Dr. ULIMIRI V. Somayajulu is currently CEO and Executive Director, Sigma Research and Consulting, New Delhi. He has more than 22 years of experience in social/developmental and demographic research on wide ranging issues in India and Sri Lanka. He has MBA, PG Diploma in Management, Diploma in Management and PG Diploma in Human Resource Management from IGNOU, M. A. Sociology from Annamalai University, Ph. D. and M. Phil. from International Institute for Population Sciences and M. Sc. Statistics from Andhra University. He is member of East West Center, Honolulu. Population Environment Research Network, and International Union for Scientific Study of Population (IUSSP). He is Executive Board member of International Society for Urban Health (ISUH), General Secretary and Board of Trustee Treasurer of the Indian Association for Study of Population (IASP) and Vice President of the Indian Association for Social Sciences in Health (IASSH). He has coordinated around 350 research projects in social and development sectors. He edited five books and author of about 105 papers in Demography, Disaster Management, Development, Gender, Health, Ageing, Mental Health, Health Financing, Poverty Alleviation, Corporate Social Responsibility, Family Welfare and HIV/AIDS, published in edited volumes National Journals, and presented at National and International Conferences/Seminars.

Dr. G K Panda is a Senior Professor in the Dept. of Geography and Deputy Director of the Population Research Center at Utkal University, Bhubaneswar. He has nearly three decades of teaching and research experience at the post graduate level in Geography and its allied subjects like Population, Health and Environment, Natural Hazards and Disaster Management. He was a gold medalist at graduation and post graduation level in Geography and was a visiting fellow of the Liverpool University in 1995. His research works are mostly in the programme areas which interface between public sector, national, international agencies and civil society organisations. He was a research consultant to the UNDP and OSDMA for the preparation of the Odisha State Natural Disaster Vulnerability Analysis and Risk Assessment Report. He has worked for many national and international agencies like WHO, UNDP and CARE. As the Chief Executive of the PRC, he has undertaken research studies like NFHS, DLHS and NRHM in Odisha.

Dr. (Ms) Ranjana Kar is now serving as Lecturer in Statistics at Rural Health Training Centre, Jagatsinghpur. She has M Sc and Ph D in Statistics from Utkal University, Bhubaneswar and Master Degree in Population Sciences from IIPS, Mumbai and training in Epidemiology from the Liverpool School of Tropical Medicine, U.K. She has served the Health and family Welfare Dept., Govt. of Odisha as M & E Officer, Asst. Director (Statistics) and. She was the Coordinator for the NFHS -3 for the state of Odisha. She was associated with other research studies of national significance such as CNA Approach, KAP study on use of iodized salt & IDD, Use and Acceptability of the ISM and estimation of MMR using snowballing technique in Odisha. Her books on Fundamentals of Bio-Statistics and Health Information System have been widely used by the medical and paramedical students.

Dr. Pradeep Mishra is the Additional Director of Population Research Centre, Lucknow University, Lucknow since 1991. Between 1981 and 1991 he was associated with Population Research Centre, Patna University, Patna. He has completed many large scale field based research studies relating to Bihar, Uttar Pradesh and Uttarakhand. He has contributed/ edited many books and research reports. He has been involved in teaching population studies to post graduate students of Lucknow University. He has been actively involved with the Indian Association for the Study of Population (IASP) and has served as Treasurer and General Secretary. Presently he is Vice President of the Association.

Dr. Kaushalendra Kumar Singh is a Professor and Head, Department of Statistics, Banaras Hindu University, Varanasi. He has M Sc and Ph D in Statistics from BHU, Varanasi. He has also worked at the Carolina Population Center, University of North Carolina at Chapel Hill, USA as a postdoctoral fellow of the Rockfeller Foundation and the Evaluation Project funded by USAID respectively in early nineties. His current areas of research include Reproductive Health and HIV/AIDS. He is recipient of 'Young Scientist' award of the Indian Science Congress Association in 1982. He served the Indian Association for Study of Population (IASP) as Treasurer.

SERIALS PUBLICATIONS
www.serialspublications.com
4830/24, Ansari Road,
Darya Ganj, New Delhi-110 002
Phones : 2324 5225 Fax : 2327 2135
E-mail : serials@sify.com
serialspublications.india@gmail.com

Price Rs. : 1595/-
ISBN: 978-81-8387-579-0

POPULATION, REPRODUCTIVE AND CHILD HEALTH

Ulimiri V Somayajulu
Gopal Krishna Panda
Ranjana Kar
Pradeep Mishra
Kaushalendra Kumar Singh

POPULATION, REPRODUCTIVE AND CHILD HEALTH

Perspectives and Challenges

Ulimiri V Somayajulu
Gopal Krishna Panda
Ranjana Kar
Pradeep Mishra
Kaushalendra Kumar Singh

Serials

11

Factors Affecting Patterns of STI/HIV in Four High Prevalence States in India: An Epidemiological Exploration

S.K. Singh, Nidhi Sharma and Barsharani Maharana

Introduction

Globally, despite several decades of advocacy, awareness raising and investment in programmes to control the spread of HIV, the HIV epidemic grows as the number of new infections outstrips the AIDS related deaths (*UNAIDS*, 2006 Global Report on the AIDS Epidemic, 2006). The result has been largely ineffective targeting of prevention of interventions, misapplication of available resources and the loss of early opportunities to address the unique factors driving infection in the population groups most at risk within the country (*study of transmission, UNFPA)*. There is plethora of documented proofs and literature on various aspects of HIV epidemic underlining the serious challenge that existence of HIV/AIDS poses to every nation across the globe. Apart from a being a serious health problem, the multi layered effects of the epidemic on the socio-economic fabric of whole nations, makes HIV/AIDS a potential development threat worldwide. According to WHO AIDS epidemic update 2009, the number of people living with HIV worldwide continued to grow in

2008, reaching an estimated 33.4 million [31.1 million–35.8 million]. The total number of people living with the virus in 2008 was more than 20% higher than the number in 2000, and the prevalence was roughly threefold higher than in 1990 (2009 AIDS epidemic update, WHO). Nevertheless, globally the annual number of new HIV infections have declined from 3.0 million (2.6-3.5 million) in 2001 to 2.7 million (2.2-3.2 million) in 2007. The annual number of new HIV infections globally has declined, and HIV prevalence among young people has fallen in many countries (UNAIDS, 2008). According to new data in the *AIDS epidemic update 2009*, new HIV infections have been reduced by 17% over the past eight years. Asia's epidemic has long been concentrated in specific populations, namely injecting drug users, sex workers and their clients, and men who have sex with men. The proportion of women living with HIV in the region rose from 19% in 2000 to 35% in 2008. In particular countries, the growth in HIV infections among women has been especially striking. In India, women accounted for an estimated 39% of prevalence in 2007 *(National AIDS Control Organisation, 2008)*. Transmission among sex workers and their clients is helping to drive a much broader epidemic of heterosexually acquired HIV, resulting in extensive transmission among individuals who engage in low levels of risk behaviour (Wang et al., 2009)

Indian HIV epidemic is also witnessing a dynamic phase, which is heterogeneous in nature in different parts of the country. Recent reports on HIV epidemic scenario in India coming out from various national and international agencies exhibit a declining trend in HIV incidence and prevalence over the past few years (UNAIDS Welcome Trust Centre for the Epidemiology of Infectious Diseases). There are growing evidences of stabilizing HIV epidemic in India but limited to Tamil Nadu and Maharashtra. Evidences also indicate that HIV has begun to fall among young antenatal clients aged 15-24 (the first group in whom change is expected) in Southern states (Kumar et al, 2006, Arora et al, 2007), First national population-based HIV survey yielded an adjusted HIV prevalence of 0.36% in general population of India. The adult HIV prevalence

during the past few years has remained almost stable at 0.4% varying between 0.45% in 2002 and 0.36% in 2006. PLHIV in all ages in 2006 was 2.47 million. Around 4% of them were children, 8% among the age groups 49 or above and the remaining 88% in 15–49 age groups (Technical report on HIV estimates, NACO, 2006).

Programmatic Response to the Epidemic

Knowing the epidemic and response can help countries to craft an optimally effective national response (UNAIDS, 2007). A long-standing impediment to putting this advice into practice has been the dynamic heterogeneous nature of this infection clubbed with difficulty of reliably estimating and characterizing new HIV infections. Efforts are made at every stage and at every level, internationally and nationally to combat this epidemic which claims for the biggest health catastrophe for human race. Indian HIV epidemic is mainly concentrated in the high risk groups in the population and these groups namely FSWs, MSMs, IDUs, single male migrants, et al, carry the major burden and drivers of disease in the population. On the other hand, recent updates vouch for the growing evidences that HIV in India has not been restricted to the high risk population but increasing categories of bridge population and their nature and pattern of interactions with different high risk groups increases the complexities of HIV epidemic many folds, thus, posing a serious threat to the programmatic response across the country. Considering the convoluted nature of HIV epidemic in country, India's HIV response has often undermined the generic approaches, and tried to address the major local drivers of epidemic in each context. Responses to the HIV are tailored and prioritized to address the major drivers of transmission, and investments are made in effective interventions, to reach a majority of those at genuine risk of infection through targeted interventions operating at various levels. Evidence-based and result-oriented strategies and programme and interventions with scope for innovations and flexibility are designed by prioritizing local contexts. As a part of nation's response to this public health

issue, various systematic efforts and structural interventions are carried out across different rounds of NACP. *NACP-3 focuses on*

- Prevention of new infections by saturation coverage (>80%) in high risk groups
- Expanding care, support and treatment opportunities for people living with HIV by providing anti-retroviral treatment
- Strengthening capacity at all levels
- Strategic information management at national and state levels.

Statement of the Problem

The nature of HIV epidemic is complex and in Indian context tabooed and fluid as the epidemic in India is mainly driven by certain population groups and mainly through heterosexual routes. Being home to several epidemics with distinct vulnerability, maturity, and impact, the efforts call for decentralized decision making and implementation. Further, along with effective planning efficient output in the form of speed, scale and coverage of targeted interventions are of particular concern. Another gap in the existing efforts is rural coverage. Almost all prevention programs have focused on urban population neglecting rural areas completely in the efforts to combat the HIV/AIDS. The services that deal with care and support programs are primarily based on sentinel surveillance data, while first time ever community based HIV testing and prevalence of the epidemic in NFHS 3 broke a number of myths putting several challenges to the existing programmatic response of the epidemic. This highlighted the need for accurate and reliable data for efficiently carrying out evidence based planning.

According to NACO Phase-III (2006-2011), the HIV epidemic in India is very heterogeneous with diverse modes of infection, particularly in southern and western states, namely, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra and two north eastern states, namely, Nagaland

and Manipur. It is evident from the National Family Health Survey (2005-06) that HIV tests were conducted for 85 percent of the 62,182 eligible women and 78 percent of the 64,175 eligible men in India. For both the sexes combined, coverage was 82 percent. In the survey, 6 percent of women and 14 percent of men did not complete individual interviews, so they were not eligible for blood tests. In addition, 6 percent of women and 5 percent of men who completed individual interviews refused to provide blood for HIV testing. Hence, it is indispensable to find out the socio-economic and demographic factors associated with HIV prevalence. In this paper the north eastern states are exempted because the survey team was not able to collect blood samples for HIV testing due to the local opposition.

Objectives of the Study

1. To analyze the socio-demographic and behavioral factors affecting HIV related risk behavior in four high HIV prevalence states and country as whole;
2. To estimate the probability of transition from last to last sexual partners in different High HIV prevalence states;
3. To examine the major covariates of HIV prevalence among men and women, and
4. To assess the extent to which the epidemiological transition in terms of early diagnosis and treatment of STIs leads to differential HIV prevalence across different states

Methods and Materials

The present study relies on the secondary sources of information since under NACP-III, there are multiple sources of data available for understanding the HIV prevalence rate on one hand and behavioural aspects on the other. Employing these multiple sources of data provides an opportunity to resort to meta analysis and data synthesis that enable to delineate a comprehensive picture of the current epidemic. The study employs quantitative techniques using standard statistical tools to substantiate the laid down objectives using the data from three National level Surveys.

National Family Health Survey-3

The NFHS-3 collected the information from a nationally representative sample of 1,09,041 households with 1,24,385 women in the reproductive age group 15-49 and 74,369 men aged 15-54 years. The survey provides data on key indicators of HIV prevalence, high-risk sexual behaviour, along with many other variables. Because of the low level of HIV prevalence in India (less than 1 percent of the adult population according to the official estimate at the time that NFHS-3 was being planned), very large samples would be required to obtain reliable estimates of HIV in individual states. Therefore, it was decided to design the sample to provide state-level HIV prevalence estimates only for the six states mentioned above. To ensure that the state-level HIV estimates were reasonably precise, those six states were oversampled. All women age 15-49 and all men age 15-54 living in all sample households in those states were eligible for the HIV testing component of NFHS-3. HIV testing in NFHS-3 was carefully designed and implemented based on sound scientific principles and substantial field experience in incorporating HIV testing in national household surveys. Respondents who consented to participate in the HIV testing provided blood drops from a finger stick that were collected on special filter paper cards and dried overnight. The dried blood spot samples were delivered to SRL Ranbaxy collection centres from where they were shipped by courier to the SRL Ranbaxy laboratory in Mumbai, where the HIV tests are conducted. External quality control for the HIV testing was conducted on more than 5,000 NFHS-3 blood samples by the National AIDS Reasrach Institute in Pune.

Behavioural Surveillance Survey (BSS)

In conformity with the National AIDS Prevention and Control Policy, National AIDS Control Organisation (NACO) commissioned the first Behavioural Surveillance Survey (BSS) in 2001 as a part of NACP-II. This provided the baseline information on high risk behavioural patterns, knowledge, awareness and practices related to spread of HIV/AIDS in the

country. Towards the end of NACP-II, after a gap of five years since the first wave of BSS, NACO commissioned the second wave of BSS in 2006 to measure the changes in behavioural indicators. The second generation surveillance for HIV emphasizes the significance of understanding the behavioural patterns and trends that increase the emergence of the HIV epidemic. They give direction to the programmatic efforts by showing the impact of the interventions and areas that need focus of different initiatives. Behavioural Surveillance aids national as well as sub-national planners and administrators in planning, implementation as well as monitoring the interventions to tackle the HIV epidemic.

Epidemiological Surveillance

Surveillance is the ongoing systematic collection, collation, analysis and interpretation of data in order that ACTION may be taken. Deriving programmatic implications for further ACTION is the main purpose of Surveillance system. Surveillance is aimed to provide data within the limitations of time and extent. Feasibility and cost effectiveness to conduct the study every year is an important aspect in planning the surveillance activities. For HIV sentinel surveillance, specific sites are selected across the country for different target populations where an annual exercise of collecting a stipulated number of samples for HIV testing is undertaken. Since data is collected from the same selected sites every year, it provides information to understand the spread and trends of HIV epidemic in different geographical regions as well as in different population sub groups. In the absence of any other information, the data is also used for the purpose of estimation of HIV infected persons in the country. Surveillance for HIV infection comprises of four broad areas: HIV Sentinel Surveillance, AIDS Case Surveillance, Behavioural Surveillance and Sexually Transmitted Infections (STI) Surveillance. HIV Surveillance closely monitors and tracks the level, spread and trends of the epidemic as well as the risk behaviours that predispose the growth of epidemic.

The data from the above three sources has been triangulated to get the epidemiological and the behavioural trends which are further used for understanding the factors that are driving the HIV epidemic.

Results and Discussion

Major issues emerged from the analysis and its relevance in the context of on-going programmes and interventions have been presented under three broad domains.

Factors Affecting the HIV Related Risk Behaviour

Premarital sexual relations and two and more number of lifetime sexual partners are positively associated with prevalence of STI and HIV. Given that most HIV infections in India are contracted through heterosexual contact, information on sexual behaviour is important in designing and monitoring intervention programmes. To study the vulnerabilities, *we* designed analytical models that include four behavioral parameters namely comprehensive knowledge, multiple sexual partners, condom use in the last sex and any STI in the past 12 months in addition to a number of socio-economic factors. Further, the priority issue in studying the high risk sexual behaviour is the nature and pattern in partner exchange rate and adaptation of safe sexual practices. Behaviour transition analyzed in the context of recent changes in multiple partner sexual relations among men in the general population is carried out using Markov chain model.

Table 1
Variation in Core Indicators Portraying HIV Related Risk Behaviour in India and Four High HIV Prevalence States

	Comprehensive Knowledge of HIV/AIDS		*Condom Use in Last Sex*		*STI in Last 12 Months*		*Two or More Lifetime Sexual Partner*	
	Men	*Women*	*Men*	*Women*	*Men*	*Women*	*Men*	*Women*
India	33.0	17.0	6.0	3.7	4.7	11.1	19.1	2.0
Tamil Nadu	37.0	12.0	2.9	1.6	1.1	4.0	15.4	0.9
Karnataka	29.0	12.0	1.7	1.2	0.5	2.9	14.8	0.3
AP	32.0	15.0	2.0	0.3	1.7	3.1	27.2	0.9
Maharashtra	53.0	30.0	6.9	4.3	2.6	4.6	12.7	1.2

Table 1 reveals that in the southern states, Maharashtra and India, percentage of men having comprehensive knowledge of HIV/AIDS is more than women. Among all the above states, Maharashtra has the highest percent of men (53 percent) and women (30 percent) having comprehensive knowledge. The Table shows that condom use is more among men than in women. In the southern states, percentage of men using condom is less compared to Maharashtra. In Andhra Pradesh, 0.3 percent women used condom. At the national level and state level, it is observed that reported prevalence of Sexually Transmitted Infections (STIs) among women is more than men. At all India level, 11 percent women reported to have had STIs, while 5 percent men reported so. Thereported STI prevalence among men and women is less in the southern states than Maharashtra. Percentage of women engaged with two or more lifetime sexual partners is less compared to men. In Andhra Pradesh, highest percentage (27 percent) of men are involved with more than two lifetime sexual partners followed by Tamil Nadu, Karnataka and Maharashtra.

One of the priority issues in researching high risk sexual behaviour is the nature and pattern in partners. Considerable proportion of men in India, especially mobile men including short term migrants and truckers, working as bridge population in the transmission of HIV epidemic from high risk to low risk population. Therefore, there is a need to analyze the variation in type of sexual partners in the last 12 months prior to the survey, if respondents report to have more than one sexual partner.

Markov-chain model is used to study the transition probabilities revealing variation in the type of last but one to the last sexual partners in the 12 months prior to the survey. For completeness, a brief description of Markov-chain model has been presented below. The information regarding the relationship with sexual partners has been considered and classified into five groups namely *Spouse; Girlfriend/Fiance/Live-in-partner; Other friends/relatives; Casual acquaintances/others and Female sex workers* in order to have meaningful insights into the risk behaviour.

Let P_{10}, P_{20}, P_{30},....., P_{k0} be the probabilities that respondent has sexual relations with R_1, R_2,....., R_k type of partners in their sexual intercourse with last but one sexual partner. Suppose Pij be transition probability that the respondent having earlier sexual relation with the sexual partner i moves to partner j during the sexual encounter with last type of partner, where sexual encounters with both the sexual partners have occurred in the 12 months prior to the survey, where i and j vary over to 1,2,3,.....,k (in the present case i and j vary from 1 to 5). As per the properties of transition probabilities,

$$P_{ij}>=0 \text{ and } \sum_{i=1}^{k} pij = 1$$

It is worth mentioning here that probability of moving from i^{th} type of sexual partner to the j^{th} type of sexual partner does not depend upon how it reaches to the j^{th} place. Under such condition, if the probability of Pio and Pij are known, one step current probabilities P_{1c}, P_{2c}, ..., P_{kc} of a respondent to have sexual intercourse with different type of sexual partners R_1, R_2,....., R_k can be obtained using the formula:

$$P_{jc}=\sum_{i=1}^{k} pio\ pij \text{ for } j=1,2,3,.....,k$$

Where $P_{io}=n_{io}/n$ and $P_{ij}=n_{ij}/n_{io}$

nio=$\sum_{i=1}^{k} nij$ and n_{ij} that is the number of respondents having relationship to their last but one sexual partners R_i and moved to have sexual intercourse with type of partners R_j currently for one step for ij=1,2,3,.....,k. The P_{jc} is given by:

$$Pjc=\sum_{i=1}^{k} PioPij \text{ for } j=1,2,3,.....,k$$

The estimates of transition probabilities for the type of last but one sexual partner to the type of last sexual partner, among the above five categories of sexual partners, have been presented by three southern states and Maharashtra (in Table 2).

The estimates of transition probabilities for the type of last but one sexual partner to the type of last sexual partner, among the above five categories of sexual partners, have been presented in Table 2. It presents the probability of transition from last but one to the last sexual partner among men in India, Maharashtra, Andhra Pradesh, Tamil Nadu and Karnataka who reported to have sex with two partners in the last 12 months prior to the survey. It is evident from the Table that in India among men having sexual relations with two or more sexual partners in the last 12 months, those having their last but one sexual partner as spouse have a probability 0.70 to have the last sexual partner as spouse. While, almost one-fifth of such respondents, having last but one sexual partner as spouse reported to move from spouse to Girlfriend/fiancé/ live-in-partner as their last sexual partner. Another 11 percent of them moved to casual acquaintance or other friends or relatives where there is less likely to have knowledge of the sexual background of the last sexual partner and more risky in nature if the practices of condom use is negligible in such relations. In Tamil Nadu, Karnataka, Andhra Pradesh and Maharashtra men who are having their last but one sexual partner as spouse have a probability of 1.0 to have the last sexual partner as spouse. It is observed that the major shift occurs from non spousal to the spousal sexual partners in the above states. The maximum increase in the probability of sex with spouse from last but one to the last sexual partner has been found in Tamil Nadu (from 0.11 to 0.80) followed by Andhra Pradesh (from 0.19 to 0.77), Karnataka (from 0.21 to 0.78) and Maharashtra (from 0.09 to 0.57). However, the intensity of sexual relations with female sex workers as the last sexual partners has declined in India, Maharashtra and in the southern states.

Table 2
Probability of Transition from Last but one to the Last Sexual Partner for Three Southern States, Maharashtra and India

India	*Spouse*	*Girlfriend/ fiance/ live-in partner*	*Other friends/ Relatives*	*Casual Acquitance/ others*	*Female Sex Workers*
Spouse	0.70	0.19	0.04	0.07	0.00
Girlfriend/fiance/live-in partner	0.57	0.36	0.03	0.00	0.04
Other friends/relatives	0.62	0.20	0.17	0.00	0.02
Casual acquitance/others	0.69	0.06	0.13	0.10	0.03
Female sex workers	0.49	0.13	0.09	0.02	0.27
pi.	0.13	0.31	0.33	0.08	0.15
pjc	0.60	0.23	0.09	0.02	0.06
Tamil Nadu					
Spouse	1.00	0.00	0.00	0.00	0.00
Girlfriend/fiance/live-in partner	0.79	0.07	0.14	0.00	0.00
Other friends/relatives	0.87	0.07	0.07	0.00	0.00
Casual acquitance/others	0.00	0.00	0.00	0.00	0.00
Female sex workers	0.75	0.00	0.00	0.00	0.25
pi.	0.11	0.30	0.33	0.00	0.26
pjc	0.80	0.04	0.08	0.00	0.08
Karnataka					
Spouse	1.00	0.00	0.00	0.00	0.00
Girlfriend/fiance/live-in partner	0.78	0.22	0.00	0.00	0.00
Other friends/relatives	0.67	0.20	0.13	0.00	0.00

Contd.

India	Spouse	Girlfriend/ fiance/ live-in partner	Other friends/ Relatives	Casual Acquitance/ others	Female Sex Workers
Casual acquitance/others	0.67	0.00	0.33	0.00	0.00
Female sex workers	1.00	0.00	0.00	0.00	0.00
pi.	0.21	0.21	0.36	0.14	0.07
pjc	0.78	0.12	0.10	0.00	0.00
Andhra Pradesh					
Spouse	0.65	0.00	0.20	0.10	0.05
Girlfriend/fiance/live-in partner	0.73	0.20	0.07	0.00	0.00
Other friends/relatives	0.92	0.03	0.03	0.00	0.03
Casual acquitance/others	0.85	0.08	0.00	0.00	0.08
Female sex workers	0.63	0.05	0.11	0.00	0.21
pi.	0.19	0.14	0.36	0.13	0.18
pjc	0.77	0.06	0.08	0.02	0.07
Maharashtra					
Spouse	1.00	0.00	0.00	0.00	0.00
Girlfriend/fiancé/live-in partner	0.55	0.39	0.00	0.00	0.06
Other friends/relatives	0.53	0.29	0.12	0.00	0.06
Casual acquaintance/others	0.50	0.25	0.00	0.00	0.25
Female sex workers	0.50	0.00	0.11	0.00	0.39
pi.	0.09	0.40	0.22	0.05	0.23
pjc	0.57	0.23	0.05	0.00	0.14

Major Covariates of HIV Prevalence among Women and Men

As evident from the existing literature, HIV prevention programs should target risk behaviors in the context of primary private relationships (Nemoto, et al.,) as they are major forces shaping the prevalence. In addition, the importance of the role of underlying socioeconomic and cultural determinants has been increasingly acknowledged, and contextual variables have been receiving more attention in epidemiological research on the distribution and determinants of HIV and other sexually transmitted infections *(Boerma, WHO).In* spite of being relatively lower prevalence of HIV among women, evidence suggests that women are more vulnerable, across the world, in terms of contracting the infection and the subsequent consequences. Both structural (socio-economic, political) and cultural (traditional norms) factors are responsible for rendering women positive are many times different than that for men, making it necessary to separately study the factors that operate for both the genders. Table 3 and table 4 present the logistic regression odds ratios of HIV prevalence among women and men.

Table 3 represents the logistic regression odds ratios of HIV prevalence among women in all over India, Maharashtra and the three southern states. The Table depicts that age is significantly correlated with HIV prevalence in all the states and India. In Andhra Pradesh, HIV prevalence among women with age 25-34 is 3.1 times more likely compared to the women with age 15-24. In Maharashtra and India also the same scenario is seen i.e. the prevalence among women between age 25-34 is more likely than those with age 15-24. When all three southern states are combined, it is observed that the odds of HIV prevalence are high in the age group 25-34. In all the three southern states with increase in women's educational qualification, the prevalence is decreasing. In Maharashtra and India, HIV prevalence among highly educated women is respectively 46 percent and 62 percent less likely than the uneducated women. Respondent's exposure to mass media, comprehensive knowledge on HIV/AIDS and alcohol consumption are not significantly associated with HIV

Table 3
Logistic Regression Odds Ratios for Socio-economic and Behavioural Determinants of HIV Prevalence among Women in Four High Prevalence States and India

Background Characteristics	*AP*	*Karnataka*	*Three States*	*Maharashtra*	*India*
Age					
15-24®					
25-34	3.167**	1.472	1.762*	1.756***	1.796*
35 and above	1.275	0.439	0.713	0.908	0.944
Education					
No education®					
Primary	1.303	0.247*	0.51**	1.172	0.939
Secondary	0.532	0.274**	0.396**	0.818	0.798
Higher	0	0.428	0.136*	0.544**	0.376**
Place of residence					
Urban®					
Rural	0.663	2.453	1.299	0.805	0.797
Wealth quintiles					
Poorest®					
Poorer	0.594	0.559	0.475**	0.840	0.845
Middle	1.164	0.38	0.551*	1.002	0.997
Richer	0.911	0.931	1.074	1.348	1.306
Richest	0.491	1.034	0.556	0.674	0.646
Exposure to mass media					
No Exposure®					
Exposure	0.582	1.642	0.81	1.294	1.292
Comprehensive knowledge of HIV/AIDS					
No®					
Yes	0.868	0.496	0.94	1.373	1.349
Alcohol consumption					
No®					
Yes	0.526	0	0.453	1.494	1.496
Number of lifetime sexual partners					
One partner®					
Two or more partner	13.24***	0	11.267***	6.06***	6.222***
Condom use in the last sex					
No®					
Yes	–	–	53.895	2.504*	2.471*
Any symptom of STI					
No®					
Yes	0.675	1.286	1.774	1.131	1.133

prevalence. In all the three southern states, Maharashtra and India, the prevalence of HIV among the women who are engaged with more than two lifetime sexual partners are respectively 11.2 times, 6.0 times and 6.2 times more likely than their counterparts. It is a matter of concern that in the southern states and India, for women who used condom in their last sex, HIV prevalence is respectively 2.5 times and 2.4 times higher than those who did not use condom in their last sex.

Table 4 portrays that in the three southern states, Maharashtra and India, the odds of HIV prevalence among men are higher in the age group 25-34 and 35 and above. In the southern states, HIV prevalence among men with age 25-34 and 35 and above is 5.7 times and 3.9 times more likely than the men with age 15-24. In India, the prevalence among highly educated men is 48 percent less likely compared to the educated men. However, in rural India and Maharashtra, the odds of prevalence are less. The likelihood of prevalence in India is less among the men having comprehensive knowledge of HIV/AIDS. In India, among men who consume alcohol,the HIV prevalence is 1.2 times more likely compared to those who do not consume. In the three southern states, Maharashtra and India, men who are engaged with two or more than two lifetime sexual partners are more likely to be infected by HIV/AIDS. In the southern states, men with two or more lifetime sexual partners are 2.1 times and in India 1.8 times more likely to experience HIV/AIDS. Condom use among men is not significantly correlated with HIV prevalence. In southern states it is observed that the odds of prevalence are high among the men who are affected by sexually transmitted infections compared to those who are not affected.

Programmatic Responses to the Epidemic

The analysis of the data from epidemiological surveillance conducted in 2003, 04 and 05 is analysed to get the prevalence of HIV among ANC attendees and STI patients attending STI clinics. ANC attendees are the proxy population for getting the HIV estimate for general population whereas STI patients forms the high risk group and is used to get the estimates

Table 4
Logistic Regression Odds Ratios for Socio-economic and Behavioural Determinants of HIV Prevalence among Men in Southern States, Maharashtra and India

Background Characteristics	*AP*	*Karnataka*	*Three States*	*Maharashtra*	*India*
Age					
15-24®					
25-34	3.97*	–	5.796**	1.915	4.782***
35 and above	2.848	–	3.937*	1.368	3.879***
Education					
No education®					
Primary	1.191	0.708	1.075	1.878	1.283
Secondary	1.125	0.5	0.845	1.164	0.985
Higher	0.362	0.43	0.426	0.983	0.522**
Place of residence					
Urban®					
Rural	1.335	0.62	1.063	0.543*	0.705**
Wealth quintiles					
Poorest®					
Poorer	4.658	0.393*	0.638	0.967	0.928
Middle	3.934	0.314**	0.575	0.730	0.93
Richer	6.744*	0.262**	0.864	0.757	1.147
Richest	2.071	0.2**	0.376**	0.653	0.691
Exposure to mass media					
No Exposure®					
Exposure	1.114	3.221	1.52	0.823	1.391
Comprehensive knowledge of HIV/AIDS					
No®					
Yes	0.901	0.396	0.848	0.959	0.669**
Alcohol consumption					
No®					
Yes	1.014	0.973	0.912	1.396	1.275*
Number of lifetime sexual partners					
One partner®					
Two or more partner	1.234	3.857***	2.149***	1.475	1.801***
Condom use in the last sex					
No®					
Yes	0.528	0.558	0.551	0.701	0.832
Any symptom of STI					
No®					
Yes	3.215*	13.483**	2.71*	0.000	1.604

among the HRG population. These estimates serve as indicators that serve as basis for categorisation of states into high and low prevalence areas, thus making these two groups very important in HIV epidemic. Table 5 portrays the HIV prevalence in ANC and STD clinic attendees for the time period 2003-05. The Table shows that in Andhra Pradesh, the prevalence of HIV among the ANC clinic attendees has increased from 1.25 percent to 2.25 percent, but in 2005 a decline of 0.25 percent is observed. However, in Karnataka and Maharashtra the prevalence among ANC clinic attendees is same for each time period. Tamil Nadu recorded a hasty decline from 2003 to 2004, and the prevalence is same for both the years 2004 and 2005. In Andhra Pradesh, the prevalence of HIV among the STD clinic attendees has declined from 2003 to 2004 and again increased by 7 percent in 2005. Karnataka recorded a steady intensification of HIV prevalence among STD clinic attendees from 2003-05. In Tamil Nadu and Maharashtra, there is not much difference in the HIV prevalence among STD clinic attendee for the three time periods.

Table 5
Variation in HIV Prevalence among ANC and STD Clinics Attendees during 2003 - 05 based on Epidemiological Surveillance

	ANC Clinics			*STD Clinics*		
	2003	*2004*	*2005*	*2003*	*2004*	*2005*
Andhra Pradesh	1.25	2.25	2.00	21.47	16.40	22.80
Karnataka	1.25	1.25	1.25	10.40	12.00	13.60
Tamil Nadu	0.75	0.50	0.50	9.64	8.40	9.20
Maharashtra	1.25	1.25	1.25	10.00	10.40	10.40

Figure 1 and 2 show the variation in prevention efforts in terms of number of TIs across the four high prevalence States from 1995 to 2005. The following figure shows the variation in prevention efforts among FSWs across these four states in terms of number of TIs in the state. The graph depicts that since 1995, the starting of HIV interventions in India, the prevention efforts in terms of number of targeted interventions increasing and has been mostly evidence based. The TIs in these high

prevalence states have been mostly catering to the high risk population groups including FSW, MSM, IDU, etc.

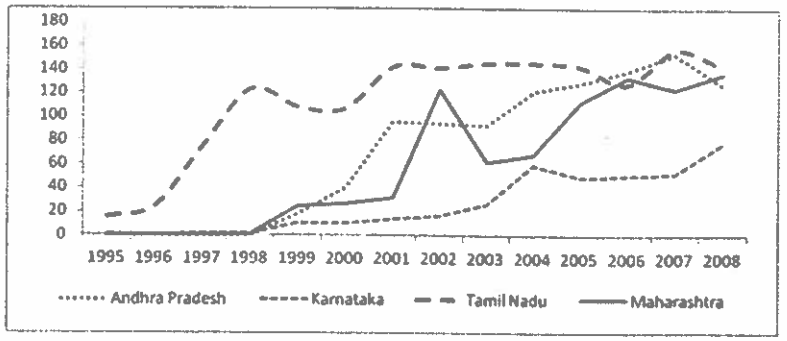

Fig. 1. Variation in Prevention Efforts in terms of Number of TIs Across Four High Prevalence States

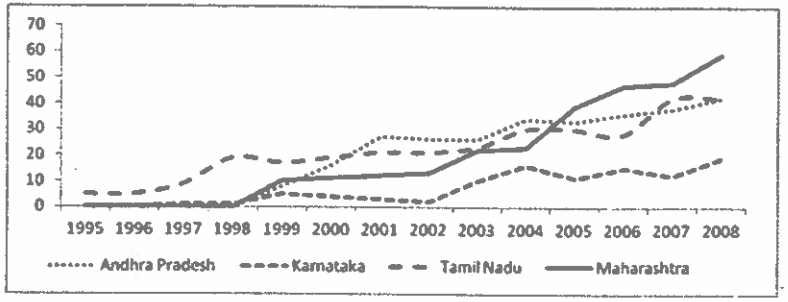

Fig. 2. Variation in Prevention Efforts among FSWs Across Southern States

Discussion, Conclusions and Recommendations

The overall improvement and success of HIV prevention program for combating HIV among general population is evident from reduction in prevalence among ANC attendees. Nevertheless, the gaps seem to be widening for STI patients especially in the states of Andhra Pradesh and Karnataka as positivity among STI patients in these states is on a rise. Andhra Pradesh also exhibits very high muti-partner behaviour and at the same time very poor in terms of condom use whereas Karnataka reported the lowest levels of condom use among all the states. As a matter of concern it is important to note

that STI prevalence is higher among females as compared to males in all the states with Maharashtra being the highest. This can be an alarm for the policy makers and programmers to shift the focus of intervention towards the needs of women and develop new women friendly HIV as well as integrated sexual and reproductive health programs.

Substantiating the fact that multi partner behaviour in terms of having more than two life time sexual partners and non-use of condom in last sexual intercourse are significant factors affecting HIV prevalence for both men and women in all the four high HIV prevalence states. It has also been found that education among women and correct HIV comprehensive knowledge among men is also affecting their HIV positivity in most cases by shaping their risk behaviours. The severity of alcohol on the success of HIV prevention programs especially for men is reinforced by findings of this study. This highlights the need to address the interface of alcohol and risky sexual encounters, which act as catalyst to HIV transmission.

The study underlines some of the important implications that can be instrumental in designing the NACP 4 guidelines. The lessons for NACP 4 primarily comprise of the fact that we need to focus at identification of corridors of high risk networks before planning of programmatic response to strengthen addressing local drivers of epidemic. Strategizing to reinforcing BCC messages with saturation coverage to ensure behavioral transitions in terms of declining multiple partner relations and condom use should be a priority. Further, evidence shows that improving service provisions for early diagnosis and treatment has resulted into low prevalence of STIs which is an important indicator for HIV control. Declining STIs coupled with consistent condom use has resulted in epidemiological transition in HRG as well as general population. Emergence of new corridors of MSM networks is evident especially in the three southern states, posing a newer challenge for the programs and interventions in these states. Increasing evidence of rural epidemics in Karnataka and elsewhere demands integrated preventive efforts in addition to addressing care and support to PLWHA.

References

Arora P. Kumar P. Bhattacharya M. Nagelkerke N. Jha P. (2008), Trends in HIV Incidence in India from 2000 to 2007. The Lancet, Volume 372, Issue 9635, pp. 289 - 290.

International Institute for Population Science and ORC Macro Int., National Family Health Survey -3 (2005-06): India Report, Vol.1. 2007.IIPS, Mumbai

Joint United Nations Programme on HIV/AIDS. Overview of Global AIDS Epidemic (2006), *http://data.undids.org/pub/GlobalReport/2006/2006_GR_CH02_en.pdf.* 2006 Report on the Global AIDS Epidemic.

Kumar R. Jha P. Arora P. (2006), Trends in HIV-1 in Young Adults in South India from 2000 to 2004: A Prevalence Study. Lancet; 367: 1164-1172.

National AIDS Control Programme-III (2007), Halting and Reverting HIV Epidemic in the Country.

Nemoto T. Operario D. Keatley J. Lei Han. Soma T. (2004), Psychosocial Factors Affecting HIV Risk Behaviours among Male-to-female Transgender in San Francisco. American Journal of Public Health. 2004 July; 94(7): 1193–1199.

NACO (2006), Technical Report on HIV Estimates.

UNAIDS (2006), Global Report on the AIDS Epidemic, United Nations Joint Programme on HIV/AIDS, Geneva.

UNAIDS (2008), Report of the Global AIDS Epidemic.

UNAIDS (2009), Study on Modes of Transmission.

UNAIDS (1999), Trends in HIV Incidence and Prevalence: Natural Course of the Epidemic or Results of Behavioural Change?, UNAIDS, best practice collection, key material.

UNAIDS (1999), Welcome Trust Centre for the Epidemiology of Infectious Diseases.

Wang S. Mishra V. Agrawal P. Alva S. Yuan Gu. (2009), Changes in HIV-Related Knowledge and Behaviours in Sub-Saharan Africa. DHS Comparative Report.

WHO (2009), AIDS Epidemic Update.

Boerma J. Weir. S. (2005), Integrating Demographic and Epidemiological Approaches to Research on HIV/AIDS: The Proximate-Determinants Framework. *The Journal of Infectious Diseases.* Vol. 191.

12

Does the Interface of Alcohol and Risky Sex Among Migrants a Bane for Urban Health Mission in India? Evidence from Low Income Slums of Mumbai

S.K. Singh, Shivanand Chauhan and Arpita Das

Introduction

Research from several developing countries suggests that migration has significant effect on the spread of sexually transmitted infections including HIV because of the vulnerability of migrants to risky lifestyle and indulgence in high risk sex behaviour (Gupta et al, 2010). Migration not only affects the size and socio-economic situation of both the origin and destination places but also affect the migrants socially and culturally. Migration brings about immediate changes in occupation, social condition and economic status of the people. Several socio-demographic characteristics of the migrants such as young age, never married status or non-spousal residence, peer pressure and substandard living environment with easy and close access to pornographic material and limited access to health care may all serve to enhance their alcohol use and risk behaviors resulting their vulnerability to STIs and HIV/AIDS (Decosas et al., 1995; Mabey, 1996; Mayaud,1997; Gupta and Singh, 2002).