 2016 (CNA 2002). According to Industry Canada (IC) estimates, (IC 1999), more than 27,000 Canadian nurses had migrated to the US in the 1990s, with more than 25% of 3000 graduates leaving in 1995 and 825 nurses leaving in 1996 (Zhao et al. 2000). According to another

estimate, 22% of RN licensure applicants in the US between 1997 and 2000 were trained in Canada (Buchan et al. 2003). On the other hand, the number of foreign-trained nurses applying to take the registration examination in Canada increased from 1200 in 1999 to 5000 in 2002 (Keatings 2006). More than 17,000 foreign-trained nurses applied to write the Canadian Registered Nurse Examination (CRNE) between 1999 and 2003 (Jeans et al 2005). The number of foreign-trained nurses who took the examination for the first time increased from 548 in 1998 to almost 2200 in 2003 (Little 2007). Most of the foreign-trained nurses taking the registration examination in recent years have been from the Philippines and India (Little 2007).

Saudi Arabia

Between 1992 and 2006, Saudi Arabia was the single largest employer of Filipino nurses, with 64,479 newly hired nurses deployed to Saudi Arabia during these years (Philippine Overseas Employment Administration 2006). Dependent almost entirely on foreign nurses, the Saudi health system has had a very diverse workforce, with nurses from 40 different countries working at one hospital in Saudi Arabia in 1998 and 35,000 foreign nurses working in the country in 1994 (Luna 1998). In the same year, only 13% of the nursing workforce comprised Saudi nationals (Al-Osimy 1994 cited in Luna 1998 and Tumulty 2001), whereas in 1996, of a total of 57,110 nurses in the country, 89% were from elsewhere (Tumulty 2001). The 2000-2001 annual report of the Ministry of Health in Saudi Arabia reported that, altogether, 70,000 nurses were employed in the country at the time and 80% of them had been recruited from other countries. Driven by the desire to reduce dependence on foreign workers and "Saudization" in every sector of the economy, a number of private and public nursing schools have been established in recent years. However, given the explosive population growth and the small number of nurses graduating locally every year, Saudi Arabia will continue to rely on large numbers of foreign-trained nurses to provide health care in the country.

Numbers Leaving Developing Countries

Accurate data from developing countries regarding the number of nurses graduating, retiring or leaving are not available. In a recent paper, Clemens and Pettersson (2008) discussed the challenges in collecting data from developing countries and discrepancies in the numbers reported in various studies. They have demonstrated that due to the differences in the classification and characterization of individuals, previously reported numbers of African-born doctors and nurses working in nine recipient countries are seriously flawed and suffer from gross underestimation. Dovlo (2007) and Galvez Tan (2006) have also pointed out significant inaccuracies in compiling data from various sources on the training, availability and migration of nurses in sub-Saharan Africa and the Philippines. A host of factors including lack of uniformity in the initial and subsequent registration at home and recertification requirements abroad contribute to these difficulties (Clemens and Pettersson 2008).

The Philippines

Attracted by the large sums of money sent home by Filipino workers and the impact of these remittances on the local economy, for years, the government has actively pursued a policy of exporting nurses to other countries. Consequently, the Philippines became and continues to remain the largest exporter of nurses in the world (Ball 2004; Brush and Sochalski 2007; Lorenzo et al. 2007; Galvez Tan 2006). Also, because of the organized and coordinated efforts of the government to export nurses and other workers overseas, good quality data are readily available on the number of nurses leaving the country every year. By 2000, more than 250,000 Filipino nurses were scattered throughout the world (Ball 2004). Between 1992 and 2006, a total of 119,547 nurses left the Philippines for other countries, with 54% arriving in Saudi Arabia and about 10% going to the US. Of the 193,223 professionally active Filipino nurses in 2003, about 85% were working abroad (Lorenzo et al. 2007; Galvez Tan 2006). Whereas in the past Filipino nurses had mostly worked in the US and Saudi Arabia, in recent years, job opportunities in European countries such as Ireland, the Netherlands and

the UK have also attracted nurses from the Philippines (Lorenzo et al. 2007; Galvez Tan 2006). For several consecutive years, two to three times more Filipino nurses have left the country than have been licensed each year (Adversario 2003; Galvez Tan 2005).

The Caribbean Region

Approximately 300 nurses leave the Caribbean region every year. Between 1998 and 2002, 993 nurses resigned from their posts in seven Caribbean region countries, with a “declared intention to migrate” to the UK, US or Canada (Hewitt 2004 cited in Salmon et al. 2007). Between 2001 and 2003, the Caribbean region produced 1199 newly trained nurses but lost 900 to overseas migration (Salmon et al. 2007). In 2000, the Caribbean countries collectively faced a shortfall of 35%, which increased to 42% in 2003. This shortfall resulted in 3322 vacant positions in 2003 (Salmon et al. 2007; Yan 2006). The combined production capacity of all Caribbean countries in the same year could only fill 36% of these positions. It has been estimated that more than 8% of RNs and 20% of specialist nurses leave Jamaica every year (Lowell et al. 2004).

Africa

More than 29,000 nurses from sub-Saharan Africa are estimated to be working in OECD countries (Table 2). Based on census data from South Africa and eight Western destination countries (Great Britain, USA, Canada, France, Australia, Portugal, Spain and Belgium), Clemens and Pettersson (2008) have shown that approximately 70,000 African-born nurses were working in these countries in 2000. This number constitutes 10% of all African-born nurses in the world. Their data also showed that 81% (n = 807) of Liberian- and 78% (n = 134) of Burundi-born nurses were working overseas, while in the same year only 38 nurses were working in Burundi and 185 in Liberia. Most Liberian nurses working overseas were in the US, whereas most Burundian nurses were in Belgium. Similarly, 66%, 63% and 49% of nurses born in Gambia, Mauritius and Sierra Leone were working overseas. The largest number of African-born nurses working overseas came from Nigeria (12,579), with Algeria (8245), Morocco (5176) and Ghana (4766) also losing thousands of nurses to the nine recipient countries.

A recent study of nursing students in Uganda (Nguyen et al. 2008) found that 70% of participating students anticipated leaving Uganda in the next 5 years, and the vast majority hoped to migrate to the US and the UK. Denton (2006) has reported that Malawi, one of the most resource deficient countries in Africa, has been losing 100 or more nurses to global migration every year. Between 1999 and 2001, 114 (60%) nurses left one hospital in Malawi, whereas 500 nurses, more than twice the number graduating that year, left Ghana in 2000 alone (Buchan and Sochalski 2004). In the same period, Ghana faced a shortfall of 4000 nurses (Buchan and Dovlo 2004; Dovlo 2007). All 48 sub-Saharan African countries combined have only 1.3% of the world's trained health workers (WHO 2004b) and collectively face a shortfall of 600,000 nurses (Denton 2006). Whereas most developed countries have more than eight or nine nurses per 1000 population (Table 1), most sub-Saharan African countries have less than two nurses for the same population (Padarath et al. 2003; WHO 2006). In some of the sub-Saharan African countries, the nurse-to-population ratio is approximately 1:5000 (Dovlo 2007). It is estimated that 600,000 additional nurses would be needed to bring the ratio to the level of other low-income countries (Liese et al. 2003)

India

Khadria (2004, 2007) has reported that approximately 18,000 to 20,000 nurses left India between 2002 and 2004. This exodus compromised the healthcare system's ability to provide healthcare to the degree that in 2004 there were not enough nurses to adequately staff the 915,000 beds in more than 38,000 private and public hospitals. At times, hospitals in India have experienced mass resignations at 24 hours' notice. For example, the Holy Family Hospital in New Delhi on several occasions in the early 1980s experienced the resignation of up to 50 nurses at a time (Edward 2005). Internationally, 2–3 nurses are recommended for each doctor, but the estimated ratio in India in recent years has

been around 1.3 nurses per physician (Khadria 2007). Since this ratio is derived by including an estimated number of 865,135 nurses who hold the General Nursing and Midwifery diploma rather than a Bachelor of Science (BSc) degree, the ratio might be considered an over-estimation.

Table 2. Nurses and midwives from selected sub-Saharan African countries working in OECD countries

Country	At Home	In OECD
Ghana	17,322	2267 (13%)
Kenya	37,113	1213 (3%)
Mauritius	4438	781 (18%)
South Africa	184,459	13,496 (7%)
Zimbabwe	9357	3183 (34%)
Total from all of sub-Saharan Africa combined	616,204	29,597 (5%)

Source: WHO – World Health Report 2006 (WHO 2006).

China

Over the years, public financing and under-investment in nurse education has led to a shortage of nurses in China (Fang 2007). With a total of 1.3 million registered nurses, China's overall nurse-to-population ratio is around 1:1000 (Jiang et al. 2004 cited in Fang 2007). Paradoxically, there are few employment opportunities for nurses in terms of the number of budgeted position at hospitals and other facilities. For example, only 0.4 nurses are budgeted per hospital bed and 0.7 nurses per physician in China (Mao 2004, Jiang et al. 2004 both cited in Fang 2007). The imbalance between the number of trained nurses in the country and the number of budgeted nursing jobs in the system has resulted in an artificial surplus and under-employment of nurses. Consequently, there is a growing interest among nurses to seek employment in countries like Saudi Arabia and Singapore. Recognizing the problem of under-employment, the Chinese government is promoting the export of nurses through intergovernmental agreements. In the last 10–15 years, hundreds of English-speaking Chinese nurses have found employment in these countries every year, with a contractual obligation to return home after 2–3 years. Through private companies that charge between US\$4000 and US\$15,000 to arrange overseas employment, hundreds more have migrated to Australia and the UK in the last 5 years (Fang 2007). Despite considerable interest on the part of commercial recruiters to recruit from China, few nurses can afford the amounts these companies charge to arrange overseas employment.

Latin America

Less information is available on nurse migration from Central and South American countries. Overall, the number of nurses migrating from Latin America to the US, Canada and Europe is smaller than that from the Philippines, India or South Africa. The pattern of migration also is more regional than cross-continental. Data from the Peruvian Association of Nurses indicate (Chavez 2004 cited in Malvarez and Agudelo 2005) that over the years, 15% of Peruvian nurses (5120) have migrated to Italy (57%), the US (36%) and Spain (7%). Countries like Argentina and Brazil have lost a relatively small proportion (2–3%) of their nurses to the US. However, the impact of migration for countries with small stocks of nurses has been staggering. For example, El Salvador and Panama lost 60% and 47% of their relatively small stock of nurses to migration. Similarly, 25 nurses migrated from Paraguay to Europe in 2004 alone (Malvarez and Agudelo 2005). Other reports from various parts of Central and South America suggest that in recent years hundreds of nurses from countries like Paraguay, Honduras, Panama, Ecuador and Nicaragua have migrated to other Latin American countries, the US, Italy, and Spain. The regional migration of nurses in Latin America seems to have

favoured Belize, Chile, Costa Rica and Argentina. For example, in 2004, 87 nurses from Nicaragua migrated to Belize (Malvarez and Agudelo 2005). However, for many “nurses on the move” these countries are only an extended stop before getting to their final destination in Europe or North America. Through intergovernmental agreements and technical support programs, hundreds of Cuban nurses are also working abroad in a number of African and Latin America countries.

Factors Promoting Departure from Developing Countries

The pull and push factors that encourage nurses from developing countries to migrate have been discussed in a number of studies (Dovlo 2007; Denton 2006; Lorenzo et al. 2007; Kline 2003; Padarath et al. 2003; WHO 2004a, 2006). The push factors that encourage nurses to emigrate include low wages, poor working conditions, low job satisfaction and few opportunities for professional growth as well as unstable or hostile socio-political conditions in the home country. Although other factors are also important, the wage differential between source and destination countries is the single most important driver of nurse migration (Lorenzo et al. 2007; WHO 2004a, 2006). For example, in a recent survey 70% of nursing students in Uganda who expected to migrate in the next 5 years indicated that low wages were the primary reason for their desire to leave the country (Nguyen et al. 2008). Data from five African countries showed that better remuneration was the most important factor affecting health professionals’ decision to emigrate. It was cited as an important factor in the decision to migrate by 68% of surveyed health professionals in Cameroon – the lowest in the survey – and by 85% of respondents in Ghana – the highest. Better remuneration was closely followed by “conducive work environment,” “better management of health services” and “continuing education” as other factors affecting the decision to emigrate (WHO 2004b, 2006).

The significance of wage differential between source and destination countries as a determinant of migratory patterns is better appreciated by noting that in terms of purchasing power parity, a Canadian nurse in 2004 made 14 times more than a nurse in Ghana and 25 times more than one in Zambia (Vujicic et al. 2004). The yearly salary of a nurse in the Philippines ranges between \$900 to \$2040 depending upon rural or urban location (Adversario 2003), whereas his or her counterpart in the US or Canada makes about \$48,000 or more (Martin et al. 2004). In the Philippines, the salary of a physician ranges between US\$3600 to US\$9600 per year. In recent years, many physicians have chosen to retrain as nurses in the hope of finding employment overseas because they stand to make 6 to 13 times more by migrating to the US or Canada as a registered nurse than staying in the Philippines as a physician (Santos 2005).

There is some evidence that improvement in non-financial factors such as career development opportunities, transparency in promotions and supportive supervision can have a favourable impact in curbing the intent to migrate (Mathauer and Imhoff 2006; Awases et al. 2004). Nonetheless, the opportunity to make more money remains by far the most powerful motivator in the decision (Vujicic et al. 2004). Considering the wage differential between source and destination countries, the willingness of nurses from the Philippines, India, Africa and the Caribbean region to migrate seems quite understandable. If there is an opportunity to make more money in a foreign land, even for a limited period of time, competing interests in professional growth and quality of life are likely to take a secondary place. For example, female Filipino nurses working in Saudi Arabia or even in the US might sacrifice many personal rights and social freedoms in the interest of better economic rewards (Ball 2004).

Impact on Developing Countries

Accurate assessment of the negative impact of nurse migration on developing countries is nearly impossible for a variety of reasons. To begin with, accurate data regarding training, registration, employment, retirement and migration are not available in most developing countries. Data on cost of training, unemployment, out of pocket expenses for emigration, and occupation-specific annual remittances are also not available. Thus, one can only make indirect estimates in this regard. In so doing, several assumptions would be necessary. For example, one would have to make assump-

tions about the proportion of migrating nurses who would have remained professionally active in the home country had they not migrated. Lorenzo et al. (2005) have reported that after adjustment for death and retirement, only 58% of the 332,206 Filipino nurses who ever registered with the licensing board were employed as nurses within the country or overseas in 2003. Among the 193,223 who were professionally active in 2003, about 85% were working in other countries. There is no information on when and why the remaining 42% left the profession. Some information regarding dissatisfaction rates among nurses and a desire to give up the practice of nursing is available in the West (Ball 2004). In a five-country study including the US, Canada, Germany, Scotland and England, Aiken et al. (2001) found widespread dissatisfaction among nurses with almost one in four planning to leave the profession within the next year. In the UK, one in three newly trained nurses does not even register with the council of nurses at the completion of training (Oulton 2006)

In spite of the poor quality data from developing countries regarding the numbers of in-stock, in-training or migrating nurses, it is clear that developing countries are losing trained and experienced nurses much faster than they are being produced (Lorenzo et al. 2007; Salmon et al 2007; Yan 2006). To make the matters worse, nurses who leave are often the most experienced “cream of the crop” specialty nurses such as ICU, CCU and ER nurses (Lorenzo et al. 2007; Ball 2004; Yan 2006). Research by Awases et al. (2004) has shown that the number of nurses in some African countries declined by 12% between 2001 and 2003. The fact that 40% of internationally educated nurses taking licensing examinations in countries such as Canada are 40 years of age or older (CNA 2002) also supports the claim that more experienced nurses are being recruited from developing countries (Yan 2006; Khadria 2007). Consequently, the pool of senior nurses who serve as educators or administrators is being depleted. (Yan 2006). To further complicate the situation, for the past several years doctors in the Philippines have been retraining as nurses to pursue nursing employment opportunities in the West. By 2003, more than 3000 Filipino doctors had become “nurse medics” (Pascual et al. 2003 cited in Lorenzo et al. 2007; Galvez Tan 2006) while another 4000 were in training to become nurses (Galvez-Tan 2006). A majority of these nurse medics had practised as physicians for 10 or more years and many had specialty training (Lorenzo et al. 2007; Galvez Tan 2007a, 2007b).

Economic Loss

Pittman et al. (2007) have pointed out that nursing education in many developing countries is publicly financed. Therefore, migration of nurses from developing countries translates into a “massive public subsidy” to wealthier nations. The economic loss to South Africa due to the migration of its doctors between 1989 and 1997 was estimated in the range of \$5 billion (Dovlo 2007). The loss to Ghana in tuition costs alone for the 61% of graduates of one medical school who emigrated between 1986 and 1995 has been estimated at around \$5.96 million (Dovlo 2003). Between 2000 and 2003, the total economic loss in the Caribbean region through public investment in the training of nurses who left was in the vicinity of \$30.2 million (Yan 2006). Additional losses caused by the increased burden of work on the remaining nurses and resulting “sick-outs” or other effects amount to \$2.5 million. In 2006, Krigia et al. estimated that the total economic loss over a 32-year period until the retirement age of a 30-year-old Kenyan nurse leaving the country amounted to \$338,868. Currently 1213 Kenyan nurses and midwives, 3.3% of the total stock, work in seven OECD countries alone (Kirigia et al. 2006).

Economic Gain

Remittances by workers abroad and nurses in particular have a major impact on individuals, communities and countries. Direct and indirect benefits of remittances help stabilize the economic and social conditions in recipient communities as well as reduce the burden on publicly funded health services through improved access to food, housing and education (International Center on Nurse Migration [ICNM] 2007). In developing countries like India, the Philippines, Jamaica and Uganda, remittances by workers abroad constitute 2% to 14% of the GDP (International Monetary

Fund [IMF] 2003). It is alleged by some while disputed by others that remittances by nurses to some developing countries are in amounts sufficient to compensate for societal losses associated with the migration of these personnel (Kingma 2007; ICNM 2007).

Remittances to developing countries in the decade prior to 2004 were estimated to have exceeded total global developmental aid (WHO 2004a). The total amount of remittances through recorded channels worldwide in 2005 was in the vicinity of \$232 billion. Unrecorded remittances would add another 50% to the total (United Nations [UN] 2006). The share of worldwide remittances going to developing countries in 2005 was 72%. Occupation-specific information is not available. However, based on Tongan and Samoan nurses in Australia, research by Connell and Brown (2004) indicates that nurses are not only more likely than other workers to remit, but they also remit larger amounts of money and continue to do so at the same rate over an extended period of time. Similarly, Buchan et al. (Buchan et al. 2005, 2006) have reported that 50% of Filipino and South African nurses in the UK regularly send one quarter or more of their income home.

In many of the source countries, there has been a growing dependence on remittances from workers abroad. The amounts of such remittances have grown considerably over the last two decades. For example, remittances of Filipino workers in 2005 exceeded \$10 billion and were expected to reach \$14.7 billion in 2007 – an increase of \$1.9 billion from 2006 (ICNM 2007). In the face of significant under-employment or unemployment of nurses in source countries and the attraction of remittances as a steady source of revenue, there is little incentive to address the problem of “brain drain” (Villalba 2002). In fact, one easy way to deal with the problem of unemployment in countries like the Philippines and China is to facilitate the export of these workers. This seems to be the current strategy in China, where the government is actively involved in exporting nurses and has a direct financial stake in sending them to Saudi Arabia and other countries (Fang 2007). Similarly, some state governments and private hospitals in India are training nurses specifically for the purpose of sending them abroad. Khadria (2007) reported that these hospitals invest between \$4700 and \$7000 in training each of these nurses and make as much as \$47,000 when a nurse is placed overseas by a recruitment agency.

Impact on Health Indicators and Healthcare Delivery

A direct relationship between nurse migration and poor health indicators of a country is hard to establish. Several proxy measures, however, support the claim that reduced access to care and overburdening of the existing workforce are the direct result of the nursing shortage (Kingma 2007). Increased risk of patient mortality in hospital settings due to overburdening of nursing staff has previously been demonstrated (Aiken et al. 2002). Studies have also shown a positive relationship between the availability of health workers and the health status of communities. For example, health-worker density has been directly linked to population health outcomes, which have been shown to improve considerably when health-worker density reaches or exceeds a value of 2.5 per 1000 population (Anand 2004).

Maternal mortality, infant mortality and under-five mortality rates in various countries have been shown to have an inverse relationship with the number of health workers (Dovlo 2007; Sudhir and Barnighausen 2004). Sanders et al. (2003) have reported that life expectancy in 17 of the 48 sub-Saharan African countries declined as a direct result of increased incidence of communicable diseases including AIDS. In other countries, the ability of the system to test for HIV and provide antiretroviral treatment was hampered by nursing shortages (Kober and Van Damme 2004 and 2006). A downward trend in immunization coverage in some Caribbean region countries, where immunization coverage dropped from 90% to 80% in 2003, has also been attributed to nurse migration (Yan 2006). A similar decline in immunization rates has been noted in the Philippines, where immunization rates were down to 60% in 2003 from a high of about 70% in 1993 (Galvez Tan 2006).

Nurse shortages also result in increased workload and high patient-to-nurse ratios (Lorenzo et al. 2007; Yan 2006; Salmon et al. 2007; Oulton 1998). Aiken et al. (2002) have shown a direct

correlation between workload and nursing burnout. In some developing countries, the patient-to-nurse ratio has increase three- to fourfold in the last two decades. High patient-to-nurse ratios in turn contribute to low morale, high stress levels, absenteeism, medical errors, patient dissatisfaction and financial instability for hospitals. These effects trigger a vicious cycle in which more and more nurses want to leave the country (Kingma 2007; Mitchell 2003).

Evidence of the impact of workforce shortage on the infrastructure too is readily available (Kober and Van Damme 2004, and 2006). According to the 2006 World Health Report, many developing countries will not be able to achieve their Millennium Development Goals (MDGs) because of the shortage of healthcare workers (JLI 2004; WHO 2006). Whereas a minimum of 2.5 health workers per 1000 people are required to achieve the health related MDGs, only 6 out of 46 African countries meet that target (WHO 2004a). Reportedly, 200 or more hospitals in the Philippines closed in recent years due to the shortage of health workers, while hundreds more have scaled down their services for the same reason (Lorenzo et al. 2007; Galvez Tan 2007a, 2007b).

The eight MDGs adopted by world leaders under the auspices of the United Nations in September 2000 and slated to be achieved by 2015 include reduction of child mortality by two thirds, reduction of maternal mortality by three quarters, and halting the spread of HIV/AIDS, malaria and tuberculosis. Despite the efforts of many dedicated individuals the world over and the notable gains in some of the 20 targets and 60 indicators, worldwide progress has been slow and uneven (UN 2008).

It is widely accepted that the targeted problems are multifaceted and the achievement of these goals depends on simultaneous progress on multiple fronts, including reducing poverty, eliminating illiteracy, empowering women and achieving gender equality, protection of the environment and the creation of global partnerships (UN 2008). The availability, retention and distribution of adequately trained healthcare workers in appropriate numbers cannot independently eliminate the problems of high child and maternal mortality or the spread of HIV/AIDS, malaria and tuberculosis. However, access to adequate healthcare resources will significantly help in addressing these problems in the developing countries of Asia, Africa and Latin America (Dovlo 2007). The continuing exodus of nurses from developing countries seriously compromises the ability to make meaningful and sustained progress toward achieving the Millennium Development Goals (Kober and Van Damme 2004, and 2006).

Impact on Nursing Education

Nursing education has become a lucrative business in countries like the Philippines and India, where many private schools have emerged in the last 10–15 years (Lorenzo et al. 2007; Khadria 2007). The number of nursing schools in the Philippines increased more than threefold from 140 in 1970 to about 460 in 2005 (Galvez Tan 2007a, 2007b). Corresponding to the increase in the number of nursing schools has been a steady decline in the national licensure examination pass rate, from 85% in the 1970s to 45–54% between 2001 and 2004, with more than 100 schools posting a pass rate below 50% (Brush and Sochalski 2007). The questionable quality of education in schools that do not have adequate facilities or experienced full-time faculty is reflected by the closure in 2005 of 23 schools by the regulatory agencies in the Philippines (Overland 2005)

In many developing countries such as the Philippines, private health services have been growing rapidly, and nurses have increasingly been competing with physicians as direct providers of care (Lorenzo et al. 2007). Despite the increase in the number of nursing schools in the Philippines to 460, with 20,000 graduates every year, the number of nurses produced is still less than the number leaving each year (Brush and Sochalski 2007; Overland 2005; Galvez Tan 2007a). In the Caribbean region, even with increased production it would take 5 or more years for some countries to fill existing vacancies (Yan 2006). Add to that an increasing demand from population growth and aging populations, and it would take even longer to fill the gap between demand and supply. In other developing countries such as those in sub-Saharan Africa, the departure of experienced nurses not only contributes to lower quality of education, but also prevents ministries of health or education

from starting new schools or expanding enrolment in existing schools.

Other Effects

Allegedly, with the growing shortage of nurses in Canada, the UK and the US, recruiters became less selective and began to offer positions to nurses from developing countries without serious consideration for the level of training or experience. This has resulted not only in accelerated migration of nurses from source countries (Yan 2006), but has also caused a great deal of pain and frustration for nurses who subsequently could not meet the licensure and certification requirements. For example, in one case 20 to 25 Korean nurses who had paid \$25,000 each to a private recruiter to come to Canada had to return because they were not eligible to register in Canada (Jeans 2006).

How Developing Countries Are Responding

Developing countries have responded to the shortage and migration of nurses in a variety of ways. Several, including Iran, Oman, Malawi and those in the Caribbean region, have taken steps to create stability and self-sufficiency in the supply of healthcare workers (Little and Buchan 2007; Salmon et al. 2007; Yan 2006). For example, Iran established a Ministry of Health and Medical Education in 1984, which produced an additional 70,000 health workers and 27,000 medical students in the following 15 years (ICNM 2008). In the Philippines, the government has enacted laws to promote and protect the interests of migrants and their families. Several agencies in the country are involved in seeking better overseas employment opportunities for Filipino workers and provide pre-departure seminars to acquaint prospective migrants with the laws and customs of destination countries (Ball 2004; Lorenzo et al. 2007).

Policy debate on a 25-year health workforce development plan in the Philippines has emphasized the need for a rational approach toward the production and utilization of health workers (Lorenzo et al. 2007). In the last quarter century, the Filipino government has focused on expanding the country's production capacity with the intent to export nurses. However, a number of proposals have also been discussed in recent years to deal with the negative effects of nurse migration. These proposals include multilateral investment in nursing education or partnerships with hospitals in destination countries whereby Filipino hospitals are compensated for nurses recruited from them so that they can train replacement nurses. Other proposals include a mandatory service requirement prior to migration for graduates of publicly funded nursing schools, leave-of-absence provisions for nurses from developing countries to return home to help train future nurses, and establishment of returnee-integration programs (Lorenzo et al. 2007; Salmon et al. 2007; Yan 2006; Galvez Tan 2005).

In the Caribbean region, countries are independently or jointly trying creative strategies that include nurse-training partnerships with neighbouring countries or with American healthcare providers (Salmon et al. 2007; Yan 2006). Other efforts promote "temporary migration" arrangements that allow nurses to divide their time between the US and their home country or return home for specific activities such as participating in educational initiatives or volunteering their expertise in specific work settings for specified periods of time. In other cases, joint public- and private-sector for-profit business ventures are being undertaken to develop nursing schools that would attract privately paying students from all over the world. In one program, nurses from the US, the UK and other developed countries are given the opportunity to work in the Caribbean at national pay grades with the attraction of combining professional work with a tourist experience for up to a year (Salmon et al. 2007; Yan 2006).

The retirement age in some Caribbean countries is still age 55 (Yan 2006), contributing to the premature loss of the most experienced segment of the nursing workforce. Some Caribbean region governments are now seriously looking into the possibility of extending the retirement age to 60 or even 65 years. Others are attempting to employ retired nurses under reclassified job categories while allowing them to draw full retirement benefits. A regional initiative involving an array of regional

partners under the title of “Managed Migration Program” has been in the works since 2001 to effectively manage the migration of nurses and to minimize its negative impact on healthcare systems in the region. The program attempts to strike a balance between the individual’s right to choose a workplace of his or her liking and the source country’s obligation to provide adequate healthcare for its citizens (Salmon et al. 2007; Yan 2006).

Guided by the concept originally developed in Jamaica, the Caribbean Managed Migration Program was initiated in 2001 by the Office of Caribbean Program Coordination at the Pan American Health Organization. The list of partners in this initiative includes a number of national, regional and international stakeholders encompassing nursing organizations, governmental agencies and private sector organizations. By including a variety of stakeholders, the program provides a platform for all parties to work collaboratively toward developing strategies and initiatives to optimally manage the migration of nurses while safeguarding the interests of all stakeholders. The degree to which the program succeeds in its mission remains to be seen (Salmon et al. 2007).

In sub-Saharan Africa, some countries have created economic incentives such as a “rural area allowance,” a “scarce skills allowance” and an “additional duty hours allowance.” Health workers including doctors and nurses are eligible to receive these allowances if they work in designated rural areas or have skills that are in short supply (Dovlo 2007). Schemes involving guaranteed housing and transportation loans have been instituted in Ghana, whereas Malawi, Botswana and Mozambique have undertaken initiatives in partnership with international agencies such as the United Nations Children’s Fund (UNICEF) and the WHO to increase the number of nursing schools, faculty, student enrolment and fellowship programs. The Ministry of Health in Malawi, with the help of international agencies, embarked in 2004 on a multidimensional capacity-building 6-year Emergency Human Resource Plan to retain existing health workers and attract back those who had left (ICNM 2008). Tanzania and Uganda have attempted to reduce bureaucratic inefficiencies in the healthcare system and have streamlined the recruitment and promotion processes. Whether any of these incentives have produced results in terms of enhanced production and retention of nurses is not known. In fact, there are assertions that some of these schemes have created greater income disparity between doctors and nurses, with the unintended effect of greater motivation to migrate (Dovlo 2007).

Some destination countries in the West have also begun to take note of the negative impact of nurse migration on developing countries. The UK has taken the lead in adopting measures to reduce this impact by limiting the number of nurses governmental agencies can recruit from selected developing countries or by signing recruitment agreements with other governments and by developing codes of good practices and ethical recruitment policies (Denton 2006; Brush 2007). The UK government has also imposed restrictions or an outright ban on the National Health Service’s recruitment of nurses from a number of developing countries. In Canada, the Ontario Hospital Association has initiated the process for a long-range strategic plan that includes healthcare workforce planning and vision for the future. However, the plan is not focused on addressing the problem of nursing shortages and migration of nurses and is not sufficiently advanced to be implemented in the near term (Keatings 2006).

Outlook for the Future

The conjoint problems of nursing shortages and migration require all countries to adopt a long-range political and economic commitment to increase the production and retention of nurses. Mitchell (2003) has pointed out that despite copious amounts of literature on this subject, not enough is being done in destination and source countries to address the problem. Clearly, multiple factors contribute to the manifest lack of enthusiasm in both source and destination countries in this regard. For developing countries the most important hurdle is the lack of resources to close the wage differential between source and destination countries. Related factors also include political instability and bureaucratic inertia that prevent improvements in working conditions and economic growth (WHO 2004a).

Focusing on the issue of retention, Kingma (2006) makes the case that migration is less the function of pull factors than the result of strong push factors. Thus, the responsibility lies squarely with source countries to independently or in partnership with resource-rich destination countries to mitigate the push factors. She also argues that efforts to artificially curb the flow of nurses through restrictions and regulations, without the necessary steps to enhance retention by mitigating push factors, will not succeed. These observations have two significant implications. One, in the absence of significant improvements in living wages, working conditions and quality of life in developing countries, nurses will continue to leave. Two, regulatory restrictions such as bonding, fines and mandatory service requirements in the absence of meaningful socio-economic changes are neither effective nor justifiable.

Principally, the mitigation of push factors requires developing countries to close the wage differential between source and destination countries. After examining the data on wage differentials, Vujicic et al. (2004) have concluded that the difference in wages is so vast that there is no hope for source countries to entirely close the gap, and small increases in salaries will have practically no effect on the exodus of nurses in the foreseeable future. Therefore, migration of nurses and the resulting decline in source country stocks will continue in the foreseeable future.

As far as increased production is concerned, most developing countries have not invested in developing institutions to train enough nurses to meet their own needs, and most training opportunities are in publicly funded institutions. While some countries in sub-Saharan Africa and the Caribbean have no schools of nursing at all, others have too few. The Philippines and India aside, few if any schools of nursing exist in the private sector. In the absence of adequate resources, the governments in these countries are unable to develop new facilities or expand the operational capabilities of existing institutions. Consequently, it seems unlikely that the production of nurses in most developing countries will be increased in the foreseeable future.

Healthcare workforce policies in the US ultimately affect almost all source or destination countries in the world (Aiken 2007). As noted, the need for nurses in the US is projected to grow in the coming years. Currently, thousands of qualified nursing school applicants are turned away in the US every year because of insufficient enrolment places. In the absence of a policy shift to enhance the production of nurses in the US, continued migration from other countries is the most likely scenario to meet the US needs. Other than the UK, where significant efforts have been underway to increase the enrolment of nursing students (Buchan and Secombe 2006), increased production to meet the growing needs in other destination countries of the West is also unlikely to happen in the near future.

The outlook for increased nurse retention through other mechanisms is equally grim. Despite some discussions in the Caribbean community to increase the retirement age, reducing the attrition of existing stocks in various countries resulting from retirement and "burn out" is not on the horizon. There is little reason to believe that repatriation encouragement will have more than a modest effect. According to the International Organization for Migration (IOM 2007), repatriation encouragement resulted in the return of about 2000 "highly qualified" individuals to 11 African countries between 1983 and 1999. Considering that 20,000 or more individuals leave Africa every year (WHO 2004a, 2004b), the repatriation of 2000 individuals over a period of 16 years makes up for a very small fraction of the overall loss of human capital for these countries. Consequently, the gap between global demand and supply, with resulting migration, is projected to expand in the coming years (Oulton 2006; Ball 2004).

Conclusions

The global shortage of nurses is the result of economic and environmental forces that affect both source and destination countries in similar ways. In most countries the demand for nurses is on the rise and outpacing production and retention rates. That the nursing shortage has worsened over the years does not bode well for a solution in the near future. Destination countries in the West do not seem to have the political will and long-term commitment to find more enduring solutions

than quick fixes such as lenient immigration policies and overseas recruitment. They are also less inclined to help strengthen the infrastructure in developing countries to mitigate the push factors. In developing countries, the necessary resources and infrastructure currently do not exist to stop the outflow of nurses.

Further, policy makers in many developing countries do not seem to be seriously concerned about the phenomenon of “nurse drain.” To the contrary, there is a desire to compete in the global marketplace for the opportunity to export nurses and other skilled workers to strengthen local economies through remittances. In some developing countries, the private sector has embraced the idea of training nurses for export with great enthusiasm, since everyone involved, including private training hospitals, nurses, local recruitment agencies, foreign recruiters and hospitals abroad, stands to gain from the migration of nurses (Brush and Sochalski 2007; Khadria 2007; Gostin 2008).

A number of reports on the subject have provided sound analysis and sensible policy recommendations (Gostin 2008; Little and Buchan 2007; Stilwell et al. 2004; Denton 2006; Galvez Tan 2005). Most policy recommendations in destination countries focus on expanding enrolment and making a career in nursing more attractive for potential candidates. These recommendations recognize the burgeoning future demand and the need to address high attrition rates in the nursing profession. They also acknowledge the negative impact of nurse migration on developing countries. The proponents of such measures focus on domestic policy initiatives with a belief that increased production and retention of nurses in destination countries like the US or the UK will essentially close the door on migrant nurses from developing countries, thus forcing them to serve in their home countries.

Policy recommendations for developing source countries place greater emphasis on retention, repatriation and regulation. A variety of preliminary steps and interesting initiatives in many developing countries are currently underway (Dovlo 2007, Salmon et al. 2007; Yan 2006; Brush and Sochalski 2007; Lorenzo et al. 2007; Padarath et al. 2003). The short-term success and long-term impact of these efforts remain to be seen. However, in the order of magnitude, these efforts are quite modest in comparison to the size of the problem. Promising options for developing countries involve multilateral and multidimensional solutions that accept the realities of powerful push factors and attempt to find some middle ground. The Managed Migration Program in the Caribbean offers such a prototype.

Bilateral agreements between host and source countries that provide financial compensation to source-country institutions for their losses or allow nurses to periodically return home for work can perpetuate the problem by replacing existing channels of migration with government-sponsored formal channels, without helping with infrastructure development and capacity building. The most desirable direction for the future encompasses innovative multilateral agreements among consortia of countries, designed to address the global nursing shortage through mutually supportive arrangements that acknowledge the responsibilities of host countries, the rights of individuals to migrate and the concerns of source countries.

Through multilateral arrangements, host countries can augment their nursing workforce while supporting infrastructure development and institutional capacity building in the source countries of Asia, Africa and Latin America. In this regard, organizations like the Global Health Workforce Alliance, the Asian Pacific Action Alliance on Human Resources for Health, the African Platform on Human Resources for Health, the European Commission, the Pan American Health Organization Observatory on Human Resources in Health and the United States Agency for International Development (USAID) can play an important role.

Capacity Project, a USAID-funded 5-year initiative established in 2004, though not a multilateral arrangement, serves as an example. The project works in developing countries across sectors to help build, retain and sustain the healthcare workforce through planning, education, training and strengthening of institutions. Led by similar entities, multilateral arrangements with long-term commitment toward capacity building in developing countries can help ameliorate the negative impact of nurse migration.

In conclusion, the migration of nurses to more affluent industrialized societies and the resulting decline in source country stocks is likely to continue in the foreseeable future. Effective mitigation of pull and push factors, with strong political commitment and dogged determination, is not in sight as yet. However, examples of small steps being taken in both host and source countries to address the issue provide a reason for hope.

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