MODES OF HIV TRANSMISSION IN NIGERIA

Analysis of the Distribution of New HIV Infections in Nigeria and Recommendations for Prevention

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Contents

Executive Summary

Building on the recent World Bank Epidemiology and Response Synthesis Project in Nigeria, the UNAIDS Modes of Transmission Model was applied to estimate the distribution of new infections and to identify those populations at highest risk for HIV infection. Results of the modelling exercise together with recommendations for national programme planning are presented in this report. The study was undertaken by a national country team, with support from UNAIDS and The World Bank.

The World Bank epidemiological synthesis highlighted the following:

The HIV epidemic in Nigeria is geographically heterogeneous, with significant variations in ANC prevalence between the states and, although based on more limited data, with similar variations in prevalence among high-risk groups.

Significant geographical variations are also observed in reported risky behaviour. Given this heterogeneity, it would be important to better understand HIV epidemiology at the local, state and zone levels to better adapt the response.

The key objective for undertaking the modes of transmission modelling is to contribute to the ongoing efforts to understand the epidemic and sharp-focus HIV prevention response in Nigeria in terms of the scope, relevance and comprehensiveness, thus reaching all members of target populations with HIV prevention efforts.

Specifically, the Modes of Transmission review aimed to:

a) Identify the distribution of the most recent infections and the populations at greatest risk for infection through incidence modelling
b) determine the factors driving the epidemic in Nigeria
c) Re-align resource allocation for national prevention interventions in line with the priorities as highlighted by the model
d) Make policy and programmatic recommendations for HIV prevention to ensure a stronger and more effective national prevention strategy.

The modelling exercise indicated that in spite of the fact that the majority of the infections are due to the HIV transmission amongst the general population, the high-risk groups still contribute a significant portion of the new HIV infections. Directly, IDU, FSW and MSM alone, who constitute about 1% of the adult population, contribute as much as almost 23% of new HIV infections. These most-at-risk populations and their partners contribute as much as 40% of new infections. Thus over a third of new HIV infections are attributable to these high-risk groups and their partners who constitute only about 3.4% of the adult population.

The results suggest that Nigeria's HIV/AIDS epidemic is generalized as the bulk of new HIV infections occur amongst persons who are not engaging in high-risk sex, a sub-population that includes cohabiting or married sexual partners. Two-fifth (42%) of the infections occur amongst persons practicing 'low-risk' sex. Because condom use in this group tends to be low, HIV infection acquired as a result of previous/present high-risk behaviours or relationships by one of the sex partners is easily transmitted to the other unsuspecting partner.

Some key recommendations based on these findings include:

- The high level of HIV transmission that occurs amongst the high-risk groups is disconcerting, and about 20 % of infections may be attributed to female sex workers, their clients and client partners alone. Therefore, programmatic response in this area needs to focus on both female sex workers and their clients.
- IDUs, MSM and their partners respectively contribute about 9% and 10% of the annual new infections. Targeted interventions at these groups could have a considerable effect in slowing the epidemic. Unfortunately, we have very limited knowledge of the dynamics of infection transmission amongst these groups in the country due to the considerable focus on heterosexual transmission. A first step would be to expend more effort into collecting data to correctly estimate the population sizes of these groups and to design suitable interventions targeting them.
- A major finding in this study is that about 40% of infections occur amongst couples who at the time would be considered to be engaging in low risk-sex. HIV Counselling and Testing (HCT) needs to be scaled up rapidly (everybody needs to know his/her status and that of his/her sexual partners).
- Condom use should be socially marketed and promoted as the norm in all relationships (high-risk or low-risk) in which the HIV status of the partner is not known. Efforts must be made to get couples to undergo joint or couple HCT.
- There is a need for more information on clients of high-risk groups. Very little is known about their sexual behaviours and HIV prevalence.

Such information and data will contribute immensely in the design of appropriate interventions targeting these groups.

- There is a need to determine the extent and distribution of high-risk practices in the country. While it is an established fact that IDU, female sex workers and MSM engage in high-risk sex, knowledge on the distribution of these practices in the country is limited. In future, nationally representative surveys should include questions that could provide information in this regard.

1. Overview of HIV Epidemiology in Nigeria

Nigeria, with a population of 140 million in 2006, is the most populous country in sub-Saharan Africa and has a land area of 923,768 square kilometres. Approximately two-thirds of the population live in rural areas, most of which many modern social amenities. There are over 300 ethnic groups in the country. The two main religions are Christianity and Islam.

The country is administratively divided into 36 states and a Federal Capital Territory. Based on the colonial structures developed by the United Kingdom in administering the country as a colony, Nigeria still refers to 6 political zones, which while not having any administrative significance, provides a means of comparison due to some level of relative homogeneity within the zones.

HIV Epidemic in Nigeria

The first case of AIDS was reported in Nigeria in 1986. Since then the epidemic has grown from a concentrated epidemic experienced by high-risk groups to a generalized epidemic. From 1991 the country has undertaken regular sero-prevalence surveys amongst women attending antenatal clinics, from which the national HIV prevalence has been estimated. The HIV prevalence increased from 1.2% in 1991 to 5.8% in 2001. After 2003 the prevalence gradually declined to 4.4% in 2005. However HIV prevalence slightly increased to 4.6% in 2008.

Nigeria conducted its first population-based HIV sero-prevalence surveillance survey in 2007 through the 2007 National HIV/AIDS and Reproductive Health Survey Plus (NARHS Plus). NARHS was conducted in 2003 and 2005

but was limited to behavioural surveys only. The 2007 NARHS Plus added HIV/STI screening to the behavioural component and indicated a 2007 median HIV prevalence of 3.6% for the general population.

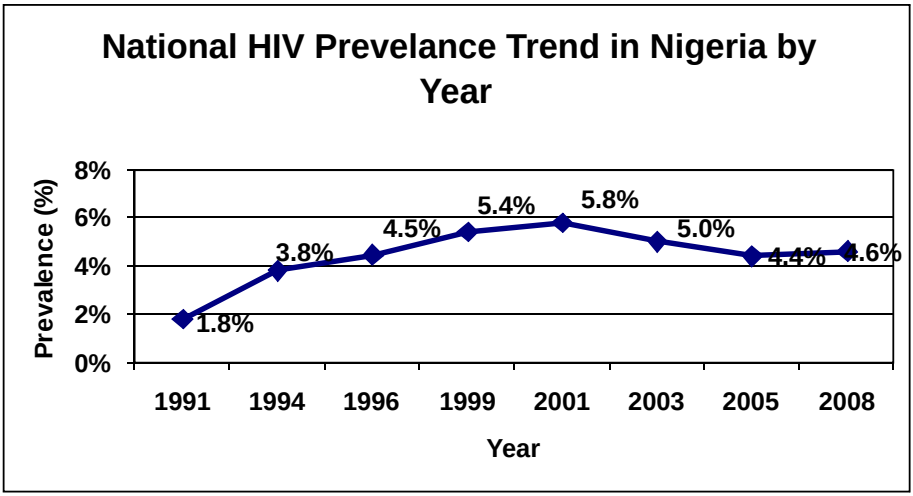

Figure 1 National HIV Prevalence Trend in Nigeria by Year

Using the Estimates and Projections Package (EPP) and Spectrum, and the 2008 ANC sentinel surveillance data, the number of people living in Nigeria with HIV infection was estimated at 2.87 million in 2008. About 271,151 new adult, and 68,864 new childhood HIV infections were estimated to have occurred in 2008. It was estimated that just over 700,000 adults and 100,000 children living with HIV required ART. Whereas the number of deaths due to AIDS in 2008 was estimated to be about 198,198, the cumulative number of deaths due to AIDS was estimated to be over 1.5 million. In terms of absolute numbers, Nigeria was considered to have the third highest burden of HIV in the world, after South Africa and India.

Though the national HIV prevalence was estimated to be 4.6% (through an

ANC-based survey) and 3.6% (through a population-based survey) in 2008, there are marked differences in the prevalence in the various states and communities. The HIV prevalence has consistently been high in some states such as Benue State with a 2008 HIV prevalence of 10.6% (ANC) and consistently low in Jigawa and Ekiti states with HIV prevalence of 1.6% (ANC) and 1.0% (ANC) respectively (Figure 2).

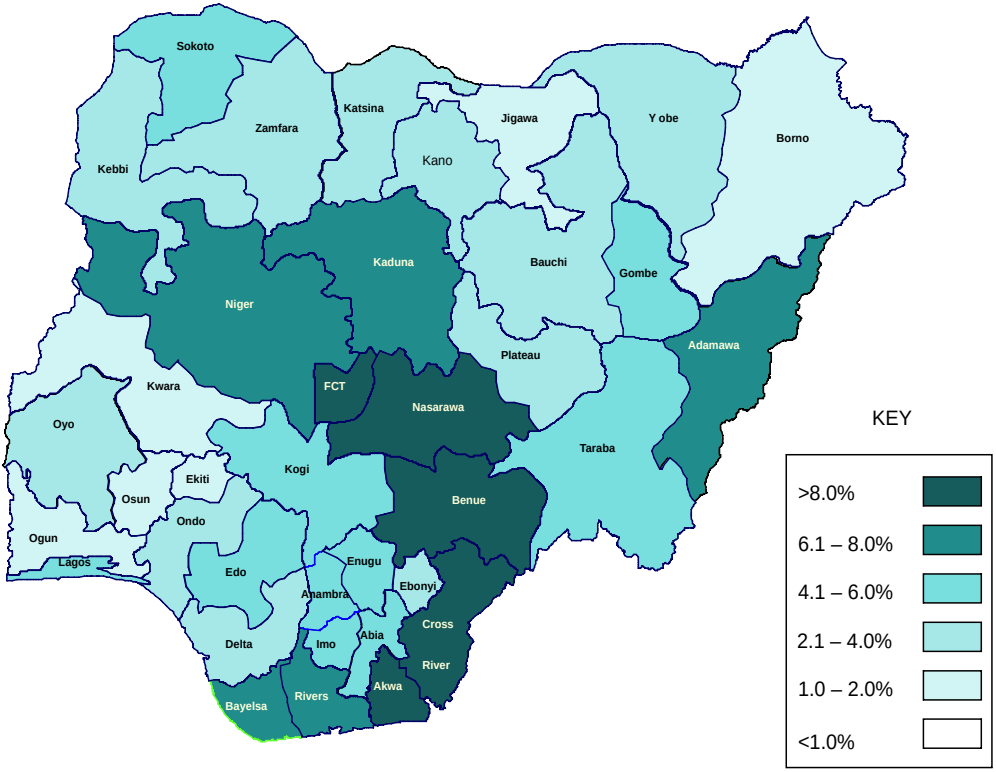

Figure 2 : HIV prevalence amongst pregnant women by state, ANC sentinel surveillance 2008

Reasons for the differences in HIV prevalence by geography are difficult to understand. Socio-cultural factors have been suggested but not substantiated. The main mode of HIV transmission amongst adults in Nigeria is through heterosexual intercourse. However other forms of transmission also occur. There is a growing psychoactive drug use amongst the urban population, especially amongst the youth. The significance of this on the HIV epidemic is hard to quantify, however an Integrated Bio-Behavioural Surveillance Survey amongst high risk groups (IBBSS) in 2007 indicated that IDUs had an HIV prevalence of 5.6% compared to the median HIV prevalence of 4.6% (ANC, 2008) that estimated the HIV prevalence among the general population.

Homosexuality occurs in Nigeria. Men who have sex with men (MSM) are known to exist in all parts of the country. However it is not practiced openly as same sex practice is regarded as a taboo. The IBBSS 2007 showed that the prevalence amongst this group was also quite high (13.5%). Again the level of this practice is hard to quantify.

Transmission through blood transfusions and other nosocomial modes of transmission is considered low but is known to occur in countries with weak and fledgling Blood Transfusion Services. As a result of this, blood-borne pathogens, including HIV, are still being transmitted through blood transfusions in such settings which are mostly in the developing nations of the world.

A number of KABP studies and behavioural surveillance surveys conducted to determine the factors that affect HIV transmission in Nigeria have indicated that age at sexual debut is low (males 19 years, females 18 years); that non marital sex is not uncommon (males 20.7%; females 10.7%); that condom use

during non-marital sex is low (males 61.3%; females 43.8%).

As indicated above in this report, female sex workers constitute a significant source of HIV infection and the IBBSS indicated an HIV prevalence of 34% among female sex workers. However, only 2.9% of the male population admitted to patronizing female sex workers in the 12 months preceding the study.

A major hitherto untargeted audience is the clients of the sex workers. Though no national study has been done, some localized studies in Nigeria have shown that more than 50% of the clients were married and most did not report condom use during last sex act with a FSW.

National Response

The first case of AIDS in Nigeria was reported in 1986 and subsequently the Honourable Minister of Health inaugurated a National Expert Advisory Committee on AIDS (NEACA) to monitor the epidemic and report directly to the Minister. In 1992, NEACA was replaced with the National AIDS/STI Control Programme (NASCP). NASCP spearheaded and coordinated the country's national response to HIV/AIDS until 1999 when the National Action Committee on AIDS (NACA) was created and located in the Presidency to coordinate Nigeria's national multi-sectoral response to HIV/AIDS. Also created in 1999 was the Presidential Committee on AIDS (PCA). NACA reports to PCA.

In order to give more autonomy and improve on its efficiency, NACA was upgraded in 2007 to a fully fledged self-accounting government agency, the National Agency for the Control of AIDS (NACA). State Action Committees

on AIDS (SACAs) and Local Government Action Committees on AIDS (LACAs) were established to coordinate HIV / AIDS activities at the state and local government levels. While NACA leadership reports to the President, the SACAs and LACAs report to the State Governors and the local government Chairmen respectively. At the national level, several Federal Government line Ministries and Parastatals, the United Nation's agencies, the Global Fund for AIDS, Tuberculosis and Malaria, bilateral government agencies, international and local NGOs, faith based organizations (FBOs) and civil society organizations (CSOs) are involved in programmatic responses to the HIV / AIDS epidemic.

The guiding principles of the national response are embedded in the National HIV / AIDS policy 2004 and the HIV / AIDS National Strategic Framework for Action (2005 – 2009). The goal of the 2005-9 HIV / AIDS National Strategic Framework for Action (NSF) is to reduce HIV / AIDS incidence and prevalence by at least 25%, and provide equitable prevention, care, treatment, and support while mitigating its impact amongst women, children and other vulnerable groups and the general population in Nigeria by 2009. The NSF has 8 objectives; two of which are targeted at reducing HIV transmission – objectives 2 and 5.

Responses targeted to groups at high risk of HIV infection

Preventive interventions include BCC for safer sex practices – abstinence, faithfulness, and condom use, PMTCT, HIV counselling and testing, blood safety, universal precaution and injection safety, and post-exposure prophylaxis. Groups mainly targeted are youth, women and the uniformed services, though the NSF mentions MSM, sex workers, IDUs and prisoners among specific groups to be targeted.

Though mention is made in the NSF of STI-specific interventions, using the syndromic approach, it appears that all stakeholders including government shied away from this important intervention as there are no public health programmes specifically funded for early diagnosis and prompt treatment of STIs. Exception to this are STIs treated under general provisions made to hospitals by government for treatment of endemic diseases.

Reliable data on the cumulative number of persons reached with preventive interventions (Abstinence, Be faithful, and Condom use) are difficult to obtain. However, a US PEPFAR-funded project reports having far reached 2,589,881 people with abstinence and be faithful (AB) only messages and 402,541 people with preventive programmes that are not AB focused from 2004 to date.

Female sex workers

Working in 342 brothels in 102 sex worker communities with an estimated FSW population of 14,000, Society for Family Health (SFH) reached 10,147 FSWs between 2003 and 2006. This is the single largest project in Nigeria targeting FSW. The 102 sex worker communities reached through this project are located in each of the 6 geopolitical zones in the country. In the North Central zone - 5 communities are located in the Federal Capital Territory, FCT, 5 in Plateau State, and 6 in Benue State; in the North East zone - 5 sex worker communities are located in Bauchi State, and 4 in Borno State; in North West zone - 7 communities are located in Kano State, and 4 in Sokoto State; in the South East zone - 10 communities are located in Enugu State and 6 communities in Imo State; in the South-South zone - 6 communities are located in Edo State, 6 in Cross River State, and 9 in Rivers State; in the South West zone - 10 communities are located in Oyo State, and 17 in Lagos State.

There are other organizations, mainly NGOs such as Nkan Iban Uko (Women of Courage) in Calabar and Women's Health, Education and Development (WHED) in Abuja, which work with FSWs.

Other high-risk groups (MSM, IDUs, Prisoners)

Information is quite scanty on other groups who are at a high risk of HIV infection such as men who have sex with men (MSM), injecting drug users (IDU), and prisoners.

Alliance Right Nigeria (ARN), an MSM-focused NGO in Nigeria and winner of the Red Ribbon-Breaker of silence awards on HIV & AIDS in 2000, is one of the few organizations representing sexual minorities in the country. From eight members who founded the organization in 1999, the organization has grown to a membership of 8,000. According the ARN's present coordinator, many funding agencies are reluctant to work with ARN. He further emphasized that regardless of the fact that some organizations have friendly dispositions towards ARN, notably UNAIDS, the US-funded Global HIV / AIDS Initiative in Nigeria (GHAIN), Ford Foundation and the National Agency for the Control of AIDS (NACA), the organization had only received US$1,000 funding from the University of Toronto, Canada for a peer education programme. UNAIDS had also directly funded another peer education programme conducted by ARN.

The stigma and discrimination that ARN has had to confront on an ongoing basis has been such that it was refused official registration by the Nigerian authorities, a situation which denied them the opportunity for funding from the World Bank MAP project in Nigeria, as the project funds registered entities only. The recent IBBSS survey indicates very high HIV prevalence in this

group, as well as high levels of bisexuality and sub-optimal condom use rates. They are a very high priority group for interventions.

Prisoners

Programming for prisoners remains a challenge. Supply of condoms in prisons remains a contentious issue as sex is not supposed to occur in the institutions. The Nigerian Prisons HIV/AIDS Programme which caters for both prisoners and prison staff receives its main funding from the World Bank MAP I Project in Nigeria through NACA. Main activities undertaken so far include HIV/AIDS workplace policy formulation and policy document production, capacity development, production of operational manual for field workers, monitoring and evaluation, and care and support to PLWHs. So far the prisons project has been funded with about N7.5 million mainly from World Bank funded MAP I Project administered by NACA.

The Nigerian Prisons HIV/AIDS Programme works in association with limited NGOs to provide education, counselling and support to prisoners to prevent transmission of HIV in the prisons.

During the midterm assessment of the implementation of the NSF, it was obvious that prevention efforts had not been scaled up with the same intensity as treatment, care and support initiatives. Efforts to address this include the development of a National Prevention Plan to clearly articulate how the country aims to reduce further transmission of HIV in the country.

Funding and implementation of the Response

Funding for HIV/AIDS activities in Nigeria increased tremendously with the inception of democratic rule in 1999. The National Agency for the Control of

AIDS (NACA) estimates that Nigeria needs an annual budget of at least US$500m to make any reasonable impact on the epidemic.

The World Bank has extended its project (MAP II) to 2012 with additional US$140million.

With the exception US PEPFAR that provided a budget breakdown, it was not possible to collect a breakdown of the different stakeholders' budgets by thematic area, to enable calculation of what proportion of their budget and subsequently the proportion of the overall national budget that goes into the different thematic areas of the NSF. The budget breakdowns were not available from majority of the stakeholders either because they do not have their budgets structured by thematic areas or because of reluctance to provide data. HIV/AIDS epidemiology and response match or mismatch might be better demonstrated from epidemiology versus budgetary allocation standpoints.

DfID has revised its programme plan and will implement an expanded multi-sectoral HIV and AIDS programme at an additional cost of £100m over the next five years. The US's President's Emergency Plan for AIDS Relief (PEPFAR) funded its Nigeria's country operational plan for the 2007 fiscal year with US$257,223,414. About 18% of this amount was budgeted for prevention activities (PMTCT, Abstinence & Be faithful, blood safety, injection safety and other non-Abstinence & Be faithful prevention), 47% was allocated to anti-retroviral therapy (Drugs and Services), 15% allocated to care of orphans and vulnerable children and palliative care (TB & HIV, and basic health care and support) and 6% to HIV counselling and testing. Other prevention programmes that support non-AB behaviour changes and condom

availability was allocated 3% of the total budget. This is the budget sub-category that could accommodate preventive activities for most-at-risk-populations (even though they were not specifically mentioned in the budget) and workplaces.

Out of the total annual budget of N1.8trillion in 2006, N10.8billion was sectoral allocation (NACA and the federal line ministries) to HIV/AIDS representing 0.58% of the total budget and about 10% total Health budget of N106billion. The Federal Government of Nigeria approved the sum of N2,296,464,901 (over two billion naira) for HIV and AIDS activities for fiscal year 2007 for NACA alone.

The Federal Government of Nigeria and the several development partners appear to be more active in HIV prevention and impact mitigation in terms of funding than the State and Local Governments. This view was corroborated by the FMOH in a statement it published in 2005 *"…it is clear that financial allocations to HIV & AIDS vary significantly from state to state … Surveys indicate that 13 out of 36 states plus FCT reported receiving funds from the states itself …Where Governors have become directly involved in the HIV & AIDS response, allocations have been reasonably generous. A good example of this is the Rivers State Government that has been supporting the procurement of ARVs with N20m annually. .... The NACA review of SACAs and LACAs found that the degree of state participation in funding HIV & AIDS programmes ranged from nothing in some states, to as much as N10 million in Lagos State. Fourteen states had nothing more than the N2 million grants from NACA, implying that there was no state support of any kind."*

This meant that 23 states received nothing from their state governments. AIDS activities in such states are supported either by the Federal Government,

development partners or both. Against this background therefore, the presence or absence of donor activities in any state may be predictive of the level of HIV/AIDS activities in such states. Akwa Ibom State, with consistently high HIV prevalence (currently 8%) falls within the category of states with only one or no donor agency working within the state.

2. Rationale for Synthesis and Modelling

The objective of the national synthesis and modelling exercise is to improve the understanding of the distribution of new HIV infections and to provide knowledge to improve present and future focus of prevention interventions in countries.

The UNAIDS Modes of Transmission model uses national prevalence and behavioural data to model the distribution of incidence in key risk populations. It is therefore an important tool in supporting country teams to "Know the HIV Epidemic". The epidemiological synthesis preceding the modelling exercise is a key requirement to develop a clear explanation of the dynamics of HIV infection and to assess the degree of alignment between programme and resource efforts and the priority areas identified through the modelling exercise. By developing an understanding of the national epidemic and context (gaps, risks, service coverage and resources), the country is able to make better decisions on prioritization and definition of goals and targets for effective scale up to Universal Access.

Success in accelerating access to treatment has not been matched by similar success in prevention. Progress made in expanding treatment access has been achieved through improved delivery of complementary services built upon evidence and strengthened monitoring systems.

In contrast, the prevention response has been inadequate. Underpinning the shortcoming in the prevention response is the inadequate use of evidence to inform the national HIV response. In addition, evidence about the success of

HIV prevention programmes has not been collected systematically and 'what works' is not always known. The result has been largely ineffective prevention interventions, misapplication of available resources and the loss of early opportunities to address the unique factors driving infection in the populations most at risk within the country.

Universal Access does not mean that 'every person requires all HIV services', but rather that all persons who need HIV services are provided with them. Therefore, we need to know who needs HIV prevention, care and support services. Achievement of Universal Access to prevention information and services requires planning and delivery of programmes based on a solid understanding of the modes of HIV transmission within the population, including identification of key populations, examination of where, in what context and why they continue to be vulnerable to infection, and an assessment of current resource allocation for prevention against these identified priority groups.

The development of the Modes of Transmission Model (MOT) and its findings will support a robust process to analyze national evidence and draw out recommendations for the national prevention strategies. This process will focus on reviewing the evidence with the primary aim of guiding decision making and improving planning.

Incidence versus Prevalence

HIV prevention interventions clearly need to be targeted at populations that are experiencing the highest burden of new (incident) infections. The difficulty we have is that there is usually very little information on where these new infections are occurring.

Nigeria has a lot of HIV prevalence data but no incidence data. Prevalence data, however is representative of infections that have occurred for as long as 15 years depending on the survival of persons once infected. The risk factors and populations that are associated with prevalent HIV infections may not be the same as the risk factors and populations that are experiencing the highest burden of infections currently.

Objectives

The key objective of the study is to contribute to the ongoing efforts to understand the epidemic and HIV prevention response in countries and thus help countries improve the scope (doing the right kind of activities), relevance (with the right populations) and comprehensiveness (reaching all members of target populations) of their HIV prevention efforts.

Specifically, the Modes of Transmission review will:

a) Identify the distribution of the most recent infections and the populations at greatest risk for infection through incidence modelling;
b) Support the determination of factors driving the local epidemic
c) Support the assessment of resource allocation for national prevention interventions with the priorities as highlighted by the model
d) Make recommendations for prevention policy and programmatic action to ensure a stronger and more effective national prevention strategy.

3. Methodology

The project was conducted by a national team and coordinated through the national UNAIDS office. The work was carried out by national epidemiological and modelling consultants, with technical support from a team of international modelling consultants. A detailed description of the national process including establishment of the team, review of data and technical support provided for work leading up to the finalization and dissemination of this work is provided in Annex A.

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Modes of Transmission Model

The purpose of the model is to calculate the expected short term incidence of HIV infections among the adult population by mode of transmission. The calculation is based on the current prevalence of HIV infection, the number of individuals in particular risk groups, and the risk of exposure to infection within each group. The model was first developed by the UNAIDS Reference Group on Estimates, Modelling and Projections in 2002 and has since then been applied in several countries. It has also been developed as part of the UNAIDS/WHO set of methods and has been included in regional training courses conducted by UNAIDS and WHO. The model and instructions for application are available at http://www.unaids.org.

The model was developed by looking into key documents within the country that provided inputs for the model such as 2005 and 2008 ANC Serological Surveillance Surveys, the Nigerian Demography and Health Survey (NDHS) 2003, the Nigerian HIV/AIDS and Reproductive Health Survey (NARHS) 2005, the National Behavioural Surveillance Survey (BSS) 2005, the country's first Integrated Bio-Behavioural Surveillance Survey (IBBSS) 2007 and the country's first population based HIV sero-prevalence surveillance survey (NARHS plus 2007). Where nationally representative data did not exist, reliable in-country research findings were used. Where no national information existed, data from other West African countries were studied and extrapolations were made. Where these also did not exist, international averages were used while recognizing the limitations of such. These values were then shared with stakeholders within the National M&E technical working group for input and consensus. Subsequently, a workshop of stakeholders was conducted to validate the country's MOT modelling results.

Inputs

Percentage of Population with Risk Behaviour

The adult (15-49 years) population in Nigeria was divided into groups based on their highest risk factor from the three main transmission modes in the country: sexual transmission (heterosexual and homosexual) and sharing needles during intravenous drug use.

Initially the general adult (15-49 years) population, disaggregated by sex, was differentiated by their sexual activity over the last 12 months. Based on data from the DHS 2003, NARHS 2005 and NARHS plus 2007, they were divided into those that did not have sex in the last 12 months; those that had sex but

with only marital partner and those that had non-marital sex. The percentage of clients of female sex workers was subtracted from males that reported non-marital sex. This was estimated at 2.9% of the male adult population based on the DHS 2003. This was based on a very limited definition of what constitutes commercial sex. When commercial sex is defined as exchange of gifts or money for sex, the percentage rises considerably.

The percentage of female sex workers was inferred from estimates of the number of FSW in the West African region (Vandepitte et al; 2006) and by looking at the urban rural population ratio. This was estimated at 0.7% and subtracted from the females that reported non-marital sex.

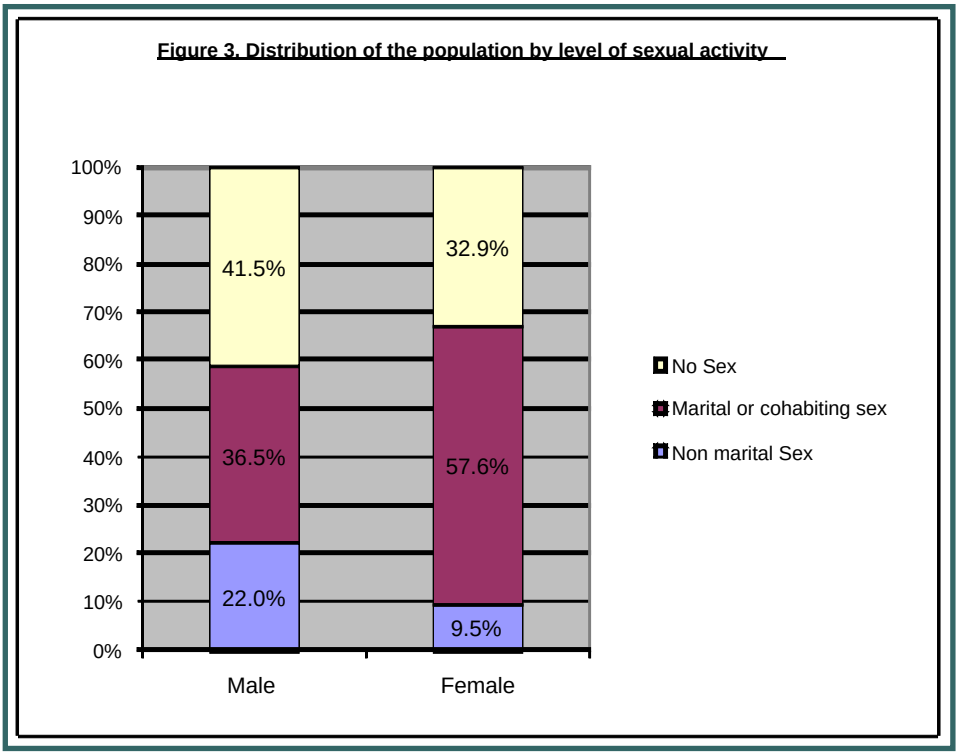


Figure 3: Distribution of the population by level of sexual activity

The percentage of men who have sex with men (MSM) was determined from the two high-risk group surveys (BSS 2005 and IBBSS 2007) conducted in the country. When asked whether they had sex with men about 0.0% to 0.8% of various groups including youth, IDUs, transport workers, uniformed services stated that they had in the past 12 months had sex with another man. The value reported amongst youth, which was 0.7%, was considered to be more likely to reflect what happens in the general population. It was also taken into consideration that under-reporting was more likely than over-reporting. This value (0.7%) was removed from those who had had casual (non-marital sex).

The fraction of persons that reported injecting drug use was determined from the general population behavioural survey (NARHS 2005). To the question whether they had used injecting drugs over the past 12 months, 0.5% of males and 0.4% of females stated that they had used such. The percentage reported among females was quite high and considered unreliable. This is based on experiences of mental health specialists in the country and the fact that in the 2007 IBBSS, females constituted only 5% of total IDUs population. To avoid the risk of over-estimation of female IDUs, the 0.4% of females who reported injecting drug use was halved. This number was also deducted from the persons having low-risk sex.

The MOT model aims to show the effect of risk not only from the perspective of the person who has sex or other risk behaviours associated with HIV infection, but also the effect of their behaviours on their sexual partners. Therefore, the percentage of persons who had a higher risk of getting infected with HIV as a result of the risk profile of their partners was determined. This was achieved by looking at the sexual characteristics of the high-risk groups (IDUs and MSM) and estimating the percentage of the opposite sex that were sexually involved with them.

Sexual partners of persons within high-risk groups:

Sexual partners of male injecting drug users:

To estimate the percentage of females who were stable partners of IDUs, the percentage of IDUs who reported living with their sexual partners, independently of whether they were married or not, was multiplied by the percentage of the male population who were IDUs: this was equal to 0.32 x 0.5= 0.16%. This information was taken from the IBBSS 2007 (*Table 3, page 27*).

Sexual partners of female injecting drug users:

Unfortunately the IBBSS did not provide reliable information on female IDUs' sexual characteristics due to the fact that more than 95% of the IDUs in this study were male. From the small sample interviewed, 8 to 18% of female IDUs reported selling sex, which indicates that this population engages in risky sexual behaviours (figure 36, p 49). However, we are here interested in regular sexual partners of female IDUs. To make an approximation, the percentage of women who were either married or living with their partner was taken from the DHS 2003 and multiplied by the percentage of women who were IDUs: this was equal to 0.789 x 0.2 = 0.16%.

Sexual partners of MSM:

Partners of MSM were estimated based on the fact that in the IBBSS 2007, 39% of them reported having sex with females. The population of females who had sex with them was therefore assumed to be (0.39 x 0.7) = 0.27%. Only few of the MSM reported being married. This is much different from the previously conceived ideas that in Nigeria and most Sub-Saharan Africa, most MSM are in union. This might therefore be an underestimation of the number of regular partners of MSM.

Sexual partners of clients of Female sex workers:

Partners of clients of sex workers were estimated based on the fact that according to the DHS 2003, 45% of men who consorted with FSWs were married or living with their partner. This led to the assumption that (0.45 x 2.9) = 1.31% of females had male partners who were clients of sex workers. Partners of FSW clients were hitherto assumed to have been low risk.

Sexual partners of men and women engaging casual heterosexual sex:

Similarly, the proportion of females and males who were partners of persons

of the opposite sex who were engaged in casual high-risk sex was estimated by determining the percentage of persons in union. Seventy percent of the females and 53% of the men are in marital or cohabiting union based on the 2003 DHS. To estimate the number of female partners of men who were engaging in casual sex we multiplied the percentage of males engaging in casual sex (22.2%) by the proportion of men that were married (53%) The same logic was used to determine the number of male partners of females who were engaging in casual sex (10.6 % x 70%).

Based on this, the model had the distribution of the population amongst these groups as reflected in the figure below:

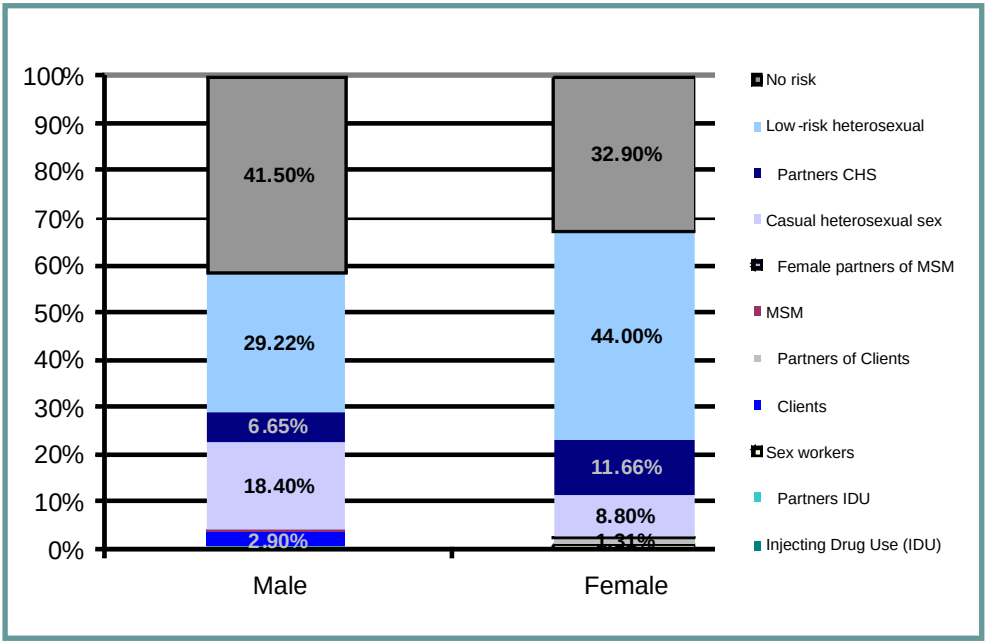


Figure 4 Distribution of adult population by risk factor for HIV Infection

- HIV prevalence

Prevalence amongst the general population was based on the latest 2007 NARHS plus sero-prevalence survey conducted in the country. The prevalence amongst the high-risk groups was based on the 2007 Integrated Behavioural and Biological Survey conducted amongst high-risk groups in Nigeria. The prevalence amongst partners of high-risk groups (partners of FSWs) was estimated by studying the relationship between sexual behaviour and HIV prevalence in West African countries and limited research in Nigeria and deducing the possible prevalence amongst these groups based on the prevalence amongst the general population and the high-risk groups.

These assumptions led to the following deductions on the next page:

Table 1: Prevalence of HIV in each group

Risk group	National	Remarks and Sources
Injecting Drug Use (IDU)	5.6%	IBBSS 2007
Partners IDU	4.5%	Assumed to be the average between the low risk group prevalence and the IDU prevalence. It was also assumed to be closer to persons engaged in casual hetero sex
Sex workers	34%	IBBSS 2007
Clients of sex workers	10.8%	This is based on deductions which suggest that HIV prevalence among clients of sex workers is about three times the prevalence of the general population. Also it is close to what has been observed in neighboring countries and limited research in country.
Partners of Clients	4.5%	This was based on the assumption partners of clients will have prevalence close to persons engaged in hetero causal sex. This was computed through secondary analysis of data from the NARHS 2007 to be 4.5%
MSM	13.5%	IBBSS 2007
Female partners of MSM	4.5%	Assumed to be similar to persons engaging in casual heterosexual intercourse rather than to the HIV prevalence amongst MSM
Low risk	3.6%	2007 NARHS plus survey
Casual heterosexual sex	4.5%	This was computed through secondary analysis of data from the NARHS 2007
Partners of persons who practice Casual heterosexual sex	4.0%	This was based on the assumption that partners of persons who engage in casual heterosexual sex have a prevalence rate close to persons engaged in causal heterosexual sex, which was computed through secondary analysis of data from the 2007 NARHS plus to be 4.5%

STI Prevalence

Sexually Transmitted Infections (STI) are known to affect the rate of transmission of HIV during sex. The prevalence of STI in the population and its distribution amongst the various groups will affect the rate of HIV transmission through sex. The prevalence of infection was estimated by the percentage of the various groups that reported having unusual genital discharge or a genital ulcer in the last 12 months. The percentage for the general population was obtained from the 2003 NDHS while the percentages for the high-risk groups were obtained from the IBBSS 2007.

The STI prevalence amongst partners of high-risk groups was obtained through a careful analysis of the marital status of the persons within each group. The tables revealed that single people had a higher rate of STI. Since these were sexually active people, it is assumed that they were having non-marital sex. The prevalence amongst single persons was therefore used as a proxy for casual sex. In the same manner, although it is quite possible that married persons were engaging in non-marital sex, only a few reported such (NARHS 2005), hence the STI symptom reporting amongst married persons was used as a proxy for persons within low risk group. The STI prevalence inputs are stated on the next page.

Table 2: Prevalence of Sexually Transmitted Infection by group

Risk behaviour	Male	Female	Source
Injecting Drug Use (IDU)	6.7%	6.7%	IBBSS 2007 page 89
Sex workers		16.1%	IBBSS 2007 page 83
Clients of sex workers	7.1%		Same as casual
MSM	6.9%		IBBSS 2007 page 87
Casual heterosexual sex	7.1%	8.3%	Table 12.21 Self -reporting of sexually transmitted infection (STI) and STI symptoms (NDHS 2003 Page 196)
Low risk	3.2%	4.0%	Table 12.21 Self -reporting of sexually transmitted infection (STI) and STI symptoms (NDHS 2003 Page 196)
No risk	0%	0%	Not applicable

Sharing of needles by IDU

From the IBBSS 2007 (table: History of Drug Use among IDU, page 108), it can be calculated that the average IDU took about 448 injections per year. The number of partners of IDUs with whom needles were shared was difficult to estimate due to lack of data. This was assumed to be only 2 persons. Responses made in the IBBSS 2007 (table: Injecting Behaviours among IDU, page 108) show that 60% of IDUs did not share needles in the last month. This was considered as being the degree of protection.

Number of sexual partners and acts per partner per year

An assumption was made that the average sexually active person had about 100 acts of sexual intercourse a year as in the latest DHS surveys where this question was asked. The reported number varied between 50 and 100 sex acts per year. Sex workers and their clients were assumed to have more. According

to the IBBSS 2007, brothel based FSW and non brothel based FSW had on average 34 and 25 clients per week respectively. As the sample sizes of these two groups were quite close it was assumed that each represented half of the FSW population and it was estimated that FSW had an average of 30 clients per week. Assuming that FSW take 10 weeks off due to menstrual periods and 5 weeks off due to personal reasons, their total number of clients per year was: 37 weeks*30=1110. In the BSS 2005, FSW reported having on average 2.7 partners per day, so the estimated number of clients per FSW per year would be 2.7*7*37=518 clients. A value (600 clients/year) between these two but closer to the BSS 2005 value was used in the model. Because it seemed more feasible when calculating the number acts of sex and number of partners for their clients. Each client is counted as a single sex act, so some of these sex acts might have occurred with the same client; this is accounted for in the model. As the total number of sex acts reported by clients and by FSW should be the same, it is possible to infer the number of clients' acts from the proportion of women who are FSW, the proportion of men who are clients and the number of sex acts reported by FSW. The number of sex acts per client is equal to: proportion of FSW * number of FSW acts/ (proportion of clients) = (0.7 *1000)/10= 70 which would translate into clients visiting FSW about 5 times per month.

The number of sex partners per year was calculated by determining the average number of partners that people in each group had based on their responses to questions in the various surveys conducted in the country. People reporting no sexual activity in the last 12 months were presumed to have no sexual partner; those reporting only marital sex were presumed to have only one sexual partner and those stating that they had had non-marital sex were assumed to have more than one. Based on the fact that only 2.1% of sexually active females

and 25.9% of sexually active males had more than 2 sexual partners in the last 12 months, this would suggest that the average persons engaging in non-marital sex had 2 or less partners a year. They were then assumed to have on average two partners per year. The number of acts per partner was defined by dividing 100 by the number of sexual partners. This was due to the fact that most surveys were based on number of days win which person had sex rather than number of acts.

Table 3: No of partners and Sex acts per partner

Adult Risk Behaviour	Number of partners per year	Number of acts of exposure per partner per year
Injecting Drug Use (IDU)	2	224
Partners IDU	1	100
Sex workers	120	5
Clients	28	5
Partners of Clients	1	100
MSM	6	15
Female partners of MSM	1	100
Casual heterosexual sex	2	50
Partners CHS	1	100
Low-risk heterosexual	1	100
No risk	0	0
Medical injections	5	1
Blood transfusions	1	1

Percentage of acts protected (%)

These are the number of sex acts in which the persons took precaution against HIV infection by using a condom; this is approximated by determining the percentage of last acts of sex in which a condom was used. These were obtained from the IBBSS and the NDHS 2003 & NARHS 2005. All values of condom use were multiplied by 0.8 in the model to take into account condom effectiveness which, according to the Cochrane review, is of 80% (*Weller and Davis, 2004*).

Table Percentage of acts protected in each risk group

Risk behaviour	Percentage of acts protected	Source
Sex workers	(73.4%) (96.9 % – 98.4%)	IBBSS 2007 page 81, 82 Condom use among the Transport Workers page 91 Condom use among the Police page 90 Condom use among the armed forces page 89
Clients of sex workers	73.4%	Calculated from data set of the NARHS 2005 Condom use among the Transport Workers IBBSS page 91 Condom use among the Police IBBSS page 90 Condom use among the armed forces IBBSS page 89
MSM	52.8%	Table: Condom Use with Male and Female Partners among MSM (IBBSS 2007 page 97)
Casual heterosexual sex	55.9%	Table 6.7: Condom Use with Non-Marital Partners (NARHS 2005)
Low risk	3%	Nigerian DHS 2003
No risk	0%	
Partners of MSM	3%	Nigerian DHS 2003 (Assumed to be regular partners and to have the same behaviour as those in the low - risk group)
Partners of FSW clients	3%	Nigerian DHS 2003 (same assumption)
Partners of IDUs	3%	Nigerian DHS 2003 (same assumption)

Sex workers reported very high levels of condom use. However the reported condom use by their clients was much lower: 73.4% (calculated from the NARHS 2005 data). This is corroborated with the percentage of various groups who patronized female sex workers as seen in the IBBSS 2007 (Transport workers 73.4%; Police 65.4%; Armed forces 93%; IDU 71.9%; MSM 83.7%). Also the female sex workers reported having non-paying sex partners for whom use of condoms was much lower (12.8 – 46.1%). The number of protected acts of sex by FSWs was therefore estimated to be 73.4%, based on the reported condom use by clients.

The percentage condom use in casual (non-marital) sex was considerable. This was reported to be 43.8% amongst females and 61.1% amongst males. The overall rate of condom use was reported as 55.9%.

The percentage of protected sexual acts of MSMs was estimated to be 52.8% based on the percentage of MSM that used a condom in the last sex with men in non-commercial sex. The estimate of condom use by their female partners was based on the fact that these were assumed to be regular partners and thus to have the same characteristics of the low-risk group where condom use was of 3%. The partners of IDUs were assumed to have come from the low-risk group; hence condom use among them was also considered to be 3%.

Condom use among persons in the low-risk group was presumed to be the same as the current use of condoms reported in the DHS 2003. This was of 3% overall which is much lower than that reported in the NARHS 2005 (10.8% for females and 25.9% for males) but probably more accurate as no other country in the region report such high condom use with stable partners. In the IBBSS all groups also reported low condom use with “regular” partners (Police

7.8%; Armed forces 11.1%; Transport workers 4.5%; IDUs 11.6%).

After entering all the data derived above, data checks were made to ensure a high degree of accuracy and consistency. It was therefore important to verify that:

a) The adult HIV prevalence obtained in the model was comparable with the HIV prevalence obtained during the NARHS plus survey.
b) The number of sex acts of FSWs was similar to the number of sex acts of their clients.

4. Results of Modelling

The model predicted that there are over 2.6 million HIV infected people in Nigeria which is close to the latest UNAIDS estimate of 2.53 millions. It predicted about 170,000 new infections in the short term amongst the 15-49 adult population which is lower than the 2007 Spectrum estimate of 210, 000 (based on ANC data as opposed to the population based data used for the model). This could also be related to uncertainty in the risk profile of partner groups (partners of MSM, partners of clients of sex workers and partners of persons engaged casual heterosexual sex). Some uncertainty also exists in the profile of clients of female sex workers.

The results suggest that Nigeria's HIV/AIDS epidemic is generalized as the bulk of new HIV infections occur amongst persons who are not engaging in high risk sex, a sub-population that includes cohabiting or married sexual partners.

More than 40% of the infections occur amongst persons practicing 'low risk' sex. Because condom use in this group tends to be low, HIV infection acquired as a result of previous/present high risk behaviors or relationships by one of the sex partners is easily transmitted to the other unsuspecting partner.

About 19% of infections occur amongst people who are sexual partners of high risk groups (female sex partners of MSM; partners of IDUs, partners of clients of female sex workers and partners of persons who have casual high risk sex). Partners of CHS, IDUs and of FSWs' clients are people who ordinarily should have been classified as low risk but are now at a higher risk of acquiring

HIV infection because of their relationships with people known to practice high risk sex and therefore not very visible as high-risk groups.

In spite of the fact that the majority of the infections are due to the HIV transmission amongst the general population, the high-risk groups still contribute a significant portion of new HIV infections. Directly, IDU, FSW and MSM with their partners, contribute as much as 32% of new infections. This is quite significant when it is considered that about a third of new HIV infections are attributable to these high-risk groups who constitute only about 1% of the adult population and about 3.4% of the adult population when sex worker clients are included.

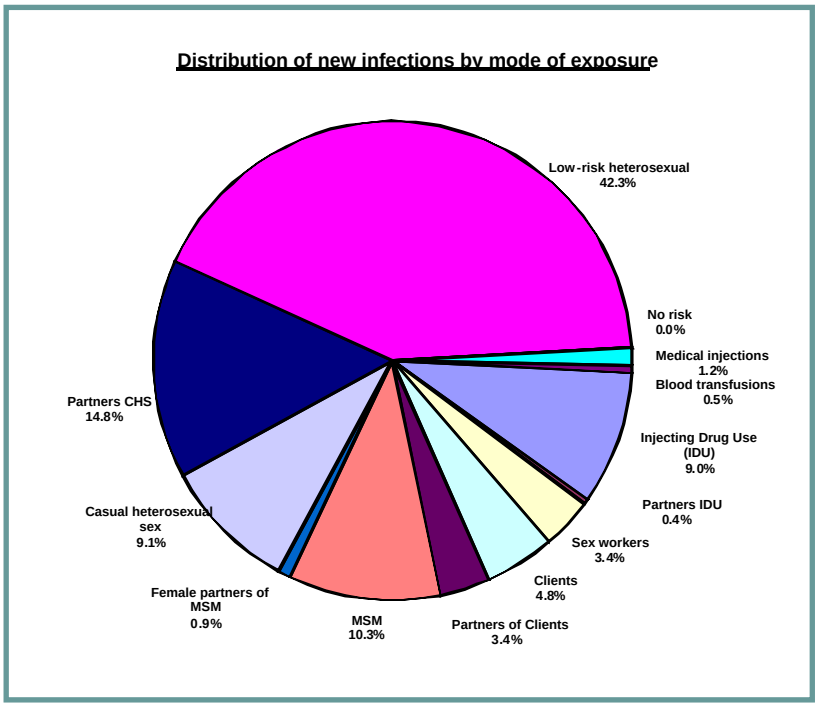
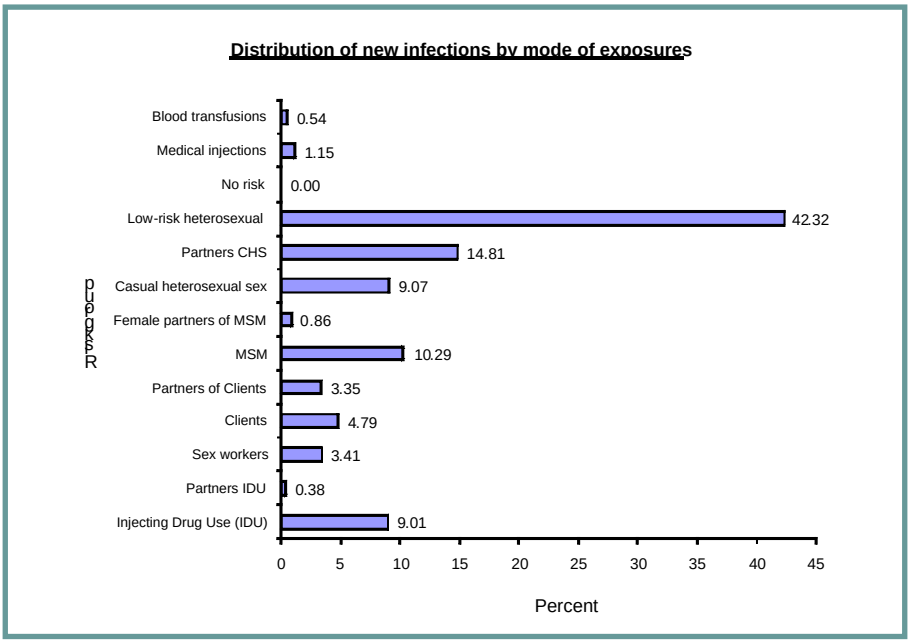


Figure 5: Short term HIV incidence in Nigeria by mode of transmission

Figure 6: Short term HIV incidence in Nigeria by mode of transmission



What are the key groups; who should we be targeting?

The presumed perceived low-risk of infection amongst persons who themselves are keeping to one partner faithfully, needs to be addressed. The notion that one is safe because he or she is doing the right thing needs to be revised to educate people that they are not safe until their partners are also faithful. There is a need to ensure that people are aware of the HIV status and the sexual practices of their partners. Any form of doubt needs to be addressed through the use of condoms during sex.

Targeting high-risk groups seems to be a very strong way of having an immediate impact on the epidemic and quickly reducing the incidence of infection in the country. By targeting FSWs, MSM and IDUs who make up only 1% of the adult population, Nigeria should be able to make an impact on

the epidemic. Unfortunately while FSWs are quite visible and easily targeted, reaching MSM and IDUs may be quite difficult considering their "invisibility". Another group that has a significant impact on the course of the epidemic and yet hard to reach is the clients of sex workers. Visible mainly at night, and spanning all levels of education and socio-economic status, this group is associated with more than 7% of the new infections.

The youths need to be targeted as well. The NDHS shows that those that practice non-marital sex are mainly the youth (2003 NDHS table 12.11).

Low-risk sex is responsible for about 50% of the new HIV infections. The use of condoms has been seen to affect the transmission of infection radically such that though a high number of partners are noticed in commercial sex, the high level of use of condoms reduces HIV transmission greatly. The low level of use of condoms during low-risk sex is a major reason for the high level of HIV transmission through this route.

5. Discussion of findings

The results of this exercise should be viewed with the knowledge that a number of assumptions were made with regard to the risk profile of partners of high-risk groups. Very few studies have been undertaken to understand the dynamics of the HIV epidemic and these groups. None has been done in Nigeria so far. The lack of data in some areas and the need to rely on data from other sources could also tilt the results obtained one way or the other. Furthermore the data on Nigeria was taken from the most recent data where possible. However, whereas some of the data used were obtained from surveys conducted in 2003, others were obtained from surveys as recent as 2007. This may have implications for the outcome of the modelling exercise.

There was more information available to determine the distribution of the population based on their risk factors for HIV, however concerning FSW and their clients there was quite a lot of variation between surveys so it would be good to take that into account.

The model uses the Bernoulli formula to calculate incidence, prevalence is included as a parameter, meaning that it does not vary, which is not realistic over time. However, because we are only using it to make a short time prediction this is not a problem. More importantly, the model does not take into account overlapping risk behaviours and categorizes people according to their most risky behaviour. In the same way, it does not include heterogeneities within risk groups which is generally an important factor in the dynamics of the epidemic.

6. Recommendations

The findings from the exercise are significant and raise a number of key questions and lead to a number of deductions.

What are the interventions that will make a difference?

- The high level of HIV transmission that occurs amongst the high-risk groups is disconcerting, and about 12 % of infections may be attributed to female sex workers and their clients alone. Work in this area needs to not only focus on the female sex workers but also their clients.
- IDUs and MSM contribute about 9% and 10% of the annual new infections respectively. Targeted interventions at these groups could have a considerable effect in slowing the epidemic. Unfortunately, we have very limited knowledge of the dynamics of infection transmission amongst these groups in the country due to the considerable focus on heterosexual transmission. A first step would be to expend more effort into collecting data to design suitable interventions for these groups.
- A major finding in this study is that about 50% of infections occur amongst couples who at the time would be considered to be engaging in low-risk sex. HIV Counselling and Testing (HCT) needs to be scaled up rapidly (everybody needs to know his/her status) and that of their sexual partners.
- Condom use should be socially marketed as the norm in any relationship in which the HIV status of the partner is not certain, rather than only during risky sex. Efforts must be made to get couples to undergo joint or couple HCT.
- Also a substantial proportion of the new infections occur in the CHS

even if condom use is quite high in this group. Campaigns directed at reducing number of partners would be an option to reduce the number of new infections

- Prevention strategies targeting high-risk groups for both HCT and use of condoms should also be scaled up.

Implications for resource allocation

- More money needs to be focused on prevention strategies that will yield the greatest reduction in HIV transmission. There is a need to expand the national programme focus on high risk groups. In the review of the National Strategic Framework in 2007, this was de-emphasized. The objective to target high-risk groups was subsumed with that of targeting the general population. In the light of these findings, it is obvious that this may not yield the best results. In the development of the National Prevention Plan, it is hoped that this will be looked into and addressed.
- Need to create Universal Access to HCT. More funding for creating universal access: wherever there is a health facility there should be HCT services.
- Need to overcome all barriers to condom usage
    - Socio-cultural
    - Poor availability
    - Cost effectiveness
    - Integrity of condoms sold

Implications for data analysis, surveillance and incidence monitoring

- General population surveys which include biological surveillance can provide important information on the effects of risky behaviour on HIV prevalence and incidence.

- There is a need for more information on high-risk groups. There is very little known on clients' sexual behaviours and HIV prevalence. The same applies to IDUs and MSM; a better understanding of their contact network and risk behaviours would allow designing adequate prevention interventions.
- There is a need to determine the burden of high risk that exists in the country and its distribution. While it is possible to establish that IDU, commercial sex and MSM are associated with high risk in Nigeria, the distribution of these practices in the country is limited. Future nationally representative surveys should include questions that could provide information in this regards.

Description of the Country Process – *coordination, collaborating roles, data selection and list of key documents reviewed.*

The process of modelling HIV incidence by modes of transmission began with a training workshop/consensus building meeting in Cotonou, Benin Republic in the second quarter of 2008. During this meeting, the MOT modelling tools were introduced by a team of international consultants to the national consultants, NACA, and UNAIDS staff from the 6 West African countries targeted for the exercise. These include Nigeria, Benin Republic, Ghana, Cote d'Ivoire, Senegal, and Burkina Faso.

Since the workshop participants were asked to come with all available epidemiological and behavioural data from their respective countries, the exercise to determine HIV incidence by modes of transmission for the participating countries actually began in Cotonou.

On arrival, the Nigerian team immediately set out to complete the MOT model. To accomplish this mission, the national consultants, assisted by NACA and UNAIDS staff collected country-specific data from relevant publications. The sources of such data included publications and reports by government, mainly the Federal Government, development partners, and indigenous NGOs.

The main sources of data include the several Federal Ministry of Health's reports on national HIV sero-prevalence surveillance surveys from 1991 to

2008, the 2005 national Behavioural Surveillance Survey (BSS) report, the 2003 National Demographic and Health Survey (NDHS) report, the 2003 & 2005 National AIDS and Reproductive Health Surveys (NARHS) reports, the 2007 Integrated Bio-behavioural Surveillance Survey (IBBSS) reports and the 2007 NARHS plus.

On completion of the first draft of Nigeria's MOT (narrative and spreadsheet) report, it was shared with the international consultants for their inputs after which the report was updated and validated through a one-day national workshop of stakeholders.

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