

India's Progress towards the health related Millennium Development Goals –HIV/AIDS

Patel^{1,2,6}, Chang J^{* 1,2,6}, Srivastava J³, Patel I⁴, Balkrishnan R^{1,2,5,6}

¹ Clinical, Social and Administrative Sciences, College of Pharmacy, University of Michigan at Ann Arbor, 428 Church Street, Ann Arbor, MI 48109-1065, USA

² Center for Medication Use, Policy, and Economics, The University of Michigan, 428 Church Street, Ann Arbor, MI 48109-1065, USA

³ E.W. Scripps School of Journalism, Ohio University, 220 Scripps Hall, Athens, OH, 45701-2979, USA

⁴ Patel Hospital, Somnath Park, Panchavati, Nasik, Maharashtra 422003, India

⁵ Department of Health Management and Policy, The University of Michigan, 428 Church Street, Ann Arbor, MI 48109-1065, USA

⁶ Center for Global Health, The University of Michigan, 428 Church Street, Ann Arbor, MI 48109-1065, USA

ABSTRACT

Submitted: 18/10/2011

Accepted: 25/11/2011

Controlling and reversing the spread of AIDS/HIV is the key focus of the 6th Millennium Development Goal (MDG) proposed by United Nations. One of the critical links for attaining MDG 6 targets is India. India has one of the largest populations of HIV infected individuals in the world and addressing this issue requires multidimensional, complex solutions. This paper looks at various social and economic factors contributing to the prevalence of HIV/AIDS in India. An overview of steps being taken by government and various other organizations to address the threat of HIV/AIDS is presented with particular emphasis on vulnerable populations like commercial sex workers (CSWs), injecting drug users (IDUs), men having sex with men (MSMs) and HIV positive children due to mother to child transmission (MTCT). The paper presents a brief overview of the challenges faced by the Indian government and the NGOs to combat HIV/AIDS and provides recommendations discussing issues and interventions based on economic efficiency perspective.

Keywords: HIV/AIDS, commercial sex workers, injecting drug users, MSMs, MTCT, NACO

INTRODUCTION

MDG 6 aims to halt and reverse the spread of HIV/AIDS by 2015. The indicators selected to measure this target were measuring HIV prevalence among pregnant women aged 15-24 years, use of condom during last high risk sex, percentage of women aged 15-24 years who are knowledgeable about HIV/AIDS, number of orphans attending school compared to non orphans aged 10-14 years, condom use rate and contraceptive prevalence rate other than condoms (MDG Report 2005). In 2007, in the age group 15-49 years, about 2.5 million people were living with HIV/AIDS and the prevalence of HIV in adults was 0.3%. Prevalence of HIV/AIDS was 6-15% in people receiving anti retroviral therapy, 7.2% in vulnerable and high risk populations like Injecting Drug Users (IUDs), 7.4% in men having sex with men (MSMs), and 5.1% in commercial sex workers.^{1,2,3}

A majority of IV drug users reside in the metropolitan cities of India, mainly Chennai, Delhi, Mumbai and Chandigarh contributing to almost 3.8% of all the HIV/AIDS infections. Among pregnant women aged 15-24 years, the prevalence decreased to 0.49% (0.95 million) in 2007 from 0.86% (1.67 million) in 2002. According to the District Level Household & Facility Survey conducted in 2007-08, only 79.9% urban women and 48.8% rural women had HIV/AIDS awareness.^{4,5,6} HIV/AIDS exerts a considerable burden on India's economy comprising about 1 percent of its annual GDP.⁷

Past measures:

In 1987, the Indian government established National Aids Control Organization (NACO) to monitor spread of HIV/AIDS in India on a nationwide basis. From 1992-1997, NACO launched Phase I, consisting of State Aids Control Sites (SACS) to collect data, perform behavioral sentinel surveillance surveys for risk assessment, perform screening of blood and blood products, and conduct public education campaigns.⁸ Phase II (1999-2006) launched by NACO aimed to reduce the spread of HIV/AIDS by providing interventions

Address for Correspondence:

Chang J, College of Pharmacy, The University of Michigan, 428 Church Street, Ann Arbor, MI 48109-1065, USA

E-mail: jochang@umich.edu

and cheap treatment to high risk populations, strengthening institutions and facilitating inter-sectoral collaboration. Currently, Phase III launched by NACO (2007-2012) aims at reversing the spread of HIV/AIDS, prioritizing prevention efforts, integrating care, support and treatment.^{8,9,10}

Present measures:

Until 2004, NACO had been promoting voluntary testing centers (VTC), voluntary counseling, support networks for HIV/AIDS patients, development of clinical trials for testing HIV vaccines and partnering with media agencies like BBC and Doordarshan (government supported broadcaster) for HIV/AIDS related programming. In recent years, several community care centers run by NGOs have been established, generic anti retroviral drugs are available and free ART (anti-retroviral therapy) is provided to about 5% HIV/AIDS patients residing in the six high HIV prevalent states of India.¹⁰ To control the transmission of HIV, several collaborative public education initiatives like the Heroes Project in partnership with Kaiser Family Foundation, the

Avahan initiative by the Gates Foundation and the Population Services International (PSI) in about 22 states in India were undertaken.¹¹ In 2005 and 2006, the Indian government encouraged global business corporations to outsource their work to India in order to strengthen Indian pharmaceutical industry's response to HIV/AIDS.⁹

Outreach programs for vulnerable populations with HIV/AIDS in India- a few examples:

A: Sex workers:

The Sonagachi project was started in 1992 by Dr. Jana. The term “Sonagachi”, translates to “golden tree” in local language, is the oldest red light areas in Calcutta, a metropolitan city in state of West Bengal. This project is being recognized as one of the finest projects that helped in controlling HIV/AIDS among sex workers in Calcutta. The seroprevalence reduced among prostitutes by 11 percent as opposed to 50 percent in the other metropolitan cities of Bombay, Delhi and Madras.¹²

Fig. 2: A summary of the Sonagachi model comprising of interventions at the community, group and individual level:

<u>Community based interventions</u>	<u>Individual based intervention</u>	<u>Sustainability</u>
Considering HIV/AIDS reduction a community priority - Through involvement of economic stakeholders comprising of sex worker industry, landowners renting rooms, madams arranging clients, babus (clients), police getting pay offs for keeping sex workers out of the jail, political parties whose future could be jeopardized if HIV infection increases in their constituency. Political Advocacy for rights of equality - Advocacy for right to equal opportunity to work, free expression, and education for sex workers Group based interventions Social relationships - Creation of an environment of trust through interaction between sex workers, change agents, and power brokers to encourage voluntary participation in interventions, Peer outreach workers - Training sex workers to help educate peers about HIV/AIDS and STDs Sex Workers and Professional Advocates - Professional advocates transfer ownership of initiatives to sex workers in order to facilitate ownership of the initiative by them and thus make the initiative more sustainable and organic.	Skills and Competencies - At individual level, the peer outreach workers serve as role models for other sex workers as gainers of literacy, employment, self confidence and respect. Social Cognitive Perceptions - The program progressed on the mere perception of hope that changes could be brought about as opposed to the US belief of achieving outcomes. Environmental Barriers and Resources Literacy - Addressed through literacy programs initiated by Professional staff followed by the outreach peer workers upon acquiring education. Economic Programs - Creation of sources of economic assistance through collaboration with financial institutions to mitigate the economic pressure that may contribute to risk prone practices by them. Condom sales - Initially condoms were sold free followed by a subsidized rate for condoms when the program gained impetus. Trade Unionization - Upon achieving success in Sonagachi, the peer outreach workers formed committees which now help other red light areas in the state.	Intervention programs should be: - Cost effective. - Useful to the target population and the society. - Sustainable over time to achieve long term results. - Realistic and must abide with the skills of the people involved. - Evolving over time.

Reference: S Jana, I Basu, MJ Rotheram-Borus, PA Newman. The Sonagachi Project: A Sustainable Community Intervention Program. pp: 405–414

Sonagachi project has been replicated in many parts of India including many areas in northeast India. Studies using the Sonagachi model have achieved positive outcomes with sex workers in terms of lower number of STDs, increase in the preventive and treatment seeking behavior accompanied by emergence of optimistic attitude towards coping with the disease.^{13,14} The tenets of the Sonagachi model have been successfully implemented in the cities of Mysore, Delhi, Madras, Bombay and Pune for carrying out interventions among CSWs.

B: Male sex workers and Men having sex with men (MSM):

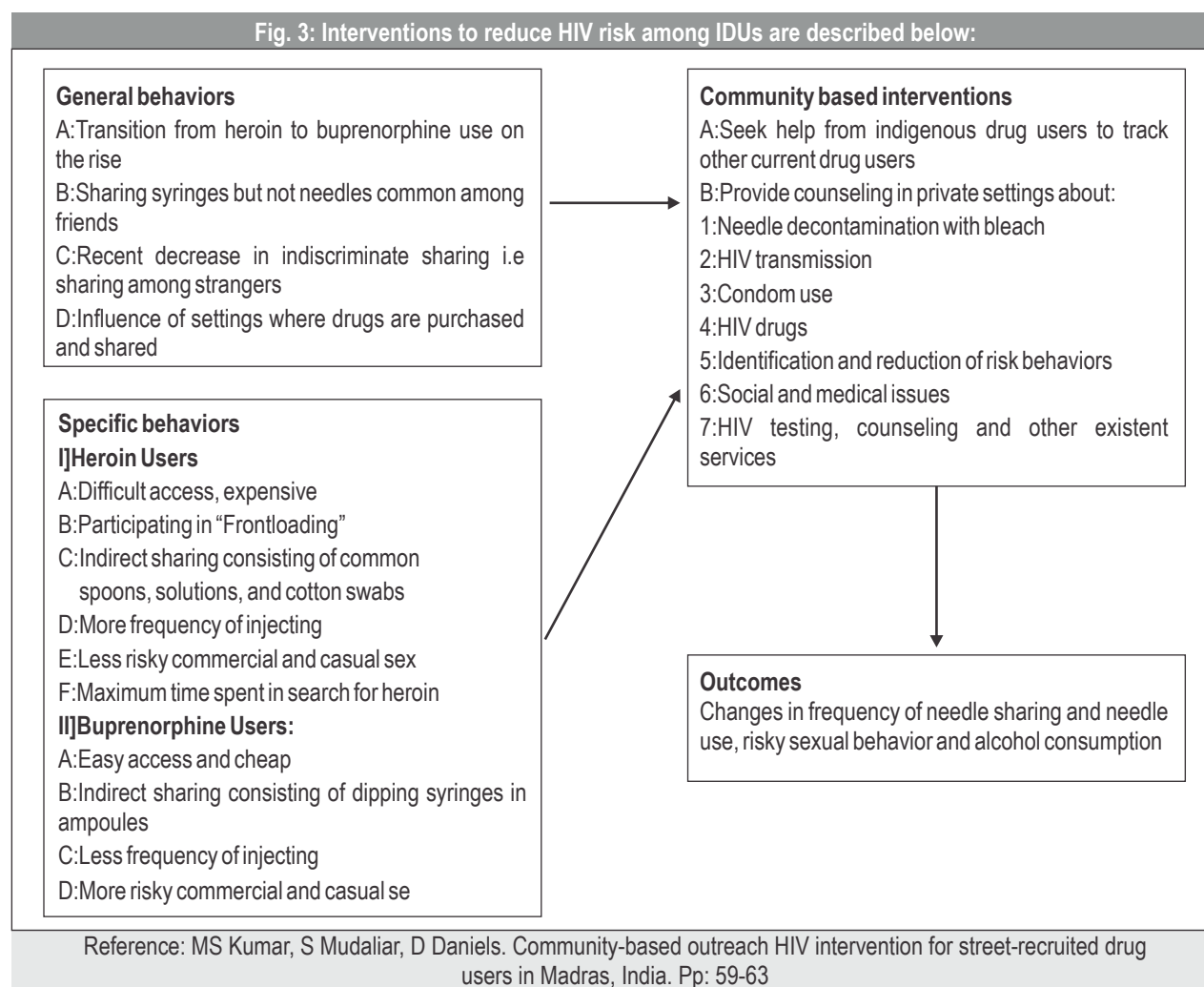
Since the last decade, the prevalence of HIV/AIDS has been on a rise among the male sex workers and MSM. Agencies like 'NAZ' (translates to “pride” in local language) foundation and 'Humsafar' (translates to “companion” in local language) thrust focus on the sexual health needs of the MSM and the gay men. In the last few years, these agencies have sponsored several consultation meetings, have worked with local male

sexual networks to address the concerns of emerging sexual identities, and have helped develop community service projects in Calcutta and Delhi. The members of the agencies work with the objective of helping lesbians and gay men establish a public arena to articulate identity issues and speak out against homophobic traditions and cultural values, thereby willing to challenge the system. However, representation in these kinds of organizations is an issue since the members mostly represent the upper class societies who have access to more life style choices compared to individuals from middle or lower middle class, irrespective of the disease condition.^{15,16}

C: Injecting drug users (IDUs):

Northeast India and some cities in the Southern part of India have a high prevalence of IDUs. Outreach programs include interventions geared towards sub cultural changes, and influencing individual behavior with support from family members and peers.

Fig. 3: Interventions to reduce HIV risk among IDUs are described below:



Outreach programs provide a chance to work with hard to reach IDU populations. Locating IDUs is a concern for most of the organizations working with IDUs. Society for Prevention, Research and Education on Alcohol and Drugs (SPREAD) is an umbrella organization that has brought all drug agencies under one roof by making them realize the importance of risk reduction associated with HIV/AIDS transmission in IDUs. SPREAD continuously strives to reduce needle sharing among IDUs, augmented by police harassment of IDUs in possession of needles.¹⁷

D: Blood transfusion:

Nearly 5 million liters of blood worth 29 million pounds is purchased every year in India. Bombay has many professional HIV blood donors who sell their blood to blood banks who in turn accept it without any tests or inquiries. In wake of this situation, the Indian government increased import of most blood products. The government has also established blood screening centers in eight cities to minimize blood contamination. Members of the Indian Health Organisation (IHO) have been carrying out community interventions to minimize the infected blood transfusion by educating blood donors.¹³ Intervention studies comparing and screening various commercially available blood products for the presence of HIV-1 antibodies have been conducted in specific cities in the country. These studies have shown more contamination in blood products manufactured in cities like Bombay and Pune compared to Delhi.¹⁸

E: Couples transmission: HIV positive males visiting brothels and having multiple sexual partners and HIV positive IDUs generally transmit the disease to their monogamous wives or partners. Studies involving interventions carried out in males going to STD clinics aim at impacting their sexual behavior by convincing them to uptake monogamy and frequently use condoms. One such intervention study conducted in collaboration with the John Hopkins University and the National AIDS Research Institute enrolled HIV negative males with STDs and called them at regular three month intervals for follow up for the period of four years. During each follow up session, males were tested for STDs by performing their detailed physical examination. They were provided with counseling about monogamy, HIV prevention, abstinence or condom uses with all sexual partners or extra marital sexual partners till their STD was cured and were also offered free lubricated condoms. Such intervention studies provide insight about the factors leading to risky sexual behavior among males. Factors like lack of information about HIV/AIDS, presence of STDs, type of sexual partners (extra marital, CSWs), marital status (single, married), lack of concern about family planning and beliefs about reduction in pleasure contributed lower rates of condom use.¹⁹

F: Mother to child transmission (MTCT): A study conducted in Bombay to reduce MTCT administered zidovudine to mothers in the last 6 weeks of pregnancy, administered oral zidovudine to infants and also requested the mothers to avoid breast feeding²⁰. A number of multi site studies implemented by NACO in high HIV prevalence Indian states have studied the uptake of zidovudine in pregnant females and nevirapine to prevent parent to child transmission (PTCT). Use of breast milk alternatives and attending antenatal clinics is also encouraged at certain sites.²¹

Donor role:

The World Bank, the major donor to NACO, provided up to \$84 million and \$191 million for phases I and II respectively. India is one of the 15 focus countries of President's Emergency Plan for AIDS Relief (PEPFAR), receiving aid of almost \$36 million in 2004. The Global Fund has provided 8 grants of approximately \$26 million each at regular intervals to India for combating HIV/AIDS, TB and malaria. Also, bilateral assistance provided by the US government through its contribution to the Global Fund, help from USAID since 1995, and help from CDC since 2001 have helped support HIV prevention and intervention activities in India. UNAIDS, WHO, UNICEF, UNDP, other UNAIDS co-sponsors, and countries like U.K, Australia and Canada have provided donor aid to help improve technical efficiency in in-country offices and NGOs. The Gates Foundation has also contributed more than \$200 million towards the Avahan initiative which is involved in community based interventions and HIV/AIDS research.^{11,22}

Major challenges:

A) Diversity among the vulnerable population: Acute conditions like poverty, illiteracy and unemployment drive vulnerable populations to resort to sex work. This in turn not only increases their risk of exposure to HIV/AIDS, but also increases the risk of HIV/AIDS among the variety of clients who come in contact with them. The diverse vulnerable population requires targeted interventions characteristic of the specific high risk population.

(B) Hidden and mobile populations: Vulnerable populations have to be on a constant move due to high economic instability. Furthermore, they remain hidden due to disempowerment, abandonment, and ostracism by society. These factors facilitate the spread of the disease and present hurdles in obtaining preventive services. As a result, it is difficult to target focused interventions consistently towards these populations.

C) Stigma and discrimination: Stigma, fear, apathy, absence of treatment-seeking behavior, low SES, gender based

inequity in access and use of services, and prejudiced provider behaviors create social hurdles for health. These factors affect medication adherence and drug supplies, quality of care, supervision, referrals and communication, leading to drug resistance and adverse drug reactions (ADRs).^{23,24}

D) Health service delivery and policy: Inadequate monitoring systems and infrastructure, improper human resources allocation management, lack of coordination between donors, NGOs, and government agencies, and absence of regulations to affect the private and public sectors alike pose challenges to achieving MDG 7.²⁴

E) HIV positive children: Children orphaned by HIV/AIDS are more likely to have poor health, education and protection, are more prone to child labor, abuse, neglect, sexual exploitation and may be denied education, shelter and opportunities to play. Most of the newborns (i.e. about 90%) suffering from HIV/AIDS have acquired it in their mother's womb or during breast feeding and this can be decreased by treating the mothers with ART during pregnancy.

F) ART: There are certain challenges with ART therapy like discontinuation of ART treatment, denial and under reporting of the need for second line ART (i.e. more expensive drugs), and difficulty in enrolling in government funded ART programs due to tough exclusion criteria. The 3 by 5 initiative was a global effort launched in 2005 to provide 3 million people in developing countries with ART. However, with every 2 patients starting ART, about 5 people are newly acquiring HIV, making the fulfillment of the initiative challenging.^{25,26,27}

G) Other factors: Other factors that increase the risk of HIV/AIDS among girls and young women are lack of knowledge about HIV, sexual debut before age 15, forceful sexual intercourse and tacit social acceptance of violence. Besides these risk factors, the use of unsafe injections, mostly in the rural areas and the urban slums, poses a major threat for the spread of HIV/AIDS.^{4,5,6}

Anti retroviral treatment:

A proper transmission minimizing ART consists of structured ART, provision of incentives to NGOs at state and local levels for prevention and program evaluation initiatives. Preventive therapy helps control the disease in high risk populations with higher tendency to indulge in risky sexual behaviors (disinhibition). In India, prevention programs are mostly run by the NGOs and sometimes might lack the desired level of physician participation. Better response to prevention programs could be achieved if physicians could team with social workers to generate an emotional and fear based approach, visit the homes of HIV/AIDS CSWs, hand out free

condoms, educate CSWs about ART medication adherence and motivate them to regularly visit clinics. Interventions targeting illiterate sex workers should emphasize the incurable nature of HIV/AIDS, involve screening of educational films or displaying slides.^{28,29} Private health insurance plans are slowly gaining popularity among the educated population in India and the prospects of universal health insurance seem promising in the near future. However, the current absence of universal healthcare insurance poses several access issues among the ART users resulting in medication non compliance, increased risk of development of ART resistant HIV strains, increased difficulty in controlling opportunistic illnesses, more uptake of monotherapy and shortened life span of the HIV/AIDS patients.^{28,29}

Structured antiretroviral therapy consists of counseling, testing the disease stages, taking triple drug antiretroviral medications and regular physician visits. Information about structured ART should be made available to the people when they visit physicians or through public initiatives organized by the government and NGOs, both at the local and state level.^{30,31} A structured ART can minimize disease transmission by modeling the therapy on the basis of existent performance based fiscal mechanisms in India.²⁸ Even though generic versions of antiretroviral medications are manufactured by some big Indian pharmaceutical companies, like Cipla and Ranbaxy, these medications are unaffordable to the poor people.³² Introduction of universal health insurance in India could potentially aid the poor people in procuring not only the anti retroviral medications at a subsidized rate but also medications for opportunistic illnesses like TB that commonly affects HIV/AIDS patients³⁰. The patient specific toxicity associated with ART can be alleviated by maintaining a healthy diet and life style and use of cheaper alternative forms of medications like Ayurveda and Homeopathy which aim at strengthening the immune system with minimum side effects.^{28,29} As the availability of ART increases, more people will be motivated to undergo testing and start ART, thereby making it possible to monitor more people. Clinical data has to be combined with authentic laboratory data containing information about various tests indicating, a) diagnosis in order to start ART, b) viral load to determine disease progression, c) CD4 count to assess the state of the immune system, and d) blood biochemistry to start second line ART upon resistance development. The data from all the above tests should be obtained by proper management procedures conducted by physicians and well informed staff.^{28,33} In India, due to unequal access to services, cost savings obtained from subsidized treatment of opportunistic diseases are consumed up by HIV/AIDS patients who do not have access to

HIV/AIDS care. However, treating opportunistic illnesses is a small aspect of ART. Even though structured ART is expensive, it increases the number of saved life years.²⁸ The expenses associated with structured ART can be offset by cost savings achieved by postponing the treatment of opportunistic illnesses if structured ART is used.²⁸ Like pharmaceutical companies located in the Western world, big pharmaceutical companies in India should be encouraged by the government to donate money for philanthropic causes like HIV/AIDS awareness campaigns whereby the companies could disclose their sponsorship to generate consumer goodwill. Currently, the Indian government is partnering with several international donors like WHO and Avahan to implement interventions and ensure access to structured ART and HIV/AIDS care at an affordable price. In order to extend this affordable care to each and every HIV/AIDS patient in India, it is important that monetary resources are allocated towards long term sustainability of both the treatment and prevention of HIV/AIDS.

Recommendations:

There is an indisputable association between poverty and communicable diseases. HIV/AIDS is a resurgent infectious disease which is a developmental issue, a public health crisis and a human rights issue facing the nation in the era of globalization and liberalization. The policies pertaining to neo liberal globalization in India have constrained health care services to cost effective interventions, increased cost of services, led to privatization of health services and imposition of user fees in government health facilities, ignored shortage

of healthcare personnel in rural areas, promoted medical tourism leading to brain drain and affected agriculture which has reduced job opportunities and increased social insecurity. Vertically designed programs focus on interventions targeting limited risk factors identified through reductionist theories and cost effectiveness criteria. Horizontal programs which focus on the broader issues related to the spread of HIV/AIDS, involve community and consider socio economic factors like poverty, lack of education, unemployment, marginalization of women, development concentrated in urban areas and migration patterns should be designed (MDG India report 2009, Wada Na Todo Abhiyan 2010, MDG report 2010). With highly diverse individuals in vulnerable populations, it is necessary to use population specific interventions. For this purpose, it is necessary that centers be established centrally in NACO corresponding to specific vulnerable populations. Most of the states in India are dominated by specific vulnerable populations. NGOs work at the grassroots level and are involved with community based participatory research and interventions. In light of the work done so far by NGOs, the government must collaborate with NGOs in discovering and prioritizing the vulnerable population specific needs for optimum dissemination of funding and resources. A hierarchical structure in NACO comprising of national, state and local level centers will be effective in dealing with the disparate individual state specific problems. It is essential to adopt a disease specific approach when dealing with micro issues and a health system specific approach when dealing with macro issues (Travis 2004).

Table 1: A summary of the sentinel surveillance data collected by NACO classifying the Indian states based on the prevalence of HIV/AIDS:

Groups	States	High risk population (people attending IDUs and STI clinics)	Low risk population (women attending antenatal clinics)
Group I	Maharashtra, Tamil Nadu, Karnataka, Andhra Pradesh, Manipur, Nagaland	> 5%	> 1%
Group II	Gujarat, Goa, Pondicherry	> 5%	<1%
Group III	Remaining states	< 5%	< 1%

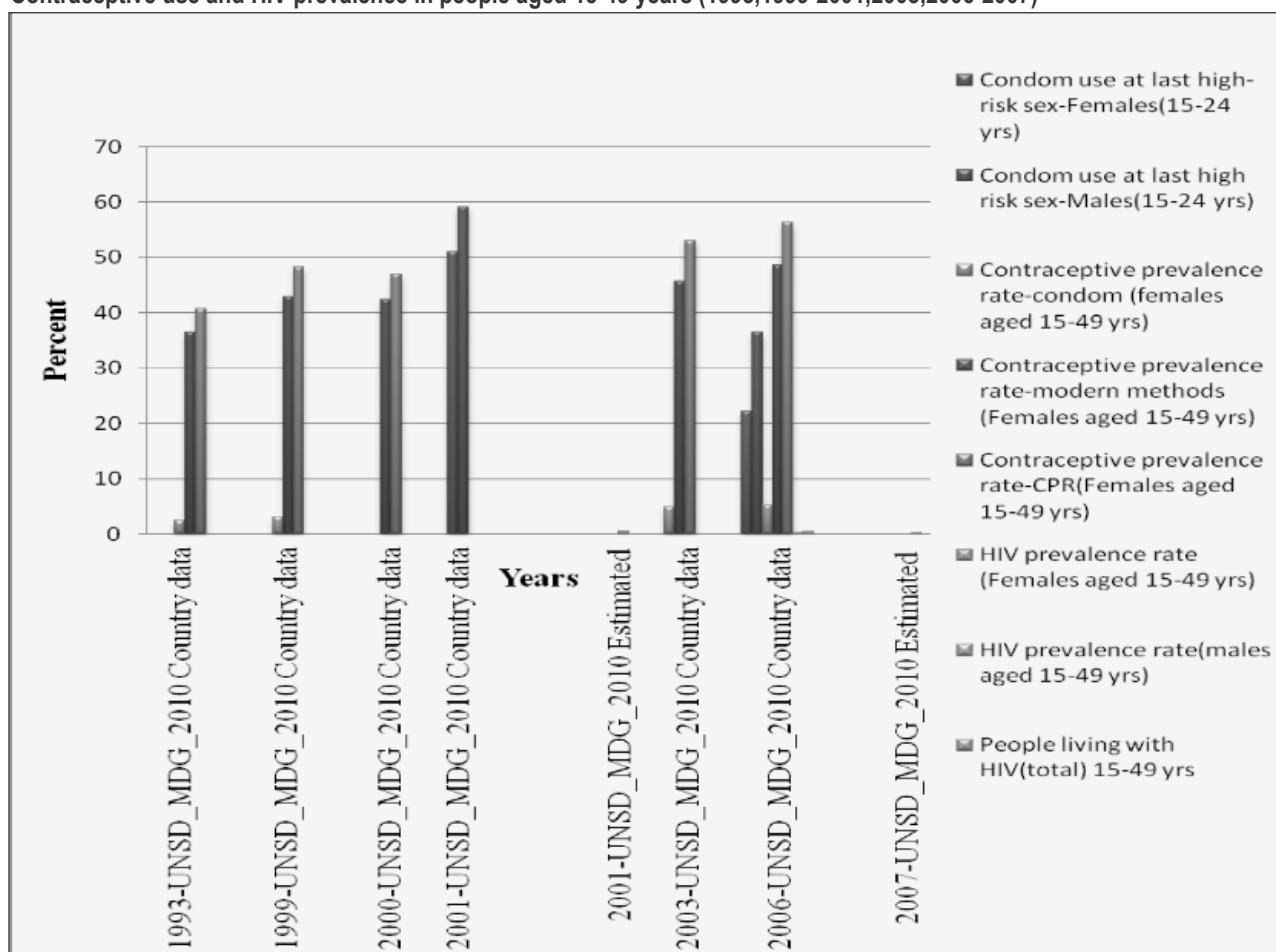
Reference: S Mohammed, S Panakadan. HIV/AIDS in India: Problem and Response. pp: 192

Table 2: A brief summary of the short term and long term goals to combat the challenges faced by the centers in NACO while working with both the private and public sectors:

Challenges	Short term goals to combat micro issues	Long term goals to combat macro issues
Financial problems, user fees	Provision of HIV/AIDS drugs and services at a subsidized rate	Development of generic HIV drugs
Transportation problems	Provision of outreach facilities (mostly done by NGOs)	Construction of facilities with respect to concentration of the population
Lack of technical skills and knowledge in the staff	Provision of updated continuous education about newer available techniques when renewing their medical licenses (like in US).	Incorporate AIDS related information, technical skills in the training curriculum of doctors, nurses and other staff
Lack of motivation	Provision of rewards with respect to services rendered	Promotions, empowering people, involve them in decision making
Deficits in planning and management	Up taking and incorporating managerial models, skills which have been successful in other situations, countries	Assigning experienced managers in the health ministry capable of bringing about a change
Compromised care by private practitioners	Proper education to combat stigma	Establishing regulatory system, penalty on service refusal

Reference: Travis 2004.

Contraceptive use and HIV prevalence in people aged 15-49 years (1993,1999-2001,2003,2006-2007)



Time period	Condom use at last high risk sex- Females (15-24 years)	Condom use at last high risk sex males (15-24 years)	Contraceptive prevalence rate- condom (females aged 15-49 years)	Contraceptive prevalence rate modern methods (females aged 15-49 years)	Contraceptive prevalence rate CPR (females aged 15-49 years)	HIV prevalence rate (Females aged 15-49 years)	HIV Prevalence rate (males aged 15-49 years)	People living with HIV (total) 15-49 years
1993 *	Na	Na	2.4	36.5	40.7	Na	Na	Na
1999 *	Na	Na	3.1	42.8	48.2	Na	Na	Na
2000 *	Na	Na	Na	42.3	46.9	Na	Na	Na
2001 *	51.0	59.0	Na	Na	Na	Na	Na	Na
2001 †	Na	Na	Na	Na	Na	Na	Na	0.5
2003 *	Na	Na	4.8	45.7	53.0	Na	Na	Na
2006 *	22.2	36.5	5.2	48.5	56.3	0.3	0.4	Na
2007 †	Na	Na	Na	Na	Na	Na	Na	0.3

Footnotes: * UNSD_MDG_2010 country data, † UNSD_MDG_2010 estimated data,

Reference: UNSD_MDG Report_2010

CONCLUSION

HIV/AIDS in India presents an extremely complex task for policy makers and other organizations working towards addressing this issue. On one hand, issues like stigma associated with HIV/AIDS, lack of trust towards government and interventions, lack of awareness and underdeveloped medical infrastructure create a complex set of social and medical constraints, on the other hand, limited availability of funds makes it essential to evaluate the efforts and intervention from a return on investment perspective. The only way to attain sustainable and long lasting solution may be to conceptualize the issue as a multidimensional problem and attempt to address it through policy making and initiatives at various levels. From this perspective, Behavioral and psychosocial support systems, economic incentives, sustainable partnerships, strengthening intervention programs and effective public health policies can together make a huge difference in achieving the greater good of the AIDS patients in the Indian communities.

REFERENCES

1. PEPFAR [Internet]. U.S. President's Emergency Plan for AIDS Relief: 2008 Country Profile: India. 2008. Washington DC(US): Office of U.S. Global AIDS Coordinator and the Bureau of Public Affairs, U.S. State Department [cited 2010 December 20th]. Available from: <http://2006-2009.pepfar.gov/pepfar/press/81851.htm>.
2. Mohammed S and Panakadan S. HIV/AIDS in India: Problem and Response. J Health Manag 2003; 5(2): 191-205.
3. Solomon S, Chakraborty A and Yepthomi DR. A Review of the HIV Epidemic in India. AIDS Educ Prev 2004; 16: 155-169.
4. Central Statistical Organization [Internet]. Millennium Development Goals- India Country Report 2009. Mid-Term Statistical Appraisal. New Delhi (India): Ministry of Statistics and Programme Implementation, Government of India; 2010 [cited 2010 December 20th]. Available from: http://mospi.nic.in/rept%20_%20pubn/ftest.asp?rept_id=ssd04_2009&type=NSSO
5. Jan Swasthya Abhiyan [Internet]. Millennium Development Goals in India, 2010- A Civil Society Report. New Delhi (India): Wada Na Todo Abhiyan; 2010 September. [cited 2010 December 20th]. Available from: <http://asiapacific.endpoverty2015.org/files/mdgs-report-final.pdf>.
6. United Nations [Internet]. The Millennium Development Goals Report 2010. New York (US): Department of Economic and Social Affairs United Nations; 2010. [cited 2010 December 20th]. Available from: <http://www.un.org/millenniumgoals/pdf/MDG%20Report%202010%20En%20r15%20low%20res%2020100615%20-.pdf>.
7. Anand K, Pandav CS and Nath LM. Impact of HIV/AIDS on the national economy of India. Health Policy 1999; 47: 195-205
8. Mospi.nic 2006. Ministry of Statistics & Programme Implementation Government of India. 2006 Millennium Development Goals (mdgs) - India Country Report-2005 Released http://mospi.gov.in/mospi_social_pr.htm
9. USAID/India. HIV/AIDS Health Profile, September 2008. <http://www.usaid.gov/in/> [accessed 20 March 2009]

10. NACO (2007) HIV Sentinel Surveillance and HIV Estimation 2007 - A Technical Brief Government of India http://nacoonline.org/upload/Publication/M&E%20Surveillance,%20Research/HIV%20Sentinel%20Surveillance%20and%20HIV%20Estimation%202007_A%20Technical%20Brief.pdf [accessed on 20 December 2010]
11. Kates J, Martin A and Carbaugh A [Internet]. HIV/AIDS Policy Fact Sheet September 2005. California(US): The Kaiser Family Foundation; 2006 September. Report No.: #7312-03 [cited 2010 December 20th] Available from: <http://www.kff.org/hiv/aids/upload/7312-03.pdf>.
12. Jana S, Basu I, Rotheram-Borus MJ and Newman PA. The Sonagachi Project: A Sustainable Community Intervention Program. *AIDS Educ Prev* 2004; 16(5): 405-14.
13. Gangopadhyay DN, Chanda M, Sarkar K, *et al.* Evaluation of Sexually Transmitted Diseases/Human Immunodeficiency Virus Intervention Programs for Sex Workers in Calcutta, India. *Sex Transm Dis* 2005; 32 (11): 680-84
14. Basu I, Jana S, Rotheram-Borus MJ, *et al.* HIV Prevention Among Sex Workers in India. *J Acquir Immune Defic Syndr* 2004; 36(3): 845-52.
15. Khan S. Culture, Sexualities, and Identities: Men Who Have Sex With Men In India. In: Sullivan G and Jackson PA (eds). *Gay and Lesbian Asia: Culture, Identity, Community*. New York, Harrington Park Press. 2001; 99-112. Available from: http://books.google.com/books?id=mfQqAQ1OQDkC&printsec=frontcover&dq=Gay+and+Lesbian+Asia:+Culture,+Identity,+Community&source=bl&ots=SF18SATdRA&sig=sMkd9MSITV2GKQCUW6u2Z_ffs9U&hl=en&ei=n5F2TcGsKNOAhAfXuMn2Bg&sa=X&oi=book_result&ct=result&resnum=3&ved=0C4Q6AEwAg#v=onepage&q=India&f=false [last accessed on 2010 December 20th].
16. Asthana S and Oostvogels R. The social construction of male 'homosexuality' in India: implications for HIV transmission and prevention. *Soc Sci Med* 2001; 52: 707-21.
17. Kumar S, Mudaliar S and Daniels D. Community-based outreach HIV intervention for street-recruited drug users in Madras, India. *Public Health Rep* 1998; 113(1): 58-66.
18. Tripathy SP, Malaviya AN, Singh YN, *et al.* HIV antibody screening of commercially available blood products in India. *Indian J Med Res* 1991; 93: 15-8.
19. Bentley ME, Spratt K, Shepherd ME, *et al.* HIV testing and counseling among men attending sexually transmitted disease clinics in Pune, India: changes in condom use and sexual behavior over time. *AIDS* 1998; 12(14): 1869-77
20. Godbole S and Mehendale S. HIV/AIDS epidemic in India: risk factors, risk behaviour & strategies for prevention & control. *Indian J Med Res* 2005; 121: 356-68
21. Nagelkerke NJD, Jha P, Vlas SJ, *et al.* Modelling HIV/AIDS epidemics in Botswana and India: impact of interventions to prevent transmission. *Bull World Health Organ* 2002; 80(2): 89-96.
22. Avahan- The India AIDS Initiative [Internet]. The Business of HIV Prevention at Scale. New Delhi(India): Bill and Melinda Gates Foundation ;2008 [cited 2010 December 20th] Available from: http://www.gatesfoundation.org/avahan/Documents/Avahan_HIVPrevention.pdf
23. Bill and Melinda Gates Foundation. *Why India- HIV/ AIDS Epidemic*. <http://www.gatesfoundation.org/avahan/Pages/why-india.aspx> [accessed 19 March 2008]
24. Travis P, Bennett S, Haines A *et al.* Overcoming health-systems constraints to achieve the millennium development goals. *Lancet* 2004; 364: 900-06.
25. United Nations [Internet]. (2008) The Millennium Development Goals Report 2008 . New York (US): Department of Economic and Social Affairs United Nations; 2008. [cited 2010 December 20th] Available from: <http://www.un.org/millenniumgoals/pdf/The%20Millennium%20Development%20Goals%20Report%202008.pdf>
26. Gibson E and Lepcha P [Internet]. Measuring India's Progress on the Millennium Development Goals. A Citizen's Report. New Delhi (India): Wada Na Todo Abhiyan; 2007 December. [cited 2010 December 20th]. Available from: <http://endpoverty2015.org/node/175>
27. Jan Swasthya Abhiyan [Internet]. Millennium Development Goals in India, 2010- A Civil Society Report. New Delhi (India): Wada Na Todo Abhiyan; 2010 September. [cited 2010 December 20th]. Available from: <http://asiapacific.endpoverty2015.org/files/mdgs-report-final.pdf>.
28. Central Statistical Organization [Internet]. Millennium Development Goals – India Country Report 2005. New Delhi (India): Ministry of Statistics and Programme Implementation, Government of India; 2006 [cited 2010 December 20th] Available from: http://wbplan.gov.in/docs/MDG_India_country_Report.pdf.
29. Over M, Heywood P, Gold J, *et al* [Internet]. HIV/AIDS Treatment and Prevention in India: Modeling the Costs and Consequences. World Bank Publications; 2004: 33-63. Available from: <http://siteresources.worldbank.org>

org/INTINDIA/Resources/IndiaARTReport1.pdf[last accessed on 2010 December 20th].

29. Kalichman SC, Ramachandran B and Catz S. Adherence to Combination Antiretroviral Therapies in HIV Patients of Low Health Literacy. *J Gen Intern Med* 1999; 14:267-73.
30. Farmer P, Léandre F, Mukherjee J, et al. Community-based treatment of advanced HIV disease: introducing DOT-HAART (directly observed therapy with highly active antiretroviral therapy). *Bull World Health Organ* 2001; 79: 1145-51
31. Farmer P, Léandre F, Mukherjee JS, et al. Community-based approaches to HIV treatment in resource-poor settings *Lancet* 2001; 358: 404-09.
32. Parameswaran G. Stemming the Tide: Successes, Failures and Lessons Learned in Tamil Nadu, India. *Dialectical Anthropology* 2004; 28: 397-414.
- 33 Mukherjee JS, Farmer PE, Niyizonkiza D and McCorkle L. Tackling HIV in resource poor countries. *BMJ* 2003; 327: 1104-06.