The Critical Role of Locally Conducted Research in Guiding the Response to the HIV Epidemic in Jamaica

JP Figueroa

ABSTRACT

Locally conducted research has played a critical role in guiding the response to the human immunodeficiency virus (HIV) epidemic in Jamaica. Active HIV/AIDS case-based surveillance and serosurveys helped to define the acquired immunodeficiency syndrome (AIDS) epidemic in Jamaica and identify those who were most at risk. Studies among sexually transmitted infection (STI) clinic attendees identified genital ulcers and syphilis as risk factors for HIV infection and were suggestive of other risk factors. Given the synergistic role of HIV and other STI, an integrated approach was taken to HIV/STI control and the STI services were strengthened based on research. Studies were conducted among sex-workers (SW), men who have sex with men, persons who go to sites to meet new sex partners, prisoners and others most at risk in order to understand risk factors and better guide the HIV/STI response. National population based surveys were conducted periodically to monitor knowledge, attitudes, beliefs as well as sexual behaviour and condom use. The research contributed greatly to Jamaica's comprehensive HIV/STI control programme that has been effective in slowing the HIV epidemic, reducing HIV prevalence among SW and STI clinic attendees, preventing mother-to-child transmission, reducing syphilis rates and mitigating the impact of HIV on the population.

Keywords: Evidence, HIV, Jamaica, policy, research, STI

El Papel Crítico de la Investigación Local a la Hora de Orientar la Respuesta a la Epidemia de VIH en Jamaica

JP Figueroa

RESUMEN

Las investigaciones realizadas localmente han desempeñado un papel crítico a la hora de orientar la respuesta a la epidemia del virus de la inmunodeficiencia humana (VIH) en Jamaica. La activa vigilancia y los estudios serológicos de casos VIH/SIDA ayudaron a definir la epidemia del sindrome de inmunodeficiencia adquirida (SIDA) en Jamaica, e identificar los casos con mayor riesgo. Los estudios realizados a pacientes con infecciones de transmisión sexual (ITS) que acudieron a las clínicas, identificaron las úlceras genitales y la sífilis como factores de riesgo de la infección de VIH, sugiriendo también otros factores de riesgo. Dado el papel sinergético del VIH y otra ITS, se adoptó un enfoque integrado en relación con el control de VIH/ITS y se fortalecieron los servicios de ITS sobre la base de la investigación. Se realizaron estudios entre trabajadoras sexuales (TS), hombres que tenían sexo con otros hombres, personas que acuden a citas para encontrar nuevas parejas sexuales, prisioneros, y otras personas con grandes riesgos, a fin de entender los factores de riesgo, y orientar mejor la respuesta al VIH/ITS. Se realizaron estudios con la población nacional periódicamente, con el propósito de monitorear el conocimiento, las actitudes, las creencias así como el comportamiento sexual y el uso del condón. La investigación contribuyó grandemente al programa integral de control del VIH/ITS de Jamaica. Este programa ha sido efectivo en disminuir la epidemia de VIH, reduciendo la prevalencia de VIH entre las TS y los pacientes de ITS, previniendo la transmisión madre a hijo, reduciendo la tasa de sífilis, y mitigando el impacto del VIH en la población.

From: Department of Community Health and Psychiatry, The University of the West Indies, Kingston 7, Jamaica.

Correspondence: Professor JP Figueroa, Department of Community Health and Psychiatry, The University of the West Indies, Kingston 7, Jamaica. E-mail: peter.figueroa10@gmail.com

Palabras claves: Evidencia, VIH, Jamaica, política, investigación, ITS

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BACKGROUND

The Caribbean has a long history of conducting important research that has helped to guide the development of health programmes and policies (1, 2). Much of this work has been conducted by The University of the West Indies (UWI). In this regard, the work of the Tropical Metabolism Research Unit (TMRU) and its successor organization, the Tropical Medicine Research Institute (TMRI) is particularly noteworthy for its contribution to international health (3, 4). However, significant research has also been conducted by health professionals working in the Government health services (5, 6). This paper describes the research associated with the National HIV/STI Programme in Jamaica, based in the Ministry of Health, and which has been pivotal in guiding the response to the human immunodeficiency virus (HIV) epidemic and developing programmes and policies aimed at controlling HIV and mitigating its impact.

During the early years of the acquired immunodeficiency syndrome (AIDS) epidemic, I was the Senior Medical Officer (Health) in Kingston and by the mid-1980s I was acting as the Principal Medical Officer (Epidemiology). I became the first Director of the National HIV/STI Programme in the late 1980s while I was the national epidemiologist and remained Director until I became Chief Medical Officer (CMO) from 1997–2002 while the CMO Dr Barry Wint served as Health Advisor to CARICOM. On Dr Wint's return as CMO in 2002, I became Chief, Epidemiology and AIDS, and again took over leadership of the National HIV/STI Programme until my retirement from the Ministry of Health in 2008.

Defining the HIV Epidemic

When the AIDS epidemic began, it struck fear into the hearts of many Jamaicans because AIDS was fatal, persons developed obvious clinical signs such as wasting, diarrhoea and skin rash, it was sexually transmitted and it was associated with homosexuality. The first case reported in Jamaica was in late 1982 in a gay man living in New York who came home to die (7). The first dozen reported cases were all men, many of whom were men who had sex with men (MSM). However, interviews with some of the early cases revealed that heterosexual men were also being affected, primarily seasonal workers (migrant farm workers) who went to cut sugar cane in Belle Glades, Florida and sailors (8). The first woman reported with AIDS in Jamaica in 1987 was the common-law wife of a migrant farm worker (7, 8). Information about the early epidemic was learnt through interviews with patients with AIDS.

Clearly, one of the first challenges was to define the AIDS epidemic in Jamaica. This was approached by establishing a surveillance system for AIDS based on the surveillance system already in place for communicable diseases. In 1985, on our advice, the CMO made both AIDS and HIV infection notifiable diseases by administrative order under the Public Health Act (7). It was clear to us from the outset that we needed to track the HIV epidemic and not only the AIDS epidemic which followed in its wake. An HIV/AIDS case reporting form was developed and most of the doctors in the Government hospitals, which accounted for 95% of hospital beds in the country, readily reported AIDS cases. AIDS was included among the diseases for which there was a system of active hospital surveillance through weekly visits by designated health staff to all public hospitals (7).

The challenge was to gain the confidence of the private doctors to report their patients who were very concerned about their AIDS status becoming known. In 1993, all physicians in Jamaica were surveyed and of the 418 physicians (35%) who responded, 35% of those in private practice and 75% of those in the public sector reported seeing one or more patients with AIDS (9). Among physicians who had seen AIDS patients, 54% of those in private practice and 64% of those in the public sector had reported all their cases. Nearly one third (29%) of private practitioners expressed reservations about treating persons with HIV/AIDS and 16% preferred not to report cases. Despite the relatively high level of under-reporting among private physicians, most cases of AIDS appear to have been reported once the patient was admitted to hospital (9). However, there is no doubt that many HIV cases were undetected and many were not reported. This is still likely to be the case.

The ELISA HIV test became available in early 1985. It was first introduced to Jamaica by the Ministry of Labour. It was a requirement by the United States of America (USA) employers of the migrant farm workers to have them HIV tested prior to them going to the USA (7). Applicants for permanent resident status in the USA were also required to be HIV tested. By December 1985, the ELISA test was being used at the National Blood Bank to screen blood donors (7). The Epidemiology Unit in the Ministry of Health made arrangements to receive the results of the total number of persons being HIV tested and the number and names of those testing positive from the Ministry of Labour, the physicians working for the US Embassy, the National Blood Bank and the main private laboratories once they began HIV testing. These data served a useful purpose for tracking HIV among the population as well as providing counselling and support for those persons testing positive.

In those days, antiretroviral medication was not available in Jamaica. However, patients were given co-trimoxazole and some opportunistic infections were treated. For

those of us who treated persons with AIDS prior to the availability of antiretroviral (ARV) drugs, it was a painful challenge trying to find a way to ease the relentless suffering and frequent shame experienced by so many courageous, yet bewildered persons. Despite the stigma, close family members and friends often quietly cared for their loved ones while anxiously hiding the truth from most of their family, friends and neighbours. The horror stories of discrimination appeared in the press but the innumerable acts of love and courage remained hidden.

Once the ELISA HIV test became available, a number of HIV surveys were conducted to assess the extent of the HIV epidemic among different population groups. In 1986, HIV was already well established among MSM [9.6%] (10). HIV prevalence was very low among public sexually transmitted infection (STI) clinic attendees (0.25%) and no HIV infections were found among 239 prisoners or 4000 food service workers (7, 8). The first survey of female sex-workers (SW) was not until 1988/89 when 12% were found to be HIV positive (7). By 1990, 3.1% of public STI clinic attendees in Kingston were HIV positive (11) and HIV prevalence among repeat STI clinic attendees in St James, western Jamaica, was as high as 10% (12).

An important innovation in tracking the HIV epidemic was the introduction of HIV sentinel surveillance among public antenatal clinic (ANC) attendees in 1989 and attendees at public STI clinics in 1990 (7). Over the years, these data have given us important insight into the course of the HIV epidemic in Jamaica with HIV prevalence among ANC attendees peaking at 2.0% in 1996 and falling to 0.9% in 2010 and HIV prevalence among STI attendees peaking at 7.1% in 1999 and falling to 2.9% (males 3.6%, females 2.5%) in 2010 (13, 14).

Quarterly written surveillance reports on the HIV/AIDS epidemic were prepared, submitted to the CMO, Permanent Secretary in the Ministry of Health and Minister of Health and disseminated widely, including through the media (15). These reports helped to galvanize policy-makers and the public concerning the course of the epidemic, the implications for the country and the measures needed to control the epidemic. For instance, the 10-fold increase in HIV prevalence among STI attendees between 1986 and 1990 helped convince policy-makers and the public that the HIV epidemic in Jamaica was spreading rapidly despite the small number of reported AIDS cases. This facilitated additional resources being made available by the Government and international donors for HIV/AIDS control. The surveillance data showing higher AIDS case rates in St James helped to convince the tourism sector of the need to support HIV workplace programmes and helped to mobilize additional resources to strengthen HIV control programmes in Montego Bay in Jamaica (15).

Defining Risk Factors for HIV

The HIV/AIDS case-reporting system gave some insight into the risk factors for HIV infection. In addition to MSM, female SW and migrant farm workers, it was noted that informal commercial importers (ICI) who travelled abroad frequently were also at risk, as were sailors (7, 8). These groups were therefore targeted for prevention interventions. Early in the epidemic, it became clear that in Jamaica more heterosexuals were being affected with AIDS than homosexuals. Some of our colleagues from the developed countries found this difficult to accept, claiming that stigma prevented Jamaican men from admitting that they were homosexual. While stigma against homosexuality is strong in Jamaica, it certainly did not explain our findings. It was critically important for us to independently identify the role that heterosexual transmission was playing in Jamaica at a time when AIDS was seen primarily as a gay man's disease. We also noted that reported AIDS cases included persons of all social classes and occupations (7, 8). Through our independent assessment of our surveillance data, case reports and investigations, we were able to alert the Jamaican population of the risk of HIV infection to all sexually active persons.

In 1990, there were a series of studies of HIV among STI clinic attendees at the Comprehensive Health Centre in Kingston, the main referral clinic for STI in Jamaica. Among men, independent associations for HIV infection included a positive MHA-TP serology for syphilis [Odds Ratio (OR) 3.2, 95% Confidence Interval (CI) 1.1, 9.5], history of genital ulcers (OR 2.9, CI 1.0, 8.0) and bruising during sex [OR 3.0, CI 1.1, 8.3] (11). Among women, a history of "bad blood" (syphilis) and positive gonorrhoea culture were associated with HIV infection. Our conclusion was that conditions giving rise to a disruption of the genital epithelium in men such as bruising (trauma) with sex and genital ulcers may facilitate HIV transmission from women to men while inflammation of the cervix (*eg* gonorrhoea) may facilitate male-to-female HIV transmission (11).

We enrolled 970 STI patients in a follow-up study between November 1990 and January 1991 (16). We re-examined 710 (73%) of these patients (333 men and 377 women) between January 1992 and July 1993. The overall HIV incidence rate was estimated to be 0.7 per 100 person years (CI 0.3, 1.4); 1.4 (CI 0.6, 2.8) for men and 0.2 (CI 0.004, 0.9) for women while the overall incidence for HTLV-I was 0.9 per 100 person days (CI 0.4, 1.7); 1.0 for men and 0.8 for women (16). Both the HIV and HTLV-I incidence rates may have been underestimates because those patients lost to follow-up may have had a somewhat higher risk. On univariate analysis, among men there were significant associations between HIV infection and drinking alcohol before sex, cocaine use, total number of sex partners, having sex with a prostitute since enrolment, ever accepting money for sex, the average number of sex partners per month, bruising

during sex and genital ulcers found on follow-up examination. This analysis needs to be interpreted with caution in view of the small number of seroconvertors, which did not allow testing for independent effects in a logistic regression model. However, the findings were consistent with other studies at the time showing an association between HIV infection and genital ulcers and sex with a SW (17–19). Approximately half the persons with AIDS at the time reported a history of an STI and one quarter of the men admitted to sex with a female SW. It was clear to us that SW were an important source of HIV infection in the population and that other STI, especially syphilis were contributing to HIV transmission. The reported risk behaviour of persons with AIDS has been relatively stable over the years (13, 14).

The Early Response to the HIV Epidemic

Our early prevention interventions were based on data from our surveillance system and our serosurveys. Initially, much effort was spent on explaining to the public the basic facts about HIV, how it was transmitted and how to prevent it. A highly successful prevention programme was mounted by the Ministry of Labour with the support of the national programme to educate migrant farm workers of the risk of having unprotected sex while abroad. The famous Jamaica playwright Trevor Rhone worked with the national programme to produce a video drama about a farm worker becoming HIV infected and this was used to educate farm workers and many Jamaicans about the risk of unprotected sex. The Association for the Prevention of STD (ACOSTRAD) was supported to work among SW and Jamaica AIDS Support was supported, *inter alia*, to work among MSM (20).

From the outset, we saw the importance of explaining to the public that the AIDS epidemic was preceded by a silent HIV epidemic and that HIV was a sexually transmitted disease that after a number of years caused AIDS by eroding the person's immune system. Conceptually, we did not separate the AIDS epidemic from other STIs as was the case in many countries. Instead, we sought to integrate HIV control with the STI control programme (7). In this respect, we benefitted immensely from the wisdom and work of Dr Alfred "Freddy" Brathwaite, Senior Medical Officer (STD), an internationally recognized STI expert. The three main components of the first HIV medium term plan were STI control, condom promotion and behaviour change.

We also realised the importance of tracking the knowledge, attitudes, beliefs and practices (KABP) of the population with respect to HIV/AIDS and sexual behaviour (20). The first national population based KABP survey was in 1989 and there have been several such surveys since. Through these surveys, the level of awareness concerning HIV/AIDS, knowledge of how to prevent HIV infection, persons' risk perception, their number of sexual partners and condom use were tracked. These surveys have shown how deep rooted certain HIV myths and attitudes are (21). They have consistently identified that approximately half of adult men in Jamaica reported having more than one sexual partner in the past year although only 10%–15% of women do so, possibly because women under-report their number of sexual partners due to social desirability bias (20, 22, 23). On the other hand, women appear to be more likely to have different sexual partners in series while men tend to do so in parallel (24).

Based on our understanding of sexual behaviour in Jamaica and the widespread practice of having more than one sexual partner, the decision was taken to promote universal condom use among all sexually active persons (20). The basic message was "abstain from sex if you are young, stick to one faithful partner and use a condom every time". Again some of our colleagues from developed countries questioned this approach as they considered it unrealistic. The national KABP surveys have tracked the impressive increase in reported condom use at last sex with a non-regular partner in the early years of the epidemic with a plateau in behaviour change over the past decade or more (13, 20). The condom market in Jamaica grew from 2.5 million condoms (20% sold) in 1985 to 5.8 million (45% sold) in 1991, approximately 10 million annually between 1995 (54% sold) and 2002 (70% sold). It declined to 8.3 million (56% sold) in 2004 and increased to 12 million in 2006 [44% sold] (13, 25). Because of the need to promote national family planning goals, we also promoted dual methods use ("double protection") namely use of an effective family planning method (such as the oral contraceptive pill or an injectable) as well as condom use. The reproductive health surveys conducted by the National Family Planning Board and the healthy lifestyle surveys conducted by the Epidemiology Research Unit of the TMRI have also provided important data on sexual patterns that have been helpful to the National HIV/STI Programme.

Strengthening STI Control

Dr Freddy Brathwaite, a Trinidadian by birth, joined the Government Health Service in Jamaica in 1958 and became the Senior Medical Officer (STD) in 1968. He was based at the Comprehensive Health Centre in Kingston with island-wide responsibility for control of STIs. He had the vision of the synergistic relationship between HIV and other STIs, brilliantly described by Judith Wasserheit (26) and the need to strengthen STI control in Jamaica. He won us to his vision and the additional resources made available for controlling AIDS were readily extended to supporting a significant strengthening of the STI services supported by USAID and the German Technical Cooperation (GTZ). This vision was also supported by the findings of the research conducted among the STI clinic attendees showing *inter alia* that syphilis was a significant risk factor for HIV infection (11, 16).

The research among STI clinic attendees was used to improve patient care as well as guide the national HIV/STI programme. A standard STD medical record was developed, clinic procedures streamlined, STD syndromic management

introduced, treatment protocols revised, criteria for HIV testing developed and the rapid plasma reagin (RPR) test introduced in order to have same day laboratory results for syphilis testing (15). A survey of urethral isolates of *Neisseria gonorrhoea* from 116 heterosexual men in Kingston in 1990–1991 found that 80.2% exhibited plasmid-mediated resistance to penicillin, tetracycline or both (27). In 1991, a clinic-based method was used to assess the public STI services and the findings were used to revise clinical practice guidelines, prepare a STD case management manual and improve services (28, 29).

Between 1990 and 1995, the number of STI clinics was increased from seven to 12 islandwide, 35 new contact investigators were trained and employed and a major public education programme was conducted including condom promotion and interventions targeted at high risk groups (20). Thousands of health staff in both the public and private sectors were successfully trained in syndromic management of STI. A clinic-based method for assessing the quality of STD services was conducted in 1991 and the correct treatment rate was estimated to be 82% for gonorrhoea and 70% for syphilis (28). A repeat survey conducted in 1996 found that 100% of 125 public sector practitioners were treating these conditions correctly (30). A survey of physicians in private practice in 1993 found that, in general, working diagnoses correlated well with clinical observations and treatment given matched well with diagnosis according to national guidelines (31). Pre- and post-tests of private physicians following STI training workshops held between 1993 and 1995 improved significantly; however, important deficiencies in management remained, showing the importance of ongoing training and mentoring (32).

The prevalence of genital ulcers among patients attending STI clinics increased from 6.8% in 1983 to 12.8% (men 18.2%, women 6.8%) in 1990 (33). A study of the aetiology of genital ulcers among STI attendees was conducted in 1996 using multiplex polymerase chain reaction (PCR) analysis (34). Of 304 genital ulcer specimens analysed, 52.0% contained herpes simplex virus DNA, 23.7% *H ducreyi* DNA, 10.2% *T pallidum* DNA and 22.0% were negative (34). One-fifth (22%) of these persons with genital ulcers were HIV positive. Reported contact with a prostitute was associated with HIV infection ($p = 0.007$), reactive syphilis serology ($p = 0.011$) and chancroid ($p = 0.009$). The sensitivity and specificity of clinical diagnosis of syphilis, herpes and chancroid was significantly lower than with M-PCR analysis. If toluidine red unheated serum test ((TRUST): New Horizons Diagnostics, Columbia, MD) and MHA-TP alone had been used for the detection and management of syphilitic ulcers, 26% of the cases would have been missed. The conclusion of this research was that the relatively poor accuracy of clinical and locally available laboratory diagnosis supported the need for syndromic management of genital ulcers in Jamaica (34).

Surveillance for STD in Jamaica, especially for syphilis, improved after 1983 (33). Syphilis seroreactivity rates among pregnant women attending public ANCs increased from 5% in 1985 to 17% in 1990 (20). Reported cases of congenital syphilis increased annually from 1985 to reach 60 cases in 1990 and a peak of 68 cases in 1994 (20). At public ANCs, blood was taken for syphilis testing and sent to Kingston or Montego Bay for Venereal Disease Research Laboratory (VDRL) testing. Results were frequently delayed so pregnant women with syphilis were not being treated promptly. The importance of having same day results for syphilis testing was recognized as critical. A decision was taken to introduce TRUST at the Compre-hensive Health Centre, Kingston, and six peripheral health centres. Between May 1993 and December 1994, 15.5% of 32 913 STI patients and 8.3% of 8914 ANC attendees were found to be syphilis reactive (35). Of 2001 samples evaluated, 96.6% were correctly reported at the peripheral sites. Of 129 syphilis seroreactors detected, 88 (68%) were treated the same day and 21 (16%) within three days after testing. An evaluation of 504 women giving birth at Victoria Jubilee Hospital, Kingston, the leading maternity hospital in Jamaica, in 1996, found 6.7% of the women to have syphilis (both TRUST and MHA-TP positive), indicating continued weaknesses in the system (36). With the roll out of decentralized syphilis testing islandwide, the rate of infectious syphilis fell more than ten-fold from 150 per 100 000 population in 1987 to less than 10 per 100 000 in 2003 (13). Reported cases of congenital syphilis fell to 12 cases in 2004 (13). Every case of congenital syphilis indicates a failure of the health system.

In 1994, diagnostic algorithms for the treatment of women presenting to the Comprehensive Health Centre with vaginal discharge were evaluated. Of 752 women assessed, 54% had at least one STI, 34% had a cervical infection (chlamydia 24.9%, gonorrhoea 16.4%), trichomoniasis 24.9%, yeast 35.1% and bacterial vaginosis (clue cells), vaginal fluid pH > 4.5 and fishy vaginal odour with or without potassium hydroxide (KOH) 37.8% (37). The preferred algorithm which included a risk score and pelvic examination performed well with a sensitivity of 84.5%.

A study in 1995 of 767 female family planning clients found 26.9% had at least one STI (38). The prevalence of chlamydia was 12.2%, trichomoniasis – 11.5%, syphilis – 5.9% and gonorrhoea – 2.7%. None of the decision models evaluated was a satisfactory alternative to laboratory testing (38, 39). In 1997, 269 ANC attendees in Kingston's inner city were tested for reproductive tract infections. Prevalence of trichomoniasis was 18.0%, bacterial vaginosis (Nugent score 7+) 44.1% and candidiasis (wet mount) 30.7% (40). The validity of a syndromic case management approach among 371 pregnant women was found to be poor with a positive predictive value lower than 36% for all diagnoses and high false positive rates (41). The syndromic approach did not perform well among the family planning or ANC women, most of whom were asymptomatic, in contrast to

relatively good performance among women presenting with an abnormal vaginal discharge at the STI clinic. Appropriate STI detection tools were lacking and this remains the case. Simple, affordable, valid, point-of-care STI test kits are urgently needed.

Priorities for Local AIDS Control Efforts (PLACE)

Over the past decade, Jamaica has had a productive collaboration with MEASURE Evaluation supported by United States Agency for International Development (USAID) and in particular with Dr Sharon Weir. Under her guidance, we conducted a PLACE survey in ten communities in the parish of St James in 2003 (42). Using the PLACE methodology, numerous sites of a wide variety of types, especially in Montego Bay, where persons go to meet new sex partners were identified. A core of customers (20–30%) appeared to be more sexually active while commercial sex and transactional sex were definite features at many sites. There was a significant gap between opportunities onsite for prevention and actual prevention activities that needed to be addressed (42).

The PLACE method provided an excellent method to systematically reach those persons most at risk of HIV and other STIs. This led to a highly ambitious project of conducting an HIV prevention randomized controlled trial in Kingston at 147 sites where persons go to meet new sex partners, grouped into 50 geographic clusters randomized to receive or not receive a multilevel PLACE prevention intervention (43, 44). The intervention was delivered by 50 trained outreach workers in 2006. Although there were no significant differences between intervention and control groups in the proportions of men and women who reported new or multiple relationships in the past year and inconsistent condom use, many lessons were learned. For instance, it was confirmed that the population reached was more at risk and an appropriate target for intervention. Persons were generally receptive to HIV testing at these sites and willing to provide urine or vaginal swabs for STI testing (44).

We have simplified and adapted the PLACE methodology to better reach those most in need of HIV prevention interventions throughout Jamaica. During 2011, we used the PLACE method to do an HIV and STI survey of workers and patrons including SW at sites across the island. The results of these surveys are currently being analysed, however, there are important new insights with programmatic implications. Through this research, we have introduced highly sensitive testing for STIs using PCR DNA amplification methods (Gen Probe). The results indicate that STIs remain a serious problem. Unfortunately, the high cost of these methods precludes their wider use.

Persons Most at Risk for HIV

Initial surveys of female SW found HIV prevalence in Kingston to be 12% in 1989 (7) and 14% in 1995 while in Montego Bay, HIV prevalence was significantly higher at 25% in 1993 (15). Special interventions were targeted at SW over the years and HIV prevalence has declined to 9.0% in 2005 (45) and to 5% in 2008 (14). Over the three decades of the HIV epidemic, cultural sexual norms have shifted and the sex industry has boomed and taken more diverse forms including explicit sex on stage. Although policy-makers have been unwilling to develop formal policies to regulate the sex industry and promote safe sex in locations where it takes place, they have supported the programme's consistent outreach work with SW over the years. This is definitely a success case and shows that HIV prevention works.

On the other hand, HIV prevalence among MSM was 10% in 1985 (10) and increased to approximately 32% in different surveys in 1993 and 2007 (46). We have failed to find effective interventions to reduce the HIV prevalence among MSM in Jamaica. The considerable stigma associated with homosexuality in Jamaica is certainly a factor contributing to the high HIV prevalence among MSM. This drives the HIV epidemic among MSM underground and makes it more difficult to reach MSM with prevention and treatment services. Interestingly, for those MSM who did access services, the majority (82%) were satisfied with the treatment that they received which is similar to the level of satisfaction found generally in the health services (46). Approximately 50% of MSM are bisexual and therefore a bridge for HIV transmission to the general population (10, 46). A recent modes of transmission study suggests that MSM are increasingly driving the HIV epidemic in Jamaica. Our experience working with MSM makes it clear that it is in the public health interest, and consistent with their human rights, that sex between consenting adult men should not be a criminal offense and that any discrimination on the basis of their sexual orientation should be actively combated. Risk factors for HIV infection among MSM are significantly associated with social vulnerability, receptive anal intercourse, other STIs and accepting money for sex (46).

There have been several surveys targeted at adolescents showing that sex begins at an early age in Jamaica and that many school children are sexually active (13, 47–49). Some studies bring important new insights. The peer-led research among young women in downtown Kingston, Jamaica, was one such study because it showed that many girls were not passive in their relations with older men but were actually using them to suit their needs (50). Hope Enterprises have done many studies on behalf of the National HIV/STI Programme in addition to the national KABP surveys. One important survey showed that over 90% of teachers, parents and students interviewed were in favour of sex education in schools. Although there is an active health and family life education programme in schools, this programme does not adequately meet the needs of sexually active school children nor does the HIV Education Policy adequately address this challenge. Condom skills need to be taught in schools and condoms need to be more readily

available for young persons who are sexually active. We were able to achieve a policy that gives minors the right to reproductive health services.

Research led by Katherine Andrinopoulos among inmates of the correctional services helped to establish a comprehensive medical programme for inmates that included HIV testing and treatment (51). In 2006, HIV prevalence was 3.3% among inmates. However, among persons located in a separate section that included MSM, the HIV prevalence was 25% (51). Human immunodeficiency virus prevalence has been shown to be high among persons using crack/cocaine (52) as well as among homeless persons in Kingston.

Condoms

A number of studies related to condom use have been conducted in Jamaica in collaboration with Family Health International (FHI) and/or the Centers for Disease Control (CDC), Atlanta, USA. In 1992, a survey comparing standard condoms with "extra-strong" condoms found similar breakage rates [3.4% for standard *versus* 2.7% for extra-strong condoms] (53). In 2002, 414 men presenting with urethral discharge were randomized to receive either the standard clinic condom or a choice of four different condoms (54). Men were treated presumptively at enrolment and followed up at one, two, four and six months. Participants in the choice group had a strong preference for the most popular condom in Jamaica. However, this did not translate into higher condom use. The six-month probability of first incidence gonorrhoea, chlamydia or trichomoniasis was 21% in the choice group and 17% in the control group; the difference in the survival curves was not significant [$p = 0.35$] (54). In the same trial, 18.5% of participants reported condom breakage during the seven days prior to the screening visit and 3.5% reported the condom slipping off (55). Following counselling, breakage rates decreased and remained below 10% throughout the trial. Self-reported condom use was associated strongly with decreased incident chlamydia, gonorrhoea and trichomoniasis (56). The relationship between condom use and prevalent STI was weaker.

Paediatric and Perinatal HIV/AIDS in Jamaica

Jamaica has made tremendous progress towards eliminating mother-to-child transmission of HIV. Significant credit for this must go to the collaboration between health professionals at the UWI and government health services led by Professor Celia Christie and supported by the Elizabeth Glaser Paediatric Foundation International Leadership Award (57). Professor Christie has mentored and supported many of her colleagues to do important HIV research that has contributed to improved patient care in Jamaica as well as reducing mother-to-child HIV transmission. Two special supplements of the West Indian Medical Journal have been produced along with numerous presentations at international conferences (58, 59).

HIV Vaccine Trials

Jamaica has been part of the HIV Vaccine Trials Network's attempt to develop an HIV vaccine that would prevent HIV infection (60). Two different HIV vaccine trials (HVTN 204 and HVTN 502/504) were conducted in Jamaica, based at the Epidemiology Research and Training Unit (ERTU) which is on the same compound of the Comprehensive Health Centre in downtown Kingston. Following the results of the Step trial (HVTN 205) indicating a possible increase in HIV risk among uncircumcised men with prior adenoviral infection, HIV vaccine trials were suspended in Jamaica due to the lack of a suitable candidate vaccine for trial which was not based on an adenoviral vector (61). Approximately 80% of adult Jamaicans have prior exposure to adenoviral infection.

The Epidemiology Research and Training Unit (ERTU)

Most of the research conducted in support of the national HIV/STI programme has been based at the ERTU which is a not-for profit research organization affiliated to the Ministry of Health that was established in 1987 in order to facilitate research, training and clinical practice. Since its inception, the ERTU has managed numerous research studies and projects supported by grant funds from various research and development agencies including the Royal Tropical Institute, Netherlands, USAID, United Nations Development Programme (UNDP), Family Health International, Centers for Disease Control, National Institutes of Health and MEASURE Evaluation. It would not have been possible to do this research without an organization like the ERTU. The relationship with the Ministry of Health has been mutually beneficial and has facilitated major renovations of the clinical and administrative facilities at the Comprehensive Health Centre on three different occasions.

Other Studies

It is not possible to do justice to all the HIV research that has been done in Jamaica and to discuss the impact that these studies may have had on the HIV response. In developing media messages and HIV prevention strategies, a significant amount of formative and qualitative work was done as well as marketing surveys. Much of this has not been published in peer reviewed journals and many of these reports are not readily available. The national HIV/STI programme has developed mature systems for HIV surveillance and monitoring and evaluation which generate regular reports of high quality (14, 62, 63). These reports have documented the impressive progress made in slowing the HIV epidemic, in rolling out antiretroviral treatment and reducing the mortality due to AIDS, and in mitigating the impact of HIV on the population (13, 14, 20, 62).

There have been many anecdotal and media reports of stigma and discrimination in Jamaica but only a few published studies (64−66). The national programme has worked consistently to reduce stigma and discrimination associated with HIV and sexual orientation in Jamaica with some

success. However, much more needs to be achieved. Those of us who treat persons living with HIV (PLHIV) know that most PLHIV are supported by their family and friends and co-workers once they become aware of their status. However, very little of this is documented or made public. Treating PLHIV helped to ground me in the realities that they faced as well as provided me with ongoing insights into all aspects of their lives and the challenges of practising safe sex or adhering to medication. This alone requires a separate paper.

I have made no attempt to refer to the considerable body of research associated with family planning or sociological and anthropological studies that give insight into the cultural and sexual patterns in Jamaica. In this respect, I wish to single out the work of the social anthropologist Barry Chevannes, a friend and colleague of many years with whom I had an ongoing conversation on all these matters. There were also many others with whom I spoke over the years, colleagues, friends, patients and numerous strangers who would greet me and give me wise advice or feedback that was incorporated into the various strategies used to control the HIV epidemic. This also is another narrative waiting to be told.

CONCLUSION

In conclusion, the national HIV/STI programme in Jamaica is recognized internationally for its proactive, innovative and comprehensive approach to HIV control and for its achievements. From the outset, the programme has been evidence-driven and informed by locally based research. Perhaps the most important lesson has been our willingness to think independently and act based on our conditions while being open to developments internationally. We have benefitted from having our own team of highly trained specialists and professionals as well as committed hard working staff and many valuable partners both local and international. Much has been achieved and much remains to be done.

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