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Peer Review

WORLD HEALTH AND POPULATION

Founded and edited by members of the Department of Health Policy and Administration, School of Public Health, University of North Carolina at Chapel Hill.

From the Editor-in-Chief

T his issue of *World Health & Population* (WHP) features two excellent and interesting papers examining health issues faced by rural-to-urban migrants in China. Rural-to-urban migration is a critical and growing problem throughout the world, for which most countries are very ill-prepared. Insights from one setting, therefore, may well be useful and applicable elsewhere. Xiaoming Li, Yan Hong and associates, in both China and the United States, have implemented an important research program in this area, with support from the U.S. National Institute of Mental Health and critical collaboration/support from Beijing Normal University and Nanjing University. Specifically, Hong et al. in "Too Costly to be Ill," report on qualitative (e.g., focus group) research where their team conducted in-depth interviews of 90 rural-to-urban migrants, uncovering gaps and barriers to healthcare-seeking behaviour by migrants. In the second paper, "Health Indicators and Geographic Mobility," Li et al. analyze data from a survey of over 4,200 rural-to-urban migrants, migrating either to Beijing or Nanjing. Living conditions, employment status, general health (measured by the SF-12), depression and substance abuse were examined through multivariate techniques. Both risky health behaviours and barriers to healthcare for rural-to-urban migrants were identified. Finally, Professor Wen Chen of Fudan University a member of the Editorial Advisory Board of WHP provides a commentary and important perspective on these two papers. We are glad to offer these papers and the insight from Professor Chen on such an important issue.

Other papers in this issue continue the reporting on HIV/AIDS in Nigeria through submissions by researchers at the Nigerian Institute of Medical Research (NIMR). Manafa et al. report results from a knowledge, attitudes and practice (KAP) survey of nearly 6,000 households in Lagos State showing a change in attitudes attributable to educational campaigns, but not, unfortunately, significant changes in behaviours. Adeneye et al. look at barriers to antiretroviral therapy (ART) through questioning HIV-positive patients seeking care at the NIMR. This paper presents interesting data pointing to the better estimates of ART affordability and willingness-to-pay estimates.

Rounding out this issue are two papers demonstrating the applicability of highly sophisticated methodological approaches in analysis of data in diverse healthcare settings. Makepeace and Pal apply sequential analysis of the West Bengal National Family Health Survey to look at the impact of the length of time between births on subsequent child mortality. Cox Proportional Hazard Ratios are calculated providing empirical support for the risks of too-close spacing of children. Ro and Lee use LISREL to analyze a household production function model to estimate how a mother's education influences her time allocation for child care, and the subsequent health outcomes of the child. Their data is from a Korean Family Household survey. A third copy by Young et al. uses data from the Matlab Health and Socio-economic Survey to examine how adults in rural Bangladesh use healthcare services.

The contributing authors and editorial staff of WHP are interested in any comments or suggestions you might have on the papers or journal. Please feel free to write or e-mail us.

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Commentary: The Health of Rural to Urban Migrants in China

Wen Chen, PhD

Much more attention is being paid to the health status of rural-to-urban migrants and their access to basic health services in China, where the number of rural-to-urban migrants accounted for approximately one-quarter of urban residents. The authors of the following two papers have provided evidence for the need to improve the living and employment conditions and increasing the healthcare services available to rural-to-urban migrants. The authors' evidence is based on the questionnaire survey of 4,208 young rural-to-urban migrants and qualitative data from in-depth interviews with 90 rural-to-urban migrants in two major metropolitan centres in China. The studies show that young rural-to-urban migrants generally tend to exist in unstable living arrangements and substandard employment conditions, characterized by suboptimal health status, inferior health-seeking behaviours, elevated levels of substance use, depressive symptoms and expressions of dissatisfaction with life and work, with which the increases in mobility were associated. Lack of insurance coverage, high cost of healthcare and exacting work schedules have resulted in migrants' use of unsupervised self-treatment or substandard care.

Until now, migrants could not be brought into the urban social security system in China, except in some cities, such as Shenzhen, Zhuhai, Shanghai, Chengdu, Beijing and Zhenjiang, where rural-to-urban migrants have been covered by some social insurance schemes. Most risks and uncertainties resulting from migration are borne by migrants and their families. On the other hand, a new rural cooperative medical scheme has been promoted by the Chinese government to provide basic health security in rural areas. However, the rural-to-urban migrants, especially the young, are unwilling to enroll in the scheme because, with their relatively higher incomes and expectations as compared to rural non-migrants, they want to access better healthcare services than are delivered by rural health institutions. For migrants working in big cities, it is relatively inconvenient to utilize the covered health services that are delivered by village post, township and county hospitals. The rural-to-urban migrations put forward an important and difficult task to guarantee basic coverage for migrants' healthcare.

These two papers give us a profile of rural-to-urban migrants and an understanding of the association between health status and geographic mobility. This issue is accelerated by increased modernization and industrialization, which increases the need of rural-to-urban migrants to access healthcare in China.

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Health Indicators and Geographic Mobility among Young Rural-to-Urban Migrants in China

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Abstract

The process of rural-to-urban migration in China is accelerating with increased modernization and industrialization. To address the issues of health outcomes and geographic mobility among this population, data from 4,208 rural-to-urban migrants in two major metropolitans of China were analyzed. Results indicate that average duration of migration was 4.3 years, with younger migrants being more mobile than their older counterparts. After controlling for possible confounders, increases in mobility were associated with unstable living arrangements, substandard employment conditions, suboptimal health status, inferior health-seeking behaviour, elevated level of substance use, depressive symptoms and expression of dissatisfaction with life and work. The findings in the present study underscore the need for improved living and employment conditions and increased healthcare services available to rural-to-urban migratory population.

Introduction

A substantial global literature suggests that migration is associated with an increased risk for poor health (McKay et al. 2003). This increased risk may be related to such contextual and psycho-social factors as adopting a new socio-cultural environment, coping with changes in traditions and lifestyles, dealing with economic transitions, and overcoming barriers to gain access to local community services including healthcare delivery. Previous research has documented that stigmatization causes anxiety, which may contribute to mental and physical illnesses (Darmon and Khlat 2001; Pudaric et al. 2000). The existing literature on the relationship between migration and health has largely been limited to migrants within the United States and European countries, and those seeking permanent resettlements such as trans-culture or trans-country immigrants and war refugees (Darmon and Khlat 2001; Diaz et al. 2001; Pernice and Brook 1996; Pudaric et al. 2000). In contrast, there is limited data available regarding the relationship between migration and health status among temporary, rural-to-urban migrants in many developing countries, including China, which houses one-fifth of the world's population.

Migration from rural to urban areas was restricted in China through the official household registration ("hukou") system for almost a quarter century until economic reform took place in the late 1970s (Zhang, L. 2001). Under the "hukou" system, each individual is officially registered as either a rural or an urban resident. Rural residents could not freely move to or settle in urban areas in order to become urban residents. With the introduction in 1979 of the Rural Household Contract Responsibility System, a form of rural economic reform, China experienced rapid growth in agricultural productivity (e.g., agriculture GDP increased from 2.7% in 1970–1978 to 7.1% in 1979–1984) (Anderson et al. 2003) and a subsequent surplus of rural labour (e.g., agriculture labourers decreased from 81% in 1970 to 49% in 2000) (Anderson et al. 2003). Concurrently, rapid economic growth in urban China widened the income gap between the urban and rural areas to a historically high level in the 1990s (Anderson et al. 2003). This increasing income gap has provided a strong incentive for rural residents to migrate to urban areas in search of employment opportunities and better lives. Consequently, millions of Chinese farmers have left their villages to go to cities, forming the rural-to-urban migration, one of the largest internal migrations in China's recent history (Zhang, L. 2001).

According to the recent Chinese governmental statistics, there are approximately 114 million rural-to-urban migrants in China, accounting for 23.2% of total rural labour and 9% of the total population in China (CNBS 2003). The rural-to-urban migrants were individuals who moved from rural areas to urban areas for jobs. These migrants work or live in urban areas without official urban household registration (i.e., urban "hukou"). Most of these migrants come from the poor rural areas in interior provinces, to form a general geographic pattern of migration from the middle and western parts of China to the eastern and costal regions, where economic development was more advanced. Because of existing legal restrictions on employment and housing in urban areas, approximately 80% of the migrants do not permanently relocate (e.g., obtaining official urban "hukou") (Zhang, L. 2001).

While the current magnitude of the rural-to-urban migration is already substantial, China is facing an anticipated increase of rural-to-urban migration in the coming years because of several salient socioeconomic factors. Both the rural-urban income disparity and the rural labour surplus have continued to rise in China in recent years. Approximately 70% of the Chinese population live in rural areas. One-quarter of rural Chinese households lived on less than one US dollar a day in 1999, compared to only 1% of urban households in the same economic condition (Anderson et al. 2003). When China became a member of the World Trade Organization (WTO) in 2002, part of China's obligation to the WTO was to decrease the duties on imported farm produce from 22% in 2001 to less than 15% after the phase-in period, and to permanently eliminate some quotas of agriculture product imports (Anderson et al. 2003). As a result, Chinese agriculture production will decrease and the surplus of rural labour will increase. With a simultaneous increase of labour needs of urban industries, more rural-to-urban migration will be expected in the coming years.

In addition, the Chinese government has gradually been relaxing its control on rural-to-urban population movement. Until recently, there had been strong government control over rural-to-urban migration. For example, there have been several institutionalized barriers to migrants seeking legitimate employment in urban areas, including the government's restriction on specified industries and corporations to employ migrants. For example, the Beijing municipal government published annual guidelines permitting or restricting certain occupations to employ migrants. In 1999, the list contained at least 36 "restricting" occupations that included telephone operators, store salesclerks, bus drivers and conductors, box-office clerks, warehouse clerks and hotel attendants (Li et al. 2005).

The cumbersome and costly administrative procedures required of migrants rendered it difficult to obtain the necessary permits for legitimate employment in cities. Rural migrants were required to pay as many as 12 different fees to local government and to obtain up to six governmental registrations or permits for employment (Li et al. 2005). It normally took migrants at least three months and cost them from 500 to 1,000 Yuan (about one month salary) to obtain all of the required registration and permits for employment (most of which need to be renewed annually). Failing to obtain these

registrations and permits had significant consequences. Migrants without the temporary residency permit were considered to be "illegal migrants" and subjected to incarceration and/or deportation by the urban public security agencies. Because of the increasing societal concern about the welfare of the migrants and increasing social tension between migrants and urban residents, both central and local governments have started to relax some regulations on rural-to-urban migration. For example, the Beijing government abolished the employment restriction in 2001 and waived some mandatory fees in 2002. The deportation law was abolished nationwide in June 2003 in response to the brutal death of a young college graduate arrested and placed in custody by local police as an "illegal migrant." While it is too early to evaluate the actual impact of these regulatory changes on the well-being of migrants in cities, the changes certainly will encourage new waves of rural-to-urban migration.

Given the size of this mobile population movement and the likelihood that this process will accelerate as modernization and industrialization proceed, the health status and access to healthcare of this migratory population have become significant public health issues in China. In moving from the rural to the urban context, migrants also encounter a rapid change of working and living conditions, a weakening of family supports and a fragmentation of their social support network that may negatively impact their well-being and health status (Diaz et al. 2001; Gao et al. 2001; Huang 2000; Pernice and Brook 1996; Stafford 1986; Tie 1999; Ying 2003). In addition, the healthcare infrastructure in China may not be sufficient to provide adequate healthcare to migrants. Along with extreme expansions of economic opportunities for the country, China's healthcare system has undergone substantial reconstruction since 1978, when the country began moving from a planned economy to a market economy.

The primary objective of the medical reform in the 1980s was cost recovery for the hospitals and other healthcare providers (Bogg et al. 1996). Parallel to its residence registration system, there have been separate health service systems for rural and urban residents. About 80% of the country's total health budget is relocated to funding hospital-based treatment in the urban areas, although the urban residents account for just 30% of the country's population (Zhang 2001). For the rural population, coverage by the affordable and generally effective cooperative health insurance reached a peak in the middle 1970s when nearly 90% of the rural population was covered. In the 1980s, rural cooperative health insurance collapsed and the coverage fell to only 5% in 1989 (Bogg et al. 1996; Grogan 1995). Virtually all rural residents must now pay for their healthcare out of their own pockets, at the point of service. The urban population, which used to be protected by governmental health insurance, has been covered primarily by employment-based health financing since 1980s (Grogan 1995).

The Chinese government's efforts to commercialize and privatize many health services have stressed the capabilities of many rural and urban health institutions, causing substantial and frequently unaffordable increases in the direct cost to patients. In both the rural and urban areas, healthcare is becoming a fee-for-service commodity that is more available to the rich than it is to the poor. As a result, access to healthcare is declining in many sectors of the population (Lampton 2003; Smith 1998). A recent study in China found that among those in the lowest income bracket who reported illness, 70% did not obtain treatment because of financial difficulty (Gao et al. 2001). Because of the temporary and informal nature of their employment, most migrants who arrive in cities without any healthcare insurance are not entitled to many of the privileges and benefits available to their urban counterparts, including health care coverage (Li et al. 2005; Zhang, L. 2001). For example, only 22.5% of female migrants in Beijing received any maternal health or family planning education, compared to almost 100% of urban residents (Zheng et al. 2002).

Even though the proportion of the rural-to-urban migrants is substantial (about 9% of the total Chinese population and 13% of the population aged 15 to 64 years), little attention has been paid to the health risk and health-seeking behaviour of these Chinese migrants. Therefore, the current study, utilizing cross-sectional data from 4,208 migrants residing in two large metropolitan areas in China, was designed to explore the association of increased geographic mobility with indices of health status and health-seeking behaviour among rural-to-urban migrants. An increasing geographic mobility is

defined as a more frequent movement in relation to the duration of migration. We hypothesized that the mobility of rural-to-urban migrants would be positively associated with (1) substandard living (e.g., unstable dwelling arrangement, poor living condition); (2) worsened employment (e.g., less pay, long working hours, more working days, and high frequency of changing job); (3) suboptimal health condition; (4) reduced health-seeking behaviour; (5) elevated substance-use behaviours (e.g., tobacco use and alcohol consumption); and (6) increased mental health symptoms (e.g., depressive symptoms, life dissatisfaction).

Methods

Survey Sites and Participants

Data were collected from migrants residing in Beijing and Nanjing, China in 2002. Beijing and Nanjing are two cities 1,200 kilometres apart. According to the China 2000 Census data, Beijing (the capital of China) has a population of 13.82 million urban residents and 3 million (22%) rural-to-urban migrants. Nanjing (the provincial capital of Jiangsu) has a population of 6.2 million urban residents and 800,000 (13%) rural-to-urban migrants.

The study sample was comprised of respondents who participated in an HIV/STD prevention feasibility study among rural-to-urban migrants in China. The details regarding sampling methodology and outreach procedures are described elsewhere (Li et al. 2004). Briefly, 10 occupational clusters and job markets (for migrant job seekers) were selected as the sampling frame for participant recruitment. The occupational clusters that employed more than 90% of the migrants included restaurants, barbershops/beauty salons, bath houses, dance halls/bars, construction companies, street vendors, small retail shops, hotels, domestic services and factories. Participants were recruited from their workplaces or job markets using a "quota-sampling" procedure such that the number of participants recruited in each occupational cluster was approximately proportional to the overall estimated distribution of migrants in the cluster.

Survey Procedures

Data were collected employing the "Migrant Health Behaviour Survey," a self-administered questionnaire developed through the joint efforts of investigators both in China and the Unites States. The questionnaire was pilot-tested for comprehension among young migrants in China and was considered to be a culturally appropriate assessment tool (Li et al. 2004). Over the course of a 45-minute session, participants completed the survey individually or in a small group (3–5 people) at worksites or public locations appropriate for survey administration. Trained data collectors provided assistance to a small number of participants (approximately 20) with limited literacy by reading survey items to them. Respondents were provided with small monetary compensation for their participation. The Institutional Review Boards at West Virginia University and Wayne State University in the United States as well as Beijing Normal University and Nanjing University in China approved the study protocol.

Measures
Demographic Measures
Variables used for measuring demographic characteristics included age, gender and education attainment (no formal education, Grades 1–6, Grades 7–9, Grades 10–12 and post-secondary education). Ethnicity (Han, Hui, Man, Mongolian and others) was also assessed, but since respondents with an ethnic background other than Han (the nation's ethnic majority) consisted of only 3% of the survey sample, they were grouped into a single category as non-Han for data analysis in the current study.

Mobility
Participants were queried about the entire duration of migration (in years) and the number of cities to which they had ever migrated. The correlation between these two variables was 0.41 (p < .01).

A ratio of the number of migratory cities to the total migration years was used as an index of mobility for each respondent. The mobility index ranged from 0.06 to 12.5 with a greater number indicating a higher level of geographic mobility (e.g., more frequent movement in relation to the duration of migration).

Living Conditions

Three items were employed to assess current living conditions: (1) type of residence in the city (apartment building, flat house, underground storage space and work shed); (2) frequency of changing residence (never, once every two to three years, once per year, at least two to three times per year); and (3) availability of basic utilities in the dwelling (e.g., toilet, kitchen, city water, gas/cylinder, telephone, TV set, shower or bath tub). To quantify living conditions, a composite score was created by indexing respondents who lived in a substandard residence (e.g., lived in an underground storage space or a work shed), lacked basic utilities in the dwelling (e.g., having no more than half of the eight utilities identified), and changed residence at least two to three times a year. The resultant living condition composite score consisted of values of 0, 1, 2 and 3 and was reverse-coded, so that greater numbers indicated better living conditions.

Employment Conditions

Five items were employed to assess general employment conditions. Participants were first asked two general questions: (1) How many different jobs have you had since you migrated to cities? (2) Where are you working now (e.g., restaurant, beauty saloon/barber, bathhouse/sauna centre/massage, dance hall/karaoke/bar, construction, street vendor, small store/shop, hotel, domestic service, factory or no job)? Respondents who identified themselves as being currently employed (or self-employed) were queried further about average hours worked per day, average monthly income (in Chinese currency Yuan) and days off per month. A composite score of employment condition was created by indexing respondents who had worked more than three different jobs in the past, had unstable employment or were self-employed (e.g., street vendor, small store/shop, domestic service), had monthly income below the 25 percentile of the sample (e.g., 500 Yuan), worked at least 10 hours per day and had fewer than four days off per month. The final employment score consisted of values 0 through 5 and was reverse-coded so that a higher score indicated a better employment condition.

General Health Condition

Nine items were employed to measure the general health condition of the study population. These items were developed by modeling items from the SF-12 Health Survey (Ware et al. 1996) in the Chinese setting. The items assessed participants' general health conditions (from poor to excellent), limitations and effects of their health conditions (both physical and emotional) on their daily work and social life in the past month. The Cronbach alpha for the nine items was 0.66. A composite health score was created by indexing those participants who reported poor health and severe limitations in their work productivities and daily life because of physical and emotional problems. The composite index was reverse-coded and ranged from 1 to 9 with a higher score indicating a better health condition.

Health-seeking Behaviour

Following a general question about how often the participant became ill in cities on a 5-point scale (where 1=never, 5=always), participants were asked additional questions assessing health-seeking behaviour in the event of an illness (e.g., do nothing, self-treatment, go to hospital, go to regular clinics or go to underground clinics).

   Participants were also asked whether they ever had a physical checkup and if they had access to healthcare facilities near their workplaces or their city residences. A composite score was created by indexing respondents who did nothing or self-treated for illness; never received any physical checkup; or had no knowledge about a healthcare facility nearby. Again, the composite score was

reverse-coded so that a higher score indicated a greater tendency of health-seeking behaviour. In addition, the participants were queried about the possible reasons for not seeing a doctor when they became ill.

Substance Use

Data on substance use were comprised of information on cigarette and alcohol consumption. Participants were asked how many cigarettes they had smoked each day during the previous month (did not smoke; 1–5 cigarettes; 6–10 cigarettes; 11–15 cigarettes; 16–20 cigarettes; more than a pack). In addition, participants were asked how many times they were intoxicated with alcoholic beverages during the previous month (none, once, twice, three times or at least four times). A composite score was created by indexing respondents who smoked at least half a pack a day during the previous month and were intoxicated at least once in the previous month. The composite score consisted of values 0 through 2, with a higher score indicating a higher level of substance use.

Depression

Depressive symptoms were measured using the Centre of Epidemiological Studies Depression Scale (CES-D) (Radloff 1977). The 20-item CES-D was introduced into China in the early 1990s (Wang 1993). The existing Chinese version of the CES-D was modified by the investigators to ensure the accuracy of the translation. The modified scale was found to have high reliability for the current study sample (Cronbach's alpha = 0.85). The scale scores ranged from 0 to 60, with higher scores indicating higher frequency of depressive symptoms.

Life Satisfaction

A scale comprised of two questions was used to assess participants' general satisfaction with their current life or employment on a 5-point scale (1=very dissatisfied, 5=very satisfied). The scale was found to have adequate reliability for the current study (Cronbach's alpha=0.75). The mean score of the two items was retained as an overall life satisfaction index. For those respondents who were unemployed, only the life satisfaction score was employed as the index in the analysis.

Statistical Analysis

Overall distributions of all measures by gender were assessed using Chi-square test for categorical variables and ANOVA for continuous variables. Associations between mobility index and health-related measures were examined using multivariate analysis of covariance (MANCOVA). The mobility index was used as the main between-subjects factor. To categorize the mobility index into a between-subjects factor in the MANCOVA model, the sample was divided into five groups using the 20th, 40th, 60th and 80th percentiles of the mobility index as thresholds. Because mobility can be potentially confounded by age, gender, marital status and level of education attained, these factors were included in the MANCOVA model either as additional between-subjects factors (e.g., gender, marital status) or covariates (e.g., age, education attainment). Pillais F test (Stevens 1996) was used for evaluating multivariate significance. The conventional F test was used for univariate testing. The t statistic was used to assess the significance of covariates.

Results

Sample Characteristics

A total of 4,301 migrants were approached for the survey, of whom 24 (0.6%) refused to participate (10 from Beijing and 14 from Nanjing). Sixty-nine additional respondents were excluded from the database either because of substantial missing data (e.g., more than half of the variables were missing) or missing data on key variables (e.g., gender). The final sample consisted of 4,208 respondents (Table 1), with 53% being from Beijing and 47% from Nanjing. Of the total sample, 40% were female and 60% were male; the mean age was 23.5 years (SD=3.8). The majority of the respondents

were of Han ethnicity (97%), were single (72%) and had at least some elementary school level education (94%). Male respondents were 1.12 years older than the female respondents (p < .01) and significantly more of the females than the males (77% versus 68%, p < .01) were single.

Mobility

As shown in Table 1, respondents had an average migration history of 4.29 years (SD = 3.05). More than half (58%) had migrated to two or more cities and 30% had migrated to three or more cities. There was no gender difference in the mobility index between genders (mobility index = 0.76 for women versus 0.72 for men). While men tended to move more frequently than women did from one city to another (e.g., 67% men versus 46% women had migrated to two or more cities, p < .01), men also had a longer migratory history than women did (4.84 years versus 3.48 years, p < .01). As shown in Figure 1, the mobility index significantly differed by age, with younger migrants being more mobile. In addition, the mobility index differed by marital status with those migrants who had never been married being more mobile than those who were married (0.83 versus 0.52, p < .0001). The association between mobility index and marital status was consistent across gender (e.g., the mobility index was 0.83 for unmarried women and 0.53 for married women; 0.83 for unmarried men and 0.51 for married men).

Figure 1. Association between age and mobility among Chinese rural-to-urban migrants
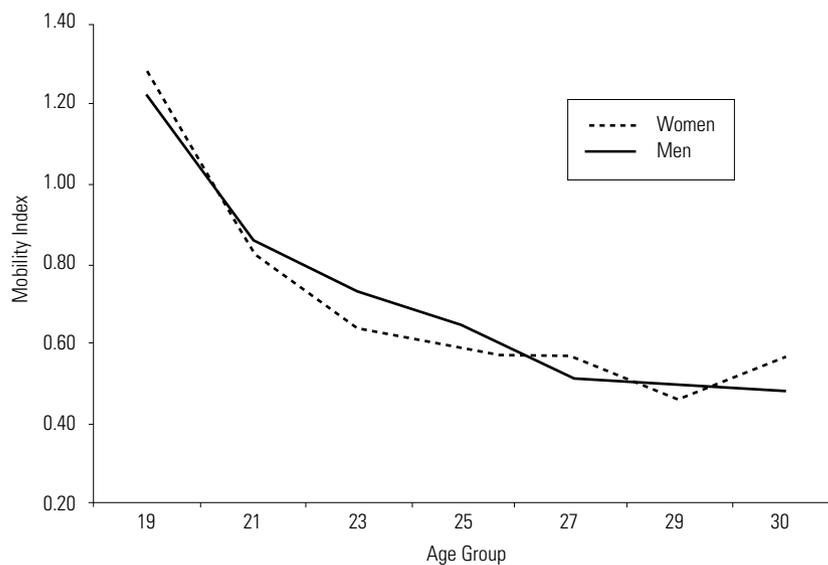
Description of Health Indicators
Living Arrangement

As shown in Table 1, 76% of the respondents reported living in apartment buildings or flat houses, 12% in underground storage spaces and 8% in work sheds/shelters. Eighty-six percent reported that their dwellings were equipped with tap water; 58% with a toilet; 45% with a kitchen; 42% with gas line or cylinder; 33% with a telephone; 55% with a TV set; and 41% with a shower or bath tub. Eight percent reported that they had none of the seven basic utilities/equipments listed above in their residence. Approximately one-quarter of the respondents reported changing their residence at least two to three times a year.

Table 1. Demographic characteristics and living conditions of 4,208 rural-to-urban migrants in China

	Overall	Female	Male
N(%)	4208(100%)	1699(40%)	2509(60%)
Mean age (yr)	23.49(3.80)	22.82(3.55)	23.94(3.90)****
Total yrs of migration	4.29(3.05)	3.48(2.42)	4.84(3.30)****
Han ethnicity	4053(97%)	1623(96%)	2430(97%)*
Single	2921(72%)	1275(77%)	1646(68%)****
Education attainment[1]			
£6	252(6%)	131(8%)	121(5%)
7-9	2313(56%)	849(51%)	1464(59%)
10-12	1372(33%)	598(36%)	774(31%)
>12	231(6%)	103(6%)	128(5%)
# of cities migrated[1]			
One	1725(42%)	911(54%)	814(33%)
Two	1152(28%)	489(29%)	663(27%)
Three	668(16%)	178(11%)	490(20%)
Four	295(7%)	59(4%)	236(10%)
≥Five	309(7%)	42(2%)	267(11%)
Site of residence[1]			
Building	1349(32%)	702(42%)	647(26%)
Flat	1855(44%)	672(40%)	1183(47%)
Underground	515(12%)	239(14%)	276(11%)
Shelter	348(8%)	29(2%)	319(13%)
Other	126(3%)	50(3%)	76(3%)
Utilities in dwelling			
Toilet	2434(58%)	1112(66%)	1322(53%)****
Kitchen	1896(45%)	779(46%)	1117(45%)
Running water	3617(86%)	1521(90%)	2096(84%)****
Gas	1767(42%)	769(46%)	998(40%)****
Telephone	1400(33%)	638(38%)	762(31%)****
TV set	2290(55%)	960(57%)	1330(53%)*
Shower/bathtub	1710(41%)	733(43%)	977(39%)**

None of the above	347(8%)	90(5%)	257(10%)****
Frequency of changing site of residence[1]			
Never	1906(44%)	852(51%)	954(39%)
once 2-3 years	551(13%)	222(13%)	329(13%)
once per year	776(19%)	295(18%)	481(20%)
≥2-3 times per year	996(24%)	298(18%)	698(28%)

Note 1. Responses significantly differed by gender (p<.0001).
* p < .05, **p < .01, ****p < .0001

More women than men lived in apartment buildings (42% versus 26%), and more men than women lived in work sheds (13% versus 2%, p<.01). More women than men had access to telephones, city water, gas and shower/bathtub, and women in general tended to stay longer than men in the same residence (51% versus 39% never moved, p<.01).

Employment Conditions

Nearly all of the respondents (96%) were currently working (or "earning money"). Whereas 67% had worked two or more jobs since migrating to the city, only 2% reported having never been employed. Distribution of the migrants who were currently working by job location is presented in Table 2. Approximately half of the respondents worked in three occupation sectors (18% in construction companies, 17% in restaurants and 13% in barbershop or beauty salon) and less than one-tenth worked in domestic services (4%) or retail (2%). The average monthly income for all respondents was 878 Yuan (equivalent to $110 with the current exchange rate) ranging from zero to 12,000 Yuan per month. On average, migrants worked 10 hours per day and received approximately three days off per month.

Significant gender differences in type of employment were observed (p < .01). For example, more women than men reported working in restaurants (20% versus 15%), barbershops or beauty salons (20% versus 9%), hotels (8% versus 4%) and domestic services (8% versus 1%). In contrast, more men than women reported working in construction (29% versus 1%). Men made slightly more money than women made (907 Yuan versus 836 Yuan, p<.01) and had fewer days off each month (2.77 versus 3.04, p<.01).

Table 2. Employment situation of rural-to-urban migrants in China

	Gender		
	Overall	**Female**	**Male**
How many jobs you have had?[1]			
None	75(2%)	31(2%)	44(2%)
One	1309(31%)	584(35%)	725(29%)
Two	1263(30%)	539(32%)	724(29%)
Three	907(22%)	354(21%)	553(22%)
Four	312(8%)	102(6%)	210(8%)

≥Five	310(7%)	78(5%)	232(9%)
Place of current employment[1]			
No job	149(4%)	54(3%)	95(4%)
Restaurant	709(17%)	345(20%)	364(15%)
Beauty Parlour	548(13%)	337(20%)	211(9%)
Bath house/ massage parlour	350(8%)	210(12%)	140(7%)
Dance hall/bar	234(6%)	210(6%)	136(6%)
Construction	744(18%)	18(1%)	726(29%)
Street Vendor	307(7%)	102(6%)	205(8%)
Small retail shop	73(2%)	46(3%)	27(1%)
Hotel	229(6%)	129(8%)	100(4%)
Domestic service	159(4%)	142(8%)	17(1%)
Factory	340(8%)	116(7%)	224(9%)
Other	346(8%)	96(6%)	250(10%)
Monthly income (Yuan)	877.97(727.35)	835.58(741.73)	906.92(716.09)**
Daily working hours	10.16(3.30)	10.09(3.51)	10.20(3.15)
Days off per month	2.88(2.25)	3.04(2.22)	2.77(2.27)****

Note 1. Responses significantly differed by gender (p < .0001).

General Health Conditions

As shown in Table 3, about one-quarter of the respondents reported they had fair or poor health. One-quarter to one-third of the respondents said that their health conditions had prevented them from performing activities that require moderate strength (such as moving a table, climbing stairs to fifth or sixth floor). One-quarter and one-tenth of the respondents reported that physical problems had reduced or prevented their work performance and accomplishment in the previous month, respectively. About half of the sample reported that emotional problems had prevented them from achieving their goals or that they suffered emotional unrest. About 5% of the respondents reported that physical pain had prevented their normal work most or all the time in the last month and a similar number of respondents reported that their health problems (either physical or psychological) had limited their social activities most or all the time. There were some gender differences, with more females reporting poor or fair health (25% versus 21%, p < .0001) and being affected or disturbed by their physical and emotional problems (mean health composite index was 7.55 for females and 7.65 for males, p < .05).

Health-seeking Behaviour

Approximately one-eighth of the sample (9% females and 15% males) reported no illness during migration. As shown in Table 3, among those who reported ever becoming ill, 7% claimed that they did nothing, approximately 50% reported self-treatment or treatment at hospitals, 19% reported treatment from pubic clinics and a small number (2%) reported seeking treatment from practitioners not licensed to practice medicine. Although significant gender differences were found among

respondents in terms of from whom and where medical care was sought, differences were relatively small (Table 3). The top reasons for not seeing a doctor for treatment included excessive cost (32%), limited time (18%) and inconvenience (11%). Seventy percent of the sample (77% women and 66% men) reported having received a physical examination, although only 28% of the sample received a self-initiated physical examination. More women than men received a physical examination because it was required by their employees or others (50% versus 37%).

Substance Use
About one-tenth of the sample reported smoking more than 15 cigarettes daily in the past month and 28% reported intoxication with alcohol at least once during the same time period. Significantly more men than women were heavy cigarette smokers (18% versus 2%, p < .01) and alcohol abusers (36% versus 16%, p < .01).

Depressive Symptom and Life Satisfaction
As shown in Table 3, the mean score of CES-D among this sample of rural-to-urban migrants was 11.52 (SD = 9.45); the CES-D score was relatively similar for males and females. More than one-quarter of the sample reported dissatisfaction with their life situation (27%) or current work (28%), with more men than women reporting dissatisfaction with their life (29% versus 23%, p < .01) or current work (30% versus 26%, p < .01).

Table 3. Health-related outcomes among rural-to-urban migrants in China

	Gender		
	Overall	Female	Male
General health condition			
Poor or fair health	946(23%)	426(25%)	520(21%)****
Health prevented activities require moderate strength	1584(38%)	885(53%)	699(28%)****
Health prevented climbing 5–6 floors	977(24%)	475(29%)	502(20%)****
Accomplished less because of physical problem	1127(27%)	441(26%)	686(28%)
Could not do much because of physical problem	448(11%)	161(10%)	287(12%)*
Accomplished less because of emotional problem	1613(39%)	670(40%)	943(38%)
Not very careful because of emotional problem	2037(49%)	852(51%)	1185(48%)*
Pain prevented normal work most or all time	167(4%)	61(4%)	106(4%)
Health limited social activities most/all the time	195(5%)	65(4%)	130(5%)**
What did you do when you got sick[1]			
Did nothing	241(7%)	103(7%)	138(7%)
Self-treated	1860(51%)	784(51%)	1076(51%)
Went to big hospital	1797(49%)	796(52%)	1001(47%)**
Went to formal clinic	711(19%)	246(16%)	465(22%)****
Saw unlicensed doctor	74(2%)	19(1%)	55(3%)**

Top 6 reasons for not seeing a doctor			
Illness was not serious	2798(67%)	1180(71%)	1618(65%)****
Had medicine handy	1342(32%)	610(36%)	732(30%)****
Too expensive to see a doctor	1334(32%)	513(31%)	821(33%)
No time	756(18%)	321(19%)	435(18%)
Afraid affecting job	633(15%)	278(17%)	355(14%)*
Inconvenience	466(11%)	173(10%)	293(12%)
Did you ever receive a physical exam?[2]			
Yes, I did it on my own will	1168(28%)	457(27%)	711(29%)
Yes, I did it because I was required to do so	1777(42%)	849(50%)	928(37%)
No, I never did it	1243(30%)	383(23%)	860(34%)
Substance use			
Smoked more than half pack daily last month	479(11%)	30(2%)	449(18%)****
Got drunk ≥ once last month	1184(28%)	275(16%)	909(36%)****
Depression (CESD)	11.52(9.45)	11.55(9.83)	11.50(9.18)
Dissatisfied with			
Current life	1114(27%)	388(23%)	726(29%)****
Current work	1184(28%)	434(26%)	750(30%)****

Note 1. Data were available only from those who had ever become ill.
Note 2. Responses significantly differed by gender (p < .0001).
* p < .05, ** p < .01, **** p < .0001

Association between Health Indicators and Mobility

As shown in Table 4, the categorized mobility index did not vary appreciably among men and women. In contrast, mobility varied with age and marital status, such that younger single migrants were more mobile (p < .01 for age and marital status). Additionally, migrants who were more mobile earned less money per month than migrants who were not as mobile (range from 694 Yuan to 944 Yuan, p < .01). Mobility was found to be negatively associated with a variety of health indicators examined in this study.

Table 4. Association between health indicators and mobility among rural-to-urban migrants in China

	Overall	Mobility Index[1]				
		1	2	3	4	5
N(%)	4149 (100%)	832(20%)	668(16%)	1166(28%)	971(23%)	512(12%)
Demographic Characteristics						
Male	2470(60%)	494(59%)	414(62%)	677(68%)	578(60%)	307(60%)

Single	2898(72%)	399(50%)	395(61%)	860(76%)	85(86%)	429(86%)****
Age (years)	23.47(3.78)	25.83(3.48)	24.86(3.60)	23.22(3.44)	21.83(3.25)	21.45(3.45)****
Duration of migration (years)	4.28(3.04)	7.25(3.10)	5.78(3.12)	3.88(2.07)	2.61(1.61)	1.48(1.08)****
# of migratory cities	2.11(1.23)	1.42(.73)	2.16(1.23)	2.15(1.17)	2.37(1.29)	2.58(1.43)****
Monthly income (Yuan)	843(726)	945(709)	918(639)	828(698)	806(879)	685(545)****
Health Indicators						
Unstable living condition	2.04(.87)	2.14(.84)	2.05(.89)	2.03(.88)	2.01(.88)	1.96(.86)**
Worsened employment condition	2.96(1.13)	2.99(1.12)	3.07(1.12)	2.95(1.12)	2.87(1.12)	2.84(1.17)***
General health condition	7.61(1.29)	7.68(1.28)	7.74(1.29)	7.67(1.27)	7.47(1.30)	7.42(1.27)****
Health-seeking	2.09(.80)	2.20(.76)	2.08(.81)	2.04(.81)	2.08(.80)	2.04(.84)****
Substance use	.40(.59)	.35(.57)	.43(.62)	.42(.60)	.41(.60)	.35(.55)*
Depression	11.51(9.43)	10.40(9.13)	10.39(8.71)	11.35(9.31)	12.53(9.72)	13.20(10.08)****
Life satisfaction	3.03(.92)	3.18(.87)	3.05(.89)	3.02(.91)	2.92(.95)	2.98(.96)****

Note: 1. Fifty-nine participants (20 women 29 men) had missing value on the mobility index.

* p < .05, ** p < .01, *** p <.001, **** p <.0001

Table 5 depicts the results of multivariate analysis on associations between mobility and health indicators. The MANCOVA model controlled for possible covariates such as age, gender, marital status, education and income. The model also assessed the interactions among mobility, gender and marital status. The analysis revealed a multivariate significance for mobility, gender and marital status as well as two of the interactions (i.e., mobility by gender and gender by marital status). Similar to the results from the bivariate analyses, increased mobility was associated with substandard living conditions (p < .05), worsened employment conditions (p < .0001), suboptimal health status (p < .05), low health-seeking behaviour (p < .001), higher numbers of depressive symptoms (p < .0001) and decreased life satisfaction (p < .05); gender was significantly associated with living condition (p<.0001), health-seeking behaviour (p < .0001) and substance use (p < .0001) in the multivariate model. In contrast, marital status was significantly associated with employment conditions (p < 05), depression (p < .05) and life satisfaction (p<.01). There were no significant interaction terms at the univariate level except the interaction between gender and marital status for living condition (p < .05) and health-seeking behaviour (p < .01).

Age was a covariate found to be negatively associated with employment conditions (p < .001). Monthly income, in contrast, was a covariate found to be positively associated with living condition, employment condition, substance use and life satisfaction (p < .0001). Likewise, migrants with higher levels of education had better living and employment conditions, more health-seeking behaviour and less depressive symptoms (p < .0001).

Discussion

The process of rural-to-urban migration in China is accelerating with increased modernization and industrialization. The fact that about half of the migrants were between the age of 18 and 29 years old (CNBS 2002) suggests that the migrant workforce in China is comprised largely of young adults. Migrants are particularly vulnerable to geographic mobility, financial instability and rapidly changing environments. In this study we report the geographic mobility and its association with a number of health indices among 4,208 rural-to-urban migrants in China. Data from the present study indicate a similar pattern of geographic mobility between migratory women and men.

Table 5. Results of multivariate analysis of covariance (MANCOVA)

	Main effects			Interaction				Covariate		
	Mobility (M)	Gender (G)	Single (S)	MXG	MXS	GXS	MXGXS	Age	Income	Education
Multivariate test (Pillais F)	3.84****	45.07****	2.55*	1.37	1.26	2.62*	1.39			
Univariate test										
Living condition	2.91*	60.98****	.09	.79	1.38	4.44*	1.16	1.46	3.42***	8.75****
Employment condition	7.78****	1.68	4.71*	2.43*	.82	.85	.52	-3.31***	6.28****	11.14****
General health condition	3.18*	2.51	.38	.35	.16	.15	1.00	-1.74	-.58	.007
Health-seeking	4.97***	27.24****	.47	.98	1.16	8.55**	1.83	-.87	1.75	6.64****
Substance use	2.69*	218.30****	.12	2.17	1.28	.30	1.75	1.63	6.18****	-.29
Depression	7.78****	.00	5.66*	1.29	1.50	1.89	1.32	-.37	-.02	-3.59****
Life satisfaction	3.12*	3.48	8.67**	.89	1.66	.18	1.17	.92	4.90****	-1.58

p < .05, ** p <.01, *** p <.001, **** p <.0001

The increasing mobility among the rural-to-urban migrants is associated with being younger and single. Increasing mobility is also associated with low income, unstable living conditions, worsened employment, suboptimal health, low health-seeking behaviour, more substance use and depressive symptoms and less life satisfaction. Although only 4% of the migrants were not employed (or self-employed) at the time of the survey, most of the migrants with jobs were working in informal sectors or labour-intensive industries (e.g., entertainment and personal services for women and construction for men).

Results from the current study suggest that rural-to-urban migrants appear to experience many health risk behaviours. Whereas data from previous studies in China indicate that approximately 4% females in the general population consume minimal amounts of alcohol on a monthly basis (Wei et al. 1995), in this study 16% females reported having consumed alcohol to intoxication at least once during the past 30 days. These rates are unusually high in a culture where alcohol consumption is acceptable in social contexts (e.g., celebrations), but is frowned upon when it occurs in isolation (e.g., solitary drinking) (Williams 1998). Migrants in the present study were also found to smoke more cigarettes than the general Chinese adult population does: 18% males and 2% females were heavy smokers among the study sample, compared to 7.5% and 0.2% among male and female adults generally in China (Yang 1997). In spite of their high level of health risk, a substantial number of migrants in our sample did not report the utilization of health facilities for healthcare (e.g., over half self-treating or doing nothing when becoming ill). Although workers are required by the government to have routine physical examination before employment in urban areas (Zhi et al. 2000), migrants in the present study appeared reticent to seek routine physical examinations (i.e., approximately one-third never had any routine physical checkup).

In the absence of formalized access to education, employment and healthcare, any population is vulnerable to health risks (Booysen and Summerton 2002; Krueger et al. 1990). Such a description is applicable to migrants in China. The legal system in China has significantly curtailed entitlement of the migrant population to basic benefits accorded to other segments of the population for almost half a century (Zhang, L. 2001). However, at any given point in time, it is difficult to characterize the nature of these restrictions because the government has repeatedly changed relevant regulations, particularly during the past decade. As a result, the migrant population is placed in a vulnerable position in two respects. First, regardless of the exact nature of legislative restrictions, migrants experience significant limitations to their entitlements. For example, migrants have to pay more than local residents for many of their daily essentials such as housing, utilities, education

and transportation (Li et al. 2005; Zhang, L. 2001). Second, the rapid change of legislation and governmental regulations further restricts access of the migrant population to entitlements to which they might have access because local authorities and programs responsible for policy implementation are uncertain as to the current legislative status. For example, in 2002 the Chinese government mandated reduction of the fees imposed by local governmental agencies on migrants for work, residence and housing permits. However, rather than increasing migrant access to these necessities, the government's initiatives resulted in the reduction of operations of these respective offices since they could no longer recoup expenses through the fees paid by migrants, thereby rendering it difficult or impossible for migrants to obtain the necessary permits, a situation exposing migrants' increased instability or mobility, as well as leaving the migrant population unable to access legitimate employment and proper housing (Zhang, L. 2001).

China faces a substantial challenge in developing a healthcare infrastructure sufficient to cover its 1.3 billion residents. This challenge is even greater considering the emerging population of rural-to-urban migrants. The Chinese government and the Chinese society in general are now starting to recognize the need for healthcare targeted specifically at rural-to-urban migrants (Liu et al. 2002; Wei, P. 2002; Xinghua News Agency 2003; Ying 2003). The findings in the present study underscore the need for increased medical and healthcare services available to this population in urban areas, as well as health promotion programs that target these migrants. Furthermore, the lack of basic facilities in their daily life, such as tap water, showers/bathtubs, restrooms and telephone lines further strains an already overburdened healthcare system. These findings underscore the importance of improving living and employment conditions in urban areas for this population.

This study has several potential limitations. First, respondents for this study were recruited through convenience sampling and therefore caution should be taken to generalize findings from this study to other migrant populations in China. Second, data used for this analysis are cross-sectional in nature; causality cannot be determined between mobility and health indicators. Third, there was no non-migrant comparison group in the current study. The lack of comparison group precludes any conclusion about the relative standing of migrants' health risks and health-seeking behaviour in comparison with other non-migratory populations in China (e.g., rural population, urban poor). Fourth, data on some specific health outcomes related to migration such as childhood immunization rates or infectious diseases were not available in this study. Despite these methodological limitations, this study is, to the best of our knowledge, one of the first efforts to examine the relationship of geographic mobility with health indicators, including health outcomes among rural-to-urban migrants in China. By providing preliminary data on important health indicators among rural-to-urban migrants in China, these findings will be helpful to China as it addresses issues and policies relevant to a vulnerable population with unique cultural, economic and health needs.

Findings in the current study, coupled with others (Grogan 1995; Li et al. 2005; Zhang, L. 2001; Zhi et al. 2000), suggest the need to systematically provide the rural-to-urban migrants with access to adequate and affordable healthcare while they are "floating" in the urban areas. Efforts are also needed to eradicate institutionalized and cultural barriers that have prevented migrants from benefiting from their urban life, by providing improved residency, employment and healthcare opportunities. Health promotion activities, including education and training (to both migrant and urban residents), are needed to improve the health conditions and lifestyles of rural-to-urban migrants and to enable migrants to assimilate themselves into the urban culture and environment.

Acknowledgements

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Too Costly To Be Ill: Healthcare Access and Health-Seeking Behaviours among Rural-to-Urban Migrants in China

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ABSTRACT

Of the 114 million rural-to-urban migrants in China, most have only temporary employment in the cities. Because of their non-urban residence, they are not entitled to many benefits and services accorded to most urban dwellers. Only limited research has been conducted on the healthcare access and health-seeking behaviours of this population. This study, based on qualitative data from in-depth interviews with 90 rural-to-urban migrants, found that migrants had limited access to regular medical services. Lack of insurance coverage, high cost of healthcare and exacting work schedules have resulted in use of unsupervised self-treatment or substandard care. The health-seeking behaviours of migrants have led to suboptimal health consequences, including delayed treatment of illnesses. Findings from this study underscore the importance of reducing institutional barriers to health services and providing affordable healthcare to this population.

Introduction

Global literature suggests that migration is associated with increased health risks (Brussaard et al. 2001; Darmon and Khalt 2001; McKay et al. 2003). Furthermore, migrants often have less access to community services, especially healthcare services, compared to local residents. Migrants' poor access to healthcare has been documented to lead to unsatisfactory health outcomes (Diaz et al. 2001; Pernice and Brook 1996; Pudaric et al. 2000; Steyn et al. 1997; Tie 1999). However, the existing literature on migrants' access to healthcare, as well as their health-seeking behaviours, has largely been limited to migrants in Western countries (such as the United States and Europe) and those seeking permanent resettlements such as international immigrants and war refugees (Darmon and Khalt 2001; Diaz et al. 2001; Pernice and Brook 1996; Pudaric et al. 2000). In contrast, there is a paucity of research in this field among the growing population of temporary, rural-to-urban migrants in developing countries, including China.

According to recent statistics from the Chinese government, there are approximately 114 million rural-to-urban migrants in China, accounting for 23.2% of total rural labour and 9% of the total

population in China (China National Bureau of Statistics [CNBS] 2003). This large-scale migration has been generated by a surplus of agricultural labour in rural areas and the increasing income gap between rural and urban dwellers (Ma and Xiang 1998). The majority of migrants come from poor rural areas in the interior provinces to search for better employment opportunities in the cities; thus, forming a general geographic pattern of migration from the middle and western parts of China to the eastern and coastal regions. This large-scale migration is one of the biggest internal migrations in China's history, and the momentum is expected to continue in the coming years (Shaokang et al. 2002; Li et al. 2006).

The rural-to-urban migrants in China are young (47.3% are younger than 25 years old). About 10% of adult migrants (15 years of age and older) are illiterate, 24% completed elementary school, 52% completed middle school and 13% graduated from high school (CNBS 2001). As most migrants have not received work skills training, they frequently undertake manual labour and personal services related to manufacturing, goods transportation, construction, entertainment, domestic service and restaurant services (Jia et al. 2001; Zhang, L. 2001). Because of existing legal restrictions on employment and housing in urban areas, approximately 80% of the migrants neither maintain permanent relocation nor obtain urban household registration, known as "hukou" in China (Zhang, L. 2001), and, therefore, are often denied access to the rights and privileges traditionally granted to city dwellers.

China's rural-to-urban migrants have attracted attention domestically and internationally (Liang 2001; Ma and Xiang 1998; Solinger 1999; Zhang, L. 2001). Earlier studies on China's migrant population have reported its "negative" impact on the urban society, such as increasing criminal rates, increasing burdens on urban hygiene and social stability (Wong 1994), and this population's threat to China's family planning policies (Beijing Bureau of Statistics 1996; Tian 1991; Zheng et al. 2001). Recent studies have focused on these migrants' limited resources, such as poor housing and living conditions (Shen 2002; Wu 2002), and their vulnerability to infectious diseases, including HIV and STDs (Anderson et al. 2003; Li et al. 2004). However, studies on this population's healthcare access and health-seeking behaviours have been limited; available studies have primarily focused on the reproductive health of female migrants (Shaokang et al. 2002; Feng et al. 2005).

China's healthcare system has undergone substantial reconstruction since 1978, when the country began moving from a planned economy to a market economy. The healthcare reform featuring "decentralization" and "marketization" has resulted in substantial, and frequently unaffordable, increases in the direct cost to patients, and reduction in health insurance coverage (Liu 2004; Liu and Wang 2001); therefore, this reform has been criticized for causing growing disparity in access to health services, especially for the low income population in both urban and rural China (Akin et al. 2005; Bloom and Xingyuan 1997).

The healthcare reform in China has affected both the rural and urban healthcare systems (Shi 1993). Approximately 80% of the country's total health budget is allocated to funding hospital-based medical facilities in urban areas, although urban residents account for just 30% of the country's population (Zhang, W. 2001). The urban population, which was formerly protected by a government insurance scheme and labour insurance scheme in the 1980s, has been covered primarily by employment-based health financing or social insurance scheme since the 1990s, with more co-payment and less coverage. The urban residents were almost fully covered in the 1980s, but the coverage fell to 52% in 1993 and 39% in 1998 (Gao et al. 2002). There is evidence that the urban residents covered with any insurance are those with regular employment or relatively high income (Gao et al. 2002).

For the rural population, the affordable and generally effective cooperative health insurance reached a peak in the mid-1970s when nearly 90% of the rural population was covered. In the 1980s, rural cooperative health insurance collapsed; the coverage fell to only 5% in 1989 (Bogg et al. 1996; Grogan 1995). Virtually all rural residents must now pay for their healthcare at the point of service. A recent study found that 94.2% of the rural residents had to pay all healthcare expenditures out of their own pockets; a survey in 1998 indicated that 36% of rural residents did

not receive any health services because they could not afford to pay (Mao 2000). Another study in a rural area suggests that financial burden has been a primary reason for not seeking necessary care (Xu et al. 2004).

The rural-to-urban migrants were not covered by any insurance before migration. Because of their "rural residence" (i.e., not having urban household registration, or "hukou"), and the nature of the work available to most of the migrants, they often are not entitled to employment-based health insurance or preventive service available to urban residents, even though they are working in the cities. For example, only 22.5% of female migrants received any maternal health or family planning education, compared to almost 100% of urban residents (Zheng et al. 2001).

Several survey studies have suggested reduced access to healthcare among the Chinese rural-to-urban migrants (Feng et al. 2005; Guan and Jiang 2004; Shaokang et al. 2002). Our quantitative investigation among rural-to-urban migrants in China has also suggested that increase in geographic mobility was associated with inferior health-seeking behaviours (Li et al. 2006). However, qualitative studies on this issue from the perspective of rural-to-urban migrants have been very limited. Our present study, based on 90 in-depth interviews among rural-to-urban migrants in Beijing and Nanjing, will explore their perceptions related to healthcare access in the cities, perceived barriers to formalized medical care, health-seeking behaviours, and the health consequences.

Methods

Research Sites
The data collection procedure of this study has been described elsewhere (Hong et al. in press). Briefly, this study included 90 semi-structured and open-ended individual interviews conducted in two major Chinese cities, Beijing and Nanjing. These interviews were designed to collect qualitative data regarding the cultural and social context of rural-to-urban migrants' lives in the cities. The interviews also served as the formative phase of an HIV/STD intervention feasibility study among young migrants. Beijing, the capital city of the China, has a population of 13.82 million, including three million rural-to-urban migrants, and is located in Northern China (Beijing Bureau of Statistics 2002). Nanjing, with a population of 5.6 million, including 800,000 migrants, is the capital city of Jiangsu Province in East China (Nanjing Bureau of Statistics 2003).

Interview Guide
Open-ended interview guides with suggested probes were constructed based on several informal group discussions among young migrants, local community leaders (both formal and informal), healthcare providers, government officials and project staff. The group discussions were conducted to elucidate topics to be probed in the individual interviews among the migrants. The themes identified from the group discussions served as the foundation for individual interview guides. The resultant interview guides included open-ended questions covering demographic information, migration experiences and living and working in the cities. Questions regarding migrants' access to healthcare services included their perceptions and experiences of seeking healthcare in the cities, their coping strategies and possible consequences. The interview guide used open-ended questions to encourage extended responses.

Procedure
A purposeful sample of 90 participants was recruited at the migrants' work places, labour markets and homes through network sampling. Local community leaders (both formal and informal) in the migrant settlements served as facilitators for the recruitment process. Individual interviews were conducted in places established as convenient for the interviewees. All interviewers were trained faculty members and graduate students from Beijing Normal University and Nanjing University. Each participant was assured of his/her confidentiality in the study, and an informed consent form was signed before the interview started. Each interview took about 60 to 90 minutes; all interviews were audio-taped and

transcribed. The Institutional Review Boards at West Virginia University in the United States, Beijing Normal University and Nanjing University in China approved the study protocol.

Participants

The 90 participants (50 in Beijing and 40 in Nanjing) ranged in age from 16 to 37 years and included approximately equal proportions of males and females. Nineteen of the participants were married; two were divorced, and 69 were single. Thirty-six had completed middle school (compulsory in China – although 14 of the migrants had no more than primary school education), nine had graduated from high school and 30 had graduated from post-secondary schools (including vocational school, three-year colleges, etc.). Forty-six had first migrated to cities between the ages of 16 and 19. The duration of their stay in Beijing or Nanjing varied from one to more than 11 years.

Data Analysis

Data analysis began with multiple readings of the transcripts and field notes, which were in Chinese. Coding themes were developed drawing upon the constructs from the interview guide and new themes emerging during the interview and coding process (Silverman 1993; LeCompte and Schensul 1999). Text coding and analysis were then conducted in Chinese by members of the research team who are Chinese-English bilingual, following the procedures outlined in the recent qualitative literature (La Pelle 2004; Ryan 2004). For each coded transcript, detailed summaries were prepared in English. To minimize the translation bias, a substantial amount of original quotes were retained in the summaries. The summaries reflect the range of responses, with some indication of consistent responses. Because this study is focused on aspects of migrant's healthcare in urban areas, we have confined this analysis to these domains: access to healthcare services in the cities, perceived barriers to formalized medical care facilities, health-seeking behaviours and possible health consequences.

RESULTS

No Healthcare Coverage

None of the participants was covered by any health insurance or was provided with healthcare benefits by their employers. They spent little on healthcare, with most reporting no expenditures or only several yuan a year (approximately eight Chinese yuan = 1 US dollar) and a few reporting expenditures of 50 to 100 yuan. The exceptions to this were the individuals who were involved in trauma or required surgery.

> "Last time my wife came to Nanjing to visit me, she was hit by a car, and had to be hospitalized, we had to pay all the fees, and we spent about 3000 yuan." [Male, aged 27.]
> "I rarely spend any money on medicines. But last year, because I had stones in my urine and had to go to hospital. And my girlfriend was pregnant and had to do an abortion in the hospital. So I spent a lot of money [for healthcare] last year." [Male, aged 25.]

Only two participants reported having received physical examinations, and both were required to do so to obtain health certificates for their work.

Low Utilization of Medical Facilities

Medical services in urban China are delivered primarily through hospital-based facilities, which offer both in-patient and out-patient care (Cohen and Henderson 1983). Chinese people usually refer to "medical facilities" as hospitals. When we asked the participants if there were any medical facilities in their neighbourhood, some stated that they did not know or that hospitals were too far away. Some migrants were able to identify the hospitals close by, but few had visited those hospitals.

> "I don't know, I am not sure. I usually do not go to hospitals." [Male, aged 23.]

"I know there are many hospitals nearby, I know them. But I have never been to any of them." [Female, aged 27.]

"Medical facilities? Hmm, no, there might be some in XXX. But they are too far away." [Male, aged 21.]

Many migrants pointed to pharmacies or small private clinics (usually unlicensed) and referred to them as "medical facilities."

"Yes, there is one, a pharmacy store." [Male, aged 20.]

"There are many pharmacy stores close by, and there is a small clinic." [Female, aged 19.]

"I know some pharmacy stores, but not hospitals. I usually do not go to hospitals." [Female, aged 23.]

"I don't know about hospital, but I know there is a pharmacy store." [Female, aged 27.]

Reasons for not Seeking Formalized Medical Care

"Too Expensive"

The majority of the participants reported that they never or rarely used hospital-based healthcare. Expenses were the most commonly cited explanation for their non-utilization.

"Honestly, people like us came to work in Beijing; we dare not go to the hospital; it is just too expensive...." [Female, aged 27.]

"Unless I am really sick, I definitely will not go to the hospital. It is quite expensive." [Male, aged 24.]

"Hospitals? There is nothing good about them! They only know how to charge you money!" [Male, aged 30.]

Some migrants who had experiences with hospital-based care often felt that the services were not worth the charges.

"Once I went to a hospital, I found it was very expensive, and the doctors in the hospitals had very bad attitudes!" [Female, aged 23.]

"I spent 100 yuan in the hospital just for drops — I felt really bad about spending that money."[Male, aged 24.]

One participant became quite agitated when talking about the costly services offered in the hospital. He shared his own experiences of seeking care for his son in a hospital:

"Hospitals in XX [name of the city]…to be honest with you, I can't afford it. In my hometown, if you spend 1000 yuan, it must be a very serious illness; but in XX, 1000 yuan cost is very common. I just had an experience. My son's hand was cut when he was playing, so I took him to a hospital. They wanted to charge 240 yuan for several stitches. They even wanted to charge 50 yuan for just cleaning the wound. I was really angry, so I left the hospital and went to a small clinic nearby; they only charged 100 yuan for the same operation. I could say the hospitals in XX are darkest in the world!" [Male, aged 30.]

"I Have No Time."

Some migrants reported that they had neither the time to become familiar with hospitals in their neighbourhoods nor the time to visit any hospital for healthcare.

"I don't know any hospital. Because I work from morning 'til night; and we can't go out during

work. In lunch time, they have the lunch boxes delivered to our work site." [Female, aged 27.]
"We don't go to hospitals usually. No time. Once I was really sick, but the work schedule was very tight. I was very sick and almost in coma, but I only stayed in the hospital for half a day and got one shot, and I had to return to work after that." [Male, aged 26.]

"We Should Not Be Spoiled."
For these migrants working hard every day, going to hospital seems a luxury for privileged individuals. As one remarked,

"Migrant workers like us, should not be spoiled." [Male, aged 22.]

Some migrants believed that they themselves were the ones to count on, coupled with a sense of relying on luck.

"People like us working outside [the village] have to learn how to take care of ourselves. If you don't take care of yourself, nobody will." [Female, aged 27.]

"We Can't Get Sick or the Boss Will Get Rid of Us."
Taking a day off and visiting a doctor may be equally "unaffordable." A 20-year-old man used to work in an express-delivery company. One time he was seriously ill, but his employer refused to allow him to leave:

"My stomach and back were causing great pain; but my boss was very busy at that moment. I asked for a sick leave. He said, 'you can't. There are so many things for you to do.' I had no choice but had to hold on. When I really could not hold on, my boss said, 'tell you the truth, you really should not stop, you should hold on by biting your lips.'" [Male, aged 20.]

Another migrant reported that he and his co-worker could not openly discuss their illnesses because of the fear of losing jobs.

"Some of my co-workers have arthritis or something. But even if we are sick we don't say it. If we say it, the boss will get rid of us." [Male, aged 34.]

Coping Strategies
Since many of the migrants do not seek healthcare in regular medical facilities, such as hospitals, how do they take care of themselves when they became ill in the cities? They appeared to employ a wide variety of coping strategies including "just hold on", self-treatment with over the counter (OTC) medicines from pharmacies, having home remedies, obtaining medicines from urban residents and receiving care in private, small (usually unlicensed) clinics. Their very last resort was the hospital, but usually only after they tried many other efforts and considered themselves to be seriously ill.

"Just Hold On"
Many migrants neither took any medicines nor sought any medical care when they were sick:

"I usually just hold on. Usually after seven days, I will be fine again." [Female, aged 19.]

"Unless I am having a fever and cannot move myself out of the bed, I will still go to work. If I am so sick [that I can not get off bed], I will go to a clinic to get a shot and then go back to work. For us, we are already used to that." [Female, aged 30.]

"I don't take medicines, I just hold on. Because if you take medicines, you will feel very weak the next day and can't work." [Male, aged 22.]

"Go to Buy Some Medicines in the Pharmacies"

The most frequently reported coping measure for illness was unsupervised self-treatment with OTC medicines from pharmacies. Buying medicines is considered an efficient alternative to seeking care from a physician, as it saves time as well as money.

> "Because of our work, we often work long hours, so we don't have much choice about what we eat and where we live, and we cannot care much about personal hygiene….we usually prepare some medicines at home, if we get sick like a cold or something, we can be prepared for it." [Male, aged 21.]

> "I rarely get sick. If I do, I always have some medicines at home, no need to go to hospitals." [Male, aged 23.]

> "There are many drug commercials on TV. [If I get sick] I just go to buy some medicines. It takes two or three days, no more than one week and then I will be fine; no need to go to hospital." [Female, aged 30.]

> "If I get sick, I just go to buy some medicines in the pharmacy. My mom told me what to buy before I came here." [Female, aged 22.]

> "If I get sick, just a cold or fever, I just buy some medicines. Ten yuan of medicines will take care of that." [Male, aged 24.]

Home Remedies

Many migrants reported that they used traditional Chinese remedies for self-treatment.

> "If I get sick, like a cold or running a fever, I never go to see a doctor. I usually boil some ginger tea, and it works well. I rarely even have medicines. Ginger tea is very effective." [Male, aged 21.]

> "In Spring, when it is really windy, I often have a headache because of the wind, and I drink some alcohol to take care of that. When I have a cold and cough, I will buy some pears and cook them with rock sugar. After I eat that, I will be fine. I usually don't take medicines." [Male, aged 29.]

Some even performed surgical procedures for themselves.

> "I never go to the hospital. Even one time when I was really in bad luck, and had a dozen corns on my foot, I didn't go to the hospital. I bought a corn gel and had an operation for myself. I bought a knife and cleaned it with alcohol, and then I cut the corns out with the knife." [Male, aged 20.]

"Luckily My [Urban] Friends Have Insurance Cards."

Urban residents who are employed are usually insured through their employer-sponsored healthcare and therefore are entitled to many subsidized medical services, including discounted prescription drugs. Because migrants are not eligible for these services, some migrant workers reported they asked urban residents with insurance for help. Some migrants reported receiving prescription drugs from their urban neighbours or employers, who can easily get discounted medicines with their insurance.

> "We can't get any discount if we go to the hospitals, so we don't go there. We just ask the regular employees [those with urban residence and health insurance, as opposed to the temporary workers] to buy some medicines for us. It is easy for them to get medicines." [Female, aged 26.]

"I used to have very serious neurasthenia. I often woke up at midnight with nausea, and I almost lost my vision. So I had to go to hospital to get some painkillers. It is very expensive in the hospital, and luckily some of my friends have insurance cards. So I asked them to get the medicines for me." [Male, aged 22.]

"I usually don't care if I have a cold or have a fever, unless I really cannot hold on. Then I will ask for some medicines from my co-workers [those with insurance]. [Male, aged 25.]

Sometimes, the urban residents voluntarily offer assistance. A woman working as a domestic servant remarked:

"Sometimes I go to buy some medicines, but most of the time, the 'young aunts' [the urban residents in her neighbourhood] give me the medicines. They said it is easy for them to get medicines. So I didn't reject them and just took them." [Female, aged 35.]

Sought Substandard Care

The high cost and inconvenience of the hospitals had led many migrants to turn to private and usually unlicensed clinics for diagnosis and treatment.

"If I get sick, like running a fever or something, I just go to the small clinics. The clinics are opened for us non-locals. They are run by migrants too, but it is only a single big room." [Male, aged 28.]

The largely unmet medical needs and lack of access to professional healthcare among this large growing migrant population have encouraged the emergence of many private unlicensed clinics. These clinics were welcomed by the migrant workers because of their convenient locations, flexible payment schedules and low cost.

"There are many small clinics in this area, run by my fellow villagers. In our hometown, people are very poor. You get treatment but [if you] have no money, it is OK; you can pay it after the fall harvest. After you sell the crops and collect the money, then you pay the bill. They do the same here; you can get treatment without immediate payment. In my hometown you pay only 20 yuan for drops; here [in the small clinic], you only pay 30 yuan. But in hospitals, they will charge you at least 50 or 60 yuan. It is nonsense." [Male, aged 19].

"The small clinics are convenient and much cheaper. They are close to where I live. And they are for us – migrant workers. They can treat the common illnesses such as cold, fever, and headache. It is good for us as long as they can tell us what kind of medicines to take." [Male, aged 28.]

However, many of these clinics were run by unlicensed or underqualified staff.

"They [the small clinics] don't have the licenses; they just came and opened the clinics. And people in this area like to go to these clinics because we can't afford the big hospitals." [Male aged 19.]

Delayed Treatment

Some migrants did seek medical care in hospitals but usually only after trying many other efforts and perceiving themselves to be seriously ill. For migrants, hospitals are generally the last resort for care when they were left with no other choice.

"Illnesses are big or small. For small illnesses, you can just hold on by yourself; even some big

illnesses, you can buy some medicines by yourself, plus there are many folk medicines. Unless you are really really sick, you don't need to go to hospitals." [Male, aged 20.]

Similar to other populations without health insurance, migrant workers often delayed necessary treatment.

"Many times when I am asleep, I often have cramps in my legs. I wake up and take a deep breath; it really hurts. After a while, it is gone, then I go back to sleep. And the next day it is the same. I know it might be due to lack of calcium. I haven't seen a doctor for this. I am afraid it would be too expensive. I can't afford the expenses." [Male, aged 21.]

When they did receive healthcare in hospitals, the migrants were usually severely ill.
"Last year, I had no place to live, and stayed in the bar [where he works]. It was really cold in winter, really really freezing. I finally caught a cold, and it turned out to be very bad. I was running a fever, more than 39 degrees. I held on for three days and had to go to a hospital, and had three bottles of drops. After a whole night [of staying in hospital], I got much better." [Male, aged 21.]

"I went to a hospital once. I was working continuously for 48 hours. We stayed up a whole night, and then another night. Sometimes we ate a little bit at night; sometimes we even skipped lunch or just had some instant noodles and didn't even have time to drink water. I finally got sick. All the medicines I took didn't work and had to go to a hospital." [Male, aged 24.]

Another migrant relayed how they used hospitals for "big illnesses":
"I only went to the hospital once. It was last year, I slept on a brick floor, and the next day I began to run a fever. I was really sick and homesick and really wanted to go home. I had the fever for three or four days, and later on had to go to a hospital." [Female aged 29.]

Some even delayed treatment for infectious or severe diseases. For example, a young man described his own experience:

"Last time I wanted to donate my blood, but they said my blood had some problem and asked me to have a test. I went to a hospital and the lab showed it was positive for hepatitis B. But they said it is pretty expensive to treat it and it takes time. So I just let it be." [Male, aged 20.]

Discussion
In this study, we found that the high cost of health services and the lack of any health insurance resulted in under-utilization of healthcare services among migrants, which led to a series of ineffective health-seeking behaviours such as unsupervised self-treatment, going to unregulated clinics or "just holding on" without seeking any medical care. By the time they did receive formalized or professional care, they were often seriously ill. These findings were similar to those studies regarding migrant populations in other countries (Bollini and Siem 1995; Hansen and Donohoe 2003). It is worth noting that the most frequently cited reason for their non-utilization and under-utilization of health services was affordability rather than availability. Our findings also suggest that long working hours, lack of sick leave, fear of losing jobs and attitudes of urban healthcare providers are other reasons for their under-utilization of urban medical care facilities and their current suboptimal healthcare-seeking behaviours.

We should note that such problems related to healthcare may not be limited to only the rural-to-urban migrants. In both the rural and urban areas of China, healthcare is becoming a fee-for-service commodity that is more available to the rich than to the poor. As a result, access to healthcare is declining in many sectors of the Chinese population (Smith 1998; Lampton 2003; Liu 2004).

Inadequate access to health services and under-utilization of healthcare among the rural population and urban poor (e.g., unemployed) have been reported (Gao et al. 2002). Therefore, we need to interpret the migrants' healthcare behaviours within the social context of inequality in access to healthcare, one of the negative results of China's healthcare reform (Akin et al. 2005). The "high cost" of seeking professional care as indicated in this study goes beyond the monetary expenses or "out-of-pocket" payment, but reflects a range of institutional barriers including lack of legal urban residence (i.e., "hukou"), low social status, lower income and denied entitlement to employer-sponsored healthcare benefits (Shaokang et al. 2002).

The millions of rural-to-urban migrants account for 9% of the total Chinese population. They provide massive and cheap labour, which is instrumental to China's economic development. In fact some observers suggest that China's economic miracle is resting squarely on the shoulders of these migrant workers. Although they are helping to create the new affluence, only rarely are they reaping their fair share of the benefits (Smith and Fan 1995).

Previous studies conducted among the migrant population suggest that their living and sanitary conditions are often below minimum standards (Li et al. 2006). Migrants in this study also reported that they worked to tight schedules and high pressure, and had poor working and living environments, which may further heighten the risk of introducing new diseases or increasing the prevalence of infectious diseases (such as malaria and TB) (Smith and Fan 1995). Previous studies among Chinese rural-to-urban migrants found that many migrants were at high risk of HIV or STD; some of them also engaged in other risk behaviours such as smoking, drinking and substance abuse (Chen et al. 2004; Li et al. 2004; Lin et al. 2005; Yang et al. 2005). It is also believed that a fundamental challenge to China's ability to deal effectively with the HIV epidemic lies in its poorly developed public health system and in major disparities in healthcare between the rich and poor, between rural and urban populations and across different regions (Grusky et al. 2002). The rural-to-urban migrant population, because of its migratory status and relatively low socioeconomic status, is especially vulnerable to the negative consequences of such disparities in healthcare.

The Chinese government and Chinese society in general are beginning to recognize the need for healthcare among the rural-to-urban migrants (Liu et al. 2002). The first health promotion activity targeting the migrant population took place in Beijing on April 2004 (China Population Network 2004). However, greater efforts are needed to translate the concern into actual policies and implementation. As noted in the introduction, most of the urban residents who are employed receive healthcare benefits from their employers, but these benefits are not extended to rural-to-urban migrants, even though they work in the cities as well. Recently, there has been a growing appeal to reestablish the Corporate Medical Services in rural China, and some pilot programs are already underway (Wang et al. 2005). However, rural-to-urban migrants, because of the separation of their current residence (urban) and their permanent household registration (rural), would most likely be excluded from this proposed healthcare system reform.

The major limitation to this study is the lack of a comparison group for these migrants, either the rural residents or their urban counterparts. The lack of comparison group precludes any conclusion about the relative standing of migrants' healthcare accessibility in comparison with other socioeconomically disadvantaged groups in China (e.g., rural population, urban poor). For example, one may argue that these migrants, because of the increase of their disposable income and wider availability of medical facilities in cities, may actually have better access to healthcare, in comparison with those still living in rural areas. Future study is needed to compare the healthcare access among different populations in China. Nonetheless, the findings of this qualitative study, with a focus on rural-to-urban migrants, a rapidly growing and highly vulnerable population, have significant public health implications. Another limitation to this study is that the participants were recruited from two big metropolitan areas (Beijing and Nanjing) and might not be representative of migrant populations in small cities or other regions in China.

This study underscores the importance of providing affordable and effective healthcare services to this population. Given the large number of migrants and the expected continuous growth of rural-to-urban migration in the coming years, prompt and effective actions are needed. We suggest

the following actions to improve migrants' access to healthcare and promote their health.

First, the government should implement policies that require employers to provide equally affordable insurance coverage to both urban employees and migrant employees. Migrants should not be deprived of entitlement to health benefits and community services because of their household registration status.

Second, the government should subsidize healthcare costs for low-income migrants or those who are self-employed. Subsidization should also be extended to those clinics that provide low-cost services to the low-income population (including migrants).

Third, an immediate progressive solution to improve healthcare services among this population may include appropriate regulation and utilization of the private clinics, which are already popular within the migrant communities because they are accessible and affordable to the migrant population. The government should provide resources as well as oversight to ensure the quality of their services. Appropriate referral systems between private clinics and hospitals should be established so that patients who need complex evaluations or treatment could receive timely and quality services.

Fourth, the rural-to-urban migrants' health can be further promoted by improving their working and living conditions. Finally, community-based health promotion programs should be designed and implemented in the migrant communities to improve their awareness of available resources of healthcare and preventive measures of health maintenance.

Acknowledgments

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Post-intervention Survey on the Knowledge, Attitude, Beliefs and Practices of People in Lagos State, Nigeria about HIV/AIDS

O.U. Manafa, O.A. Ahmed and B.D. Omotola

Abstract

The purpose of this study was to evaluate the impact of a mass-education campaign on knowledge, attitudes and practice of people leaving in Lagos State, Nigeria.

A pre- and post-intervention survey was conducted among 6000 respondents from 116 administrative wards randomly selected from all the 20 Local Government Areas (LGA) in Lagos State (300 respondents per LGA) in January 2002 to document the effect of a series of communication interventions on the prevention of HIV/AIDS implemented between May and December 2001 in the state and to describe the changes that may have occurred in the knowledge base, attitude, beliefs and practices.

The result showed that the level of knowledge is relatively high as indicated in both the pre- and post-intervention survey, though there was a gain in knowledge in some areas after the intervention. Respondent's practices as they relate to issues that cause the spread of the disease did not change significantly after the intervention.

The study demonstrated that mass campaigns using multiple channels can be effective in HIV/AIDS prevention, with the observed positive change and the sustained level of awareness.

Introduction

Together Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) has become one of the most critical developmental issues. HIV/AIDS was initially believed to be a health problem and challenge, but the overwhelming impacts on a number of developmental indices, including life expectancy, affect productive and sexually active age groups, the positive correlation between HIV/AIDS, migration, urbanization as well as cultural changes, are some of the indicators of its role in development.

Since the first case of AIDS was diagnosed in Nigeria in 1986, the disease has systematically permeated the entire social fabric of the country, affecting men, women, adolescents and children, indeed every Nigerian is vulnerable and at risk. The results of the limited periodic national HIV/STI seroprevalence surveillance surveys show that HIV prevalence in Nigeria is increasing progressively among the general population. It rose from 1.8% in 1991 through 5.4% in 1999 to 5.8% in 2001, with women accounting for more than half of the 3.2 million infected individuals. At the end of that year 2001, UNAIDS estimated that 1 million children orphaned by AIDS are living in Nigeria. One million seven hundred thousand of those infected are in the reproductive age group of 15–49 years (NACA 2002). However, there was a drop in the latest 2003 seroprevalence rate of 5%, with approximately 3.8 million Nigerians living with HIV/AIDS. In that year there were about 300,000 new cases and 80,000 children were born to HIV positive mothers (NACA 2004). Despite this, current projections show an increase in the number of new AIDS cases from 250,000 in 2000 to 360,000 by 2010.

Several factors have contributed to the rapid spread of HIV in Nigeria. These include lack of sexual health information and education, stigma and discrimination, poor healthcare services, sexual networking services such as polygamy, low condom use, poverty, low literacy and low status of women, among others.

There are many established strategies currently being pursued globally and in Nigeria to control the spread of HIV, and in all cases communication plays an important and pivotal role because the dissemination of information will lead to prevention of risk behaviours and spread awareness and thus lead to a reduction in social stigma. The World Health Organization (WHO) has advocated the role of education in spreading knowledge of HIV/AIDS transmission. The mass media (radio, television, newspapers and magazines) have been used primarily for this purpose. The effect of mass media as a preventive and control strategy in any part of Nigeria is unknown. There has been no state- or nationwide study to measure the impact of mass media and other education campaigns on peoples' knowledge, attitudes and practices as they relate to HIV/AIDS. This study, which was a pre- and post-intervention survey, looked at the knowledge, attitudes and practices of people living in Lagos State, Nigeria, before and after an intervention (mass campaign) education programme in 2001.

Survey Methodology

The study is part of a larger intervention study sponsored by the Aids Preventive Initiative in Nigeria (APIN) to improve the knowledge, attitudes and practices (KAP) of people of Lagos State, Nigeria, on HIV/AIDS. A baseline KAP survey of the people of Lagos on HIV/AIDS was conducted in March 2001. The baseline survey findings were used to design and adapt an effective HIV/AIDS mass-education programme. Following this, a series of education interventions were conducted between May and November 2001. At the end of the intervention period a follow-up survey was undertaken in February 2002. The follow-up survey was designed to measure the level of HIV/AIDS knowledge, attitudes, beliefs and practices among Lagos State residents. The study was jointly conducted by four non-governmental organizations (NGOs) and the Nigerian Institute of Medical Research, which made up the information, education and communication work group. The four NGOs are: the Association of Volunteers in the International Service (AVSI), HIV/AIDS Concern Group, Hope Worldwide Nigeria and Nigeria Youth AIDS Programme (NYAP). The study was initiated and funded by the Lagos State HIV/AIDS Control Agency with resources from the Aids Preventive Initiative in Nigeria. The study did not receive ethics approval. At the time it was initiated the institute did not have an ethics committee nor was there any in the country readily available to give ethics approval. The institute constituted an Institutional Review Board in November 2003, and reports of all completed studies conducted within the institute from 2000 were submitted to the Review Board as well as protocols for ongoing studies that were initiated from 2000.

Survey Sample

The study followed a pre- and post-design. Baseline surveys were conducted prior to the intervention's introduction in May 2001. The mass-education intervention was held between May and December in 2001 and the post-intervention data collection was carried out in January 2002. The study sampled members of households randomly selected from streets in each of the 20 LGA of Lagos State and these included students, artisans, professionals, educated, non-educated, Christians, Muslims, males and females. An identical sampling technique was used to select samples in both the baseline and follow-up survey. This technique was used because the research did not target specific study groups but targeted the whole Lagos State community and a reliable sampling frame from which to select a random sample of the whole State population was not available at the time of study. The respondents from the baseline and follow-up survey are separate though they were selected in as close a manner as possible, and the same number of samples was used in both surveys. The survey team did not make an attempt to re-contact the baseline respondents.

Demographic Characteristics

In the pre-intervention survey, the study had 61.5% males and 38.5% females with age range from 18-70 years. Majority of the respondents were Christians at the time of study (68.9%) while half were single (50.1%), the rest were either married, separated divorced or were co-habiting. The sample for the post intervention is similar to that of the pre-intervention survey. The study had 59.3% males and 40.7% females, age range 18–70, with the majority being Christians.

Study Site

Lagos State is located on the southwestern part of Nigeria, on the narrow coastal plain of the Blight of Benin. It lies approximately between longitude 20° and 42′ and 3° and 22′ east and between latitude 60° 22′ and 60° and 2′ north. Its landmass covers 358,861 hectares (3,577 sq. km). At the time of study the State was divided into 20 Local Government Area councils (LGA). Historically it has been inhabited by the Aworis and Eguns with an admixture of other pioneer immigrant settlers collectively called "Lagosians." Geographically Lagos State is the smallest state in Nigeria, but ranks highest in population, which is over 5% of the national estimate. The 1991 census figure for the state is 5,725,116.

Study Procedures

The study covered all the 20 LGA in the state. In each of the LGA the number of wards was identified and half (50%) of the wards were randomly selected for the study. The number of streets in each selected ward was identified, and systematic random sampling was used to select streets that were used for the study. A systematic random selection was also used to select the households in each street used for the study. A total of 300 questionnaires were administered per LGA, making a total of 6000 for the entire state.

Recruited participants were engaged in a multi-step intervention process: 1) pre-intervention data collection; 2) participation in the mass rally campaign and group education; and 3) post-intervention data collection.

Survey Team

Ten interviewers were recruited to administer the questionnaire per LGA, while two persons served as supervisors in each LGA. One day of training was held for the supervisors and interviewers in questionnaire administration technique, supervision and collation of data. Five interviewers were assigned to each supervisor. The interviewers administered the questionnaire in the field while the supervisors checked and edited all questionnaires that were returned by the interviewers.

Pre-intervention Knowledge, Attitude and Practice (KAP) Survey

A pre-tested semi-structured questionnaire was used to ascertain respondents' KAP, both in the pre- and post-intervention phases. The questionnaire schedule included the following:

- socio-demographic characteristics of respondents
- respondents' understanding of the causation, transmission, prevention and control of HIV/ AIDS
- their belief system and attitudes towards people living with HIV/AIDS
- their practices and behaviour related to exposure

Mass Campaign

Intervention was conducted in all the 20 LGA and was targeted at all individuals in the LGA. The intervention adopted four approaches, namely: training of members of the Local Action Committee (LAC) on HIV/AIDS; Training of Trainers (TOT) workshop for school teachers; campaign rallies; and radio, television and newspaper messages in clips, jingles and special features articles.

Training Members of the Local Action Committee (LAC) on HIV/AIDS

Members of the LAC were trained in each of the 20 LGA which served as the study sites. The training included the causation, transmission, prevention and control of HIV/AIDS. They were also trained in education and communication intervention schemes and in how to use the various materials adapted for the study intervention.

Training of Trainers (TOT)

A TOT workshop was held for selected teachers in each of the LGA of study. This was aimed at educating teachers on how to provide technical assistance and present education programmes to their students and other members of the community, to improve their presentation skills, gain a deeper knowledge of the study and exchange ideas. The training lasted for three days.

Campaign Rallies

Campaign rallies were held in all 20 of the LGAs. The different LACs together with the four NGOs were involved in the planning and implementation of the rallies. Each campaign rally took place between 9am and 6pm on the scheduled day in each LGA. These were mobile rallies driven around very strategic locations in the state, with at least 10 stops in hot spots such as markets, garages, motor parks, bus stops and such locations where people congregate for different social activities in each LGA.

Group Education

In addition to the mass rallies, a specially targeted group education programme was implemented. This included prevention of HIV/AIDS in workplaces for artisans, immigration officials and sportsmen and women in government sporting centres. The training lasted one day and participants were provided with skills and information to eliminate the risk of HIV infection, proper handling of work equipment and tools to avoid HIV infection and desirable behaviour and practices for healthy leaving.

Education Packages

Several education packages targeted to different social groups (e.g., parents, women, men, adoles- cents, truck drivers among others) that were earlier developed by the National AIDS Control Agency in collaboration with international agencies like the United Nations Children's Fund (UNICEF) were adopted and adapted for distribution in each of the mass campaign rallies, with relevant talk and demonstration. Banners, T-shirts, face caps and other memorabilia were designed and distrib-

uted to participating public members as reminders of the awareness programmes, while adequate print and electronic media coverage was given to the programme.

Follow-up Survey (Post-intervention Survey)

After the baseline KAP survey, the training and the campaigns/educational intervention, a follow-up survey was carried out in the same way as the baseline pre-intervention survey. The result permitted pre- and post-intervention comparison.

Statistical Methods

The data generated was analysed using the EPI info software version 6.04. Data collected on the demographic and the KAP of respondents were analysed using descriptive statistics. Statistical comparisons of data were tested using the chi-square and Students t test at a significance level of 5%.

Limitations of the Survey

This study like other pre- and post-intervention surveys has some limitations and these include:

- Samples were not randomly selected, though attempts were made to reach a broad group of the population.
- Differences exist in the demographic characteristics of respondents of the baseline and follow-up surveys, though attempts were made to select them in as close a manner as possible.
- Bias may have been introduced based on the individual people selected to be interviewed in each household, as each interviewer chose anyone from within the household selected. It may be that those not chosen might have better or worse KAP on HIV/AIDS, but how this affected the study might be unclear.
- As in all surveys social desirability may have occurred, as respondents may have modified their answers according to their perceptions of interviewer's expectations.
- The result cannot be applied to the general population and since the survey did not have a control group, it cannot be categorically stated that the observed outcome was as a result of the intervention. Advertisements on increasing awareness on HIV/AIDS are available in the media in the state and a toll-free hotline for information on the subject was made available by the State government. These various education measures might have made an impact on the populace and could have affected the outcome of this study.

Though advertisements to increase awareness on HIV/AIDS were communicated through the media, the APIN intervention was a comprehensive and extensive outreach that used many methods and materials and some of the materials were specifically adapted to reach a particular audience.

Results

The study revealed that the overall level of awareness of HIV/AIDS among the sampled respondents in the post-intervention survey is 96%, a result similar to that obtained in the baseline (95%). The percentage of those receiving information from various channels increased, though not significantly from the baseline, and 18.2% in the post-intervention study indicated the street campaign as their channel of information (Table 1). As in the pre-intervention survey, there was no significant difference between the sexes in the level of awareness. The rate of awareness increased with increasing educational status with those having tertiary education and above being more aware. This is statistically significant both in the pre-intervention and post-intervention surveys.

Peoples' belief that HIV/AIDS exists did not change after the intervention, 94.3% and 93.2% in the post- and pre-intervention survey respectively did believe that HIV/ADS exists. Belief in the existence of HIV/AIDS was higher in the younger age group and was highest in age group of

20–29 in both surveys; however, a significant difference occurred in the belief about existence in the older age range (50 years and above) with 82.1% in the post-intervention survey and 41.8% in the pre-intervention survey.

Table 1. Distribution of level of awareness of HIV/AIDS by sources of information

Source of information	Pre-intervention	Post-intervention
Relations	4.4	6.7
Friends/neighbours	28.3	29.6
Newspapers	23.4	21.2
Radio/TV	73.7	79.3
School	4.5	8.4
Health facility	4.6	8.6
Street campaign	-	18.2

The level of knowledge of HIV/AIDS in Lagos was relatively high, as indicated in both surveys, though some improvement was made after the intervention. The number of respondents mentioning at least one route of infection increased. 86.3% in the post-intervention survey and 79.5% in the pre-intervention survey rated unprotected sexual relationships as the major route of infection. Other methods of infection identified were: sharing of needles and sharp objects, 46.5% (post), 39.1% (pre); blood transfusion, 29.8% (post) and 24.9%, (pre) (Figure 1). In both surveys their level of education influenced their identification of the route of infection and so did religion. The increase in their level of knowledge about the route of infection was accompanied by an increase in condom

Figure 1. Respondents' perception on how one can be infected with HIV
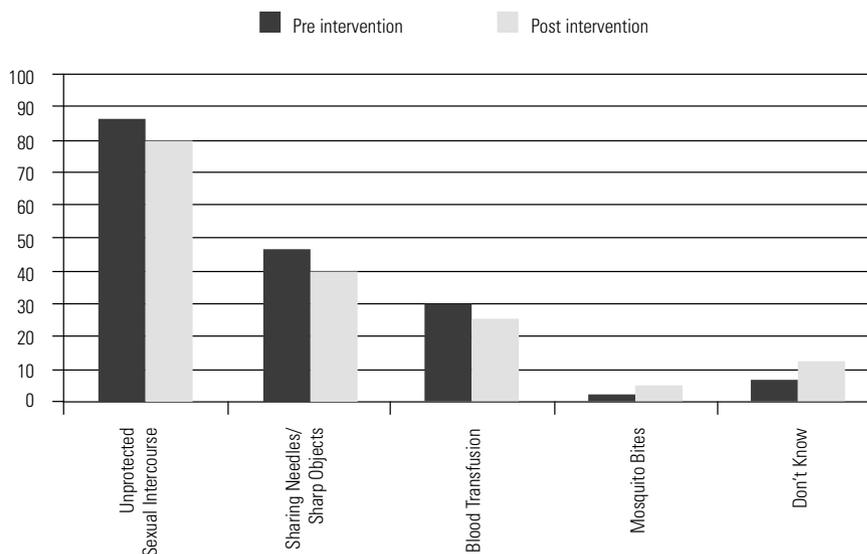
use. The percentage of respondents that use condoms during sexual intercourse increased 46.9% and 38.4% in the post- and pre-intervention studies respectively. A percentage of the study population changed from occasional users to regular users after the intervention, the percentages being 42% and 39.8% in the post- and pre-intervention studies respectively. No significant difference was observed between demographic characteristics of respondents and condom use in the pre- and post-intervention surveys.

The follow-up survey indicated a remarkable improvement in the respondents' perception on identifying people that are HIV positive. Seventy-five percent admitted they did not know how one could identify a person infected with HIV as against 42.3% at baseline. Despite this, respondents believed that there are indicators by which one could identify those with full blown AIDS, with frequent illness being the most mentioned indicator. Forty-eight percent of them affirmed that laboratory tests is the only sure means of identifying persons infected with HIV in the post-intervention survey; the percentage was 22.3 in the baseline survey.

It is interesting to note that the majority of respondents in the post-intervention survey believed that HIV/AIDS mass campaigns are a result-yielding tool in the control of the disease. The post-intervention survey also indicated a significant improvement in their knowledge on the control of the infection, with 47.8% and 12.7% mentioning mutual fidelity respectively in the post- and pre-intervention surveys. Other methods of control are education campaign, abstinence from sex, use of new syringes and obeying God's word (Figure 2). Similar to the pre-intervention survey, significant differences were demonstrated in their knowledge of control measures and socio-demographic characteristics measured by age, sex and level of education.

Figure 2. Respondents' perception on how the spread of HIV/AIDS can be controlled
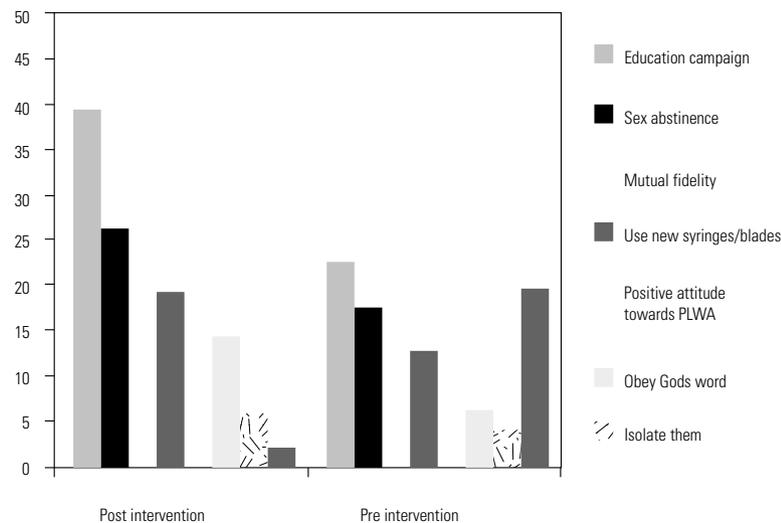
The level of knowledge about HIV infection prevention increased significantly following the intervention. The proportion mentioning different kinds of preventive methods increased from the baseline, with abstinence (58.2% in post-intervention survey) topping the list as against 27.6% in the baseline. Other preventive measures mentioned in both surveys, but at a higher percentage in the post-intervention survey, are regular use of condoms, avoiding the sharing of needles and other sharp objects, mutual fidelity and avoiding blood transfusions. In the baseline survey, 40.3% of the respondents indicated that they did not know any method of prevention; this improved significantly in the follow-up survey, as the percentage of "do not know" decreased to 4.2 (Figure 3).

Figure 3. Respondents' perception on the prevention of HIV infection
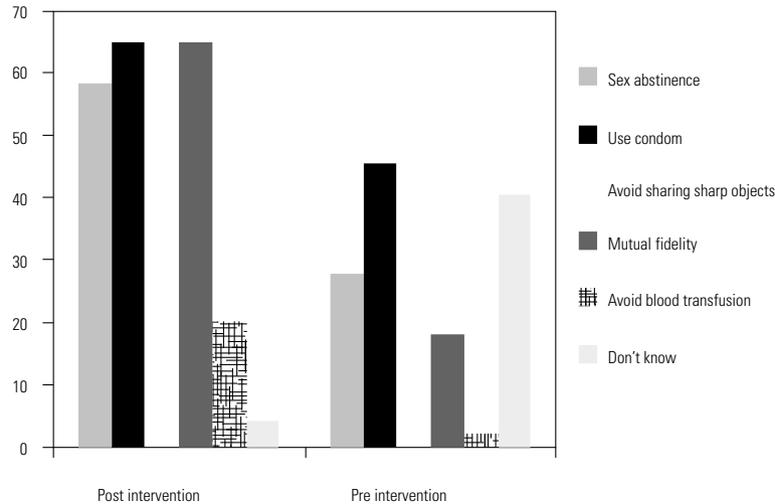
Their level of knowledge about associated risks between HIV/AIDS and sexually transmitted infections (STI) increased with 83.8% of the respondents in the post-intervention survey affirming that there are associated risks between HIV/AIDS and STIs as against 62.5% of the pre-intervention survey. The knowledge of the associated risks between HIV/AIDS and STIs gradually increased with the educational status of respondents both in the pre- and post-intervention surveys, but the increase was more remarkable in the post-intervention survey (Figure 4).

Figure 4. Relationship between education and awareness of associated risk between HIV/AIDS and STIs
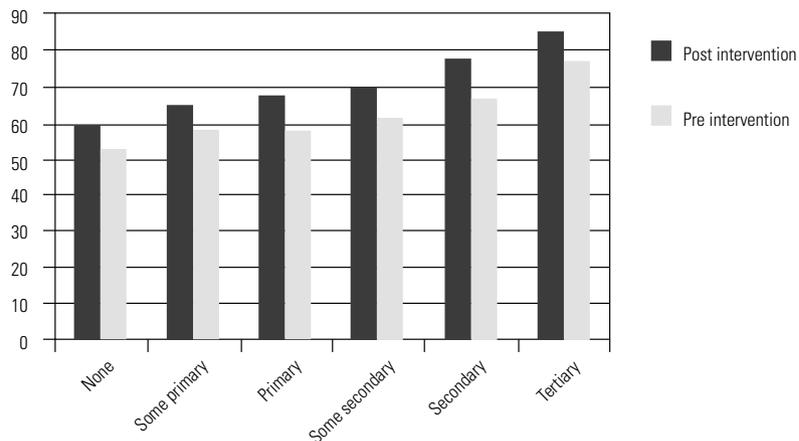
In both the interventions, knowledge about the cure of HIV/AIDS varied. The percentage of people that did know that there is no cure for the disease as at the time of interview increased significantly from 11.2% in the pre-intervention survey to 38.4% in the post-intervention survey. Despite the intervention, quite a proportion still think one can obtain cure through traditional means.

The follow-up survey did not record much change in the respondents' attitude towards people living with AIDS (PLWA). The baseline survey revealed that respondents' general attitudes towards (PLWA) was very negative, with only 30.4% admitting that they will relate with PLWA as normal human beings. The percentage increased slightly to 33.9% in the post-intervention survey. Attitudes during both survey were not influenced by gender and education but were significantly influenced by age, with the older respondents having very negative attitudes.

As in the pre-intervention survey, more than half of the respondents had one or more sexual partners. The percentages are 38.1% and 40.1% for one sexual partner and 23.7% and 25.1% for two partners in the post- and pre-intervention surveys respectively. There was only a slight percentage decrease of those with two sexual partners. The number of people that had three or more sexual partners decreased after the intervention from 23.4% to 19.5%.

Discussion

Mass media and other forms of education campaigns have been used in various tropical countries including Nigeria to convey information, promote healthy practices and reduce transmission of HIV/AIDS and some other tropical diseases. The impact of educational intervention programmes on other conditions, for example, onchocerciasis, have been documented and reported to be effective in Nigeria (Manafa et al. 2003). This study extends information on the impact of mass education on HIV/AIDS.

The pre-intervention survey KAP of the people towards HIV/AIDS indicated an awareness of the disease. Their level of contact with the mass media and interactions with friends seemed to be important factors in determining and explaining people's KAP about the disease. Study from other countries indicated that the mass media have been very important sources for HIV/AIDS information (Benfo 2004).

There is no difference in the aggregate score of level of awareness between the pre- and post-intervention stages for both surveys. This implies that awareness, which is a fundamental requirement to behaviour changes in relation to HIV/AIDS, was high in Lagos State, even before the intervention, due to the high profile status enjoyed by HIV/AIDS information, education and communication in the last three to four years that resulted in the Nigerian government accepting the challenge of becoming the arrowhead of HIV/AIDS control in Africa.

Though studies from the literature indicate that people of low socio-economic status are not only economically poor but also find themselves severely restricted to basic information including health information, the post- and pre-intervention surveys were able to identify significant changes in levels of awareness across the states, but on aggregate terms, access to HIV/AIDS information in Lagos did not reflect the inequality in socio-economic status. Mass media as typified by television, radio, newspaper, magazines, pamphlets and stickers are the most singular important source of information, which is a similar to observation that of Ross and Carson (1988). Interpersonal information through friends, neighbours, workplaces and health facilities were also important source of AIDS information, which is in line with observations in other countries and studies.

It is interesting that similar proportions of the aggregate respondents did not have significantly improved knowledge, attitudes or practices in some areas. This observation may give an erroneous impression that the campaign had little or no impact on the population, rather the methodology applied to the study may be responsible for such observations. The messages were mass communicated and did not specifically target the respondents.

However, there appeared to be improvement in some other key knowledge areas such as identification of persons with HIV. Similarly, a significantly higher proportion was able to identify severe rapid weight loss and frequent sickness as signs and symptoms that could be used to identify PLWA. This observation could be attributable to the effect of the campaigns and mass communication.

The knowledge of the respondents on how HIV/AIDS can be controlled appeared to have increased with a significantly higher proportion identifying the positive role of mass campaigns,

abstinence and mutual fidelity of married couples as priority control measures. Other areas where improvement occurred in knowledge included the associated risks between HIV/AIDS and STIs, =HIV/AIDS and blood transfusions as well as regular use of condom.

Attitudes towards PLWA appeared not to have significantly changed, particularly with issues of stigmatization with similar proportions in the pre- and post-intervention surveys indicating they will avoid them. However, significantly higher proportions identified advice and counselling as a positive attitude towards PLWA in the post-intervention survey. In general terms the population appeared to be adopting some positive attitudes towards PLWA, which could be further enhanced with appropriate sustained messages.

Risk behaviours appeared to have changed slightly, with 43.2% having multiple sex partners compared to 48.5% in the pre-intervention survey. Similarly the proportion of occasional condom users increased slightly across the state. Previous awareness as indicated in the pre-intervention survey and their improved KAP does not mean that people have fully and generally forsaken long-standing behaviours and practices and support the view that education campaigns should be continuous until reasonable behavioural changes are observed and recorded within target communities. The gap in the distribution of knowledge and behaviour has also been described by Benfo (2004) in Ghana as well as in so many other developing countries as reported by Caldwell (1999) and WHO/GPA (2000).

Behaviours are generally influenced by factors such as age, education, social status, religious beliefs and the environment within which such populations reside. A fundamental assumption that is also true is that the information available and how such information is perceived, analysed and manipulated by societal values and norms influence behaviour. The intervention services of the dissemination of HIV/AIDS messages were able to identify most of the audiences and specific messages and channels that were used, thus the justification for using print media to capture the literate audience, radio, television and short plays/films for families, concerts, rallies and displays to capture the attention and interest of youths, while discussions and workshops at workplaces provided the needed messages to workers.

The study observed that the fear of God in terms of obedience to God's rules and laws was also given significant recognition, thus the need to utilize religious organizations as channels for dissemination of HIV/AIDS messages.

This study recorded some improvements in peoples' KAP towards HIV/AIDS after an education campaign. It also fully suggests that educational campaigns should be done on a continuous basis and assessed so as to measure their impact on the target populations.

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Limitations to Access and Use of Antiretroviral Therapy (ART) Among HIV Positive Persons in Lagos, Nigeria

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Abstract

The study was designed to examine the knowledge and perception of HIV positive persons about the antiretroviral therapy (ART) program and to determine their ability to pay for ART and the treatment of other opportunistic infections in Nigeria. This is aimed at identifying factors that may impede effective delivery and utilization of ART in the country. One hundred and twenty-five HIV positive persons seeking ART at the Nigerian Institute of Medical Research (NIMR) clinic, Lagos, were studied using questionnaires. Respondents' average monthly income was ₦11,253.00 (US$90.00). Almost 26% (25.6%) were unwilling to seek ART at the nearest hospital because of fear of stigmatization. While 9% wanted the therapy for free, the majority was willing to pay ₦500.00 (US$4.00) per month. The average affordable price based on the subjects' assessment was ₦905.00 (US$7.24), while the median was ₦500.00 (US$4.00) per month. Eighty-eight percent believed ART would prolong their lives. The ART drugs need to be affordable and building on the positive perceptions of ART is imperative.

Introduction

It is generally acknowledged that there is no cure currently available for HIV/AIDS (Jackson 2002; Lamptey et al. 2002). The last few years of the 20th century saw enormous progress and rapid transformation in the treatment of HIV/AIDS using antiretroviral therapy (ART) (Mocroft et al. 1998; Jackson 2002). While the availability and wide distribution of antiretroviral drugs in developed countries have proven to be effective in drastically reducing morbidity and mortality associated with HIV infection (Palella et al. 1998; Tarantola 2000; WHO 2000; Jackson 2002; Lamptey et al. 2002), the world is now confronted with the necessity of accelerating access to care and treatment in developing countries where approximately 95% of the world's population with HIV/AIDS lives (UNAIDS 2001; 2002; WHO 2003). It is estimated that less than 5% of people in urgent need of

ART currently use these treatments in developing countries such as in Nigeria (UNAIDS/WHO 2002a; WHO 2002a; 2003). It is consequent to this that the Accelerating Access Initiative otherwise tagged '3 by 5' Initiative was announced by the World Health Organisation (WHO) and the Joint United Nations Programme on HIV/AIDS (UNAIDS) to achieve accessibility of three million HIV positive persons to antiretroviral treatment by 2005. The initiative was taken to accelerate access by bridging treatment gaps through public-private partnership in countries. A fundamental principle of the Accelerating Access Initiative is that HIV positive persons need to play a central role in designing, implementing and monitoring ART programmes (UNAIDS/WHO 2002b; UNAIDS 2004).

In Nigeria, plans to make ART available and accessible to an estimated 4.9 million HIV positive persons were completed in late 2001 (National AIDS/STDs Control Program 2001; UNAIDS 2002). With the commencement of the treatment program with the combination of stavudine, lamivudine and nevirapine, about 10,000 adults and 5,000 children of the estimated total number of 4.9 million infected persons in the country are to be treated in selected health institutions across the country during the first year; the program will later be scaled up. People undergoing treatment will pay US$120 per year and the government will cover the remaining cost (UNAIDS 2002).

On the other hand, very little is known about the knowledge, perception and acceptability of ART among HIV positive persons in Nigeria. Information on the perception of ART among HIV positive persons in the country is important in understanding and determining the likelihood with which they will be willing to accept and seek the drug therapy prior to the program's scale-up.

Here we present the knowledge and perception of HIV positive persons about the ART program in Nigeria as prerequisite information on factors that might impede its effective delivery and utilization.

Materials and Methods

The study was carried out at the Nigerian Institute of Medical Research (NIMR) clinic designated for treatment of HIV/AIDS patients located in Lagos State (6 25N, 3 27E geographic coordinates), south-west Nigeria, the catchment areas, Lagos, predominantly comprised of *Yoruba*-speaking communities with urban and rural settlements. Nevertheless, the state is cosmopolitan, with a population of about 13 million people. It serves as a melting pot of people with diverse ethnic and socio-cultural backgrounds from all parts of the country, comprised of *Yoruba* from the south-west, *Igbo* from the south-east and *Hausa* from the north, as well as people of other nationalities. The people are a mix of Christians, Muslims and indigenous religious practitioners. Lagos being a former capital of Nigeria remains the commercial and industrial nerve centre of the country. The Lagos State HIV prevalence rate is 3.5% (urban 2.1% and rural 6.3%) (National AIDS/STDs Control Program 2001). The NIMR clinic serves as referral facility for HIV positive persons in Lagos State and also draws patients from other parts of the south-west Nigeria.

One hundred and twenty-five HIV positive persons seeking ART at the NIMR clinic, Lagos, 60 males and 65 females, were studied using semi-structured questionnaires between March and October 2002 following their informed consent. A sample size of 114 but approximated to 125 in case of drop-outs was calculated using the table for a minimum sample size estimate for a population survey with 95% confidence interval (Lemeshow et al. 1990). The sample size was calculated using the formula:

$$n = \frac{Z^2 p(1-p)}{d^2}$$

where n = sample size, Z = 1.96, p = 0.05, d = 0.04

$$n = \frac{1.96^2 [0.05(1-0.05)]}{0.04^2} = 114$$

Prior to the study proper, a pilot study was carried out using a similar setting through which the questionnaire was validated. An exit method of interview was adopted in administering the questionnaire during the survey. The respondents were selected using the systematic random sampling method (Neuman 1994; Moser and Kalton 1997). The clinic register of patients booked for consultation on clinic days during the survey period was used as the sampling frame. The samples for both the males and females were drawn separately to ensure adequacy and representativeness of the overall sample. The data from the clinic survey were analyzed using the EpiInfo 6.04a software. The study protocol was reviewed and approved by the Institutional Review Board of the Nigerian Institute of Medical Research, Lagos.

Results

Of the 125 respondents interviewed, 52% were females and 48% were males. The age of the respondents ranged from 15 to 60 years and the mean age was 35.3 years with a median of 34 years. Most (31.2%) of the respondents were aged 30–34 years. While 21.6%, 18.4% and 14.4% were 35–39, 40–44 and 25–29 years respectively, 4.8% and 4.0% were 45–49 years and 50 years and above accordingly. Almost 5% (4.8%) of the respondents were adolescents aged 15–24 years. The age by sex distribution of the respondents is presented in Figure 1. The respondents reported a high level of literacy, as 96.8% had formal education: primary (19.2%); secondary (37.6%); and tertiary (40.0%). Only 2.4% had no formal education, and 0.8% was indifferent. Their marital status was as follows: single (30.4%), married (58.4%), separated (0.8%) and widowed (10.4%). Of the 125 respondents, 36.9% were traders, 23% were formally employed and 16.4% were unemployed. Respondents' average monthly income was ₦11,253.00 (US$90.00) and median was ₦7,500.00 (US$60.00). Of the patients, 48% in Figure 2 either earn no income or earn below the national monthly minimum wage of ₦7,500.00 (US$60.00).

Figure 1. Sex distribution of respondents by age
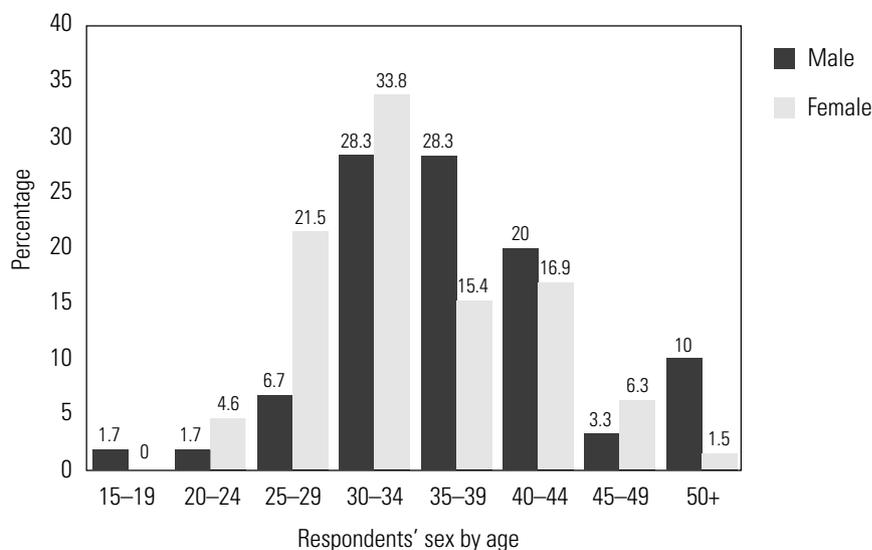
Fifty-five (44.0%) were diagnosed HIV positive ≤6 months to interview, 22.4% 7–12 months, 24.8% 1–3 years, 8% > 3 years and 0.8% could not remember. With 80 (64.0%) never seeking any treatment prior to specifically seeking ART, 45 (36.0%) had previously sought care and treatment of opportunistic infections not specifically involving use of antiretroviral drugs from different places

Figure 2. Income distribution of respondents

Income (Naira/Per Month)
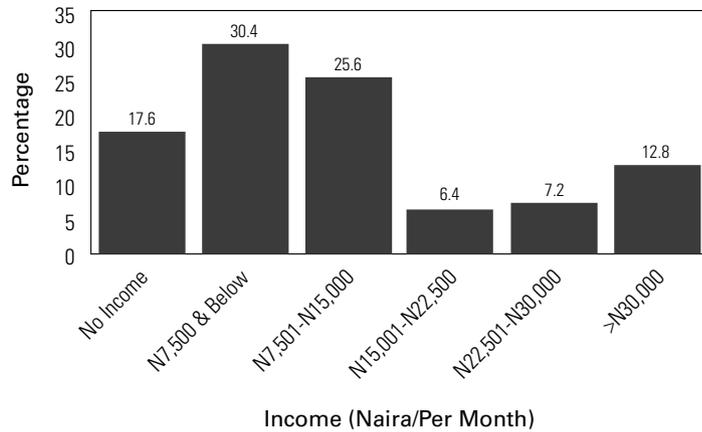
prior to seeking ART for an average of nine months and a median of three months: public hospitals (22.2%); private hospitals (26.7%); NGOs (15.6%); traditional healers (4.4%); church (2.2%) and 28.9% were indifferent. The average monthly treatment cost reported by the latter category of respondents was ₦32,419.00 (US$259.00) and median was ₦8,150.00 (US$65.00). Reasons given by those who had not previously sought any treatment prior to the ART included: disbelief in the test result (3.8%); no sign of illness yet (5.0%); no cure yet (6.3%); high cost of ART (8.8%); have just been diagnosed HIV positive (23.8%); lack of knowledge of where to go or what to do (28.8%); other reasons such as fear of being used as 'guinea pigs' by fake medical practitioners and herbalists claiming to have cure (4.7%); and no reason at all (18.8%). Thirty-two (25.6%) of the patients were unwilling to seek ART at the nearest hospital because of strong fears of stigmatization and discrimination.

Figure 3. Perceived fair price for ART among patients

Perceived Price (Naira)
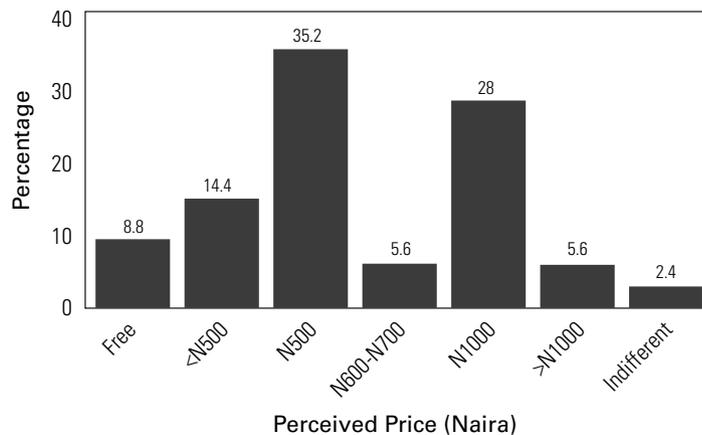
The major sources of information about the ART program among the respondents were hospitals (27.2%), television (15.2%), NGOs (14.4%), friends/neighbours (12.8%), relations (10.4%), radio (6.4%), newspapers (5.6%) and can't remember (8.0%).

The respondents were asked to indicate an amount of money that they would be willing to pay for ART per month based on their financial situation, other expenses and the role of the government in subsidizing the cost of ART in the country. While 9% wanted the therapy for free as illustrated in Figure 3, a majority (35.2%) was willing to pay ₦500.00 (US$4.00) per month. The average affordable amount of money the respondents were willing to pay was ₦905.00 (US$7.24) while the median was ₦500.00 (US$4.00) per month. Reasons justifying the perceived affordable amount of money by the respondents were: low income/poverty (44.8%), enhanced affordability for patients (35.2%), other complementary drugs to buy and routine laboratory tests to be done (4.0%) and ART should be free for government is buoyant (3.2%). Figures presented in Table 1 shows the costs of all laboratory tests to be done by the respondents before undergoing treatment (at baseline) and every three-month interval as routine tests while on ART. The respondents would pay a total of ₦40,000.00 (US$320.00) per year (i.e., ₦10,000.00/3 months x 4). In addition, the specified amount the respondents pay monthly for ART at the NIMR clinic is ₦1,000.00 (US$8.00) [i.e. ₦12,000.00 (US$96.00) per year].

Table 1. Costs of routine laboratory monitoring tests for HIV/AIDS patients at NIMR clinic, Lagos

Tests	Cost (₦)	Cost ($)
1. HIV Viral Load	4,500.00	36.00
2. CD4 Cell Count	2,000.00	16.00
3. Haematology (haemoglobin, WBC, lymphocytes, platelet etc.)	1,000.00	8.00
4. Clinical Chemistry (sodium, potassium, urea, glucose, creatinine, HDL & LDL cholesterol, triglycerides etc.)	2,500.00	20.00
Total	₦10,000.00	$80.00

*Exchange Rate: US$1.00 = ₦125.00
Source: Price List of Services, Human Virology Laboratory, Nigerian Institute of Medical
Research (NIMR), Lagos, 2005.

It needs to be emphasized that 4.8% of the respondents expressed their concern over the sustainability of the ART program by the government, with less concern for the cost. Many of the respondents expected better care, going beyond just access to ART. Only 6.4% were unwilling to pay for treatment of opportunistic infections with 3.2% undecided.

Overall, 88% had positive perceptions about the ART program, with the belief that the drugs would prolong their lives. However, when asked if they would be willing to seek ART when it is being scaled up and is made available at any nearest designated health facility to their homes other than the NIMR clinic, which is one of the 25 selected clinics for pilot study of the ART program across the country, 69.6% responded in the affirmative while 25.6% and 4.8% were unwilling and undecided respectively. While those willing mentioned convenience and easy accessibility as their reasons, those unwilling were bothered with the problems of stigmatization and discrimination if seen visiting such clinics in their neighbourhood (45.5%) and fear of getting fake or substandard ART drugs if the program is expanded.

Discussion

The high preponderance of females who were in the prime age of childbearing among the patients as illustrated in Figure 1 calls for more serious efforts to be directed towards making nevirapine

therapy above all more adequately accessible for them and many others who may desire to have children. We believe that adequate provision of nevirapine therapy for this category of HIV positive persons will go a long way in controlling the spread of HIV through mother-to-child transmission of the virus.

Moreover, Figure 1 confirmed earlier findings that in sub-Saharan Africa where Nigeria belongs, women are generally infected at a younger age (mostly younger than 25 years) than men (Jackson 2002; Lamptey et al. 2002). Young people's (adolescents aged 15–24 years) vulnerability to HIV infection was further affirmed by the results of the study as some of the respondents interviewed were in this age group. Their vulnerability is perhaps attributable to their scant knowledge of the mechanisms of HIV transmission and how the infection could be avoided. The results further confirmed the fact that HIV/AIDS affects people in their prime working ages of 15–49 years (National AIDS/STDs Control Program 2002). These findings underscore the urgent need for more adequate sexual and reproductive health education emphasizing vulnerability to HIV infection in the community targeting these populations.

The fact that the majority of the respondents were informed about ART and had been referred for the therapy by hospital directors and NGOs is encouraging. The present referral system for the program can still be reviewed and improved upon in order to enhance the accessibility of larger numbers of HIV positive persons, particularly those in remote rural areas to the therapy. To complement the efforts of government on the ART program, community- and faith-based organizations need be involved and encouraged to carry out large-scale, effective psycho-social interventions with far-reaching effects into local rural areas, as meeting the needs of HIV positive persons involves much more than ART and medical care. The knowledge and experience of these organizations will complement the national treatment program and help sustain long-term community engagement with ART. Moreover, providing ART to HIV positive persons carries social and economic costs that need be weighed against the benefits. Hence, an effective response to meeting the needs of HIV positive persons requires a multi-sectoral approach.

The willingness to pay for the treatment of opportunistic infections is encouraging. However, addressing the perceived high cost of the drugs by the respondents in the study and the costs of laboratory tests they are expected to pay for, in line with their income distribution in Figure 2, there is a need to make the drugs and the routine laboratory monitoring tests more affordable for the average HIV positive person in resource-limited settings such as Nigeria. In a country like Nigeria where the per capita income according to the Public Reference Bureau (2002) is US$800.00 and HIV positive persons require an adequate balanced diet and are expected to pay about ₦12,000.00 (US$96.00) and ₦40,000.00 (US$320.00) for ART and laboratory monitoring tests respectively per year, the costs of the routine laboratory monitoring tests are going to be more prohibitive for these patients because this amount is 3.3 times higher than the fixed cost of ART and 80 times higher than the affordable cost the respondents were willing to pay.

The costs of treatment and laboratory tests in particular need to be made more affordable because the high cost of medicines is a major factor limiting access to ART in developing countries, a fact which was emphasized by UNAIDS/WHO (2002b) and WHO (2002b; 2003). A situation where the larger proportion of HIV positive persons are either unemployed or earn a monthly income of ₦7,500.00 (US$60.00) or less as illustrated in Figure 2 will limit their purchasing power and impede meeting the goal of the Accelerating Access Initiative in the country in particular and the global target of WHO's 3 by 5 initiative.

On the respondents' fears about the sustainability of ART and the quality of drugs, it needs be realized that ART is a life-long commitment; interruptions to supply can endanger life and lead to the development of drug-resistant strains of the virus. Hence, the provision of maximum possible support to ongoing efforts needs to be made to develop efficient procurement mechanisms and supply management programs. The drug chain for the ART program during expansion requires optimum conditions of implementation to allay the fear of the patients about the quality of the drugs. It is essential that standards are developed and adhered to across the range of activities and

services necessary to provide HIV treatment regardless of location as emphasized by WHO (2002c). More importantly, awareness about the treatment program needs to be created using far-reaching media like radio.

It is encouraging that a large proportion of the respondents interviewed had a significantly positive perception about the ART program. It is therefore imperative to build on the positive perceptions about the program by scaling up from pilot projects to widespread access to ART and to embrace a strategy that reduces fear of stigmatization and discrimination being felt and experienced by HIV positive persons. Knowledge of HIV status in a socially supportive environment will be a significant motivator for individuals to seek ART just as positive perceptions about the ART program could motivate individuals seeking HIV testing and counselling. This is imperative particularly in a situation where it is estimated by UNAIDS/WHO (2002a) that 9 out of 10 HIV-infected people in sub-Saharan Africa do not know their sero-status. In addition, increased access to treatment and care must be linked with prevention. Care and prevention are two sides of the same coin – better care for HIV positive persons will have little impact if not linked with prevention programs, including counselling and testing. By reinforcing and strengthening prevention efforts, the country can avoid the dilemma emphasized by WHO (2003) in which the benefits of reduced morbidity and mortality among HIV positive persons have been undermined by rising infection rates.

It needs to be emphasized that one of the limitations of the study is the sample size of those interviewed. The rationale for this sample was that 125 was deemed adequate and representative of the about 10,000 HIV positive adults being treated under government ART program in selected health institutions across Nigeria compared to an estimated 4.9 million HIV positive persons who are eligible for ART in the country at the time of the study, given the limited resources available at our disposal to ensure successful completion of the study. Another limitation of the study is the subjective nature of the survey considering that all the results are based on reports by the interviewed individuals. These, however, do not undermine the validity of the results, as further studies need to be carried out using larger samples.

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Appendix I

Survey Questionnaire on the Perception of HIV Positive Persons on Antiretroviral Therapy

QNo_____ Facility_____
Name of respondents_____
Interviewer_____ Date of interview_____
Interview starts_____ Interview ends_____

Section A: Background of respondent
1. Sex: (1) Male   (2) Female
2. Age (in years) _____
3. Occupation   (1) Unemployed   (2) Trading   (3) Farming   (4) Artisan:
    (5) Professional   (6) Housewife   (7) Other (please specify)_____
4. Education   (1) None   (2) Primary   (3) Secondary   (4) Tertiary
    (5) Other (please specify)_____
5. Religion   (1) Christianity   (2) Islam   (3) Traditional
    (4) Other (please specify)_____
6. Marital status   (1) Never married   (2) Married   (3) Divorced   (4) Separated
    (5) Widowed
7. What is your earning per month? _____

Section B: Respondent's sick role behaviour
8. When were you diagnosed to be HIV positive?   (1) < 6 months   (2) 7-12 months
    (3) 1-3 years   (4 > 3 years:
9. What do you know about HIV/AIDS?_____
    _____
    _____
10. Have you sought HIV treatment for since you were diagnosed?
    (1) Yes   (2) No   [**If Q.1 is no, please respond to Q.11 and go to Q.28**]
11. If Q.10 is no, why have you not sought treatment?_____
    _____
    _____
12. If Q.10 is yes, where do you usually seek treatment?_____
    _____
    [**If treatment does not involve drug use, please go to Q.19**]
13. Kindly describe the treatment procedure(s)_____
    _____
    _____
14. How long have you been seeking the treatment?_____
15. At what interval do you go for the treatment?   (1) Anytime   (2) Every week
    (3) Every month   (4) Every month   (5) Every 2 months
    (6) Other (please specify)_____
16. How do you perceive the treatment you usually sought and receive?_____
    _____
    _____
17. Following treatment, what is your health condition usually like?
    (1) Improved greatly   (2) Improved somewhat   (3) About the same   (4) Worse
18. Do you experience any side effects after taking the drug?   (1) Yes   (2) No
19. Do you take herbs for your treatment?   (1) Yes   (2) No

[If Q.19 is no, please go to Q.28]

20. If Q.19 is yes, please describe your experience on this_____
_____
_____

21. Which herbs do you take in treatment for HIV/AIDS?_____
_____
_____

22. How do you use the herbal preparation? (State the specific dose e.g. cup, spoon and time
interval between use in a day)_____
_____
_____

23. For how long do you usually take it (State the number of days/weeks/months)_____
_____
_____

24. Do you experience any side-effects after taking the herbal remedies?
(1) Yes   (2) No

25. If Q.24 is yes, please describe the experience_____
_____
_____

26. After taking the herbal preparation, what is your condition usually like?
(1) Improved greatly   (2) Improved somewhat   (3) About the same   (4) Worse

27. How much do you spend for the treatment?_____

28. In your own opinion, what is/are the best way(s) of treating HIV/AIDS?_____
_____
_____

29. Why?_____
_____

Section C: Knowledge and perception of ART

30. How did you hear about the government initiative on ART programme?
(1) Relations   (2) Friends/Neighbours   (3) Newspaper   (4) Radio   (5) Television
(6) Other (please specify)_____

31. What information about the ART did you get from your source?_____
_____
_____

32. How do you perceive the initiative of the government?_____
_____
_____

33. Would you be willing to seek ART if available at the nearest hospital to you?
(1) Yes   (2) No

34. If Q.33 is no, why?_____
_____
_____

35. If Q.33 is no, why?_____
_____
_____

36. In your own opinion, what should be a fair price for the ART drugs for a month treatment?
_____

37. Please explain your reasons_____
_____
_____

38. If you are told that you have some opportunistic infections, would you be willing to pay for the treatment?   (1) Yes   (2) No
39. If Q.38 is yes, why?_____
    _____
    _____
40. If Q.38 is no, why?_____
    _____
    _____

Maternal Education and Allocation of Time and Children's Health in South Korea

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Abstract

This paper attempts to identify the mechanisms through which maternal education affects child health through her time allocation. Estimating a LISREL system of production functions for child health with the 1994 Korean household survey data, it is shown that a mother's education promotes her child's health by allocating a greater amount of time for leisure.

I. Introduction

The past theoretical and empirical works on the household production have emphasized two distinctive aspects. On the one hand, the time-allocation behaviour or pattern of household and subjects related to it have been studied by Becker (1965), Gronau (1972, 1977), Wales and Woodland (1977), Kooreman and Kapteyn (1987), Juster and Stafford (1991) and Malathy (1994). On the other hand, the household production of commodities, especially health, using consumer goods and services as inputs and its implications, have been investigated by Grossman (1976, 2003), Inman (1976), Rosenzweig and Schultz (1981, 1982a, 1982b, 1983), and Behrman and Wolfe (1987). These studies, in particular, have paid special attention to the time-allocation patterns or roles of women in the household.

Relatively little, however, is known about how a mother allocates her time for improving child health within the household. The mother's time is assumed to be an essential input for the production of child's health. Therefore, ignoring the time-allocation behaviour of mother can seriously distort her productive role in child health in a household setting. The productivity of the mother's time input is estimated by the mother's educational achievement, which affects how her household production technology influences child health. The efficiency of converting the chosen inputs into output is measured by the resulting child's health status. The productivity of inputs for the produc-

tion of child's health, including the mother's time allocated for the child's health, is determined by the household's own health production technology used by the mother (Leibowitz 1974; Becker 1981). The mother's health behaviour is, in turn, shown to be determined or influenced by the quality of human capital (education) the mother has acquired (Kenkel 1991). The connection between the mother's schooling and her health behaviour may be expressed as an example of a high quality of human capital improving consumption efficiency by adopting an efficient consumption technology (Lancaster 1966).[1] Since the unobserved components of the household may have multiple aspects, empirical studies usually employed latent variable approaches to incorporate these imperfectly observed variables that are related to health such as nutrition, healthcare, home environment, and hereditary traits (Behrman and Wolfe 1987).

This study proposes an integrated study of the allocation of time within the analytical framework of the household production of health using Korea's survey data. To gain much better insights regarding the role of mother's schooling in health, time allocation and health-related inputs, we specify and estimate latent variable models. The objective of this study is to identify the mechanisms through which a mother's education affects a child's health by allocating her time between leisure, work and household chores. In order to see how the allocation of a mother's time affects the inputs and outputs of a household production function for her child's health, we set up the following two structural models. First, the time allocation is assumed to have no impact on child health in the 'basic' model. Second, the mother's allocation of time is added to the basic model in our extended model. The empirical analysis is conducted with the 1994 Korean household data collected through a questionnaire form supplemented by an anthropological mode of intensive follow-up interviews (Scrimshaw 1992; Chambers 1992).

Although the main body of past empirical studies of the household health production had been conducted with the published data of the U.S., recently an increasing number of studies have emerged in developing countries and Japan (Yamada et al. 1998). These include studies based on the data from India (Rosenzweig and Schultz 1982a; Malathy 1994), Botswana (Mueller 1984), Nicaragua (Behrman and Wolfe 1987), Brazil (Psacharopoulos and Arriagada 1989), Philippines (Strauss 1990), Côte d'Ivoire (Senauer and Garcia 1991), Nepal (Pokhrel and Sauerborn 2004), Pakistan (Iram and Butt 2004) and Russia (Fedorov and Sahn 2005). As far as this subject is concerned, no empirical studies are conducted in middle-income countries, including South Korea.

The remainder of this article is organized as follows: Section II outlines an analytical framework that shows how mother's educational attainment affects her time-allocation decisions and heath-related inputs and then how these allocation decisions affect child health. This framework is used to derive an econometric model of child health production in South Korea. Section III presents the survey data and estimation formulation to test the model. The results of the empirical analyses are reported in Section IV. The final section provides the summary and conclusions of the study.

II. Analytical Framework

A one-period household production of utility model is constructed on the basis of "revised approach to consumer choices" (Becker 1971). In that model, a household is assumed to choose the amount of health and other commodities as inputs for utility production in such a way to maximize its utility. The household utility function may be presented as follows:

$$U = u(H_c, Z) \tag{1}$$

where H_c is child's health and Z is a vector of other (than health) commodities produced by the household. u represents a strictly convex and twice differentiable utility function. Each household's

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1 Since Lancaster's consumption technology may be regarded as the household production technology, it is hypothesized that the mother's schooling improves the child's health by enhancing the household's own health production technology (Haveman and Wolfe 1984). Thus, the advancement of such technology, like any other technological progress, improves the efficiency in the production of child's health.

health and other commodities are produced subject to the household's budget and time constraints, using each household's own technology for the production of health and other commodities. The household's budget and time constraints are determined by the full income available from the household members' disposable income and wealth. The household's budget, therefore, may be seen as determined by the allocation of the total time between market and nonmarket activities given its marginal productivity. In this model, housework is included in the work in the market place. In this way, work and leisure are divided according to the traditional dichotomy of how time is allocated.

In other words, the allocation of time among work, housework and leisure under the assumption of utility maximization behaviour determines the budget and time constraints simultaneously (Kooreman and Kapteyn 1987). The budget for the household production of health is determined by the proportion of total budget allocated for non-health commodities, i.e., Z. The time constraint for the household production of health is, then, determined by the mother's and the father's time allocated for market activities. The maximum time available for the household production of health is the total time for all nonmarket activities. Under a severely restricting assumption, all the inputs for the production of child's health (commodity) are classified into three components: child's nutrition (N), healthcare (C) and home environment (E). The budget and time constraints may be shown as follows:

$$P_N N + P_C C + P_E E + P_Z Z \leq w_M T_{MW} + w_F T_{FW} + I_N \equiv I \tag{2}$$

$$T_{MW} + (T_{MH} + T_{ML}) = 24 \tag{3}$$
$$T_{FW} + (T_{FH} + T_{FL}) = 24$$

where P's are the respective prices for nutrition, health care and home environment; I_N is non-labour income and I is the total household income. w_M, w_F and T_{MW}, T_{FW} are mother's and father's wage rate and total time spent for work in the market, respectively. T_{MH} and T_{FH} is mother's and father's time allocated for housework activities, and T_{ML} and T_{FL} represent mother's and father's time allocated for leisure, respectively.

Given the above budget and time constraint for the household production of child's health, its function is formulated on the premise that the production of child's health is a commodity of which the inputs include nutrition, healthcare, home environment, allocation of the mother's time for the child's health and pre-determined factors such as hereditary traits, mother's schooling and her age, and household income. Nutrition, healthcare and home environment are widely acknowledged as the vital inputs for the household production of child's health (Rosenzweig and Schultz 1981, 1982a, 1982b, 1983; Behrman and Wolfe 1987). In order to take account of the effects of exogenous variables on the child's health status, the child's hereditary traits or the health heterogeneity of the child at birth (Behrman and Wolfe 1987) are inserted into our child's health (status) estimation model. Mother's schooling and her age are included because it is widely recognized that these variables influence the efficiency in producing child's health. The quadratic in age is also included because, as mother's age advances, the positive influence of her life experience is assumed to face a diminishing return due to physical deterioration. The household production function of child's health can be expressed as follows:

$$H_C = f(N, C, E, T, G, S_M, A_M, A_M^2, I) \tag{4}$$

where T, G, S_M, A_M and I are (allocation of) the mother's time, hereditary traits, mother's schooling, mother's age and household income, respectively. The allocative efficiency is obtained by choosing the optimum combination of health inputs under the condition of maximization of (1) subject to (2), (3) and (4). The production efficiency is obtained by choosing the household's own health production technology f, which maximizes the productivity of health inputs.

III. Empirical Analyses

3.1. Data and Variables
The data are collected using a method that combines a questionnaire survey and anthropological-style intensive interviews during March to August 1994. The sampling method used may be described as a modified random method stratified by the area of residence of interviewees: an urban upper-middle and high-income area, an urban low-income area and a rural (low-middle and low income) area. We include in this study the households of 450 mothers who have children aged five years or less. The data were originally collected with a questionnaire designed for a multi-disciplinary study (Scrimshaw 1992; Chambers 1992). Therefore, they contain qualitative responses to numerous behavioural questions as well as quantitative ones.

Table 1 shows the means, standard deviations and measurements for the variables that we select for our analyses. The definitions of the variables used are as follows.

Child health is represented by child's health status, the number of episodes of child's illness and child's annual average growth rate. Child health status is measured by the mother or the interviewer's subjective assessment of child health status.[2] To indicate a degree of health status, a seven-point rating scale is used, that is, 1 = very poor, 4 = average and 7 = excellent. The number of episodes of illness during the previous year is also used as an indicator of health status. The annual average growth rate is measured by dividing current weight minus weight at birth by age.

Table 1. Means and Standard Deviations for Variables Used In Analysis

Variables	Means (Standard Deviations)	Measurements/Indices
Child Health		
Child health status	5.29 (1.56)	7-point rating scale
Number of episodes of illness	3.61 (2.18)	number during last year
Annual average weight	3.65 (2.27)	Kg
Allocation of Mother's Time		
Work	5.64 (4.44)	hours per day
Leisure	4.08 (3.31)	hours per day
Nutrition		
Diet pattern	3.60 (1.32)	7-point rating scale
Baby feeding	4.34 (2.42)	7-point rating scale
Lactation period	6.30 (3.21)	months
Health Care (Health belief and behaviour)		
Mother's knowledge about her child health	4.88 (1.26)	7-point rating scale
Efficacy for Western type of medicine	5.15 (1.38)	7-point rating scale
Number of immunization injections	-0.06 (1.25)	per year
Home Environment		
Family happiness level	5.12 (1.49)	7-point rating scale
Noise level	4.37 (1.91)	7-point rating scale
Sanitary condition	4.95 (1.61)	7-point rating scale
Hereditary Traits		
Mother's health status	4.87 (1.64)	7-point rating scale
Father's health status	5.18 (1.68)	7-point rating scale
Grandmother's health status	4.52 (2.00)	7-point rating scale
Grandfather's health status	4.83 (1.95)	7-point rating scale
Grandmother-in-law's health status	4.19 (1.97)	7-point rating scale
Grandfather-in-law's health status	4.70 (2.03)	7-point rating scale
Exogenous Independent Variables		
Mother's schooling	12.08 (3.58)	years of schooling
Mother's age	31.25 (3.59)	years old
Total household income	1020.5 (598.8)	U.S. $ per month

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2 If the respondent and interviewer disagree, the difference is solved through reconciliation.

Definitional problems exist for allocation of mother's time.[3] For many mothers, it was difficult to distinguish between leisure and housework activities, particularly for those without a job in marketplace. Playing with a child or children is included in leisure activities.

Nutrition is represented by three indices, including diet pattern and baby feeding measured by the seven-point rating scale, and lactation period measured in the unit of months. The diet pattern refers to main diet measured by 1 = vegetable only, 4 = half vegetable and half meat and 7 = meat only. Baby feeding method is represented by a scale ranging from 1 = baby formula only through 4 = half baby formula and half breast-feeding to 7 = breast-feeding only.

Healthcare is represented by three indicators that reflect the level of mother's knowledge about her child's health, her preference for Western over the Oriental medicine[4] and deviation from the age-standardized number of immunization injections for children. The level of mother's knowledge about her child's health is measured by 1 = nothing, 4 = average and 7 = excellent. The efficacy for Western type of medicine is measured by 1 = very inefficient, 4 = moderate and 7 = very efficient.

Three indicators of home environment are adopted. They are the family's happiness scale, the household noise level and sanitation condition. These indicators are also measured by the seven-point rating scale, that is, 1 = very poor (or generally not happy), 4 = fair and 7 = excellent (or generally very happy).

Six indicators are used to represent hereditary traits. They are the health status of mother, father, grandmother, grandfather, grandmother-in-law and grandfather-in-law as assessed by the respondent and interviewer.[5] All indices on their health status are measured by the seven-point rating scale, that is, 1 = very poor, 4 = average and 7 = very good. To a varying extent, the child's health is acknowledged to have been pre-determined before birth according to many known hereditary traits. Therefore, the measurement problem for the contribution of the mother to her child's health is serious (Inman 1976). In this study, the variables representing the child's hereditary traits are used as control variables for health heterogeneity among child's health status.

As exogenous independent variables, three variables are used. Mother's schooling is measured by the completed years of schooling, with a mean of 12.08 years.[6] Mother's average age was 31.3 years and average household income was $1,020.5 per month at the 1994 exchange rate.

3.2. LISREL Formulation and Estimation

The household production function of child's health may be tested using Joreskog and Sorbom's linear structural relationship (LISREL) model (see the Appendix).[7] The structural equation model is referred to as the form in which each equation of the model has simultaneous relationship with one another. That is, the structural equation (or covariance structural model) means simultaneous equations model, which is used to detect the causal relationship of latent variables through measurement model.

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3 The mother's time is measured over the sampling period.

4 In Korea, mothers determine their choice of care among the three types of medical services, namely, Western, Oriental and Folk medicine. So, Korean mothers have a greater range of selection in choosing health (care) production technologies than do mothers in the Western world.

5 If either one or both grandparents were deceased, the parent's assessment of grandparent's health status is used. If one grandparent is alive or all grandparents are alive but live in a separate household, again the parent's assessment is used.

6 Although mothers' schooling has a tendency with the potential endogeneity with childbearing decisions, mother's education is considered an exogenous variable because both the cultural context and a number of previous studies (Rosenzweig and Schultz 1981; Behrman and Wolfe 1987 and Thomas et al. 1991) justify our assumption.

7 For more details, see Joreskog and Sorbom (1983) and Arbuckle and Wothke (1999).

IV. Empirical Results

4.1. Basic model

Table 2 shows LISREL estimates of child health production function. Shown in panel A are the estimates for the measurement model of indicator relations and the goodness-of-fit measures (R^2) for each indicator variable. Panel B represents the estimates for the structural model of child's health production function for health-related inputs such as nutrition, healthcare, home environment and hereditary traits with R-squared values.

First, an examination of the indicator relations to the dependent variables shows that there exist significant associations between our observed indicators and the latent variables. Except for annual average growth, all of the coefficient estimates have a priori predicted signs, marking obviously non-zero at the 1% level. Child health is found to be most highly associated with the number of illnesses for the past one year and the level of mother's knowledge about her child's health. Nutrition is somewhat correlated with all three indicators: the feeding pattern, lactation and diet pattern. Healthcare is associated most strongly with the level of mother's knowledge about her child's health, and to a less extent with the number of immunization injections standardized by age and relative efficacy on Western medicine.[8] Home environment is connected most strongly with sanitation but it has a weaker association with noise and happiness level. Hereditary traits are related highly to all six indicators. Thus, most of our indicators seem to represent the latent variables relatively well.

We next examine the child health production function. Panel B shows that most of the significant coefficient estimates have the expected signs. Home environment and hereditary traits have significantly positive effects on child health, though nutrition is negative and healthcare is positive, albeit never significant. Mother's age and household income have significant and positive impacts on child health. Income shows an added indirect effect on child health through home environment. A noteworthy result is that the quadratic form of age variable has a strong negative effect on child health, indicating that older women have less knowledge of modern type of health-related inputs.[9] Mother's age and the quadratic in age, however, do not have any impacts on the inputs of a household production function for her child's health. Hereditary traits of parents and grandparents as control variables have strong positive effects on future generations, child or grandchild. This result provides adequate evidence that human capital measured by health stock is transferred through generations.

In our basic model, a mother's schooling has less significant impact on child health, though it has significant and positive impact on nutrition and healthcare. While only home environment among health-related inputs has a significant impact on child health, we can see that a mother's education does not have any direct or indirect effects on child health. This result runs counter to findings of many other studies (Rosenzweig and Schultz 1982b; Behrman and Wolfe 1987; Wolfe and Behrman 1982; Thomas et al. 1991).

4.2 Extended Model

Table 3 shows the estimates of the extended LISREL model adding a mother's time allocation for work and leisure time to the basic one. When mother's time allocation is included in the health production function (panel B), time for leisure takes the only significantly positive coefficient for home environment. Time allocation by a mother thus appears to be a relatively more important deter-

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8 One unique characteristic of the healthcare system in Korea is that Oriental and Folk medicine, besides Western medicine, are still widely used. Korea's pluralistic healthcare system, distinctive from those of Western developed countries, offers opportunities and challenges for Korean mothers in their children's care and the care of their health. So which type of medicine the mother chooses among the three is an important factor affecting the child's health.

9 The Korean data shows that younger mothers tend to have longer years of schooling than older ones.

minant of home environment than other health-related inputs.[10] Like the result in the basic model, home environment and hereditary traits have significant and positive effects on child health.

Table 2. Estimates of Child Health Production Function –
Without Considering Mother's Time Allocation

Panel A. Measurement Model of Indicator Relations		
Indicator Variable	**Estimate (t-value)**	**R²**
Child health		
- subjective assessment	1ª	0.415
- no. of illness	-1.475(5.82)	0.461
- annual average growth	0.065(1.71)	0.081
Nutrition		
- diet pattern	1ª	0.143
- feeding pattern	-2.424(6.05)	0.250
- lactation	-3.022(5.88)	0.222
Health care		
- level of mother's knowledge	1ª	0.155
- efficacy of Western medicine	0.919(3.47)	0.108
- no. of immunization injections	-0.827(3.42)	0.102
Home environment		
- happiness level	1ª	0.039
- noisy	2.633(3.49)	0.165
- sanitation	4.882(2.76)	0.804
Hereditary traits		
- mother's health status	0.856(6.88)	0.365
- father's health status	0.722(5.31)	0.245
- grand mother's health status	0.721(4.78)	0.173
- grand father's health status	0.830(4.85)	0.237
- grand mother-in-low's health status	1ª	0.343
- grand father-in-low's health status	0.836(5.24)	0.225

Panel B. Structural model of production functions				
Explanatory Variable	**Child Health**	**Nutrition**	**Health care**	**Home environment**
Nutrition	-0.804(1.36)			
Health care	0.232(0.74)			
Home environment	0.425(1.65)			
Hereditary Traits	0.342(4.26)			
Mother's schooling	0.011(0.24)	0.072(5.42)	0.037(2.47)	0.004(0.79)
Mother's age	0.562(2.88)	0.021(0.24)	0.188(1.53)	0.076(1.49)
Mother's age²	-0.009(2.87)	0.001(0.14)	-0.003(1.36)	-0.001(1.27)
Household Income	0.006(1.96)	0.004(4.52)	0.003(2.41)	0.001(1.75)
R^2	0.304	0.711	0.324	0.090

X^2(183)=528.03, Adjusted goodness-of-fit index(AGFI)=0.715.
ª Normalized to be one.
Asymptotic t-ratios are shown in parentheses. The critical asymptotic t-ratios are: 1.28 for a one-tailed test and 1.64 for a two-tailed test at the 10% level; 1.64 for a one-tailed test and 1.96 for a two-tailed test at the 5% level; and 2.33 for a one-tailed test and 2.58 for a two-tailed test at the 1% level.

Though a mother's age and quadratic in age have less significant effects on inputs of a household production function, they have strong effects on child health, that is, output of the function. Therefore, mother's age has a positive effect on child health and home environment, as well as an

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10 We allow non-zero covariance between the relations for time for work and leisure because of the possibility of a common unobserved factor affecting both of this pair. The covariance and *t*-value between the disturbances from these time variables are –5.929 and 8.50, respectively, suggesting that there is an omitted common unobserved factor.

indirect effect on child health by means of home environment. Also, income has a significant and positive effect on child health, nutrition and leisure time, and has a negative effect on work time. Moreover, home environment has an indirect effect on child health, especially depending on family's leisure time spending.

Table 3. Estimates of Child Health Production Function – Considering Mother's Time Allocation

Panel A. Measurement Model of Indicator Relations		
Indicator Variable	**Estimate (t-value)**	**R²**
Child health		
- subjective assessment	1[a]	0.400
- no. of illness	-1.530(5.85)	0.479
- annual average growth	0.070(1.87)	0.101
Nutrition		
- diet pattern	1[a]	0.142
- feeding pattern	-2.372(6.02)	0.239
- lactation	-3.091(5.97)	0.231
Health care		
- level of mother's knowledge	1[a]	0.129
- efficacy of Western medicine	1.135(3.66)	0.137
- no. of immunization injections	-0.906(3.42)	0.102
Home environment		
- happiness level	1[a]	0.057
- noisy	2.382(3.79)	0.197
- sanitation	3.585(3.48)	0.632
Hereditary Traits		
- mother's health status	0.848(6.87)	0.360
- father's health status	0.717(5.31)	0.243
- grand mother's health status	0.726(4.82)	0.176
- grand father's health status	0.832(4.88)	0.240
- grand mother-in-low's health status	1[a]	0.345
- grand father-in-low's health status	0.833(5.26)	0.225

Panel B. Structural Model of Production Functions						
Explanatory Variable	**Child Health**	**Nutrition**	**Health care**	**Home Environment**	**Time for work**	**Time for leisure**
Nutrition	-0.772(1.26)					
Health care	0.156(0.44)					
Home environment	0.500(1.92)					
Time for work	0.003(0.09)	-0.019(1.24)	0.000(0.01)	-0.007(0.66)		
Time for leisure	-0.019(0.40)	-0.008(0.36)	0.041(1.48)	0.030(1.84)		
Hereditary Traits	0.332(4.22)					
Mother's schooling	0.016(0.34)	0.067(5.02)	0.024(1.72)	-0.003(0.41)	-0.334(4.78)	0.177(3.05)
Mother's age	0.549(2.87)	0.017(0.19)	0.158(1.41)	0.107(1.67)	-0.257(0.43)	0.210(0.42)
Mother's age²	-0.008(2.86)	0.001(0.11)	-0.002(1.26)	-0.001(1.45)	0.002(0.26)	-0.002(0.30)
Household Income	0.007(2.21)	0.004(3.86)	0.002(1.37)	0.000(0.17)	-0.033(6.00)	0.027(5.90)
R²	0.306	0.727	0.379	0.182	0.356	0.320

X^2 (211)=577.77, Adjusted goodness-of-fit index(AGFI)=0.771.

[a] Normalized to be one.

Asymptotic t-ratios are shown in parentheses. The critical asymptotic t-ratios are: 1.28 for a one-tailed test and 1.64 for a two-tailed test at the 10% level; 1.64 for a one-tailed test and 1.96 for a two-tailed test at the 5% level; and 2.33 for a one-tailed test and 2.58 for a two-tailed test at the 1% level.

Our primary concern in this paper focuses on the estimated effects of mother's schooling on child health and the allocation of her time. Expanding the basic model to include the time allocation does add to the explanatory power of mother's educational attainment and child health. A Mother's

educational attainment has a significant and positive impact on nutrition, healthcare and time for leisure and negative on time for work and has an added indirect effect on home environment through time for leisure. That is, more educated mothers are likely to allocate a proportionately greater amount of time for leisure and less time for work than the less educated. Also, the mother's education positively influences the child's health by creating a better home environment conducive to the child's health through allocating a greater amount of time for leisure. Therefore, in the Korean case, a mother's schooling has an indirect effect on child health by means of the mother's time allocation and home environment. Thus, the mother's schooling seems to play an important role in this integrated system that considers time allocation effects in the household production of health.

V. Summary and Conclusion

The euphoria about the contribution of the investment in human capital to economic growth in the 1960s and in the early 70s has somewhat subsided recently (Denison 1985). The quality of human capital, however, has found new sources of contribution to economic (human) welfare. The household production theory has shown that the human capital accumulated through education increases the consumption efficiency, thus increasing the utility gained from a given consumption expenditure (Michael 1973). This theory has also shown that health is an indispensable component of human capital and it has a positive correlation with schooling (Grossman 1976).

This study has provided an insight into another aspect of the role of human capital in the household production of health. We believe that this study's contribution lies in showing that there are synergetic effects of a mother's education and the educated mother's allocation of time on her child's health by using a statistical analysis of the data drawn from Korea, a middle-income country. If the time allocation is excluded, the mother's schooling appears to have strong effects on health-related inputs regarding nutrition and healthcare. But when time allocation is included, a mother's educational attainment shows less impact on these variables, but on the other hand, strong effects on time allocations for work and leisure. That is, more educated Korean mothers have a tendency to allocate a proportionately greater amount of time for leisure and to utilize it for making a better home environment than less educated mothers do.

Women in developing countries spend a substantially higher amount of time on housework compared to their counterparts in developed countries. This is perhaps attributable to two major factors. First, in the Western countries, the household with two sources of income is likely to have a higher income than the household where the wife spends less time for gainful employment. In Korea, most low-income mothers are engaged in one form or another of income-earning activities in a formal or, more likely, in an informal sector. Most wives in high-income households have a college degree and are not employed in Korea.[11] A second explanation is that a paucity of opportunities for women to get access to high-paying jobs and cultural traditions that emphasize family values make Korean women's educational achievements a more important factor for their children's health. That is, a longstanding Korean socio-cultural tradition regarding the role of women, particularly that of those with a child or children, appears to induce them to prefer mothering to working at the market place.[12]

This study confirms the documented contention that improving the educational opportunity for women and enhancing the socio-cultural environment for mothers to have an incentive and motivation for a better education will promote child health and reduce the high infant and child mortality rate in developing countries. If one fails to notice the synergetic effects of mother's education and her time allocation, however, then we can warp the mother's productive and allocative role in her child's health in the household production activities. Research design efforts to examine this relationship in the future would be more rewarding.

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11 In this case, 74% of mothers with college degrees are not employed.

12 Whereas more educated mothers are likely to seek self-fulfillment in careers in Western cultures, Korean women with a high level of schooling still aim at self-fulfillment by becoming a skillful master of their households while their husbands are at work outside the home for long hours.

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Appendix

The model estimates the unknown coefficients in a set of linear structural health production equations included the imperfectly measured health status, nutrition, healthcare, home environment and hereditary traits. The matrix form of the structural equation model is:

$$\mathbf{Y} = \Gamma \mathbf{Y} + \Delta \mathbf{X} + f\mu \tag{A1}$$

where $\mathbf{Y}' = (H, N, C, E, T_{MW}, T_{ML})$ is a vector of endogenous variables of which the first four variables are imperfectly observed.[13] $\mathbf{X}' = (G, S_M, A_M, A_M^2, I)$ is a vector of exogenous variables and the first variable is also latent. It is assumed that $f\mu = (f\mu_1, f\mu_2, \ldots, f\mu_6)$, as vector of errors in equations, is uncorrelated with $\mathbf{X}$ and that $\mathbf{I} - \Gamma$ is non-singular. Γ and Δ are coefficient matrices. In this study, Γ and Δ have the following matrix forms:

$$\Gamma = \begin{bmatrix} 0 & \gamma_{12} & \gamma_{13} & \gamma_{14} & \gamma_{15} & \gamma_{16} \\ 0 & 0 & 0 & 0 & \gamma_{25} & \gamma_{26} \\ 0 & 0 & 0 & 0 & \gamma_{35} & \gamma_{36} \\ 0 & 0 & 0 & 0 & \gamma_{45} & \gamma_{46} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \tag{A2}$$

$$\Delta = \begin{bmatrix} \delta_{11} & \delta_{12} & \delta_{13} & \delta_{14} & \delta_{15} \\ 0 & \delta_{22} & \delta_{23} & \delta_{24} & \delta_{25} \\ 0 & \delta_{32} & \delta_{33} & \delta_{34} & \delta_{35} \\ 0 & \delta_{42} & \delta_{43} & \delta_{44} & \delta_{45} \\ 0 & \delta_{52} & \delta_{53} & \delta_{54} & \delta_{55} \\ 0 & \delta_{62} & \delta_{63} & \delta_{64} & \delta_{65} \end{bmatrix} \tag{A3}$$

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13 Housework time is not included in the analysis because it is highly correlated with leisure time and also because our concern is focused on leisure time, which includes time spent for playing with a child or children.

As in the health production function in (4), the first row of Γ means the effects of nutrition, healthcare usage, home environment and time allocation on the production of child's health. The first column of Γ has zero elements because the time and other health-related inputs are assumed not to be influenced by health outputs. Also, the second to fourth rows of Γ show the effects of time allocation on nutrition, healthcare usage and home environment. The first row of Δ represents the impact of hereditary traits, mother's schooling, her age and household income. And, the first column of Δ indicates the hereditary traits variable that is considered as a control variable. The remaining zero restrictions imposed on Γ are based on the assumption that the health inputs have no two-way influences.

Vectors $\mathbf{Y}$ and $\mathbf{X}$ are not observed, but instead vectors $y' = (y_1, y_2, \ldots, y_p)$ and $x = (x_1, x_2, \ldots, x_q)$ are observed. The measurement model for y and x is:

$$y = \Lambda_y \mathbf{Y} + \varepsilon \tag{A4}$$

$$x = \Lambda_x \mathbf{X} + \delta \tag{A5}$$

where Λ_y and Λ_x are a regression matrix of y on $\mathbf{Y}$ and x on $\mathbf{X}$ respectively and $\varepsilon(\delta)$ is a vector of error term in $y(x)$ that is uncorrelated with $\mathbf{Y}(\mathbf{X})$, $f\mu$, and $\delta(\varepsilon)$.[14] The model uses the maximum-likelihood estimation method based on the assumption that the observed variables have a multi-normal distribution.

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14 Before an attempt is made to estimate a model, the identification problem must be resolved. Let $m(n)$ and $p(q)$ be the number of latent dependent (independent) variables and the number of observed indicators on latent dependent (independent) variables, respectively. For identification of our model, a necessary condition is that the number of independent observed moments $[(p + q)(p + q + 1)/2]$ is equal to or greater than t being the total number of free parameters in the model. t is $mn + pm + qn + m(m + 1)/2 + n(n + 1)/2 + p(p + 1)/2 + q(q + 1)/2$. In this case, as the number of independent observed moments is 300 and t is 360, we need at least 60 restrictions. To satisfy the condition, we impose as follows: firstly, we normalized each of the five latent variables to be one. Next, Γ, Δ, Λ_y and Λ_x put 25, 5, 70 and 40 zero restrictions, respectively. Also, covariance matrix of ε and δ implied 91 and 45 zero restrictions, respectively. Therefore, our model is identified.

Effects of Birth Interval on Child Mortality: Evidence from a Sequential Analysis

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Abstract

Unlike most existing studies, this paper examines the effects of birth interval on child mortality in a sequential framework. Birth spacing is captured by the length of time since the birth of the last child and the time varying covariates identifying the arrival of a younger sibling during any month after the birth of the present child. We use an instrumental variable method to reduce the endogeneity bias and compare the hazard estimates of child survival with and without instruments for birth spacing. These instrumented sequential results not only reaffirm the static inverse relationship, but also emphasize that the inverse relationship between birth interval and child mortality crucially depends on both the gender and the birth order of the child.

1. Introduction

Quantity-quality tradeoff lies at the heart of the Beckerian models, which among other things provides a rationale for an inverse relationship between fertility and mortality. The relationship between fertility and mortality is central to many explanations of the demographic transition and important for population programmes in low-income countries, often characterized by imperfections in labour and capital markets. In the presence of these constraints, household income plays a crucial role in explaining child quality (Becker 1991) so that more siblings mean less resource per consumption unit. Thus children will do better when accompanied by siblings with fewer intrinsic advantages. Moreover, for a society with pro-male bias (Behrman et al. 1982; Sen and Sengupta 1983), children with more sisters will be better off than children with more brothers. One can also consider

other possible demographic reasons affecting this negative relationship. For example, as fertility falls, pattern of family formation (e.g., relating to birth spacing,[1] parity and mother's age at birth), alters in ways beneficial to maternal and child health (Trussell 1988; Potter 1988; Hobcraft 1987).[2]

There is a long tradition of investigating the relationship between fertility and mortality in low-income countries. While Benefo and Schultz (1996) examine the effects of child mortality on fertility, LeGrand and Phillips (1996) report that higher total fertility reduces mortality in rural Bangladesh, though the effect was not very strong.[3] Some others have considered the effects of birth interval on child mortality. For example, Curtis, Diamond and McDonald (1993) report significant effects of birth interval on postneonatal mortality in Brazil. Choe, Diamond, Kim and Steele (1998) compare the effects of son preference on child mortality in Bangladesh, Egypt and South Korea and find indirect evidence that shorter birth spacing leads to higher mortality. However most existing analyses of the relationship between fertility and mortality have been done in a static framework. Also most of these studies do not address the important problem of simultaneity between fertility (or birth interval) and child mortality, which is likely to bias the available estimates.[4] The present paper attempts to address these issues while examining the effects of birth interval on child survival.

The empirical analysis of the present paper is based on the complete birth history data obtained from the 1992–93 National Family Health Survey (NFHS) from West Bengal. Since the relationship between birth interval and child mortality is in nature, we construct a sequential birth history of the sample women aged 13 to 49 years and construct birth history of children born to this women (where age is right censored at 60 months) that records the arrival of younger siblings during each month of a child's life. We estimate duration models of time to death *separately* for male and female children in terms of variables indicating birth interval, among other individual, parental/household and sibling characteristics. In particular, two types of birth spacing variables are included; namely, time since the last birth (prior birth spacing) and time varying covariate indicating arrival of younger siblings (indicators of posterior birth spacing) during each month of first sixty months of a child's life. We first estimate a conventional child survival function which depends, among other things, on these spacing variables, treating them as exogenous.[5] However, the household chooses birth spacing (and number of children) to maximize the present value of income produced by all family members. This income stream depends on the survival prospects of the children. Consequently the optimal values of birth interval (as well as number of children) will depend in part on the values of the error term in the mortality equation, giving rise to a problem of endogeneity. We use an instrumental variable method to correct for the resultant endogeneity bias of the uninstrumented estimates of mortality hazard.[6] To this end, we generate instruments for birth spacing variables, which are then included in the subsequent child survival function. We compare these estimates with and without instruments to examine the effects of simultaneity bias on child survival.

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1 In addition to reduce maternal depletion, longer birth interval also reduces the competition for limited parental care and resources in societies with credit market imperfection, thus improving the allocation of resources to the current child.

2 Bongaarts (1987), however, challenged the basis of this inverse relationship.

3 Several plausible factors were highlighted for the unexpected underestimation of the negative effects of fertility on child mortality, including the experimental design of the data from Matlab project and relatively short period of the study.

4 One important exception is Bhargava (2003), who makes a serious attempt to address the problem of simultaneity arising from the inclusion of number of older boys and older girls of the context child while analysing child survival in the Indian state of Uttar Pradesh. The analysis also includes birth interval as an explanatory variable though it was treated as a purely exogenous variable.

5 Other explanatory variables are chosen very carefully to avoid the problems of simultaneity. See further discussion in section 2.

6 We are aware of the possible problem caused by weakly correlated instruments and take care to generate the best instruments from the available information. We have also attempted to resolve this issue elsewhere by determining birth interval and child mortality as correlated processes (Makepeace and Pal, 2004).

The paper is developed as follows. Section 2 explains the data and develops the empirical child survival function while section 3 discusses the results. Section 4 concludes.

Table 1. Comparison of West Bengal with Important Indian States

States	Popln. (in mn) 1991	Female literacy Age 7+ 1991	Female labour participa- tion 1991	Total fertility rate	Infant Mortality Rate per 1000 1990-92	Death rate, age 0-4. 1991 (per 1000)	
						Female	Male
Kerala	29	86.2	12.8	1.8	17	4.1	4.5
Punjab	20	50.4	2.8	3.1	57	18.4	15.6
Haryana	16	40.5	6.0	4.0	71	23.8	22.3
Maharashtra	78	52.3	26.5	3.0	59	16.7	15.9
AP	67	32.7	30.1	3.0	71	20.2	22.3
Tamil Nadu	56	51.3	25.1	2.2	58	15.3	16.9
WB	68	46.6	8.0	3.2	66	20.8	20.4
India	846	39.3	16.0	3.6	80	27.5	25.6

Note: AP: Andhra Pradesh; WB: West Bengal
Source: Drèze and Sen (1995); Government of India web site: www.ni c.in/mohfw/popindi.html.

2. Data and Methodology

India is an interesting case in point. Child mortality rates in general and especially for girls are among the highest in the world.[7] There is also an interesting regional variation within the country. Table 1 compares West Bengal's demographic performance with important Indian states in 1991. Female mortality rate in the 0 to 4 years age group in 1991 was lower than the male mortality rate in the southern states of Andhra Pradesh, Kerala and Tamil Nadu, but higher in most other major states.[8] Our sample is drawn from the eastern Indian state of West Bengal. In the postindepend- ence period, West Bengal started its economic development in a relatively good position among the Indian states, as reflected in its high rate of urbanization, strong industrial infrastructure and very high productivity of land. However, by 1967–68 the incidence of rural poverty was above-average in the state, and the situation did not improve perceptibly in the 1980s. For example, though the infant mortality rate (IMR)[9] in rural West Bengal has declined between 1981 and 1990, the state's own rate of decline in the 1980s was not much faster than the Indian average; in fact, it was surpassed or equalled by Bihar, Uttar Pradesh, Gujarat, Punjab, Kerala and Tamil Nadu (Sengupta and Gazdar 1997), thus justifying our interest to study the case of West Bengal. Even though West Bengal has moderate levels of female literacy among the Indian states, use of modern nonterminal methods of contraception remained rather low (Pal and Makepeace 2003). While about 31% of rural and 24% of urban couples were sterilized, as many as 45% of rural and 40% of urban women in NFHSS 1992–93 sample did not use any contraception. This means that only about 18.5% of rural and 24.7% of urban eligible women were currently using some modern contraception (e.g., pills, IUD, condoms, etc.).

The focus of the Indian family welfare program on sterilization as reflected in the NFHS 1992– 93 has been considered to be unsatisfactory, and subsequently a new draft plan for the family welfare

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7 Infant mortality rate in 1992 was 79 in India as against 18 in Sri Lanka, 31 in China, 13 in South Korea and 26 in Thailand per 1000 live births in the year.

8 Though the female mortality rates are generally lower in the Western countries.

9 Number of infants who die before reaching one year of age, expressed per 1000 live births in a given year.

programme was undertaken in 1994. The new draft focuses, among other key issues, on method-specific contraceptive targets and incentives and expanding the use of male and reversible contraceptive methods (for spacing births). We are, however, not aware of any economic analysis examining the effects of birth spacing and child survival in India, which justifies our interest in the subject.

2.1. Data

We use the National Family Health Survey (NFHS) 1992–93 household-level data[10] from rural and urban West Bengal. This allows us to construct a complete birth history for each woman aged 13-49 years. Given that the death rate in our sample tails off from age five onwards, we focus on children aged five years or below. For each child in the sample, t starts with a value of zero at birth and is right censored at 60 months. There are 12,902 children in our sample, of whom 51% are male.[11] Considering the residential location, 81% male and 82% of the female children in our sample came from rural areas of the state. About 14% of both rural male and female children died before reaching the age of 60 months, while the corresponding proportion was lower for children living in urban location (10% for female and 11% for male).

2.2. Empirical Child Survival Function

The indicator of child health in our analysis is the time to death. In general, the time to death of the i-th child, T, will depend on a vector of characteristics, X_i.

Among other things, we highlight the role of family resources. Since older first-time mothers and literate mothers tend to be more educated[12] and from higher income families, we use the age at first birth and literacy as proxies for income and wealth. We have obtained the first principal component of a number of asset variables and use this as a measure of wealth.

Castes of the Hindu households are considered to be good indicators of household wealth in the Indian context. Hence, we include controls for the lower castes.

The provision of public services like water, sanitation and health depends on the residential location. Since the availability of these services influences child survival, we include dummies for whether the household lives in a rural area and whether the household lives in a backward area. Since there may be gender differences, we include a gender dummy (in the pooled regression only) and whether the first child is female as an instrument for the presence of female children.

Variables capturing spacing between consecutive siblings may affect child health in several ways. First, shorter birth spacing would imply more maternal depletion, and therefore a limited ability of the mother to take care of the current child (including breast feeding). In addition, shorter birth spacing would imply more children, and therefore a greater strain on other parental resources per consumption units. In other words, parents can devote more time and effort to bring up a child if there is longer prior and posterior birth spacing, which would also help to limit the family size.[13] To this end, we include a variable measuring the time since the birth of a previous sibling. We also

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10 The second NFHS undertaken in 199–99 is designed to strengthen the database further and facilitate implementation and monitoring of population and health programmes in the country. The principal objective of NFHS-2 remained as before, though it included some additional information relating to measurements of the nutritional status (e.g., height and weight) of all eligible women, blood test of women and children for haemoglobin. However, the information regarding birth interval and child survival that we use remained very similar.

11 This basic data-set is expanded to include monthly birth history of younger siblings per woman in our sample and the size of this expanded sample is 620469.

12 Information about the father was collected from the woman concerned. There were lots of missing as well as inconsistent values for father's age. Secondly, most fathers were literate, and hence it was causing problems of convergence. Thus, we could not include comparable characteristics of the father as we did for the mother.

13 There are other health risks of shorter birth spacing as well. For example, it may increase the likelihood of having premature babies or transmission of diseases because of crowding in the family.

include time varying variables that take the value 0 until a subsequent child is born and the value 1 thereafter.[14]

Among other sibling characteristics, the gender of the first child cannot be correlated with the innate ability of the second child, and can therefore be used as an exogenous variable in determining child survival. Similarly, without much problem, one can include if the first child died to indicate familial genetic problems, if any. The latter may take account of "death clustering" such that families experiencing child death may have shorter birth intervals (Dasgupta 1997). We have also included a variable to indicate if the current child is one of twins.[15] The latter can be treated as another health variable since it will be associated with factors such as low birth weight (although competition for limited parental resources will also play a role).

Finally, cultural preferences for sons in the Indian society are found to be important in birth spacing, and therefore in child survival. Hence one needs to examine the important role of gender in this respect. We start our analysis by considering a pooled regression with gender interaction terms and find significant differences by gender with respect to many explanatory variables. Then we proceed to consider separate male-female hazard functions for child survival.

The full list of characteristics employed in the empirical analysis and their definitions are given in Appendix 1.

The relationship between time to death and the vector of characteristics is commonly specified in terms of the hazard rate. The hazard rate, $\lambda_i(t)$, shows the rate at which individuals die at age t given that they have lived to be t years old. We use Cox's proportional hazard model[16] so that the hazard rate for t is:

$$\lambda_i(t) = \exp(X_i\beta)\lambda_0(t)$$

The hazard has "baseline" component, $\lambda_0(t)$, common to all individuals with a value that depends only on t. Systematic differences between individuals ($i \neq j$) shift the hazard. For example, when only the value of the k-th regressor is different, then

$$\lambda_i(t)/\lambda_j(t) = \exp(X_{ki} - X_{kj})\beta$$

A positive value for β implies that an increase in the value of a regressor will increase the hazard rate and, hence, lower the time to death.

3. Empirical Analysis
The main purpose of this section is to present the hazard estimates of time to death among young male and female children in West Bengal. We begin by examining the empirical distribution of time to death (section 3.1), and then consider the estimates of child survival hazard functions (section 3.2).

3.1. Kaplan-Meier Survivor Functions
Let us start with a description of the empirical distribution of the duration of child survival using Kaplan-Meier estimates of the survivor function. The survival function $S(t)$ shows the proportion

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14 Both these indicators of birth spacing are clearly endogenous to child survival. We deal with this problem by producing instruments for these variables. See further discussion in section 3.

15 One, however, needs to be careful about the treatment of the twins and the corresponding birth order since birth order in our data-set is recorded in a continuous fashion, without taking account of the twin birth. Here, we have given the second born twin the same birth order as the first born.

16 Cox's proportional hazard specification is a semiparametric model of duration that is analytically tractable and places relatively few restrictions on the hazard. It also allows the use of time-varying covariates that plays an important role in our analysis.

of children that survive until period t. The estimates are summarized by gender in Table 2 for (a) first-born children, (b) "other" children[17] and (c) all children. To simplify the table, we present the estimates at six points corresponding to birth[18] and each year up to the age of five.

We focus on the implications of these survival rates for the corresponding hazard rates. For example, the survival rate of a first-born female child is 0.9219 at birth; the corresponding hazard rate at birth turns out to be 0.0781. For first born male child, however, the hazard rate at birth is 0.0921, higher than that of girls by about 1 and a half percentage point. Similarly, the hazard rate at birth is higher for "other" male children (0.0574 as against 0.0523), though the margin is much

Table 2. Kaplan-Meier Survivor and Hazard Functions

	First-born	Middle-order & youngest	All children
Periods (years)	**Male children**		
0	0.9079 (0.0921)	0.9426 (0.0574)	0.9322 (0.0678)
1	0.8631 (0.05)	0.9037 (0.04)	0.8919 (0.0432)
2	0.8532 (0.0115)	0.8926 (0.0123)	0.8810 (0.0122)
3	0.8440 (0.0108)	0.8852 (0.0083)	0.8732 (0.0089)
4	0.8403 (0.0044)	0.8764 (0.01)	0.8659 (0.0084)
5	0.8383 (0.0024)	0.8729 (0.0039)	0.8629 (0.0035)
	Female children		
0	0.9219 (0.0781)	0.9477 (0.0523)	0.9400 (0.06)
1	0.8813 (0.044)	0.9049 (0.045)	0.8979 (0.0448)
2	0.8714 (0.0114)	0.8932 (0.013)	0.8868 (0.0124)
3	0.8629 (0.0098)	0.8794 (0.0155)	0.8746 (0.0138)
4	0.8571 (0.0068)	0.8716 (0.0089)	0.8673 (0.0083)
5	0.8551 (0.0023)	0.8662 (0.0062)	0.8629 (0.0051)
Logrank test			
Chi-square (1)	2.25	0.53	0.05
P-value	0.1335	0.4651	0.8171
Wilcoxon test			
Chi-square (1)	2.53	0.26	0.24
P-value	0.1120	0.6097	0.6242

Note: Numbers in the parentheses show the corresponding hazard rates.

smaller; we also note that compared to first-born children, the hazard at birth is generally lower for the nonfirst-born children of a given gender. Thereafter, the hazard rate decreases with the passage of time for both male and female children (irrespective of their birth orders) such that the male-female differential also vanishes. For example, at $t=1$, the male-female differential is just about one percentage point for first-born, while at $t=4$, female hazard is slightly higher for the first-born child. This pattern can be explained by various exogenous factors, which takes us to the determination of hazard rates in terms of a multivariate regression framework, to which we now turn.

We also test for the equality of survivor functions between male and female children of different birth orders. Two standard rank tests – namely, the logrank and Wilcoxon[19]– are applied (see Table

17 It is important to distinguish first-born children from other nonfirst-born ones since mortality risks are found to be different for these two groups of children (e.g., see Muhuri and Preston 1991).

18 When we estimate the statistical models, we assume that people who die at birth are one day old when they die.

19 Logrank test is appropriate when the hazard functions are thought to be proportional across gender, while Wilcoxon test is appropriate when the hazard functions vary nonproportionally.

Table 3: Sample Characteristics – Means and Standard Deviations
(in the parentheses) for the Time-Varying Data-set

Variables	Male	Female	All
AGEMUM1	17.57 (2.93)	17.63 (2.96)	17.6 (2.95)
LITMUM	0.38 (0.48)	0.38 (0.48)	0.38 (0.48)
TWIN	0.01 (0.09)	0.008 (0.09)	0.01 (0.09)
FSTFEMALE	0.36 (0.48)	0.64 (0.48)	0.5 (0.5)
FIRSTDIE	0.18 (0.39)	0.18 (0.38)	0.18 (0.38)
PREVHAT	38.67 (8.07)	37.65 (7.85)	38.18 (8.05)
YHAT1	0.26 (0.44)	0.28 (0.45)	0.27 (0.44)
BORDER	2.87 (1.86)	2.88 (1.86)	2.87 (1.86)
AGLAND	0.53 (0.50)	0.53 (0.49)	0.53 (0.50)
PUCCA	0.16 (0.36)	0.15 (0.36)	0.15 (0.36)
RADIO	0.41 (0.49)	0.41 (0.49)	0.41 (0.49)
TELE	0.13 (0.34)	0.13 (0.34)	0.13 (0.34)
PCASSET	0.04 (1.01)	0.02 (1.02)	0.03 (1.02)
SC	0.10 (0.29)	0.10 (0.30)	0.10 (0.29)
ST	0.05 (0.22)	0.06 (0.23)	0.05 (0.22)
MUSLIM	0.31 (0.46)	0.29 (0.46)	0.30 (0.46)
RURAL	0.80 (0.40)	0.81 (0.39)	0.81 (0.39)
BACKWD	0.25 (0.43)	0.25 (0.43)	0.25 (0.43)
Observations	315784	304685	620469

2) by gender for first-born, nonfirst-born (middle-order and youngest children) and also for all children taken together. We cannot reject the hypothesis that the survivor functions are the same for the nonfirst-born and all children; according to the Wilcoxon test, we can, however, reject the null hypothesis of equality of survivor functions at about 11% level for the first-born children in our sample.

3.2. Determinants of Child Survival

There are two methodological issues to be addressed here. The first one relates to the gender difference in child survival, if any. We start our analysis by considering the pooled sample of male and female children to examine how the exogenous variables may explain the gender differences in child survival for first-born and other (middle order and youngest) children.[20] In addition to variables reflecting family endowment, household assets and sibling characteristics (as described above), we include a set of gender interaction terms. We construct a likelihood ratio statistic to test the joint significance of the gender interaction terms. Both LR statistics are statistically significant,[21] suggesting that there is significant difference by gender with respect to various exogenous explanatory variables in our sample. Hence we focus on the estimates obtained from separate male-female hazard functions for child survival.

The second issue is more complicated and relates to the possible simultaneity of the variables related to birth spacing in determining child survival. First we estimate a survival hazard model where birth spacing is treated as a purely endogenous variable. We then adopt an instrumental variable approach where we first generate appropriate instruments of these indicators of birth spacing and

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20 There are some differences in the specifications for the regressions for the first-born children and other children. For obvious reasons, birth order, characteristics of the first-born sibling and the prior birth spacing instrument are not included in the equation for the first-born children.

21 The significance of gender differences are also confirmed when a Weibull model is used in place of the Cox model.

then include these instruments, among others, to determine the child survival hazard function. Finally we compare these two sets of estimates, with and without instruments, to find out the effects of simultaneity bias on child survival.

Table 4. Uninstrumented Hazard Estimates for Child Survival
(Where time since last birth is PREVIOUS and presence of younger siblings is YOUNG1)

Variables	Male		Female	
	First born	**Middle-order and youngest**	**First born**	**Middle-order and youngest**
AGEMUM1	-0.04 (1.85)*	0.003 (0.22)	-0.13 (5.05)**	0.01 (0.38)
LITMUM	-0.26 (1.85)*	-0.33 (3.02)**	-0.25 (1.68)*	-0.41 (3.69)**
TWIN	1.53 (3.71)	1.35 (5.16)**	1.76 (4.42)**	0.87 (3.43)**
FSTFEMALE	-	-0.01 (1.20)	-	0.01 (0.08)
FIRSTDIE	-	0.17 (1.77)*	-	0.31 (3.37)**
PREV1	-	-0.03 (9.35)**	-	-0.03 (8.08)**
BORDER	-	-0.04 (1.42)	-	-0.02 (0.60)
PCASSET	-0.15 (2.05)*	-0.12 (2.27)*	-0.14 (1.81)*	-0.09 (1.55)
SC	0.02 (0.09)	0.4 (3.13)**	-0.13 (0.65)	0.19 (1.49)
ST	0.4 (1.82)*	0.39 (2.36)*	-0.39 (1.36)	-0.03 (0.17)
MUSLIM	0.13 (0.89)	-0.19 (1.76)*	-0.03 (0.19)	0.01 (0.13)
RURAL	0.02 (0.11)	-0.04 (0.33)	0.02 (0.09)	0.20 (1.54)
BACKWD	-0.17 (1.15)	0.29 (2.94)**	0.32 (2.21)*	0.02 (0.20)
YOUNG1	0.28 (0.81)	0.35 (1.72)*	0.41 (1.21)	0.69 (3.71)**
Log-likelihood	-2279.5783	-4572.1572	-1886.8024	-4592.0449
Chi-square	76.77	236.53**	130.21**	208.15
Number of *subjects* [1]	1955	4581	1856	4416

Note: [1] Note that the total number of observations in each case was at most 60 times the number of subjects in each category. Numbers in the parentheses denote the corresponding t statistics. '*' denotes that the variable is significant at10% or lower level , while '**' denotes the same at 1% level.

Table 5. Hazard Estimates of Birth Spacing for All Children

(1) Variables	(2) Mean (standard deviation)	(3) Coefficient (T-ratio)
INTERCEPT	-	-3.44 (41.991)**
AGEMUM1	17.64 (2.98)	-0.04 (10.453)**
PUCCA	0.15 (0.35)	-0.23 (6.155)**
TELE	0.12 (0.33)	-0.25 (5.666)**
RADIO	0.4 (0.49)	-0.11 (4.648)**
SC	0.10 (0.30)	-0.08 (2.164)*
MUSLIM	0.31 (0.46)	0.14 (5.716)**
RURAL	0.82 (0.39)	0.14 (4.462)**
FIRSTDIE	0.22 (0.41)	0.13 (5.210)**
MALE	0.51 (0.50)	-0.04 (2.003)*
Log-likelihood	-	-153076.977
Chi-square	-	746.55**
ln a	-	0.096 (12.590)**
Number of observations	12902	12902

Note: These estimates are obtained by starting with the full model and then excluding insignificant regressors (namely, LITMUM, AGLAND, ST, BACKWD, FIRSTFEM) at successive steps until all remaining regressors are statistically significant. Number in the parentheses denote the corresponding t statistics. '*' denotes that the variable is significant at 10% level or lower and '**' denotes the same at 1% level or lower.

Table 6. Hazard Estimates for Child Survival (with Instruments)

Variables	Male		Female	
	First born	Middle-order and youngest	First born	Middle-order and youngest
AGEMUM1	-0.03 (1.672)*	0.01 (0.553)	-0.13 (5.373)**	0.03 (1.203)
LITMUM	-0.26 (1.830)*	-0.3 (2.796)**	-0.24 (1.675)*	-0.43 (3.879)**
TWIN	-1.01 (1.573)	0.9 (2.628)*	0.11 (0.187)	1.04 (3.259)**
FSTFEMALE	-	-0.1 (1.117)	-	0.03 (0.354)
FIRSTDIE	-	0.17 (1.687)*	-	0.27 (2.609)**
PREVHAT	-	-0.01 (0.987)	-	-0.03 (1.705)*
BORDER	-	-0.03 (1.237)	-	-0.01 (0.498)
PCASSET	-0.14 (1.926)*	-0.07 (0.916)	-0.13 (1.656)*	0.01 (0.150)
SC	0.007 (0.035)	0.36 (2.775)**	-0.14 (0.692)	0.17 (1.317)
ST	0.4 (1.823)*	0.39 (2.398)*	-0.39 (1.334)	0.004 (0.023)
MUSLIM	0.1 (0.686)	-0.18 (1.526)	-0.06 (0.396)	-0.02 (0.211)
RURAL	0.01 (0.047)	-0.12 (0.853)	0.001 (0.007)	0.02 (0.118)
BACKWD	-0.17 (1.188)	0.28 (2.796)**	0.31 (2.173)*	-0.001 (0.015)
YHAT1	2.85 (4.703)*	0.62 (2.058)**	2.08 (3.779)*	0.52 (1.994)*
Log-likelihood	-2271.615	-4629.2518	-1881.0489	-4639.0224
Chi-square	92.69**	122.34**	141.72**	114.09**
Number of *subjects* [1]	1955	4581	1856	4416

Note: [1] Note that the total number of observations in each case was shown in Table 3. Number in the parentheses denote the corresponding t statistics. '*' denotes that the variable is significant at 10% or lower level while '**' denotes the same at 1% level. Instruments for time since last birth is PREVHAT and that for arrival of younger siblings is (YHAT1).

3.2.1. Hazard Estimates without Instruments

These traditional estimates are summarized in Table 4. A positive coefficient suggests that the hazard rate of dying increases with the increase in the corresponding variable while a negative coefficient implies the opposite.

The hazard of having a subsequent child is lower for older first time mothers and also literate mothers. However, being one of the twins and shorter prior spacing enhance the hazard of mortality. Arrival of the first younger sibling is only significant for the higher order children, but not for the first-born child. Gender of the first child is not significant for any child, while death of the first child significantly enhances the mortality risks of the higher order children. Household wealth significantly lowers the hazard, but primarily among young boys in our sample.

We next move on to produce the instrumented estimates of child survival with a view to compare them with the uninstrumented estimates.

3.2.2. Derivation of Instruments

In household models, parental optimisation not only determines quantity and quality of children, but also the spacing between children. Thus the fundamental problem is to find suitable instruments that reflect the spacing with the previous and subsequent siblings. In order to redress this important endogeneity problem, we take a two-step approach.

We first estimate a Weibull survival model with birth spacing (estimated as time to the birth of the next child) as the dependent variable using the largest possible sample of children. We then estimate the typical interval between births as the median of the estimated distribution. We chose Weibull model because it is relatively easy to produce estimates of the median.

The set of explanatory variables includes parental and household characteristics (AGEMUM1, LITMUM, SC, ST, MUSLIM), household assets (AGLAND, PUCCA, RADIO, TELE), charac-

teristics of the children already born (FIRSTFEM, FIRSTDIE), and the gender of the current child (MALE).[22] The choice and use of contraceptives are important determinants of birth spacing in many cases, though it is a choice variable for the couple in question and therefore, raises the question of endogeneity. Hence we use instruments that can reflect use of contraception in our sample. The religion variable, MUSLIM, is a good instrument, in that the use of modern contraception is rather limited among the Muslim couples in our sample. Mother's age is a good measure of fecundity, while mother's literacy is widely found to reduce fertility. Household assets as well as caste variables (SC, ST) instrument household wealth position in the Indian context. We also argue in our analytical model that the gender composition of the existing children (e.g., FIRSTFEM and MALE) could significantly affect parental birth spacing decisions. In this respect, we use the nontime varying sample; summary statistics are shown in column 2 of 4.

The final model specification is chosen by dropping the insignificant variables (e.g., LITMUM, AGLAND, ST, FIRSTFEM, BACKWD) in successive rounds until all the existing explanatory variables are significant at 10% or lower level. These estimates are shown in column 3 of Table 5. Mother's age and most assets variables lower the hazard of subsequent child birth. However, the hazard is higher if the couple is Muslim and the first child of the couple dies. More interestingly, we find that the hazard of subsequent child birth is lower if the current child is male, which in turn reflects some indirect evidence of son preference in birth spacing. These Weibull estimates are then used to predict the indicators of prior and posterior birth spacing to be used in the second stage child survival hazards.

Our model includes the time since the birth of a previous sibling and time varying covariates that take the value 0 until a subsequent child is born and the value 1 thereafter. The first variable is instrumented by the estimated median of time to the birth of the next sibling defined as:

$$\text{PREVHAT} = median = -\frac{1}{\hat{\theta}}\left(\ln\left(\frac{1}{2}\right)\right)\frac{1}{\hat{a}}$$

where the Weibull hazard is $\lambda(t) = a\theta(X)^a t^{a-1}$ and θ and $\hat{a}$ are the estimates of θ and a.[23]

The dates when subsequent children are born are estimated as PREVHAT in the future. The time varying covariate based on the time to the birth of the next child takes the value 0 for the period of time that is less Prevhat in the future and 1 thereafter.

We note that Prevhat is a highly nonlinear function of the regressors in the Weibull model and that the time varying covariates are not linear functions of either Prevhat or the regressors. This will ensure the identification of the coefficients in the Cox child survival model. The variable for Muslim provides a more traditional approach to identification. It is always a highly significant regressor in the birth spacing model but has very high p-values in the child survival model.

3.2.3. Hazard Estimates with Instruments

Estimates of the Cox proportional hazard model with time varying covariates are shown in Table 6 for male and female children separately.[24] The estimated coefficients of a hazard function do not give any indication of the marginal effects of the explanatory variables. Hence, we have also reported the hazard ratios in Table 7. In response to a change equal to one unit in the value of an explanatory variable, the hazard ratio for the variable concerned measures by how much the hazard rate changes in relation to the hazard rate for the original value of the variable.

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22 See Appendix for the definition of these variables.

23 We chose the median rather than the mean because skewedness of the Weibull distribution.

24 We have also performed similar regressions with the Weibull specification of the hazard and found that the results are very similar to the Cox estimates. These results can be supplied at request.

Table 7. Hazard Ratios for Male and Female Children

Variables	Male		Female	
	First born	**Middle-order and youngest**	**First born**	**Middle-order and youngest**
AGEMUM1	0.97 (-1.612)	1.01 (0.553)	0.88 (-5.373)**	1.03 (1.203)
LITMUM	0.77 (-1.830)*	0.74 (2.796)**	0.78 (-1.675)*	0.65 (-3.879)**
TWIN	0.37 (-1.573)	2.44 (2.628)**	1.12 (0.187)	2.83 (3.259)**
FSTFEMALE	-	0.91 (-1.117)	-	1.03 (0.354)
FIRSTDIE	-	1.19 (1.687)*	-	1.31 (2.609)**
PREVHAT	-	0.99 (-0.987)	-	0.97 (-1.705)*
BORDER	-	0.97 (-1.237)	-	0.99 (-0.498)
PCASSET	0.87 (-1.926)*	0.93 (-0.916)	0.88 (-1.656)*	1.01 (0.150)
SC	1.01 (0.035)	1.43 (2.775)**	0.87 (-0.692)	1.19 (1.317)
ST	1.5 (1.823)*	1.48 (2.398)**	0.68 (-1.334)	1.004 (0.023)
MUSLIM	1.1 (0.686)	0.83 (-1.526)	0.94 (-0.396)	0.98 (-0.211)
RURAL	1.01 (0.047)	0.89 (-0.853)	0.99 (-0.007)	1.02 (0.118)
BACKWD	0.84 (-1.188)	1.32 (2.796)**	1.37 (2.173)*	0.99 (-0.010)
YHAT1	17.2 (4.703)**	1.86 (2.058)*	7.9 (3.779)**	1.69 (1.944)*
Number of *subjects* [1]	1955	4581	1856	4416

Note: [1] Note that the total number of observations in each case was sixty times the number of subjects in each category. Number in the parentheses denote the corresponding t statistics. '*' denotes that the variable is significant at 10% or lower level while '**' denotes the same at 1% level.

First-born male and female children: The hazard rate of dying significantly decreases with increase in mother's age at the birth of the child and mother's literacy for both male and female children. Also, the household composite current asset variable, PCASSET, has a significant negative effect on the hazard rate for both male and female children; thus children from better off households have lower hazard in survival. First-born male children from scheduled tribe households have higher hazard rate, while the caste/religion variables are not significant for the female children. Instead, the hazard rates are significantly higher for first-born female children from backward areas of the state, while this variable is insignificant for boys.

Among various sibling characteristics, twin birth does not seem to affect the hazard rate, while the arrival of a younger sibling does have a significant impact on the hazard rate of the first-born male and female children. In particular, results suggest that arrival of younger siblings increases the hazard rate for both male and female children in our sample.

Estimates for first-born female children are generally similar to those of first-born male children. Certain differences are, however, noteworthy, especially with respect to household caste and residential location. In particular, boys from scheduled tribe households and girls from backward regions of the state have significantly higher hazard rates (and therefore significantly lower survival rates), even after controlling for household assets in our sample.

Middle order and youngest male and female children: Among parental characteristics, mother's literacy is found to play a significant role for both boys and girls, children with literate mothers having significantly lower hazard rate than those with illiterate mother. However, mother's age or composite household assets variable is not significant for male or female samples. Female children from scheduled caste families and male children from scheduled caste and scheduled tribe families have significantly higher hazard rates than the reference group of upper caste Hindus. In addition, male children from backward areas have a significantly higher hazard, though the variable is insignificant for female children.

There are also significant sibling composition effects for these groups of male and female children. Longer prior birth spacing lowers hazard rate for female children, but it is not significant for boys. However, death of the first sibling (FIRSTDIE), a twin birth (TWIN) and arrival of a subsequent sibling (YHAT1) enhance the hazard rate of both boys and girls. To conclude, besides caste and locational factors, gender difference in survival for nonfirst-born children also depends on prior birth spacing.

3.3. A Comparison of Hazard Estimates with and without Instruments

We conclude our analysis by comparing the hazard estimates with (Table 6) and without (Table 4) instruments (PREVHAT AND YHAT) of indicators of birth spacing (PREV1 AND YOUNG1). One can highlight the interesting differences in estimates with respect to these birth spacing variables. (a) For example, for first-born male children arrival of younger siblings (YOUNG1) is insignificant in the hazard regression (Table 4), while the corresponding instrumental variable YHAT1 becomes significant (Table 6). (b) For higher order children, however, prior birth interval (PREV1) is significant for both male and female children and the corresponding t-statistics seem to be spuriously high. If, however, we consider the corresponding instrumented estimates, PREVHAT is insignificant among higher order male children, while it is significant among female children (t-statistic is more reasonable too). Estimates with respect to the arrival of younger children (YOUNG1 and YHAT1) remain very similar in these two sets of estimates. Thus the relationship between birth interval and child mortality in our sequential framework not only varies between boys and girls, but also among children of a given gender, but of different birth orders.

Signs of all other regressors that are significant turn out to be similar, though t-statistics tend to be generally higher for the uninstrumented estimates. However, the values of the log likelihood function and the chi-square LR statistics are higher for the instrumented estimates, suggesting an overall improvement in the goodness of fit for the two-step instrumented estimates child survival. Taken together, there is indirect evidence that the hazard of having subsequent sibling is higher for girls (see Table 5), which in turn suggests a higher mortality risks because of shorter birth spacing following the birth of a female child. These instrumented mortality hazard estimates also suggest that shorter prior birth spacing lowers the hazard of higher order female children (the variable is insignificant for male children), while the arrival of next younger sibling enhances the hazard among all children irrespective of their gender in our sample.

4. Concluding Comments

The present paper examines the effects of birth interval on child mortality in the eastern Indian state of West Bengal. The empirical analysis is based on the sequential birth history of women aged 13-49 years. Birth spacing is captured by the length of time since the birth of the last child and the time varying covariates identifying the arrival of younger sibling after the birth of the present child. We examine the effects of birth spacing on the mortality hazard of young male and female children of different birth orders in West Bengal. In doing so, we also attempt to reduce the endogeneity bias by including instruments for birth spacing in the mortality equation and then comparing the estimates with and without instruments. It is argued here that the instrumented estimates reduce the estimation bias. These estimates suggest that longer prior birth spacing significantly lowers the mortality hazard among higher order female children. First, as the birth spacing increases, the chances of survival improve for the later-born child. perhaps because parents are able to devote more time and effort to bringing that child through his or her critical early years. However, this risk is insignificant among young boys, which perhaps indicates the importance of son preference among parents in this part of the world. Importance of son preference is also indicated by the fact that generally female children face a higher hazard of having a younger sibling than their male counterparts. The birth of the immediately next child[25] decreases the chances of survival among male and female children of

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25 The effects of other subsequent children may not be pronounced because the numbers in the sample are relatively small.

any birth order, in this case because the time, resource and effort spent on the context child decline. This could also be a result of a greater maternal depletion due to shorter the spacing.

These instrumented sequential results not only reaffirm the static inverse relationship, but also emphasize that the inverse relationship between birth interval and child mortality crucially depends on both the gender and the birth order of the child. These results also question the rationale for India government's heavy-handed policy of sterilization. Instead our results emphasize the potential success of modern family planning programmes, aiming at spacing births through popularizing various nonterminal modern methods of contraception.

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Appendix – Variable Definitions

The analysis is based on the National Family Health Survey (NFHS) 1992–93 household-level data for West Bengal.

Regression variables

AGEMUM1:   Age of the mother at the birth of the first child
LITMUM: 1 if the mother is literate and 0 otherwise
BORDER: Birth order
TWIN: 1 if the child is a twin or a triplet and 0 otherwise
FIRSTFEM: 1 if the first sibling in the family is a female and 0 otherwise
FIRSTDIE: 1 if the first sibling in the family died and 0 otherwise
PREV1:   Length of time since the birth of the immediately previous child
PREVHAT: An instrument for PREVIOUS
YOUNG1   0 for periods before the birth of the first child after the current child 1 thereafter
YHAT1:   Instrument for YOUNG1
AGLAND: 1 if the household owns agricultural land and 0 otherwise
PUCCA: 1 if the household lives in a brick house and 0 otherwise
RADIO: 1 if the household owns a radio and 0 otherwise
TELE: 1 if the household owns a television and 0 otherwise
PCASSET: A composite measure of household assets (the first principal component of
           AGLAND, PUCCA, RADIO and TELE
MUSLIM   1 if the family is Muslim and and 0 otherwise
SC   1 if the family is from a lower caste (Hindu only) and 0 otherwise
ST   1 if the family is from a scheduled tribe and 0 otherwise
RURAL: 1 if the child lives in rural areas and 0 otherwise
BACKWD: 1 if the child lives in a backward area and 0 otherwise
MALE: 1 if the child is male and 0 otherwise

Who Receives Healthcare?
Age and Sex Differentials
in Adult Use of Healthcare
Services in Rural Bangladesh

J.T. Young, Jane Menken, Jill Williams, Nizam Khan and Randall S. Kuhn

Abstract

Use of healthcare services may vary according to the cultural, social, economic and demographic situation of the person who may need care. In certain contexts, it particularly varies with age and sex of the potential user. Bangladesh is a less developed, primarily rural and predominantly Muslim traditional society with a pluralistic healthcare system. This paper endeavours to delineate the age, sex and other factors associated with obtaining healthcare in this pluralistic system. Using the Matlab Health and Socio-economic Survey, the paper uses logistic regression to ask whether factors commonly related to Western healthcare utilization in a theoretical framework useful in the study of Western research on healthcare services are also useful in the study of healthcare utilization in the developing world. Elderly women, never-married women and Hindus were less likely to visit any practitioner, which may indicate less health empowerment for these groups. Obtaining care is inversely related to household size and positively related to age (for men), education, poor health status and impaired mobility. Controlling for these factors, household wealth and ever-married status showed no significant effect on obtaining care. The differential in use of healthcare services can partially be ameliorated by changes in policy related to the elderly and women.

Introduction

There is a long history of studies of healthcare utilization in the developed world in which, frequently, higher utilization is taken to indicate better health. Inequality in use is taken as an indicator that health inequity[1] may exist (see, for example, Suchman 1965; Kohn and White 1976; Andersen and Aday 1978). In this paper, we hypothesize that there are significant differentials in use of healthcare in rural Bangladesh based on age and sex and controlling for other social and health factors; we apply a model of healthcare utilization often used in investigations in industrialized countries, with careful cultural modifications, to study these differentials.

We first examine patterns of adult healthcare utilization by age and sex in the Matlab area of Bangladesh, one of the world's poorest countries. Next, we examine these and other factors related to utilization in Matlab. Finally, we discuss the issue of equity in healthcare use and the policy implications for Matlab healthcare and social systems. To do so, we use data from the Matlab Health and Socio-economic Survey (MHSS) carried out in 1996-97[2].

Until recently, studies of healthcare use in the developed world focused almost exclusively on modern, allopathic medical care. Modern healthcare systems are far less prevalent and dominant in developing countries. Instead, pluralistic systems of care, melding traditional and modern care practices, are the norm. Government healthcare budgets, routinely $14/per person per year, are small. Provision of services must compete for funds with public health needs, such as development of clean water sources, sewage disposal and the reduction of environmental and biological hazards (Perry 2000). These differences in the cultural and medical milieu make the study of healthcare utilization in the developing world necessarily distinct from industrialized country settings.

Bangladesh ranked 139th of the 175 countries for which UNDP calculated its Human Development Index for 2003 and 132nd in per capita GDP (UNDP 2003). It is a rural (but urbanizing), densely populated, predominantly Muslim country that is undergoing a rapid demographic and epidemiological transition, with high but declining population growth, decreasing infant and total mortality rates, decreasing total fertility rates and a transition from predominantly acute to chronic disease problems (Mostafa 1999). Survival into old age is becoming the norm, but overall health of adults, and particularly the elderly, has not been a major concern for governmental and non-governmental entities. Most research and health interventions have focused on child and maternal health and mortality and family planning. Health systems for adults and the elderly are in early stages of development. Therefore, an analysis of adult and elderly use of health services is timely, and may inform the development of healthcare policy in Bangladesh.

Matlab is a river delta region about 55 kilometres southeast of the capital, Dhaka, with agriculture and fishing as its primary economic activities. Per capita income in the late 1990s was less than $400 per year. Since 1963, it has been the site of health research sponsored by ICDDR,B: the International Centre for Health and Population Research (formerly the International Centre for Diarrhoeal Disease Research, Bangladesh). The initial emphasis of research in the region was on

FIGURE 1. **Andersen and Aday Model Applied to Matlab, Bangladesh**
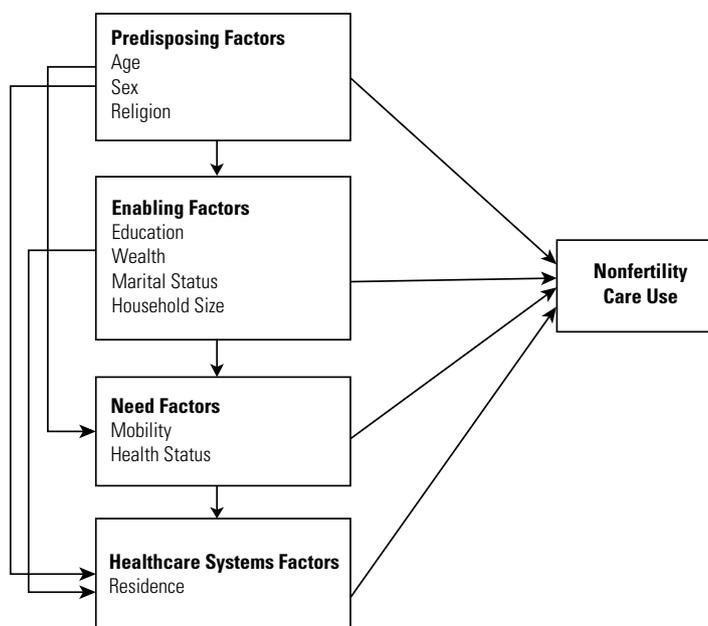
diarrheal diseases, but over the years research branched into other areas – child and maternal health, perinatal care, family planning – and social and economic determinants of health and other aspects of well-being. Underpinning these efforts, the Health and Demographic Surveillance System (HDSS) has, since 1966, collected vital event information about all residents of a defined area of Matlab, thus providing reliable longitudinal demographic data for this population. In 1978, ICDDR,B divided the HDSS region, for the purpose of its research, into consistent "program" and "comparison" areas, permitting more effective evaluations of programs. The declines in infant and perinatal mortality, general mortality and morbidity, and total fertility, particularly in the program area, have preceded and outstripped those of the rest of Bangladesh (Mostafa 1999). Modern healthcare is provided at hospitals and clinics under the direction of ICDDR,B and other governmental agencies. ICDDR,B community health workers regularly canvass, educate and offer some treatment to householders. Basic health education is offered in the schools and clinics and to adults in home visits. Mortality and other selected aspects of health in Matlab are studied on an ongoing basis. Alongside the modern systems are multiple forms of traditional medical practice that complement and interact with the efforts of the modern medical system. These traditional forms of healthcare are based on homeopathic and herbal remedies as well as some allopathic medical concepts (Islam 1980).

In this setting, the Matlab Health and Socio-economic Survey was fielded in 1996 to assess the health and socio-demographic status and behaviour of the population, particularly adults and the elderly (Rahman et al. 1999). From this survey, we examine social, cultural and economic differentials in healthcare utilization with particular focus on age and sex differentials in the use of care.

Conceptual Model

Studies of use of healthcare in the United States have long been based on theories that posit social, psychological, social network, institutional, national and international determinants of illness behaviour and the use of health services (Aday and Andersen 1975; Andersen and Aday 1978; Becker and Maiman 1975; Coulton and Frost 1982; Parsons 1951). These theories generally assume that the practitioner contacted will be a physician, enmeshed in a network of hospitals, care providers, families and institutions of care, insurers and governmental programs responsible for healthcare (in short, an allopathic healthcare system).

In the developing world, this institutional view of care and the hegemony of modern care do not hold. Complicated plural health systems combine traditional and modern practice, rarely include insurance, and have minimal governmental support, which is usually limited to specific programs to improve child and maternal health and to prevent and treat epidemic diseases (Islam 1980).

The many models of healthcare-seeking behaviour in industrialized countries (Andersen 1968; Rosenstock 1967; Suchman 1965; Suchman 1967; Kroeger 1983; Pescosolido 1992) can be classified into three principal types – the social psychological, network and health behaviour models (see Young 2004 for a critical review). Only the last seems suitable to a developing country context and to the data available for this study.

The *health behaviour model*, which can be represented by the work of Andersen and Aday (cf. 1974), posits that economic, educational, social and cultural characteristics affect and determine healthcare utilization. The original formulation included three types of factors that influence care use. *Predisposing factors* are demographic and socio-structural in nature and have a low degree of mutability (potential to be changed by social action). *Enabling factors*, such as individual, household and family characteristics, distance to care, health insurance and other resources, are those factors that may promote use; they have a higher degree of mutability. *Need factors* include health status and physical capability. Later formulations (e.g. Andersen and Aday 1978) added a fourth category, *healthcare system factors*. The health behaviour model thus can include individual factors, characteristics of the person's family and community network and the health systems in which the individual is embedded. We find it the logical choice for an initial analysis of healthcare utilization in the Bangladesh context. Figure 1 shows the version of the health behaviour model used in this analysis. The broken lines show the interrelationships of predisposing, enabling, need and health

systems factors, all of which are significant. However, in this paper, we focus on the relationships of each set of factors to healthcare use (the direct effects and the interactions with age and sex)[3].

Developing Country Studies Related to the Health Behaviour Model

Empirical analyses of factors related to healthcare utilization in the developed world that are based on the health behaviour model are plentiful, dating back to pioneering studies such as those of Greenlick (1968) and Kohn and White (1976), and have been reviewed by Young (2004). Here we consider only studies in the developing world that are based on the health behaviour model or aspects of that model.

Relationships of predisposing and enabling factors to health or healthcare have been found in studies across the developing world. A number have found gender differences in healthcare utilization and mortality (Buschkens and Slikkerveer 1982; Bloom et al. 2001). Abedin (1999) showed that, in Bangladesh, health of women and the aged was adversely affected by traditional family structure and the nuclearization of the extended family. Fosu (1989) and Subedi (1989) found some differentials in healthcare utilization by sex; the former focused on urban areas and the latter on modern care use. Okojie (1994) and Basu (1990) noted that gender inequality causes differential and often diminished healthcare utilization in the third world, thereby increasing female mortality and morbidity. Pebley (1984) found both age and sex differences in mortality and morbidity in Matlab. Chen et al. (1981) posit the lack of social empowerment of women as the cause of the female deficit in care utilization.

Studies using enabling factors have included ethnicity and religion (Bhardwaj 1975), education (Hinderling 1973), household size (Seo 1976), socio-economic status (Durkin et al. 1994), and cost of care (Sarder and Chen 1981) as factors related to utilization. Henderson (1998), studying economic, political and educational influences on obtaining care in eight provinces in rural China, found that the young obtained care more than the old, and that education, political structure and socio-economic status were not factors. D'Souza and Bhuiya (1982), however, noted an inverse relationship between socioeconomic status, education and mortality in Matlab. They also found a significant interaction between education and socio-economic status. Muhuri (1995) found that health interventions and maternal education are associated with lower child mortality and increased child healthcare utilization in Matlab. Oths (1997) in Peru and Hao et al. (1997) also found direct relationships between higher income and education and the use of healthcare in China. Kinman (1999) noted that spatial distance to care might be crucial to the decision to seek care in situations where transportation systems are inadequate. Sauerborn et al. (1989) found that distance to a clinic in Burkina Faso, as well as cost and availability of care, might affect the decision to go.

Several studies take functional capability, perceived health status and perceived quality of life as measures of need for services (Essink-Bot et al. 1997; Ware and Shelbourne 1992; Rahman and Liu 2000).

Mwabu (1986) studied healthcare decision-making in Kenya, where there is a dual traditional-modern system of care. The personal wishes of the patient as well as economic, cultural, social and religious factors were part of the calculus of care use. Gish (1990) warns that determinants of care may be local, differing from region to region, and that an overall global model may not be possible. These studies suggest, however, that the behavioural health model is appropriate for the developing world, at least as an initial perspective, and offer a set of variables to be included in the analysis. For these reasons, we treat Matlab as a local region of social, cultural, religious, economic, educational and family characteristics and investigate healthcare use in this specific context.

Data and Methods

Data

The Matlab Health and Socioeconomic Survey (MHSS) was conducted in 1996-97. The ICDDR,B Health and Demographic Surveillance System (HDSS) provided the sampling frame and a source of

internal validity for this survey[4]. A stratified random sample oversampled people aged 50 and above (Rahman et al. 1999: 26-29). Analytical frequency weights that reflect the probability that each person is included in the sample (Rahman et al. 1999: 30-34) are used throughout this analysis. The overall response rate was 95.4% (Rahman et al. 1999: 50). Non-response occurred almost exclusively because the entire household had moved between the time the HDSS data used for the sampling frame were collected and the survey. A total of 11,151 adults aged 15 and over were interviewed.

The *outcome variable* is use of the healthcare system. Respondents were asked "Did you visit a health practitioner in the last three months?" They were then asked the reason(s) for each visit in that period. Many of the visits made by women (and none by men) were for reasons related to fertility, whether pregnancy or family planning. Both the Bangladeshi government and ICDDR,B have emphasized maternal health and family planning, and the system of care for these purposes is quite different than and separate from the system for other health conditions. For these reasons, we classified people by type of use of healthcare: none in the three-month period, only for fertility-related reasons, only for nonfertility reasons, and for both fertility and nonfertility purposes. We combined the latter two categories into one – those who had any nonfertility visit to a healthcare practitioner – as an outcome variable. Unfortunately, we have no way of telling whether a woman first visited for a fertility-related reason and, in the course of the visit, was also found to have a problem unrelated to fertility, or vice versa, or had entirely separate reasons for the visits. Thus, people who visit for both reasons may not have gone for care for the problem that was unrelated to their fertility. We therefore view the proportion with nonfertility only visits as an underestimate of the likelihood of obtaining care for conditions unrelated to fertility and the proportion with any nonfertility visits as an overestimate of this likelihood, biased upward by those who went only for fertility reasons but were found to have a nonfertility-related condition that was treated, either then or in another visit. We have chosen, conservatively, to use as our measure of health utilization whether the individual had any visit unrelated to fertility in the three months prior to the MHSS. This measure includes all visits related to care for customary health problems and minimizes the influence of fertility-related visits.

The *predisposing factors* that we include are *age*, *religion* and *sex*. Age, especially of adults, is poorly measured in many developing countries because date of birth is not recorded officially, family knowledge may be inaccurate, and memory of exact dates is unreliable. The MHSS benefited from accurate dating provided by the HDSS of all births since the early 1960s; ages of all those born in the area since the inception of the system are known, basically without error. Ages of those over 40 were estimated when they were either children or relatively young adults, except for those few who migrated into the area as elders. Age is represented by both a linear and a squared term to test for nonlinear relationships. In separate models, five-year age groups were introduced, but the model fits were no better than the more parsimonious continuous representation. Because health problems generally increase with age, we expected a similar increase in healthcare use. Use of services differs by gender in many contexts. In the rural traditional society in Matlab, social norms of female modesty (purdah) as well as differential valuation of women may reduce their access to healthcare services, despite health programs targeted to women and children. Use may also differ by religion. Over 90% of Matlab residents are Muslim; the remainder are Hindus, who constitute a minority that may have less access to healthcare.

The *enabling factors* included are *education*, *per capita household wealth*, *marital status* and *household size*. Our hypothesis is that better educated people and those from better-off households have greater access to healthcare and perhaps more understanding of the need for services. Marital status may be important, especially for women, in that those who are married may be valued more within the household and therefore better able to request and receive care. Household size may be relevant in that per capita wealth may go further if there are economies of scale and there may be more people available to help in travel for healthcare and taking over the tasks of the person obtaining care. The reverse may also be true – small families with greater per capita wealth may make greater use of healthcare.

Education, reported in completed years, was divided into four categories: none, primary (1-4 years), secondary (5-9 years) and higher (10+ years). Some information on income and assets was collected from all individuals. The household head was believed to be most knowledgeable about the household economic situation, so some questions about income and assets were asked only of that person. As a consequence, information for individuals who were not asked for self-reports may be especially affected by recall and measurement biases. In addition, many adults, especially women and elders, reported no personal income, even though they report engaging in productive activities. For these reasons, we chose to use household wealth because we believe it is measured more accurately than individual income and serves as an indicator of household resources that could be applied to healthcare. Kuhn (2001) created a measure of household wealth that is the sum of real income, net transfers to the family, the value of land and the value of personal property. It ranged from 200,000 taka to 820,000 taka (at the time of the survey, $1 = 38 taka). Household wealth was divided by household size to create a measure of per capita wealth, which was then divided into three categories: low (lowest quartile), middle (middle two quartiles) and higher (highest quartile). Marital status has three categories: never-married, previously married (divorced or widowed) and currently married. Being married may itself have a salutary effect on health and healthcare use (Rogers et al. 2000). Further, those with no spouse may have fewer resources (economic and social) to deal with illness and obtain services.

Several potentially important enabling factors are not included in this study. Distance to care facilities was measured only for those who actually obtained care. Its omission is not as problematic as might be the case in other areas. In Matlab, distances to various care facilities are small and nearly uniform; most villages have local traditional practitioners. At the time of the MHSS, some care offered by the government and by ICDDR,B was provided to women in the home to preserve religious traditions. Cost of care is also omitted, primarily because it was measured only for those who actually obtained care. Much of modern care is free in Matlab (though medications, the cost of transportation, work forgone and wages lost to illness are not factored in), especially in government intervention programs for child and maternal health. Traditional care does have costs specific to the care provided. No significant insurance program exists in Matlab: therefore this factor cannot be included here.

Need factors for healthcare vary with biological infirmity and must be included in models of healthcare utilization. In this study, need is measured by two variables, *self-reported health status* and *mobility*. Self-reported health was originally measured on a scale from poor to excellent, but was transformed to two categories, poor and adequate. Rahman and Liu (1998) created an index of mobility for MHSS respondents based on self-reported and objectively observed ability to do everyday activities that may affect the capacity to obtain care in this rural setting. These abilities include climbing, carrying heavy objects and walking short or moderate distances. We use a two-category (poor versus adequate) version of the mobility index.

The only **healthcare systems factor** used here is *area of residence*. To some extent area of residence (in the ICDDR,B program area or the comparison area), treated as a healthcare systems factor in our models, may also be considered a proxy for access to modern healthcare. More health intervention and health education programs are in the program rather than the comparison area. Both increased health education and increased health programs can increase use of services.

Methods

Weighted logistic regression was used to assess the relationships of these indicators to use of healthcare by adults 15 and older (Hosmer and Lemeshow 2000). Variables were entered into the model in blocks representing predisposing, enabling, need and healthcare systems characteristics. The main effects in the predisposing characteristic category were estimated first. Next, sex and age interactions were added, since we are especially interested in asking whether the relationship of characteristics to healthcare use varies by sex and age.[5] If the main effect and corresponding interactions were jointly not significant, the variable and its interactions were dropped from further analysis. This procedure

was repeated, adding enabling, need and healthcare systems categories (and their interactions with sex and age) in sequence to produce the full model. For the final model, only those variables with significant main effects or interactions were retained.

Results

Of the 11,151 adult respondents in the MHSS, only 117 (1%) had information missing on any of the variables included in our models. The wealth variable accounted for more than half (64 people) of respondents with missing data. Residual regression analysis showed that omitting those with missing data did not affect the results. Therefore, only the 11,034 adults for whom information on all variables in the models was available are included in the analyses presented here. Table 1 contains weighted descriptive statistics for these respondents.

Healthcare Visits: Nearly half of all men (47%) and women (46%) made at least one healthcare visit in the three months prior to the MHSS, but nearly a third of women who made any visits did so either for fertility only reasons (6.9%) or for both fertility and nonfertility reasons (7.5%). No men visited only for fertility reasons and only 15 (0.2%) had both fertility and nonfertility visits. The distribution of visits by type differs by age as well as by gender. Figure 2 shows that the proportion of males who visited increases with age (bold line). The remaining lines are for women. The bottom line (the proportion visiting for nonfertility reasons only) follows the age pattern for men, but is about 20 percentage points lower. The middle line (the proportion visiting for any nonfertility reason) adds those who visited for both fertility and nonfertility reasons. Through the reproductive years, approximately the same proportion of women as men made visits for nonfertility reasons, but at older ages, substantially fewer women than men made visits. The final and highest line includes all visits for women including those visits that were exclusively fertility-related. It shows that *more* women than men visited a healthcare provider through the reproductive years. These results may reflect the differential need for healthcare that fertility causes as well as the access women have to maternal and child health programs for pregnancy care and for family planning. Because these systems are generally not available to men, we limit further analysis to nonfertility visits, whether or not there was also a fertility-related reason for visiting. In so doing, we reiterate that we cannot tell, for the 7.5% of women who gave both fertility and nonfertility reasons for their visits, whether the nonfertility visit was simply a byproduct of the fertility visit. Therefore, we recognize that differences between reproductive age women and men are likely to be underestimated in our further analyses.

FIGURE 2. **Proportions of Persons Visiting a Healthcare Provider by Age, Sex and Visit Type, MHSS 1996 (Weighted)**
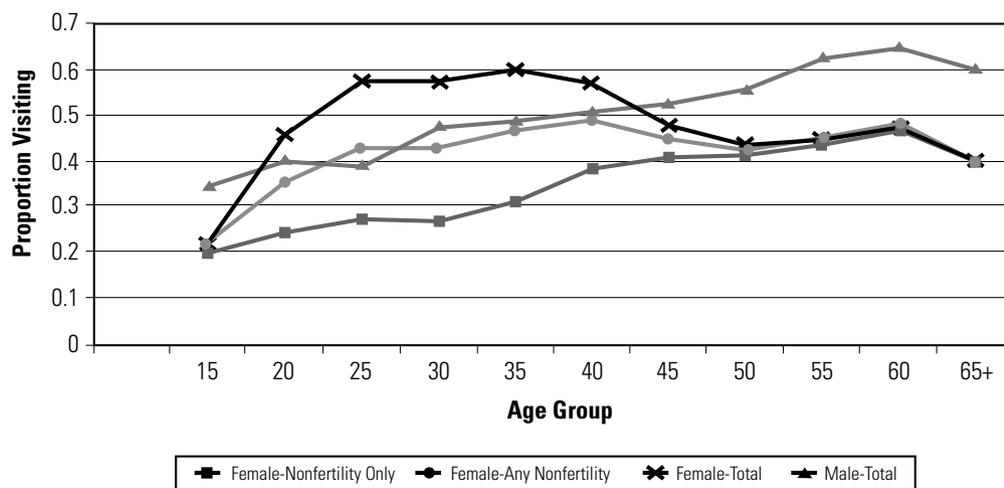
Predisposing Factors: The weighted sample contains 6% more women than men, although there were actually 10% more female than male respondents. The mean age for women (39.3) was slightly younger than for men (41.2). Overall, approximately 24% were aged 50+. The sample is largely Muslim (88%), with little difference between men and women.

Enabling Factors: There is a decided male advantage in education. Just over half of women compared to 35% of men had received no education. There are comparable deficits in secondary

TABLE 1. **Descriptive Demographic Characteristics by Sex and Variable Category, MHSS Data, 1996 (Weighted)**

		Male (%)	Female (%)	Total (%)
Sample Size		5052	5982	11034
Healthcare Visits in Three-months prior to MHSS				
Reasons for visits				
	a. Nonfertility only	47.2	31.7	39
	b. Both Nonfertility and fertility	0.002	7.5	4
	c. Fertility only	0	6.9	3.7
	Any Nonfertility (a+b)	47.3	39.2	43
	Any visit (a+b+c)	47.3	46.1	46.7
Mean Visits per Person Visiting		1.82	1.46	1.65
A: Predisposing Factors				
Sex	Unweighted	45.6	55.4	100
	Weighted	47	53	100
Age Group	15-19	22	18.4	20
	20-24	14.7	11.7	13.1
	25-29	10.5	12	11.3
	30-34	7.6	11.9	9.9
	35-39	7.9	9.7	8.9
	40-44	6.2	7	6.6
	45-49	5.1	6.6	5.9
	50-54	5.9	7.4	6.7
	55-59	5.5	5.4	5.4
	60-64	6.2	4.5	5.3
	65+	8.6	5.5	6.9
	Mean Age	41.25	39.3	40.19
	Range	15-92	15-96	15-96
Religion	Hindu	11.7	12.5	12.1
	Muslim	88.3	87.5	87.9
B: Enabling Factors				
Education	None	35	50.1	43.3
	Primary	19.1	18.9	19
	Secondary	31.4	25.1	28.7
	Higher	14.1	4.5	9
	Mean (years)	3.9	2.4	3.1
	Range	0-18	0-18	0-18
Wealth (per capita)	Low (1st Quartile)	24.6	25.5	25
	Middle (2nd and 3rd Quartiles)	49.8	50.4	49.8
	High (4th Quartile)	25.6	24.1	25.2
	Mean (in Taka)	6347	5810	6066
	Range in Taka	-140550 to 315000		
Marital Status	Currently Married	72.6	73.5	73
	Never Married	25.4	11.7	18
	Previously Married	2	14.8	9
Household Size	1	0.2	1.3	0.8
	2	2.7	2.8	2.7
	3	5.9	6.7	6.3
	4	11.7	13.1	12.5
	5	18.4	18.7	18.6
	6-10	54.9	51.7	53.1
	11-15	5.8	4.7	5.2
	16-20	0.6	1.1	0.8
	Mean Household Size	6.02	5.9	5.95
C: Need Factors				
Impaired Mobility		10.7	25.7	18.6
Poor Health Status		11.7	20.3	16.2
D: Healthcare Systems Factors				
Program Area Residence		57.5	60.7	59.3

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and higher education for women. There is little difference between men and women in per capita wealth of the households in which they reside. About the same proportion of men and women are married, but the distribution of the non-married is quite different. Almost all non-married men had never married, whereas more non-married women were previously married (and most of those were widows) rather than single. In Matlab, nearly all widowers remarry, while few widows do so. The average age of non-married men is 23.2 years and of non-married women, 40.5 years. Men and women live in households of nearly the same average size.

TABLE 2. **Logistic Regressions: Healthcare visit for nonfertility reason in three months prior to MHSS in relation to predisposing, enabling and need characteristics: 1996, MHSS**

| | | Predisposing Models | | | | +Enabling Factors | | | | +Need Factors | | | |
| | | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | | Model 6 | |
		Coeff.	P-value	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
Predisposing Factors													
Age		0.076	0.000	0.045	0.000	0.031	0.003	0.082	0.001	0.098	0.000	0.103	0.000
Age Squared		-0.001	0.000	-0.001	0.005	-0.001	0.166	-0.001	0.018	-0.001	0.000	-0.001	0.000
Religion	Hindu	-0.282	0.000	-1.252	0.001	-1.232	0.001	-1.261	0.001	-1.289	0.001	-1.245	0.001
	Muslim	ref		ref		ref		ref		ref		ref	
Sex	Female	-0.381	0.000	-1.155	0.000	-1.315	0.000	0.507	0.242	1.009	0.000	0.766	0.000
	Male	ref		ref		ref		ref		ref		ref	
Enabling Factors													
Education	None					-0.269	0.000	-0.169	0.615	-0.278	0.000	-0.282	0.000
	Primary					ref		ref		ref		ref	
	Secondary					-0.022	0.704	0.374	0.232	ref		ref	
	High					0.147	0.07	1.107	0.041	0.162	0.031	0.168	0.025
Wealth	Lowest quartile					0.037	0.441	0.115	0.673				
	Middle Two quartiles					ref		ref					
	Highest quartile					0.008	0.876	-0.324	0.267				
Marital Status	Currently Married					ref		ref					
	Never Married					-0.229	0.003	1.067	0.001	0.86	0.001	0.909	0.001
	Previously Married					0.029	0.735	-0.073	0.769	ref		ref	
Household Size						-0.028	0.001	-0.085	0.087	-0.03	0.000	-0.031	0.000
Need Factors													
Health Status	Poor									0.544	0.000	2.42	0.000
	Not Poor									ref		ref	
Mobility	Impaired									0.407	0.000	1.82	0.001
	Not Impaired									ref		ref	
Interactions between Age, Sex and													
Predisposing Factors	Age*Female			0.059	0.000	0.063	0.000	-0.008	0.652	-0.033	0.000	-0.024	0.000
	Age*Hindu			0.05	0.012	0.046	0.021	0.047	0.018	0.05	0.011	0.048	0.015
	Agesq*Female			-0.001	0.000	-0.001	0.000	-0.001	0.285				
	Agesq*Hindu			-0.001	0.042	-0.001	0.058	-0.001	0.054	-0.001	0.03	-0.001	0.037
	Hindu*Female			-0.184	0.146								
Enabling Factors	Age* No Education							-0.01	0.581				
	Age* Secondary Education							-0.025	0.161				
	Age* Higher Education							-0.044	0.141				
	Age* Low Wealth							-0.01	0.48				
	Age* High Wealth							0.012	0.444				
	Age* Post-married							-0.002	0.687				
	Age* Never Married							-0.053	0.014	-0.022	0.021	-0.024	0.021
	Age* Household Size							0.003	0.31				
	Agesq* No Education							0.001	0.439				
	Agesq* Secondary Education							0.001	0.189				
	Agesq* Hindu							0.001	0.375				
	Agesq* Low Wealth							0.001	0.258				
	Agesq* High Wealth							-0.001	0.786				
	Agesq* Post-married							0.001	0.565				
	Agesq* Never Married							0.001	0.1				
	Agesq* Household Size							-0.001	0.347				
	Female* No Education							-0.021	0.85				
	Female* Secondary Education							0.1	0.384				
	Female* High Education							0.088	0.633				
	Female* Low Wealth							-0.039	0.693				
	Female* High Wealth							-0.07	0.502				
	Female* Post-married							0.082	0.742				
	Female* Never Married							-1.014	0.000	-1.09	0.000	-1.026	0.000
	Female* Household Size							0.007	0.697				
Need Factors	Age* Poor Health											-0.062	0.001
	Age* Impaired Mobility											-0.045	0.043
	Agesq* Poor Health											0.001	0.014
	Agesq* Impaired Mobility											0.001	0.114
	Female* Poor Health											-0.325	0.016
	Female* Impaired Mobility											-0.19	0.259
Constant		-1.7	0.000	-1.26	0.000	-0.62	0.008	-1.801	0.001	-2.24	0.000	-2.538	0.000
N=11034													
Log Likelihood		-7318		-7283.2		-7254.2		-7217.9		-7155.1		-7131.1	
Pseudo-R²		0.0295		0.0341		0.038		0.0428		0.0511		0.0543	
DF		4		9		16		40		15		21	

Coefficients 0.001 and -0.001 are rounded from smaller numbers to that figure for simplicity

Need and Healthcare System Factors: There are striking differences in need. Women are more than twice as likely to be mobility-impaired than men (26 vs. 11%) and more likely to report poor health (20 vs. 12%). Slightly more women than men live in the program area.

The results of the regression analysis are provided in Tables 2 and 3. As described earlier, variables were added in blocks, first as main effects only and then with all interactions with age and sex. Nonsignificant interactions were dropped at each stage. When both the main effect of a variable and all interactions with age and sex were jointly nonsignificant, that variable was dropped from further analysis. Interactions among other predictors were tested; none was significant. Table 2 shows the successive introduction of predisposing, enabling and need characteristics. Table 3 adds healthcare system characteristics and the final model. Wealth and its interactions were jointly nonsignificant in the models in Table 2, so they are not included in Table 3 (although they were re-entered into the final model and remained nonsignificant). Similarly, secondary education did not differ from primary education in its effect, so the two categories were combined. Also, married and previously married statuses did not differ in their effects, so these categories were combined.

The log-likelihood and Pseudo-R2 of the model improve with addition of each set of factors. We recognize that the models displayed are not exactly nested, because factors were dropped at each stage of the process. However, the changes are close approximations to those of nested models. Changes calculated from fully nested models (listed as, for example, Model 2a but not shown) are given below. Starting from the model with predisposing factors only, need factors increase the explanatory power of the model the most. The change in log-likelihood and degrees of freedom for each additional set of factors is as follows:

	Change in log-likelihood	Difference in Degrees of freedom
Predisposing to Enabling (Model 2a to Model 4a)	37	6
Enabling to Need (Model 4a to Model 6a)	130	5
Need to Healthcare Systems (Model 6a to Model 9)	26	2

We limit description of the results to the final model, Model 9, starting with the predisposing factors. As expected, visits increase with age but at a decreasing rate for the reference category, ever-married Muslim males with primary or secondary education, who are in good health and without mobility restriction, and who live in the comparison area. Hindus are less likely to visit than Muslims, but the significant age interactions show that visits increase more steeply with age, but at a higher decreasing rate. For Muslim men in good health, the odds of going for a healthcare visit increase until age 51.5 and then decline, whereas for Hindu men in good health, the odds begin to decline at age 38. Overall, as Figure 2 showed, women are more likely to visit than men during the reproductive years because of fertility-related visits, but the increase with age is much lower (the age/female interaction is significant and negative). As women pass beyond the reproductive ages, they are actually less likely to obtain care, despite what can be perceived as at least equivalent need to males. As age increases, therefore, males have a distinctly better chance of having a healthcare visit than females, despite at least equivalent need.

All enabling factors except household wealth were associated with differences in healthcare. Use of healthcare services increases with education, without any significant difference by sex or age. The odds of visiting for those with no education were 24% lower than for those with primary or secondary education and 16% higher for those with 10+ years of education. Overall, never-married men use health services more than currently married men. The opposite is the case for women – the significant female/never-married interaction term is highly negative, so that never-married women use less than ever-married women. In addition, use by the never-married goes up more slowly with age (the age/never-married coefficient is negative). Odds of use of services decrease 2.6% per additional person in the household.

Differences in use by those in need through overall poor health are also gendered. Men in poor health are far more likely to visit (odds = 12.9), but the increase is sizably smaller for women in poor

TABLE 3. **Logistic Regressions: Healthcare visit for nonfertility reason in three months prior to MHSS in relation to predisposing, enabling, need and healthcare system characteristics: 1996, MHSS**

		+ Healthcare Systems						
		Model 7		Model 8		Model 9			
Predisposing Factors				Full		Reduced			
		Coeff.	P-value	Coeff.	P-value	Coeff.	P-value	Odds	SE
Age		0.099	0.000	0.111	0.000	0.103	0.000	1.109	0.012
Age Squared		-0.001	0.000	-0.001	0.000	-0.001	0.000	0.999	0.0001
Religion	Hindu	-1.323	0.000	-1.432	0.000	-1.357	0.000	0.258	0.381
	Muslim	ref		ref		ref			
Sex	Female	0.857	0.000	0.905	0.000	0.853	0.000	2.346	0.168
	Male	ref		ref		ref			
Enabling Factors									
Education	None	-0.276	0.000	-0.277	0.000	-0.276	0.000	0.759	0.046
	Primary or Secondary	ref		ref		ref			
	High	0.156	0.037	0.148	0.048	0.152	0.042	1.164	0.075
Marital Status	Ever Married	ref		ref		ref			
	Never Married	0.843	0.001	0.811	0.002	0.827	0.002	2.288	0.265
Household Size		-0.027	0.001	-0.027	0.001	-0.027	0.001	0.974	0.008
Need Factors									
Health Status	Poor	2.588	0.000	2.529	0.000	2.557	0.000	12.892	0.397
	Not Poor	ref		ref		ref			
Mobility	Impaired	0.441	0.000	0.439	0.000	0.438	0.000	1.55	0.07
	Not Impaired	ref		ref		ref			
Healthcare Systems Factors									
Residence	Program Area	0.296	0.000	0.855	0.000	0.543	0.000	1.721	0.1
	Comparison Area	ref		ref		ref			
Interactions between Age, Sex and									
Predisposing Factors	Age*Female	-0.028	0.000	-0.028	0.000	-0.028	0.000	0.973	0.004
	Age*Hindu	0.049	0.013	0.054	0.008	0.049	0.013	1.05	0.02
	Agesq*Hindu	-0.001	0.032	-0.001	0.024	-0.001	0.04	0.999	0.0002
Enabling Factors	Age* Never Married	-0.023	0.023	-0.022	0.03	-0.022	0.025	0.978	0.01
	Female* Never Married	-1.047	0.000	-1.045	0.000	-1.046	0.000	0.351	0.131
Need Factors	Age* Poor Health	-0.07	0.000	-0.068	0.000	-0.069	0.000	0.933	0.018
	Agesq* Poor Health	0.001	0.002	0.001	0.003	0.001	0.002	1.001	0.0002
	Female* Poor Health	-0.324	0.012	-0.323	0.012	-0.325	0.012	0.722	0.129
Healthcare Systems Factors	Age* Program Area			-0.022	0.077	-0.007	0.007	0.993	0.002
	Agesq* Program Area			0.001	0.206				
	Female* Program Area			-0.085	0.301				
Constant		-2.458	0.000	-2.75	0.000	-2.588	0.000		
N=11034									
Log Likelihood		-7108.7		-7103.5		-7105			
Pseudo-R²		0.0573		0.058		0.0578			
DF		19		22		20			

Coefficients 0.001 and -0.001 are rounded from smaller numbers to that figure for simplicity

health (odds = 9.3). The age pattern of use is different for those in poor health compared to those in better health and will be examined further below. The odds of a healthcare visit are 55% higher for those with poor mobility. Interestingly, these odds do not differ either by age or gender.

Finally, those in the ICDDR,B program area were more likely to visit a health practitioner and the increase with age was less steep.

To help understand use patterns, we focus on those considered disadvantaged: women, the aged, Hindus, and those whose health is poor, and where interactions make interpretation less straightforward. Figure 3 presents the log odds of a healthcare visit by gender, age and health status, holding all categorical factors at the reference category (Muslim, primary or secondary education, ever-married, mobility not impaired, comparison area residence), and household size at the mean of 6. For those who self-report their health as poor, the top two lines show that log odds of a visit increase with age just about linearly for men, while there is little change for women. For those in good health (bottom two lines), the log odds of use are curvilinear with age, increasing for men to about age 50 and then decreasing. For women, the decline begins much earlier, about age 30. Since higher proportions of people report poor health as they age, weighting these two curves leads to the original use patterns

shown in Figure 2. The figure clearly illustrates the finding above that need characteristics had the greatest explanatory power of the factors introduced in our models.

For ever-married males who self-reported good health, had primary or secondary education, and had unimpaired mobility, we compared predicted log odds of use by Hindus and Muslims in the program and comparison areas. Hindus at every age used services less than Muslims. Use peaked at age 40 for Hindus and 55 for Muslims. At older ages, decline in use by Hindus was greater than for Muslims.

FIGURE 3. **Predicted Log Odds of Healthcare Visit by Age, Sex and Health Status: Muslims with primary or some secondary education, ever-married, mobility not impaired, comparison area residence and household size 6**
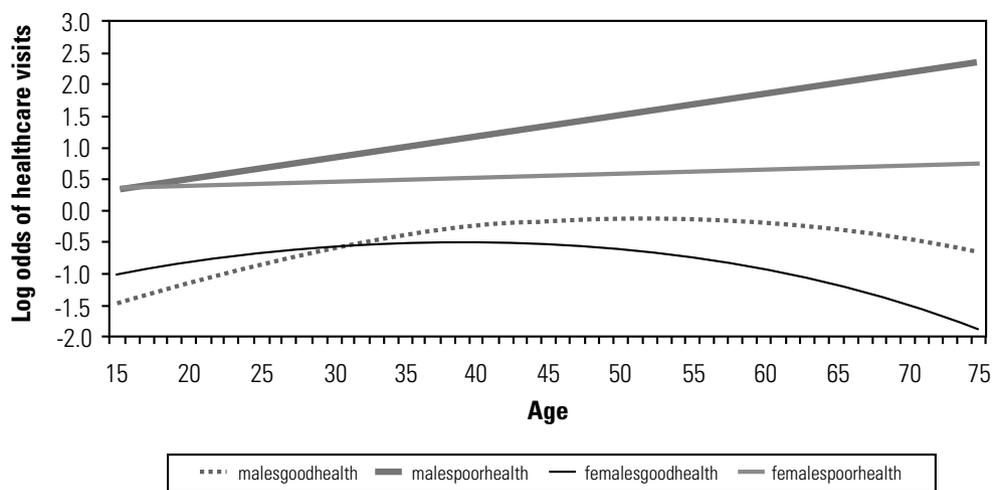
The effects of marital status and its interaction with health can be illustrated by a similar analysis of Muslim females with primary or secondary education, unimpaired mobility, and living in the comparison area. Predicted use by never-married females at each age lags behind use by ever-married females. Among the ever-married, use goes up with age if health status is poor, but the reverse is true for never-married females. However, from the mid-20's on, never-married females constitute less than 2% of their age group.

As we have seen, after the reproductive years, women are far less likely than men to have healthcare visits. However, women in the program area do have greater access to fertility-related services. For this reason, we carried out an analysis of women in which having at least one fertility-related visit in the three months prior to the MHSS was the dependent variable. Women in the program area had odds of using fertility services that were 3.2 times higher than for women in the comparison area. Some portion of this use difference appears to be spilling over to the use of nonfertility services, so that provision of fertility services may lead to greater use of general health services. However, further research is needed to demonstrate conclusively whether or not this effect indeed exists.

Summary and Conclusions

The differential use of healthcare services by age and sex has rarely been studied comprehensively outside of the developed world. We present a culturally specific methodology and empirical example that demonstrates the usefulness of the Andersen and Aday behavioural model of healthcare services utilization in one developing country context: the Matlab region of Bangladesh. Predisposing, enabling, need and health systems factors are all related to the use of services. This study clearly

FIGURE 4. **Predicted Log Odds of Healthcare Visit by Age, Religion and Residence: Males with primary or some secondary education, ever-married, not in poor health, mobility not impaired and household size 6**
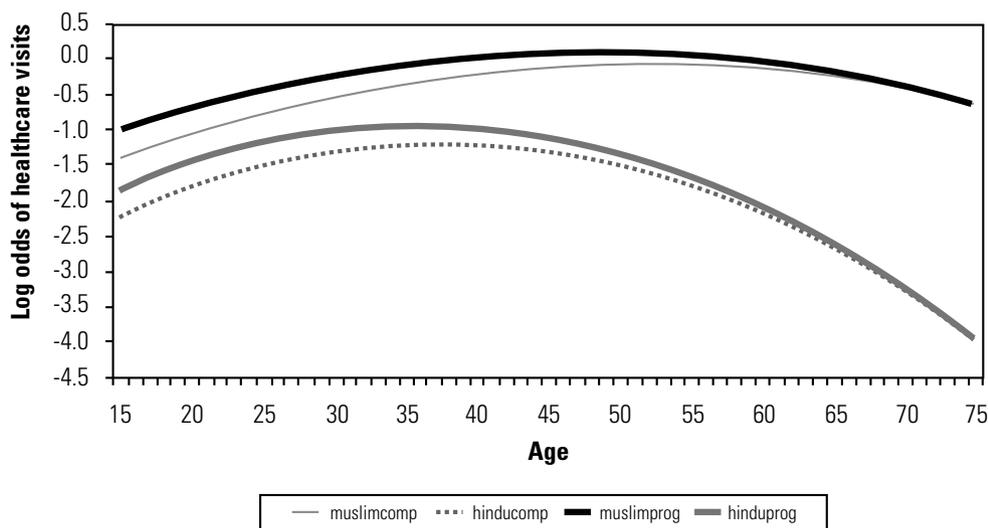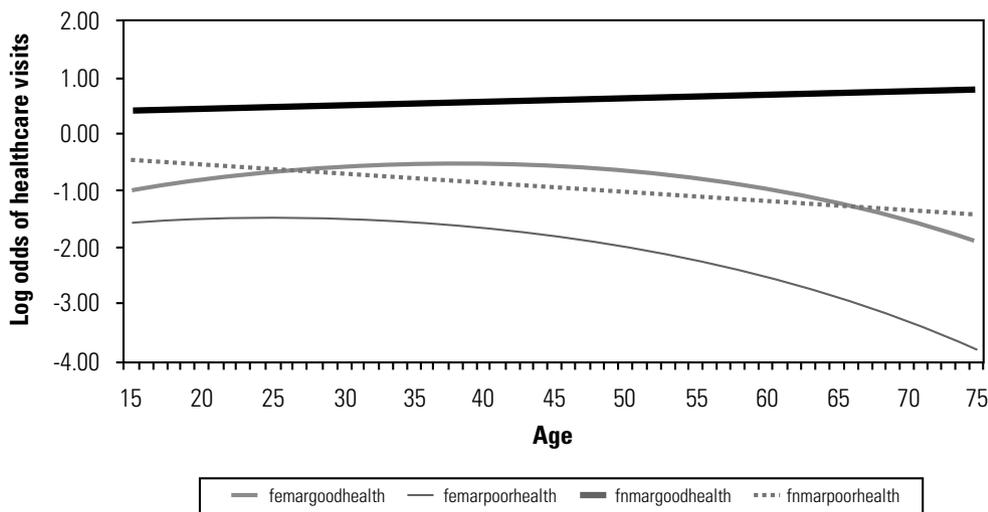

FIGURE 5. **Predicted Log Odds of a Healthcare Visit by Age, Marital Status, and Health Status: Muslim females with primary or some secondary education, mobility not impaired, comparison area residence and household size 6**

shows a deficit for older women in obtaining healthcare. Women are disadvantaged by receiving less care as they age, whether their health is good and especially if it is poor. For people in good health, there is a curvilinear relationship between age and health visits, first increasing, but then declining, so that older relatively healthy people, especially women, receive less care. The reasons for gender differences may be differential valuation of men and women that leads to fewer resources within the family being used for healthcare for those who are less economically active. This proposition is supported by the finding that for men in poor health, visits increase with age, while the gap between men and women in poor health increases markedly. Women also are more likely to be educationally

disadvantaged, thereby increasing the overall gender gap in healthcare. The education gap and the empowerment gap between men and women may affect women in ways that include less participation in decision-making and modesty norms which, though declining, make it more difficult for women to appear in public, even for healthcare visits, and are related to dependence on escorts to access available services.

Matlab has a high level of self-reported poor health – 16.2% in Matlab versus 2.7% in the United States (Rogers et al. 2000). This situation is reflected in high use of services – over 40% used services in Matlab in the three months prior to the survey. Whether these services are effective in maintaining and improving health is not known. What is clear is the need for increased attention to adult health.

That we find use increases with education and decreases with household size is not surprising in this resource-constrained society. Similarly, that the major minority group, Hindus, receives less care is also not surprising.

The policy implications of this study are relatively self-evident. As overall life expectancy is improving in Bangladesh, there is need for greater attention to the heavy adult burden of poor health that disproportionately falls on the disadvantaged – in this case women, especially as they age, and Hindus. It appears that older men can depend on their families for support and attention to their needs. The same support and attention is not being given to elderly women. There is also confirmation that policies and programs are having positive effects. The education programs in which the Bangladesh government and nongovernmental organizations have invested heavily and targeted to girls are increasing overall schooling and decreasing the gender gap. Therefore, more young adults are falling into groups advantaged by their education and better able to seek healthcare. Increasing services, as ICDDR,B has done over the years, has surely increased the rates of use of healthcare. Both men and women who live in the ICDDR,B program area are more likely to have had healthcare visits than those with comparable characteristics who live in the comparison area. It is possible that the current cross-sectional pattern does not offer a good prediction of what will happen to today's young women as they age. Younger women, who through their participation in fertility-related health programs are learning about the availability of healthcare, may, as they age, continue to expect that their health needs will be met and may have established a pattern of use that will persist beyond their reproductive years.

Further research that builds on this study is needed to provide information on which to base new policies. The Western notion that healthcare utilization is a personal right is challenged in this study of a small region of Bangladesh. Obtaining healthcare in Matlab may result from a household decision and may hinge on the economic and social contribution or potential for contribution of the person with healthcare needs. Better measures of each adult's economic contribution to the household are needed for studies of this type, as are better measures of women's status and changes in their status. If healthcare services are to be improved, there is need for better measures of health conditions so that programs can be targeted to the greatest needs. Cohort follow-up is essential to test whether the efforts for a "healthier start," whether through education or healthcare or both, are carrying over to improvements in later life. We are planning a follow-up longitudinal survey that will permit study of changes over time in health and healthcare utilization in relation to the predisposing, enabling, need and health system factors included here.

Finally, it is essential to note the great improvements in Bangladesh in education and other programs, especially for women. It is our hope that these changes – and others targeted to adults, whether female or male – will lead to improvement in health and access to healthcare as those who are advantaged by changing conditions move into older age.

Endnotes

1 According to Whitehead (1992), health inequalities may be biologically or genetically determined, and consequently inevitable. Health inequities, in contrast, result from differences in health outcomes between groups that are avoidable and unnecessary, and hence unjust.

2 The Matlab Health and Socio-economic Survey was a collaborative effort of investigators at RAND, the

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