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HUMAN IMMUNODEFICIENCY VIRUS (HIV) AND THE CONDOM.

A study of the knowledge, attitudes and behaviour
of population groups at increased risk of
HIV infection.

A Thesis submitted by SSEMBATYA-LULE GODFREY CHARLES
(MBCHB, DPH)

for the Degree of Doctor of Philosophy

in the FACULTY OF MEDICINE

at the

UNIVERSITY OF GLASGOW

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HUMAN IMMUNODEFICIENCY VIRUS (HIV) AND THE CONDOM.

A study of the knowledge, attitudes and behaviour of population groups at increased risk of HIV infection.

VOLUME ONE

DECLARATION

I declare that the work presented in this thesis is my original work, and no part of it has ever been presented to any institution for an academic award.

SIGNED _____
(DR. GODFREY. C. SSEMBATYA-LULE)

February 1991.

(c)

(i)

Dedication

My mother Beatrice Nalubowa, a woman whose efforts have greatly improved the quality of life.

My wife Margaret, the gentle sprit who comforts me when I fail, keeps me humble in success and whose strength and support is with me today.

ACKNOWLEDGEMENT

I owe my heartfelt indebtedness to my supervisors: Dr. Laurence Gruer, AIDS coordinator Greater Glasgow Health Board, and director HIV and AIDS resource centre, Ruchill Hospital, for his advice, guidance and practical assistance in the choice and all along the execution of this project; and to professor James McEwen head of department of Public Health, for his guidance and encouragement.

I am most grateful to Dr. Ivan Tait, the senior consultant physician in charge of the Department of Genito-urinary medicine at the Glasgow Royal infirmary, and all the staff of the clinic; Mrs Maurine Moore, Dr. Alison Richardson, and members of the Scottish AIDS Monitor (SAM); Mr. Jim Black, the senior counsellor, at the Ruchill counselling clinic, and the physicians incharge of AIDS patients at the same hospital; and Mr John Cameron, the clinical nurse specialist in charge of Easterhouse needle exchange scheme, for their help in numerous ways at various stages of my task.

I would have come unstuck in the later stages without the statistical assistance of Mr. Harper Gilmour and Dr. David Hole, to these I am also very grateful.

Special thanks also go to Mr Keith Murray for his great help in the hideous world of computing.

Finally I thank the Association of Commonwealth Universities under whose sponsorship the opportunity to undertake this project materialised.

SUMMARY

Prevention will likely remain the world's primary weapon against HIV for at least the next decade, and educational measures are the best available preventive alternative here in the United Kingdom and in other parts of the world.

In order to develop appropriate educational and public awareness campaigns and thereby possibly control the spread of HIV, it is necessary to understand patterns in the relationship between knowledge of and attitudes towards HIV and the sexual behaviour of those individuals and groups that are potentially at risk of HIV.

In this research, knowledge of HIV, attitudes and HIV related behaviour were assessed by four surveys of samples representative of population groups at increased risk of HIV infection.

The data for all the four studies were collected by self administered questionnaire containing up to a maximum of fifty questions.

Ugandan University students.

In Uganda, as in all African countries, HIV transmission is largely through heterosexual contact. Therefore everybody who is sexually active with multiple sexual partners is at increased risk of HIV. A sample of Ugandan University students was obtained, comprising undergraduate students from all faculties, and years of study at Makerere University. The questionnaires were offered to 1000 students, 931 responded, giving a response rate of 93 percent. The 661 male respondents had a mean age of 23.9 years and the 270 females 22.3 years. Over 90 percent of respondents reported previous sexual intercourse. The mean age of first sexual intercourse was 15.3 years for men and 17.4 years for women. More than one third of the male respondents reported a lifetime total of more than 10 sexual partners. In addition, more than two thirds of male respondents, and 37 percent of the female respondents reported at least two sexual partners during the previous 12 months with 14 percent of men, but less than 2 percent of women, reporting more than five partners. On the other hand, only about 20 percent of the male respondents and only 7 percent of the females thought they were at risk of catching HIV due to their behaviour. However, almost 65 percent of the males and 43 percent of the females said that their lifestyles had been affected by the HIV

epidemic. Of these, about 40 percent of the males and 70 percent of the females said that they had reduced the number of their sexual partners, while about half the men and 15 percent of the women had started using the condom.

The great majority of respondents appeared to be well aware of the main ways in which HIV could be spread. Transmission of HIV was associated with heterosexual intercourse by almost all respondents. Abstention from sex was seen by most respondents as a way of preventing HIV infection, though less than half thought it could be prevented by use of the condom. Most respondents had come across publicity about the condom in the past two years most often on posters and radio, and more than half associated the publicity about the condom with AIDS, whilst only 4 percent of men and 7 percent of women associated it with contraception. Eighty percent of women and more than 60 percent of men felt that condoms were either unsafe or encouraged promiscuity. Sixty percent of both men and women said they disapproved of the condom with around a quarter of all respondents disapproving them on religious grounds.

Only about one third of men and less than a quarter of women reported using the condom. Prevention of HIV/AIDS

was the commonest reason respondents gave for using the condom. Condom use appeared unrelated to age, age at first sexual intercourse or the weekly frequency of sexual intercourse. However, condom use appeared to be independently associated with: number of lifetime sexual partners; number of sexual partners in last twelve months; a positive attitude to the condom and unexpectedly, not having seen official publicity about the condom. Condoms being unsafe was the most important reason given for not using the them.

Patients attending a Sexually transmitted disease (STD) clinic.

Sexually transmitted disease clinics are important sites for studying HIV related knowledge and behaviour because they serve persons whose behaviour is with the transmission of HIV. Therefore, one study sample was made up of 778 heterosexual patients attending the genito-urinary medicine clinic at the Glasgow Royal Infirmary. The questionnaires were offered to 900 patients, 822 responded, giving a response rate of 91 percent. Forty men (7%) and 4 (1%) women indicated that they were exclusively homosexual and were excluded from the analysis. The mean age was 27.4 years for the 445 men and 24.5 years for the 333 women.

The majority of the respondents engaged in potentially high HIV risk sexual behaviour, for over two thirds of the men and about half of the women reported more than one sexual partner during the previous year. Knowledge of condom use, and the sexual transmission and prevention of HIV was generally accurate. Transmission of HIV through male homosexual sexual intercourse, and heterosexual intercourse was mentioned by over 85 percent of all respondents and most respondents believed that the condom was an effective HIV control method. The main source of information about the condom for all respondents irrespective of sex was television. In all,

the condom was most often reported to have been mentioned in the media in connection with AIDS and least as a contraceptive.

Over three quarters of the respondents approved of use of the condom. However, only 29% male and 24% female respondents reported using the condom. Worse still, only about 40 percent of all users indicated that they always used the condom. The commonest cited reason for using the condom was to prevent sexually transmitted diseases generally, while AIDS was specifically mentioned by only 15 percent of the men and 4 percent of the women. Condom use was unrelated to age, marital status, the number of sexual partners or the frequency of sexual intercourse, but was independently associated with: a positive attitude towards the condom, educational status, and having received information about the condom.

The most common reported reason for not using the condom was use of another form of contraceptive.

Intravenous drug users.

Intravenous drug users are the second most important group as regards HIV and AIDS prevalence in the United Kingdom. It is from intravenous drug users that there has been an increase of HIV transmission among heterosexuals. They are therefore a very important HIV "at risk group". The study sample was obtained from intravenous drug users attending the needle exchange scheme at Easterhouse Health Centre, Glasgow. The questionnaires were offered to 130 (100 men and 30 women) intravenous drug users, 121 responded, giving a response rate of 93 percent. All the respondents reported regular intravenous drug use. The mean number of years the male respondents had injected drugs was 5 years and the females 6 years. The male respondents had a mean age of 22.3 years and the females 22.1 years. Over 95 percent of respondents had left school at or before the age of 16 years, and 85 percent were unemployed. This study demonstrated that many respondents were at risk of acquiring or transmitting HIV infection due to their sexual behaviour. Over 70 percent of men and about 64 percent of women had had more than one sexual partner during the previous 12 months with 24 percent of men, and 25 percent of women, reporting more than five sexual partners. In addition,

more than three quarters of the respondents had sexual intercourse at least five times every week, with more than half of the female respondents reporting a frequency of more than ten.

Nearly all respondents were well aware of the sexual transmission of HIV and its prevention. Transmission of HIV was associated with male homosexual and heterosexual intercourse by over 90 percent of all respondents. 90 percent of men and over 70 percent of women believed that HIV could be transmitted through oral sex. Over three-quarters of the women and 57 percent of the men associated HIV transmission with non-penetrative sex. More men than women indicated that HIV could be transmitted through oral sex. Abstention from sex and use of the condom were seen by most respondents as possible ways of preventing HIV infection. Over three-quarters of all respondents recalled seeing or hearing about the condom in the previous two years. Most respondents mentioned the radio in particular as the main source of the condom publicity. About 90 percent of either sex could recall that the condom was mentioned in connection with AIDS. Furthermore, almost 70 percent of all respondents believed that the condom could protect against AIDS while 30 percent of male

respondents and 14 percent females mentioned that the condom could also protect against other sexually transmitted diseases. About one-third of the male respondents and one quarter of the females thought they were at risk of catching HIV due to their sexual behaviour. However, over 40 percent of the males and about 60 percent of the females said that their lifestyles had been affected by the HIV epidemic.

The condom was approved of by 67 percent of the male respondents and 57 percent, the women. Religion appeared not to have influenced attitudes to the condom. About 40 percent of the male respondents and nearly 30 percent of the female respondents reported they had used the condom. Sixty percent of men and half the women said that they had used the condom to prevent AIDS. Less than 20 percent of all condom users, and 7 percent of all respondents reported using the condom always, whilst over 70 percent of all condom users thought they could be persuaded by their partners not to use the condom. The females were more likely always to use the condom than the males. Condom use appeared unrelated to age, age at first sexual intercourse or the weekly frequency of sexual intercourse. However, condom use appeared to be independently associated with: being employed, a

positive attitude towards the condom, and having received information about the condom from the radio. Reduction in sensitivity was the most important reason given by men for not using the condom, while use of another form of contraceptive was the most important reason for women.

About 20 percent of males and 22 percent of females reported sharing "works" [syringes and needles]. Of these, 13 percent of males and 17 females would lend their "works" to other people while eight percent males and 33 percent females would borrow other peoples "works".

Male homosexuals attending gay bars and discos .

In the United Kingdom since the start of the HIV/AIDS epidemic, the gay men comprise the majority of HIV seropositives and AIDS patients.

This study looked at those gay men attending gay bars and discos in Edinburgh and Glasgow. The questionnaires were offered to 400 gay men in each city of Edinburgh and Glasgow, 256 responded, giving a response rate of 32 percent. The sample was made up of 173 Edinburgh gay men (response rate 43%), and 83 Glasgow gay men (response rate 21%). Although the ratios appear reasonable, due to the very small response rates in the Glasgow group, it was not possible to compare the responses between the two cities. Instead, both groups were combined, and comparisons were made between those who reported using the condom, and those who did not. There were 137 condom users (54%) and 119 non-condom users (46%). The condom users had a mean age of 27.7 years and the non users 28.6 years. All the respondents reported being active homosexuals. However, about 20 percent of the condom users and 18.5 percent of the non users indicated that they were bisexual. The mean number of years the respondents who reported condom use had been homosexuals was 9.5 years and the non users 9.0

years. About 83 percent of the condom users and 87 percent of non-users were employed. During the last 12 months the condom users had had a mean number of 24.5, and a median of 9 male sexual partners; and the non users a mean number of 17.1, and a median of 7 sexual partners. Ninety percent of respondents who reported condom use and about 88 percent of non users had had more than one male sexual partner during the previous 12 months, with 64.2 percent of condom users and about 56 percent of non users reporting more than five partners. Only about 7 percent of all respondents reported more than one female sexual partner during the previous 12 months. About one third of the respondents who reported condom use but only 14 percent of those who did not thought they were at risk of catching HIV due to their sexual behaviour. Of these, 51 percent of condom users and about 44 percent of non users said that as long as they continued having sexual intercourse, they were at risk of HIV. The remaining 49 percent of users and 56 percent of non users said that they were at risk because they still had sexual intercourse without a condom. None of the respondents mentioned having more than one sexual partner as putting him at risk of HIV. There was no significant difference in the reported number of sexual partners between those who thought that their behaviour

put them at risk of HIV and those who did not. About 80 percent of the condom users and nearly 70 percent of the non users said that their lifestyles had been affected by the HIV epidemic, and the majority of these said that they now only had oral sex. There was no significant difference in the reported number of sexual partners between those who said that their lifestyle had been affected by the AIDS epidemic and those who said that it had not.

As regards the respondents' homosexual activities during the past one and five years, oral sex without a condom was the most popular sexual activity overall, practised by over 80 percent of both condom users and non-users. For condom users, the biggest change in sexual activity during a five year period was in the use of condoms during anal sex which rose from about 30 percent to almost 80 percent. While for non-condom users, the biggest change was in oral sex without a condom which rose from 40 percent to 85 percent. Oral sex without a condom was the most popular sexual activity the respondents had normally had during the previous twelve months, being reported by over 85 percent of all respondents. The condom was approved of by almost 90 percent of condom users, and about 70 percent of non condom users. The reasons given by condom users for

using the condom were: prevention of AIDS 85 percent, and prevention of other sexually transmitted diseases 15 percent. Only 35 percent of all condom users, reported using the condom always, and over 70 percent thought they could be persuaded by their partners not to use the condom.

Nearly two-thirds of users indicated that their condoms had never broken while in use and only 3 percent reported that their condoms often broke. Over 90 percent of condom users indicated that they use lubricants while using condoms. Condom use appeared unrelated to age, employment, number of sexual partners or the kind of sexual activity the respondent was usually involved in.

However, condom use appeared to be independently associated with: a positive attitude towards the condom, awareness of risky behaviour, and length of time the respondent had been a homosexual.

Participating in oral sex only was the most important reason given by non users for not using the condom; inconvenience and reduction in sensitivity came second and third respectively.

Compared results.

Comparisons of the four studies of populations of people who are potentially at increased risk of HIV infection, may help to assess the impact of the various AIDS education programmes which have so far been available to the different population groups. They may also indicate whether or not the same approach to education and other preventive measures should be taken with each group.

The number of respondents in the four studies ranged from 931 in the Uganda study to 121 in the intravenous drug users study, while the response rate was over 90 percent in three studies but 32 percent in the gay men study. The respondents' mean ages were: GUM patients, 26.2 years (SD 6.5); Uganda students 23.4 years (SD 2.5); intravenous drug users, 22.3 years (SD 3.1) and gay men 28.1 (SD 8.0) years. The gay men generally reported the highest number of sexual partners, with over one third reporting over 10 sexual partners in the previous year, compared with 6 percent of intravenous drug users, and about 2 percent of the GUM and the Ugandan respondents.

The comparative analysis provided further evidence that in general respondents were aware of the two main ways by which HIV is transmitted sexually. Male homosexual sexual

intercourse, was correctly identified as a route of HIV transmission by almost all the intravenous drug users, 92 percent of the GUM patients and three quarters of the Ugandan students. HIV transmission was also associated with heterosexual intercourse by almost 90 percent of all respondents. The Ugandan students seemed the least informed of the three groups, with over a third of them believing that HIV could be spread through petting. Abstinence from sex was seen as a way of preventing HIV infection by almost two-thirds of the GUM patients and 87 percent of the Ugandan students but only 10 percent of the intravenous drug users. About 90 percent of the GUM patients and the intravenous drug users but only 47 percent of the Uganda students believed that the condom was an effective method of HIV control. A very big proportion of respondents in each of the three study groups indicated that they had seen or heard about the condom during the previous two years. Slightly more GUM patients (96%) than Ugandan students (86%) but fewer intravenous drug users (78%), recalled seeing or hearing about the condom in the previous two years. With the exception of the newspapers from which about half of each study group respondents had received information, there were marked differences regarding other sources. Over 90 percent of the GUM respondents, indicated that

they had seen the information on television, compared with 56 percent of intravenous drug users, and only about 45 percent of the Ugandan students had done so. Seventy percent of the drug users had received information from the radio compared with only about 30 percent of the GUM respondents. Overall less than half the respondents could recall that the condom had been mentioned in connection with AIDS, with about 55 percent of the Uganda students, about 45 percent of the GUM respondents and one third of drug users saying so. While around 17 percent of the Ugandan students spontaneously volunteered that the publicity had referred to the condom's unreliability, none of the other two groups did so. Just over half of all the respondents approved of the condom. This included about 27 percent of the Ugandan students, over two thirds of the intravenous drug users and 80 percent of both gay men and GUM patients. A quarter of the Ugandan students indicated that they disapproved of the use of the condom on religious grounds, compared with only 2.4 percent of the GUM patients and none of the intravenous drug users or the gay men.

Overall less than one third of respondents reported using condoms. More than half of the gay men reported condom use compared to 38 percent of intravenous drug users, 30 percent Ugandan students, and 27 percent GUM

respondents. Less than half the respondents indicated that they used the condom to prevent the spread of HIV. This was least often stated by the GUM respondents, and most often by the gay men. The GUM group reported the highest percentage of those who would use the condom always. The intravenous drug users were the least consistent users.

Only about 23 percent of the gay men, 29 percent of the intravenous drug users, and 17 percent of the Ugandan students thought that they were at risk of HIV due to their sexual behaviour. Among the stated reasons why the respondents thought their sexual behaviour put them at risk of HIV, was that they still had multiple sexual partners. About 61 percent of the respondents indicated that their sexual lifestyle had been affected in one way or the other. This included about 77 percent of the gay men, 59 percent of the Ugandan students, and about 55 percent of the intravenous drug users. Of these, almost 50 percent of the Ugandan students, about 60 percent of intravenous drug users, and over one third of gay men said that they had reduced the number of their sexual partners; about 44 percent of the Ugandan students, nearly 40 percent of the intravenous drug users and 12 percent of the gay men had started using the condom.

Nine percent of the Ugandan students but none of the other groups said they had stopped having sex altogether. Thirty eight percent of the gay men said that they now only had oral sex, and 31 percent said that they were more selective about whom they had sex with. Several reasons for not using the condom were given by non-condom users. Only two reasons; loss of sensitivity and inconvenience, were given by respondents in all the study groups. The claim that the condom was unsafe was made by only the Ugandan students, while 44 percent of the gay men who did not use condoms said that it was because they were having only oral sex. Use of another form of contraceptive was most commonly cited by respondents in the GUM study.

INTRODUCTION AND LITERATURE REVIEW.

CHAPTER 1.

HUMAN IMMUNODEFICIENCY VIRUS (HIV) AND ACQUIRED IMMUNODEFICIENCY SYNDROME (AIDS).

1.1 Acquired Immunodeficiency Syndrome: the world epidemic.

No other disease in modern times has had as global an impact as the Acquired immunodeficiency syndrome (AIDS). It is now almost ten years since AIDS was first recognised. At that time no one could have predicted that infection with the Human immunodeficiency virus (HIV) the virus generally believed to lead to AIDS, would become a new global problem of extraordinary scope and urgency.

The first cases of AIDS were reported in the United States of America in 1981, when five men who had been previously healthy developed Pneumocystis Carinii pneumonia. [*Friedman-Kien et al. 1981*] Also in the same

year, twenty six men who had been previously healthy developed Kaposi's Sarcoma [**Masur et al. 1981**].

Before then, these two conditions had been associated with people who had an abnormal immune system [**Hughes 1977**]. These thirty-one men and others reported shortly afterwards were all homosexuals [**USCDC 1982**]. Subsequent reports of similar cases in other countries point to the almost simultaneous emergence of AIDS in three areas; the United States of America, Western Europe and central Africa [**Biggar et al. 1984, Morgan and Curran 1986**].

Even though it acquired its name early on, the cause of AIDS took longer to discover. AIDS swept across the world, silently, before it was even known to exist. More evidence is coming to surface to show that this world wide epidemic was well underway by 1981 [**USCDC 1982**]. There have even been recent reports that clinical AIDS in an American citizen has been traced back to 1978 [**Melbye et al. 1984**]. Since the first cases of AIDS were reported, about ten years have passed involving much research, discovery and struggle to learn more about this disease, and to view clearly the dimensions of its threat to global health.

The advances in medical science had made almost everyone believe that for most diseases a cause, a cure and preventive measures could be found quite easily . This has not proved to be so with AIDS. However, if AIDS was destined to occur, it was at least fortunate that the epidemic came in the 1980s, rather than fifty years ago. At that time, lacking scientific knowledge and technical expertise, it would have been almost impossible to understand what was happening.

Yet today remarkably less than ten years after the disease was first recognised, medical and other researchers in the various aspects of the disease have shed more light on the problem. Between 1982 and 1984, the scope of the epidemic was , certainly the discovery and subsequent isolation and identification of the virus responsible for causing AIDS was a great break through.

1.2 The "AIDS virus".

The "AIDS virus" was discovered by Barre'-Sinoussi, Montagnier and colleagues at the Institute Pasteur, Paris, in 1983 and given the name lymphadenopathy associated virus (LAV) [*Barre-Sinoussi et al. 1983, Vilmer et al. 1984*]. In 1984 Popovic, Gallo and

coworkers [**Gallo et al. 1984**] described a virus similar to other previously described retroviruses, HTLV-I and HTLV-II which they referred to as HTLV-III. Subsequent work showed that LAV, HTLV-III and the other viruses which were isolated from patients with AIDS in America, Europe and Africa were all the same virus. A new name, Human Immunodeficiency Virus (HIV) was proposed and accepted internationally.

A new variant of the same virus has been isolated, in patients with West African connections, and is referred to as HIV II [**Guyader et al. 1987, Evans et al. 1988, Poulsen et al. 1989**]. So this means that HIV can be either be HIV I or HIV II .

1.3 Modes of transmission of the Human Immunodeficiency Virus.

Epidemiological studies have clarified how HIV spreads from person to person. This knowledge is most precious, for it tells us how to prevent the spread of the virus. Fortunately, the virus is quite limited in its routes of spread. Transmission of HIV always involves exposure to body fluids from an infected person. The dose or amount of virus, the route of exposure, and the duration of

exposure all may influence the chances of becoming infected.

HIV has been isolated from various body fluids. The greatest concentration have been found in blood [*Barre-Sinoussi et al. 1983, Gallo et al. 1984, Levy et al. 1985*], semen [*Ho et al. 1984, Zagury et al. 1984, Levy et al. 1985*], and cerebrospinal fluid [*Ho et al. 1985(a), Levy et al. 1985*]. Lower concentrations have been detected in saliva [*Groopman et al. 1984, Ho et al. 1985(b)*], tears [*Fujikawa et al. 1985*], breast milk [*Thiry et al. 1985*], colostrum [*Ziegler et al. 1985*], urine [*Levy et al. 1985*], cervical and vaginal secretions [*Vogt 1986, Wofsy 1986*]. HIV also has been isolated in brain tissue [*Ho et al. 1985(a)*], lymph nodes, bone marrow cells [*Melbye 1986*], and skin [*Kolata 1986*]. To date only blood, semen, cervical and vaginal secretions have been conclusively shown to transmit the virus [*Harris et al. 1983, Pinching 1984, Curran 1985*]. There is no evidence that it is transmitted through casual contact, by insects, or by food or water [*Mann 1988*].

HIV is transmitted:

1. By sexual intercourse
2. By transfusion of contaminated blood or blood products

3. By needle-sharing for intravenous drug use, or reusing contaminated needles

4. From mother to fetus and baby during pregnancy, childbirth, and perhaps during breast feeding.

1.3.1 Sexual Transmission.

Sexual transmission is by far the commonest way that human immunodeficiency virus is spread [**Bradbeer 1987**]. The exponential rise in the number of HIV infection and AIDS cases is restricted to certain well-defined risk groups in a pattern that strongly suggests sexual transmission or blood contact [**Gottlieb et al. 1981, Friedman-Kien 1981, USCDC 1982**]. Case clustering supports this hypothesis. In the United States sexual contact is believed to be the only risk factor for 64 per cent of AIDS cases amongst adults [**USCDC 1986**]. Early studies in the United States showed high prevalence of HIV seropositivity in male homosexuals with AIDS and among those who were apparently symptom-free [**Groopman et al. 1985**].

One of the very early studies carried out in the United Kingdom to test the hypothesis that HIV is sexually transmitted, was that carried out by Cheingsong-Popov et al. [**Cheingsong-Popov et al. 1984**]. In their study they found that 97 percent of male homosexuals with AIDS and 59 percent who were symptomatic were HIV seropositive. The finding of such a high prevalence of HIV seropositivity gave the early researchers in HIV and

AIDS a break through in the possible routes of HIV transmission. Also Gazzard et al. in their study among homosexuals in London who had had ano-genital intercourse with patients with either AIDS or persistent generalised lymphadenopathy [**Gazzard et al. 1984**], came to the same conclusion that HIV could be spread sexually. Though these studies involved small numbers, for example in the case of Gazzard et al. only 28 men, the findings supported the hypothesis so strongly that there was no reason to doubt them. Other studies have shown that the strongest correlate of HIV seropositivity was the number of homosexual partners during the 12 previous months and the frequency of receptive anal intercourse [**Anderson and Levy 1985, Clumeck et al. 1985, Goedert et al. 1985**].

In the United States of America and Europe, 65 to 75 percent of all HIV infection and AIDS cases have occurred in homosexual or bisexual men [**USCDC 1986**]. This unfortunately led much of the population in the West to think that the heterosexuals were safe from HIV. However, studies in Africa and else where have dispelled such thoughts.

There is no doubt that HIV can be transmitted between men and women (heterosexual transmission) [**Mann et al. 1986, Anderson and May 1988, Allen 1988, Piot et al. 1988,**

Skegg 1989]. Epidemiological, clinical and biological evidence for heterosexual transmission of HIV indicates that bidirectional transmission can occur by penile-vaginal intercourse [**Piot et al. 1987, Johnson 1988, Johnson et al. 1989, Laga et al. 1989**]. While the number of cases attributable to heterosexual transmission is smaller in the United States and Europe, the evidence for heterosexual transmission is convincing [**Mihill 1990**].

In the USA and Europe intravenous drug users are a major reservoir for heterosexual transmission of HIV [**Moss 1987, Schoenbaum et al. 1989**]. Out of the 8810 AIDS cases among adults associated with heterosexual transmission of HIV in 1989 in the USA, 7287 (83%) had occurred in intravenous drug users. At the same time 630 (7%) of non intravenous drug users were heterosexual partners of intravenous drug users [**USCDC 1990**]. However, in the United Kingdom, only about 5 percent of reported cases of AIDS have been attributed to heterosexual contact [**Johnson et al. 1989**], and there is ample proof that about three quarters of those who have contracted the disease heterosexually have done so from index cases who were drug users [**Hart et al. 1989, Donoghoe et al. 1989**]. In the United Kingdom, the potential for a self-sustaining epidemic will most certainly depend on rates of sexual partner change among the drug users and the

general population. And indeed it has been suggested by different workers that the current variation in the rate of heterosexual spread between different areas in the United Kingdom can be explained by the differences in intravenous drug use in the different cities in the United Kingdom [**Jesson et al. 1986, Brettle et al. 1987, France et al. 1988**]. In Italy, where by 1989 more than 50 percent of reported AIDS cases occurred among intravenous drug users, the rapid increase in heterosexually transmitted cases was attributed to partners of intravenous drug users [**WHO 1989**]. This is mainly through sexual contact with drug injecting prostitutes, who finance their drug habit by prostitution. This can be supported by evidence from a series of studies among European and American prostitutes which found evidence of infection among those who injected drugs. For example, in West Germany, of about 2,000 prostitutes tested, twenty were found HIV to be positive, of whom 50 percent were drug injectors [**Schultz et al. 1986**]. In the United States 568 prostitutes were tested and 62 found positive, of whom was 76 percent were drug injectors [**USCDC 1987**]. In Italy where only 14 prostitutes were tested, ten were found to be HIV positive, all of whom were drug injectors [**Tirelli et al. 1985**]. For the London group, only 50 prostitutes were tested, and none was found positive [**Barton et al. 1985**].

This could have been due to the very high rate of condom use by these prostitutes which may have protected them from sexually transmitted infections. The incidence of heterosexual transmission in the United States and Europe is somewhat different from that being experienced in Africa where there is widespread heterosexual transmission. As early as 1985 at the International Congress on AIDS in Atlanta, data from central Africa [**Brun-Vezinet et al. 1984, Quinn et al. 1986**] suggested that heterosexual transmission was of great importance in the development of AIDS. This conclusion was reached by using the indirect piece of evidence of the male to female ratio of AIDS victims in Zaire, being 1:1.1 (male to female) [**Piot et al. 1984**].

There have been several reported cases [**Padian et al. 1987, European Study Group 1989**] of transmission of HIV amongst spouses of patients with AIDS or AIDS related complex (ARC). One Italian study [**Fischl 1987**] looked at both healthy heterosexual partners and other household relatives of at risk individuals. As expected from known modes of transmission, only one out of 60 household relatives were HIV positive. However 15 out of 28 heterosexual partners were HIV seropositive. Another American study [**Allen et al. 1988**] reported 15 cases of heterosexually acquired HIV. What is interesting about

this study is that 81 per cent of these admitted regular contact with prostitutes.

HIV and AIDS have also been reported in sexual partners of haemophiliacs who were themselves recipients of HIV contaminated factor VIII. A study of English haemophiliacs and their sexual partners [**Jones et al. 1985**] showed seropositivity in three out of thirty-six sexual partners of seropositive haemophiliacs, one of whom went on to develop AIDS. However, this patient had received an eight unit blood transfusion during previous surgery and this may have been the source of infection with HIV. Nevertheless, the two who had no other risk factor other than heterosexual intercourse with the HIV seropositive haemophiliacs need to be noted. Another similar study also reported two cases of HIV seroconversion involving spouses of infected haemophiliacs [**Haris et al. 1983**]. Figures from a National survey of spouses of haemophiliacs suggested an incidence of seroconversion lower than that suggested above [**Redfield et al. 1985**]. Taking the examples from the studies involving the haemophiliacs, the risks of heterosexual transmission become less clear cut. In the two cases cited above, promiscuity does not seem to be a risk factor, since neither had had regular sexual contact; one admitted sexual contact only once every two

to three months [*Jones et al. 1985*], the other around two to three times a month [*Harris et al. 1983*]. Neither patient admitted being involved in preparing or administering their partners Factor VIII concentrates.

If sexual contact is indeed the only cause of transmission of HIV from the haemophiliacs to their partners, then having sexual intercourse per say with an infected individual is enough to pass on the infection regardless of the frequency and number of sexual partners, though this of course increases the chances of getting infected.

On the other hand for the other cases of heterosexually acquired AIDS including the African experience, the evidence tends to suggest that promiscuity is an important factor. It may appear that if an individual has twice as many sexual partners, the chance of getting HIV would only double. However, considering one's partner's partners, and their partners, etc., it can be seen that an individual may be or become part of a huge network of people among whom HIV could be transmitted. Only one person in an individual's sexual network has to pick up HIV for the virus to spread over the whole network.

Clumeck et al.'s study [**Clumeck et al. 1984**] among African patients shows that compared to controls matched for various parameters including age, geographic and ethnic origin and annual income, the HIV antibody positive individuals had more frequent contact with prostitutes and also a significantly higher number of different regular heterosexual partners per year, 32 compared to the control value of three.

Case reports and epidemiological surveys clearly show that the virus can be transmitted from men to women and from women to men [**Quinn et al. 1986, Johnson et al 1988**]. Several studies have investigated female partners of men with AIDS and HIV infection in an attempt to measure transmission probabilities, with widely differing results. The percentage of partners of AIDS and HIV infected individuals ranged from 18 per cent in the Peterman study [**Peterman et al. 1988**], 19 percent in the Johnson study [**Johnson et al. 1989**], 23 percent in the Padian study [**Padian et al. 1987**], to 50 percent in the Fischl study [**Fischl et al. 1987**]. Some of the differences among these studies may relate to methodological problems in assessing risk. First of all, the number of subjects in each of the studies was small. They range from only 28 in the Fischl study to 97 in the Padian study. The studies also vary in the risk groups

studied, ranging from HIV positive asymptomatic individuals through those with AIDS related complex to those with full blown AIDS. They also differ in their definition of the contact case, some examining only long term partners. Most studies to date have examined partners at only one point in time, while it has been suggested that infectivity increases as people progress towards AIDS [*Laga et al. 1989*]. This suggestion was supported by Goedert et al [*Goedert et al. 1986*] who studied the female partners of 24 infected haemophiliacs and showed that three of the women developed antibodies more than four years after their partners did.

Transmission was associated with a low T4 lymphocyte count in the index case. Separate studies of transmission from women to men have so far been small and few. Like those of transmission from men to women they have yielded a wide range of results. In one of such study, transmission from women to their male partners was reported to have been as high as 65 percent per sexual contact [*Adler 1987*], while the Johnstone study [*Johnson et al. 1989*] reported a transmission rate of only 5.5 percent. To the same extent as in the male to female transmission studies, the varying rates may be due to different study designs. One difficulty has been to establish whether infection occurred first in the man or

the woman. However, the near balanced sex ratio of HIV and AIDS patients seen in Zaire and many other parts of Africa [*Piot et al. 1984*] would strongly suggest that transmission can be in both directions, otherwise there would very quickly have been an imbalance in the sex ratio of infected persons.

From such available data, there are grounds for concern over the potential for a major heterosexual epidemic in the United States and Europe similar to that which has already taken place in Africa.

1.3.2 Additional factors.

In the sexual transmission of HIV, apart from relations with multiple sexual partners, which increase one's probability of sexual intercourse with an infected person, especially in an area where HIV infection is very common, and the number of acts of sexual intercourse with an infected partner, several other factors have been put forward as influencing the infectiousness and susceptibility.

(i) Anal intercourse.

Although all types of penetrative sexual intercourse can transmit HIV, some practices appear riskier than others. Receptive anal intercourse with an infected partner is especially likely to lead to infection. Receptive anal intercourse is a well known risk factor for transmission of HIV among homosexual men [**Evans et al. 1989, Fitzpatrick et al. 1989**] and has been described as a risk factor in heterosexual couples by Padian et al. [**Padian et al. 1987**], and by the European Study Group [**European Study Group 1989**]. The mucosa lining the rectum is delicate and tears easily during anal intercourse. The infected lymphocyte's and the virus gain access to the blood stream via the rectal mucosal abrasions. Another speculative suggestion is that made by Jaffe and his colleagues following one case-control study [**Jaffe et al. 1981**], they suggested that faeces were an important factor in HIV transmission to the receptive partner. The faeces could retain the HIV containing semen for longer periods of time, thereby giving it time to enter the blood stream. The above explanations are biologically plausible, and given the incidence and prevalence of HIV infection among the homosexual men, they are most certainly correct.

(ii) Sexually Transmitted Diseases (STDs).

There is already considerable evidence that genital ulcerations, and perhaps other sexually transmitted diseases (STDs) as well, are associated with an increased risk of sexual transmission of HIV infection [*Holmberg et al. 1988, Quinn et al. 1988, Simonsen et al. 1988*]. It has been proposed that STDs cause genital sores, which provide an exit point for blood and an entry point for blood, semen, and cervical and vaginal fluids. The STDs also raise the number of lymphocyte's and macrophages in the genital tract [*Stamm et al. 1988*]. Therefore not only may HIV penetrate more easily through the disrupted mucosa or skin, but the lymphocytes and macrophages associated with the inflammation may represent an increased pool of target cells in a seronegative person and of HIV infected cells in a seropositive one. Two prospective studies in the United States showed that genital herpes preceded seroconversion for HIV antibody in over 50 percent of the homosexual men involved in the study [*Holmberg 1988, Stamm et al. 1988*]. A cohort study in Nairobi showed that genital ulcerations were an independent risk factor for incident HIV infection in female prostitutes [*Plummer et al. 1987*]. Also another study in Nairobi showed further that the risk for HIV seroconversion increased with the number of episodes of

genital ulceration, which was mostly due to chancroid [Greenblatt et al. 1988]. In another prospective study in Kenya, 293 men were studied. These men presented with a sexually transmitted disease and a history of recent unprotected contact with a female prostitute from an urban area where over 80 percent of the prostitutes were known from another study to be infected with HIV [Simonsen 1988]. About 9 percent (24) of the men showed HIV seroconversion. It was calculated that compared with men with other sexually transmitted diseases, those with genital ulceration (mostly chancroid) had a five fold increased risk of seroconversion with HIV antibody.

Whereas most studies on this subject of the association between HIV infection and other STDs have been performed in STD clinics or on prostitutes, the same association has also been found in a community based study in Zaire [Nzirambi et al. 1988] where it was shown that HIV seropositivity was correlated with the number of sexual contacts with prostitutes who were known to have a variety of sexually transmitted diseases.

The evidence for a role for non-ulcerating sexually transmitted diseases as cofactors in HIV transmission, however, is not so clear cut. Plummer et al. [Plummer et al. 1987] found that genital chlamydial infection but not

gonorrhoea was an independent risk factor for HIV acquisition in a cohort of female prostitutes in Kenya. On the other hand, in the study by Fischl et al. [**Fischl et al. 1988**], history of gonorrhoea correlated significantly with HIV infection in the spouses of HIV seropositive subjects. It may be that in general, they act by causing an inflammatory response or erosions which may potentiate HIV transmission.

Then if it is true that sexually transmitted diseases predispose to HIV, it may therefore be that the presumed high incidence of general ulceration in urban and some rural populations is one reason for the fast spread of HIV infection in Africa.

(iii) Oral sex

The isolation of HIV from saliva [**Groopman et al. 1984, Ho et al. 1985(b)**], prompted concern that HIV could be transferred by any means that involved the exchange of saliva, especially oral sexual acts. While several studies have attributed a low risk of HIV transmission to orogenital contact [**Lyman et al. 1986**], there is still an ongoing debate over the significance of this route of infection. In order to study the possibility of oral transmission of HIV, Schechter and his colleagues of the

Vancouver Lymphadenopathy-AIDS Study Group [**Schechter et al. 1985, Schechter 1986**], recruited 700 homosexual men. These men had oral-oral, oral-genital, and oral-anal sexual contact with homosexual partners, and because of the high prevalence of HIV seropositivity in the general Vancouver homosexual population, oral contact with HIV was likely. Every six months these men completed a questionnaire, were physically examined and their blood was examined for antibodies to HIV. After two and half years of the study, the important findings were that no risk associated with oral sexual contact was detected.

Multivariate analysis showed that any apparent risk associated with oral-sexual contact and the HIV seropositivity detected in some of these homosexual men was confounded by the known risk factors of the number of sexual partners and receptive anal intercourse. The problem with putting too much emphasis on the finding of this study is that the authors do not clearly define those who had never participated in anal sex from those who had stopped it due to HIV/AIDS publicity.

In another study which is now widely quoted, Kingsley et al. [**Kingsley et al. 1987**] enrolled 2507 homosexual men who were seronegative for HIV. These men were followed for six months to elucidate risk factors for

seroconversions to HIV. 3.8 percent seroconverted. Of the men who did not engage in receptive anal intercourse within six months before baseline and in the six-months follow-up period, only 0.5 percent (3 out of 646) seroconverted to HIV. By contrast, of men who engaged in receptive anal intercourse with two or more partners during each of these successive six months intervals, 10.6 percent (58 out of 548) seroconverted. Of the 147 men who engaged in oral receptive intercourse with at least one partner during the six-month follow-up but reported no receptive or insertive anal intercourse within twelve months, no seroconversion to HIV were observed.

These results are very encouraging as regards to the remoteness of HIV transmission by the oral route. The problem is that the study was unable to determine the infection status of the sexual partners to whom these men were exposed. Perhaps these 147 men who practised receptive oral intercourse were never or rarely exposed to HIV seropositive men. However this argument seems improbable since these men had ample opportunity to be exposed to HIV infected men as in this study 67 percent of the men had engaged in receptive oral intercourse with at least 1 partner (median 2, range 1-60).

While most of the evidence points to very little chance of HIV transmission by oral sexual acts, some researchers have produced contradictory findings. One of such studies was carried out by Rozenbaun and his colleagues [**Rozenbaun et al. 1988**]. In their study they assert that three of five patients were infected by saliva, although their evidence of infection by saliva was based on the criterion of only oral sex for 3 months before seroconversion. Certainly this does not exclude the possibility that infection was associated with anal intercourse in which these men had been involved for sometime before the three months cut-off point. Further evidence against transmission by oro-genital contact comes from studies of the amount of the infective agent found in saliva. In a study by Levy and Greenspan [**Levy and Greenspan 1988**], whole saliva from 55 HIV antibody positive subjects was tested; from 16, parotid gland specimen from HIV antibody positive individuals were also tested. The findings were that of the whole saliva 5.5 percent (3/55) were HIV antibody seropositive, and of the parotid 6.3 percent (1/16) were HIV antibody positive. In addition, in the 4 samples in which antibodies to HIV were detected, the levels were extremely low. Judging from the length of time needed to recover the HIV in culture, Jay and his colleague estimated that there is less than one infectious particle per ml. Therefore based

on the amount of saliva that can be involved in oral sex, it is highly unlikely that transmission can occur by this sexual route.

Certainly as of now no one can rule out the possible transfer of HIV by this sexual route and indeed Goldberg, Kennedy and others [*Goldberg et al. 1988*] support the view that orogenital contact should not be completely discounted as an HIV risk factor, reporting a single case of a 29 year old homosexual man who was diagnosed as HIV seropositive in October 1986 in Glasgow. This man's only apparent risk exposure was unprotected orogenital sex with an HIV seropositive man. Though this reported case could have happened, taking into account all the available literature on this route of transmission, it is clear that the frequency of this transmission is so low that further information on individuals giving this risk as the sole source of HIV infection should be obtained.

Because of the seriousness of the HIV infection, and since semen may be present even without ejaculation, it is important to continue studies such as those by Rozenbaum and his colleagues to determine if, and to what degree, there is a risk of HIV infection associated with oral sexual activities.

1.4. Pathophysiology of the virus.

Many if not all, the clinical features of infection with (HIV) can be attributed to the profound immune deficiency which develops in infected individuals [*Evans et al. 1988*]. The main target of the virus is a subset of thymus derived (T) lymphocytes, which are known as helper/inducer cells. These carry on their surface a glycoprotein molecule called CD4, which has been shown to bind to the envelope glycoprotein of HIV, thereby enabling the virus to enter, infect and ultimately destroy the T cells. Since helper/inducer T lymphocytes bearing CD4 molecules play a central role in the immune response, their destruction accounts for much of the immunosuppressive effect of the virus. It has been recognised that the CD4 molecule is also present, though in lower densities, on other cells as well as helper/inducer lymphocytes. Some monocytes and macrophages carry CD4, as may some B (antibody producing) lymphocytes. When these cells are stimulated by contact with an antigen, in this case HIV, they respond by cell division and the production of lymphokines, such as interleukin 2, interferons, and B cell growth and differentiation factors. These lymphokines act as local hormones controlling the growth and maturation of other lymphocyte types, in particular the cytotoxic/suppressor

(CD8) T lymphocytes antibody producing B lymphocytes. The most striking effects of HIV are on the T cell mediated immune response. Very early after infection, within days or weeks, as in other virus infections, there may be a rise in the number of CD8 cytotoxic/suppressor cells. Following this, healthy seropositive individuals may have normal numbers of T cell subsets. Individuals may remain seropositive and healthy for many years but a mark of disease progression, in addition to the development of new clinical symptoms, is a fall in the number of helper/inducer CD4 cells. In frank AIDS there is also a fall in the number of CD8 lymphocytes [**Fuschs et al. 1988**].

1 5 Natural history of infection.

HIV infection has been known for ten years. This is still too short a time for the natural history of this chronic condition to be fully described. Most of what is considered as its natural history is a combination of what has been observed clinically, in the laboratory and intelligent speculation and predictions [**Lange et al. 1986**]. Infection with the human immunodeficiency virus can produce a very varied clinical picture, ranging from an acute seroconversion illness to "full blown" AIDS years later. HIV infection may be asymptomatic or symptomatic. If and when symptoms occur, they are often non-specific. A glandular fever like illness has been described at the time of seroconversion [**Cooper et al. 1985**]. The patient suffers from fevers, malaise, lethargy, myalgia, arthralgia, lymphadenopathy and sore throat [**Tucker et al. 1985**]. Among the first clinical syndromes to be associated with HIV, were: Persistent Generalised Lymphadenopathy (PGL), and AIDS Related Complex (ARC).

1.5.1 Persistent Generalised Lymphadenopathy.

The lymphadenopathy seen in HIV infection is termed as persistent generalised lymphadenopathy (PGL) [**USCDC 1982**,

Valle S-L et al. 1985]. The definition of PGL is: Enlarged lymphnodes at least 1 cm. in diameter in two or more (non-contiguous) extrainguinal sites that persist for at least three months in the absence of any current illness or medication known to cause enlarged nodes. The lymphnodes are symmetrically affected, and those often enlarged are in the posterior and anterior cervical chains, and axillary and submandibular regions.

1.5.2 AIDS Related Complex.

Patients who have the constitutional symptoms and signs of AIDS without the opportunistic infections or tumours found in the end stage of the disease are described as having AIDS Related Complex (ARC) [**Quinn 1984, Valle S-L 1985**]. The concept of ARC covers a wide range of diseases. This concept is of less use today as sophisticated tests have been developed. However, it can still be of use to clinicians in identifying particular ill patients. There are laid down signs and symptoms which are used in the diagnosis of ARC. ARC is diagnosed in a person who presents with two or more of those said signs/symptoms which have been present for three months or longer.

1.5.3 Acquired immune deficiency syndrome (AIDS).

AIDS is the end stage of HIV infection. AIDS is characterized by life-threatening opportunistic infections (infections that occur only in people with immune deficiency) and or cancers that occur in people with otherwise unexplained defects in immunity.

The spectrum of opportunistic infections and other symptoms in people with AIDS varies in different regions. The differences may be due to a reflections of the infections prevalent in these regions, and or may be due to lack of diagnostic facilities in some countries to detect certain diseases. In the Western world, the majority of people with AIDS are diagnosed with pneumocystis carinii pneumonia [**USCDC 1982**]. A few of them have been seen with Cryptococcal infections, cryptosporidiosis, toxoplasmosis, and tuberculosis [**USCDC 1986**].

In Africa and other third world countries, in contrast, chronic diarrhoea and weight loss are very common [**Clumeck et al. 1984**]. In addition, the most common opportunistic infections are tuberculosis, cryptococcal

meningitis, herpes simplex infection, oral or oesophageal candidiasis, and skin rashes [**Mann et al. 1986**].

Kaposi's sarcoma, the generalised aggressive type, is the most common malignancy in people with AIDS. It has been diagnosed, mostly among homosexual men, in 33 percent of AIDS cases in Europe [**USCDC 1986**], and 24 percent in the United States of America [**Haverkos et al. 1985**]. In Africa the AIDS related sarcoma as opposed to the endemic Kaposi's sarcoma is reported in 2 to 20 percent of cases [**Piot et al. 1984, Serwada et al. 1985, Bizimungu et al. 1989**] Other types of cancer, especially Burkitt's lymphoma, and non-Hodgkins lymphoma also occur in people with AIDS [**Biggar et al. 1985, Ioachim and Cooper 1986**]. Neurological disorders have also been described in people with AIDS [**Levy et al. 1985, Shaw et al. 1985, Barnes 1986**].

1.6 Progression.

What proportion of people infected with HIV will develop AIDS or other symptoms? At this point, it is difficult to say. The incubation period for the development of clinical AIDS from the time of exposure to HIV to the onset of recognised symptoms is very varied. It may depend on route of entry and host, environmental or other

factors affecting virus replication and expression [Abrams et al. 1984, Popovic et al. 1984, Valle S-L 1985]. In cases of transfusion-associated HIV, for example, the time from receipt of blood products to onset of clinical symptoms may be as short as two years [Groopman and Salahuddin 1984].

HIV is so new that long-term prospective studies are just beginning to yield results. It has been variously estimated that each year 2 to 10 percent of the infected persons develop AIDS [Blattner et al. 1985]. In 1987, analysis of five cohorts over three years showed a differing rate of progression from infection with HIV to AIDS [Cooper and Jeffers 1988]. It was 34 per cent in New York city homosexual men compared with 12 percent of a group of infected haemophiliacs in Pennsylvania [Goedert 1986]. One of the longest studies to date followed 57 homosexual men in San Francisco, who were known to be infected with HIV, for median of five years. Among the 57 men, 18 percent, had developed AIDS [Quinn 1985]. However good the results from these relatively early studies may be, one must be aware that such studies lack clinical and laboratory information needed to identify the degree of immunological impairment and the stage of HIV infection at the time of diagnosis. The difference in progression observed could be attributed to diagnosis earlier or

later in the stage of infection. T lymphocyte subset (that is, normal helper CD 4 or suppressor CD 8) cell analysis is probably the most readily available and most useful laboratory test for assessing disease progression. As the CD4 count decreases, the risk of AIDS increases [**Hofmann et al. 1987**]. Even though such tests do now exist, unfortunately very few population based AIDS surveillance studies routinely collect detailed clinical and laboratory information. Moreover a single CD4 count would be difficult to interpret, and counts need to be done at intervals, for example every six months. A drop to less than 200 cells per cubic millimeter would signal danger [**Fuschs et al. 1988, Chen et al. 1989**]. But non of such findings are cited in the above mentioned studies. However, Carne et al. [**Carne et al. 1987**] argue that clinical examination and simple haematological measurements can be sufficient in determining the risk of progression.

Several mathematical models, have been developed to try and predict the HIV incubation period [**Anderson et al. 1986**], that is the time interval between contact with HIV and the development of AIDS. For example, in one model based on the distribution of the incubation period [**Lemp et al. 1990**], the estimated time is 16 years for 76 percent of those infected, with the mean of 11.8 years

and 95 percent confidence interval of 10.6 to 13.0 years. Though model based studies have used the stage of HIV infection using the CD4 and CD8 ratios, the p24- specific antigens and other more specific antigen antibody assays, they have been based on small samples of highly selected tertiary-referral population. The observed changes in survival noted in these highly selected populations are not necessarily reflective of the entire population. They also disregard the medical treatment given and the counselling offered. This means that such findings may have little bearing to the progression of the disease in Africa and other third world countries where the disease seems to run a more acute course and where doctors often have only clinical acumen to guide them in diagnosing AIDS, though simple tests do exist in the large cities [*Widy-Wirski et al. 1988*].

Unfortunately only one early study has measured the risk of AIDS among healthy Africans with antibodies to HIV, and found a one percent risk of AIDS after one year [*Mann et al. 1986*]. This was very short and obviously underestimated the long term risk. In another relatively recent study carried out in Uganda [*Katabira 1989*], the timing of infection used was that given by the patient depending on when he first noticed the fever-like illness. Though this gave a much more realistic period of

6 months to 5 years, there was a very big source of error since so many tropical diseases and other infections can give the same clinical picture as early HIV infection. Also in search of means to explain the progression from HIV to AIDS, Bregman and Langmuir [**Bregman and Langmuir 1990**] applied Farr's law of epidemics. Farr's law of epidemics, first promulgated in 1840, and resurrected by Brownlee in the early 1900s, states that epidemics tend to rise and fall in a roughly symmetrical pattern that can be approximated by a normal bell-shaped curve. When they applied this law to the incidence of AIDS from 1982-1990 in the United States of America the crest was noted in late 1988 and declined by 1990. They therefore concluded that by 1994, the HIV and AIDS epidemics would have come to an end. Though it is true that this law could have probably have worked in some other epidemics, it certainly can not work with HIV, which has such a long incubation period. Also in 1987 the United States Centers for Disease Control (CDC) broadened its definition for AIDS to include more cases [**USCDC 1987**]. This could have affected the curve obtained by Bregman and Langmuir to prove that Farr's law applies to HIV and AIDS as well.

Indeed these model studies have been criticised by Tennison and Hagard in their prediction of the number of AIDS cases in the United Kingdom, East Anglia and

Cambridge [**Tennison and Hagard 1988**], they suggested that predictions of an incubation period of over five years are bound to be grossly inaccurate bearing in mind the on going HIV preventive activities, and that the data on the extent of infection of human immunodeficiency virus are sparse. Despite all the short comings of the various studies, it is clear from the mounting evidence that in the absence of therapy the proportion of HIV-infected people who will ultimately progress to develop AIDS is close to 100 percent [**Lui et al. 1988, Moss et al. 1988**].

What is important to remember is that the progression of HIV/AIDS epidemic is more complex than can be inferred from the calculation and prediction of the number of AIDS cases. As Dr. Jonathan Mann, the first Director of the World Health Organisation Special Programme on AIDS, suggested, it is useful to consider AIDS as three distinct, independent yet inter-twined global epidemics [**Mann 1988**]. The first is the epidemic of infection with the Human Immunodeficiency Virus itself. The second epidemic, inevitably following the first, but with a delay which can take several years is the epidemic of the disease AIDS. Finally, hard on the heels of the first two epidemics, is third epidemic of the social, cultural, economic and political responses to each of the first two epidemics.

1.7 HIV World distribution.

The geographical origins of HIV are not known. Speculation about the virus's origins is based on limited information and sometimes misinformation [*Bygbjerg 1983, Brun-Vezinet et al. 1984, Mann et al. 1986, McClure 1990*]. And therefore can only be termed just that: speculations. However, there are considerable epidemiological data on the current extent of HIV and AIDS. Based on this information, it is estimated that between eight and ten million people world-wide may be infected, and that the virus appears to be present, at least to some extent, in virtually every country. [*Brunet and Ancelle 1985, WHO 1989, WHO 1989*].

By the end of July 1990 the total number of AIDS cases reported world-wide was 273,425 [*WHO 1990*]. WHO estimated in June 1990, however, that the cumulative total of adult AIDS cases by this time was over 650,000 world-wide [*WHO 1990*]. In July 1990 WHO inflated its earlier estimate of 6 to 8 million people infected with HIV around the world to 8 to 10 million [*WHO 1990*]. The official data are incomplete and do not provide an accurate picture of the number of asymptomatic people already infected with the virus and are likely to develop AIDS in future. Many

people have already developed the disease but have not been reported due to various reasons be they economical, political or managerial. It was estimated that the number of 170,000 AIDS cases which had been reported to the World Health Organisation from 149 countries by July 1989, was roughly one-third of the number thought to have actually occurred [**WHO 1989**].

1.7.1 EUROPE AND NORTH AMERICA

Viewed by half-year of diagnosis from March 1989 to March 1990, the cumulative AIDS cases of particular European countries exhibit marked differences. On the whole, by March 1989, 21,857 AIDS cases had been reported to WHO by 32 European countries. The figures were: 24,894 by June 1989; 28,129 by September 1989; 31,497 by December 1989, and as of March 1990 34,967 [**Pub Hlth Lab Ser. 1990**]. In Europe, France has the highest number of reported AIDS cases, and by March 1990 were 9,718, or about 27 percent of the European total [**WHO 1990**]. The pattern of HIV infection varies markedly in different European regions. In northern Europe infection is most common among homosexual men; in southern Europe, among intravenous drug users [**Mann et al. 1988**].

Eastern Europe has reported few AIDS cases and the presence of any HIV infection in Eastern Europe is just emerging along with the political changes. By March 1990, only 26 cases of full-blown AIDS had been reported from the Soviet Union [*WHO 1990*].

1.7.2 United Kingdom.

The incidence of HIV infection and AIDS in the United Kingdom has so far been substantially lower than in several other countries. Comparing the cumulative rates of AIDS cases per million population, by end of March 1990, the United Kingdom one of 55.1 was ranked tenth of 16 European and COST countries [*WHO 1990*]. In the United Kingdom the first case of AIDS was reported at the end of 1981 [*Du Bois et al. 1981*] and the number of cases detected by national surveillance has since then increased rapidly. The most comprehensive data that are available concern patients in whom the virus has caused the development of the full AIDS syndrome [*Cheingsong-Popov et al. 1984*]. Clinical cases of AIDS are reported in strict confidence to the Communicable Disease Surveillance Centre in England and the Communicable Disease Unit in Scotland under a voluntary system of monitoring which began in 1982 [*Pub. Hlth Lab Ser. 1984*]. The number of AIDS cases reported each year has been as

follows: 1982, 3; 1983, 28; 1984, 77; 1985, 273 [**Acheson 1986**]; by 1987 the cumulative totals had reached 1,170, while that of HIV positive individuals had reached 7,557 [**Pub. Hlth Lab Ser. 1987**]. In 1988 the number of AIDS cases had reached 1794, while those who were HIV antibody positive had reached 9242 [**Pub Hlth Lab. Ser. 1988**]. By the end of 1989, the cumulative totals of AIDS cases were 2779 [**WHO 1990**], and by June 1990, the number of AIDS cases had reached 3433, while those who were HIV antibody positive had reached 14,090 [**Pub Hlth Lab. Ser. 1990**]. By 1985, homosexuals/bisexuals males accounted for about 90 percent of the cases of AIDS, and contributed 45 percent of the HIV antibody positives. The haemophiliacs accounted for 5 percent of AIDS cases and 23 percent of HIV antibody positive. The figures for the intravenous drug users were 2 percent and 3 percent respectively, compared to the figures of heterosexual contacts which were about 3 percent and 1 percent respectively. By the first half of 1990, the corresponding figures were: homosexuals/bisexuals males accounted for about 80 percent of the cases of AIDS, and contributed 59 percent of the HIV antibody positives. The haemophiliacs accounted for nearly 10 percent of AIDS cases and only 3 percent of HIV antibody positive. The figures for the intravenous drug users were about 9 percent and 10 percent respectively. Compared to the figures of

heterosexual contacts which were about almost 10 percent and 16 percent respectively [*Pub Hlth Lab. Ser. 1990*].

In the United Kingdom, at present, the spread of HIV by presumed heterosexual transmission remains low at less than 20 percent of all AIDS cases in the United Kingdom, but this mode of HIV transmission forms the fastest growing transmission group. The pattern of the increasing proportion of HIV antibody positive reports in the heterosexual contact in England and Wales is consistent: 3 percent in 1985, 5 percent in 1986, 9 percent in 1987, 11 percent in 1988, 13 percent in 1989 and 17 percent in the first half of 1990. The Scottish data shows a similar trend in the heterosexual contact infections: 0.4 percent in 1985, 6 percent in 1986, 13 percent in 1987, 19 percent in 1988, 22 percent in 1989 and 32 percent in the first half of 1990 [*Pub Hlth Lab. Ser. 1990*].

During these early years of the AIDS/HIV epidemic in the United Kingdom, haemophiliacs comprised the second largest group of HIV antibody positive individuals [*Acheson 1986*]. Although it is not known how many of this group will eventually progress to AIDS, further infections should not occur because of the measures that have been taken to safeguard supplies of blood and blood products [*Ebsteban et al. 1985, Mortimer 1985*].

This data like that from any other sources the world over, have to be interpreted with a certain amount of caution. For example in 1987 [**USCDC 1987**], changes giving new emphasis to the results of laboratory tests for HIV infection meant that unknown number of cases excluded previously were registrable thereafter. Also because of the problem of overlap, that is some AIDS cases will be included in the figures for HIV antibody positive cases. A much more substantial problem regarding such data is understatement. Obviously, not everybody who has been infected with HIV has presented for testing, especially because it is possible for an individual to be unaware that he or she has been infected with the virus. Consequently, there is no doubt that the information collected by the HIV surveillance system understates the prevalence of infection in the population. What is not clear, however, is the magnitude of this understatement.

Many suggestions have been put forward about the true prevalence of HIV in the United Kingdom. By 1987 the Department of Health estimated that as many as 30,000 people might be infected with the virus [**DHSS 1987**]. At that time, however, it was conceded that the figure could be wrong by up to 50 percent in either direction [**McEvoy 1985, Mortimer 1985(b)**] and experts called to give evidence to the Social Services Committee described the

estimate as "a complete guess". Other estimates suggested that 40,000 people may be HIV positive [*Pub Hlth Lab Ser. 1989*]. The most recent estimates claim that between 35,000 and 148,000 people in the United Kingdom may be carrying the virus [*Delamothe 1990*].

Against such a background of uncertainty, that alternative approaches are being looked into to enable all the concerned parties, like the government, medical professionals and social workers, gain more accurate understanding of the spread of HIV. Among the alternatives suggested is mass screening for HIV. At first glance, it appears sensible to test everybody in order to identify those infected with the HIV virus, and thereby assess the extent of the spread of the infection throughout the population. This would certainly assist in the planning for the resources that may be required to cater for them and to inform the carriers of the need to change their behaviour accordingly. But when looked at in detail, several major problems do emerge. For a population of approximately 57 million, the cost involved will be in millions of pounds.

Secondly, there is what is known as the "window period" that is, the period between exposure to the HIV and the time taken for the individual to become seropositive.

This would lead to false sense of security in those people who may have not seroconverted by the time they were tested. In addition to that, all the tests that do exist by now are not 100 percent sensitive or specific. This means that there will be those that will be carrying the virus and yet show seronegativity, this false security will be more dangerous than if no test was carried out at all. With such a state of affairs, the Secretary of State considered that mass screening of the whole population could not be justified. The government is now in favour of anonymous screening of certain population groups such as pregnant women.

1.7.3 United States of America.

The distribution of HIV infection and AIDS cases in the United States resembles that of Western Europe but the United States has larger numbers of both HIV infection and AIDS. The United States accounts for over 60 per cent of the world's reported AIDS cases, with over 105,000 reported through mid-1989 [*USCDC 1989*]. This probably does not mean that the United States is the worst affected country in the world, but rather a reflection of the efforts and resources that have been put into HIV/AIDS surveillance and reporting programmes. The United States Centers for Disease Control estimates that

as of 1988 between 1.0 and 1.5 million United States residents were infected with HIV. About 50,000 new HIV cases were expected in 1989. By 1992, the number of new cases of HIV infection is expected to rise to 70,000, and the cumulative AIDS case load will top 365,000 [**Heyward and Curran 1988**].

In some United States cities, HIV infection and AIDS cases have been concentrated among the male homosexual community, and the intravenous drug users [**USCDC 1987**]. In the population as a whole, however, HIV infection is reported to be uncommon. For example in 1988 among the United States military recruits the HIV seroprevalence was found to be only 0.12 percent [**USCDC 1988**]. Such findings should not however be taken as representative of the whole United States population. For those who join the military are usually healthy young people, and if is a policy to screen every military recruit for HIV, those who know or suspect that they are already HIV seropositive may not bother to seek recruitment.

Despite the initial rapid growth in the number of AIDS cases in the United States, the rate of increase is slowing [**Heyward and Curran 1988**]. This may be the result of safer practices adopted among homosexual men. For the percentage of AIDS cases involving homosexual men is

decreasing while the percentage among intravenous drug users is reported to be on the increase [**WHO 1989**].

1.7.4 Africa.

In many areas of Africa the prevalence of HIV infection is high, with men and women equally affected [**Piot et al. 1984, Serwada et al. 1985, Bizimungu et al. 1989**]. An estimated four million Africans are infected with HIV, mostly in urban areas of Burundi, the Central African Republic, Cote d'Ivoire, Ghana, Guinea-Bissau, Kenya, Malawi, Nigeria, Rwanda, Tanzania. UGANDA, Zaire and Zambia [**WHO 1990**]. Unfortunately recent research on HIV prevalence has shown that the infection is spreading fast into rural areas [**Della et al. 1988, Nzirambi et al. 1988**]. Prevalence within these countries varies considerably. In some African cities the prevalence of HIV infection is rising rapidly in groups such as pregnant women and blood donors that had not been considered at particularly high risk for any reason [**Carswell 1987**]. Studies of some selected populations in some countries of Central and East Africa have found prevalence as high as 30 percent [**Bizimungu et al 1989**].

HIV has created a social crisis in this continent: according to the most recent estimates by the World

Health Organisation [**WHO 1990**] one in 40 people in Central Africa is HIV positive. This means that currently half of the world's HIV positive people are in Africa. About 65,000 AIDS cases had been reported in Africa as of mid-1990, about 16 percent of the world's total [**Hooper 1990**]. However it is estimated that 90 percent of African AIDS cases are not reported [**WHO 1989**]. Reasons for the lack of reporting are many and varied, but the two main ones are: lack of resources, leading to a lack of diagnostic facilities, and inadequate data collection and analysis. The second important reason for improper reporting is the political atmosphere and stigma which accompanies HIV and AIDS acceptance. Countries that accept having high prevalence rates of HIV, run the risk of losing much needed income from the tourism industry.

Within the next few years AIDS is likely to double or triple the total adult mortality in urban areas of East and Central Africa [**WHO 1989(b)**]. Already, AIDS patients fill one-quarter to half of beds in some hospitals in Central Africa [**Mann et al. 1988**]. Child mortality is expected to increase by at least 25 percent, wiping out the hard-won gains of child survival programmes. Yet the resources to deal with this epidemic are non-existent or very few in Africa.

HIV-2, a strain of HIV that is less widespread and perhaps less virulent than the first identified HIV-1, is common only in Western Africa. In Guinea-Bissau 4.7 percent of over 1,300 household members tested at randomly selected homes in 1987 were infected with HIV-2, while none was infected with HIV-1. [**Poulsen et al. 1989**].

1.7.5. Uganda

Uganda has the largest cumulative number of reported AIDS cases of any African country [**Kaheru 1989, WHO 1990**], although this does not necessarily mean that it has the highest number of AIDS sufferers. Because the major symptoms are weight loss and diarrhoea, it is locally known as "slim" disease [**Serwada et al. 1985**].

Like in all African countries, heterosexual contact is the most important mode of transmission, since homosexuality is virtually non-existent. And as such, it affects females nearly as frequently as males [**Clumeck et al. 1985, Sewankambo et al. 1987, Berkely et al. 1989**]. As the world over, the disease mainly strikes those between 15-40 years of age. In Uganda these are the most productive members of society, the communities' breadwinners [**Berkely et al. 1989**].

The first cases of AIDS in Uganda were suspected during the last quarter of 1982 [**Serwada et al. 1985**]. Several business men died at an isolated fishing village on Lake Victoria. This fishing village was just north of the Tanzanian border and was known for its smuggling and illicit trading. It was one of many from which goods traded across the border to Tanzania. When these deaths occurred, fellow traders laughed them off as "witchcraft". Others thought they were natural justice for infidelity. The victims were all young and sexually active. Soon there were corresponding deaths among their wives.

It is highly probable that HIV was sexually transmitted from Tanzania since its appearance coincided with the movement of the Tanzanian army into Uganda in 1979-1980 [**Serwada et al. 1985**]. And indeed the site and timing of the first reported cases supports the suggestion that the disease arose in Tanzania. It is most unlikely that the disease had been reported before 1982, since medical records in Uganda are good and go back to 1944 [**Makerere Med. Sch. 1962**]. Endemic Kaposi's sarcoma, as distinct from the generalised aggressive Kaposi's sarcoma, the form associated with AIDS, has been described in Uganda since 1962 [**Byley et al. 1985, Lucas et al. 1988**], but

evidence that this was causally related to HIV is lacking. Some evidence to suggest that HIV could have been present in Uganda during the early 1970s came from studies on stored sera test [*Saxinger et al. 1985*]. However, these sera were very sticky and, like other stored sera from a region endemic for malaria, may have given a false-positive results on direct binding assay systems or on western blots [*Biggar et al. 1985, Wabwire et al. 1989*].

AIDS cases increased from 17 in 1983 to over 1,000 by 1987, but were still among younger sexually active, heterosexual men and women. As of May 1988, the cumulative number of reported cases was 4734. By August of the same year, the number had grown to 5508 [*Tomey 1989*]. By December 1989, there were over 7,000 reported cases, and still most of whom were heterosexual men and women [*WHO 1990*]. But probably this is much lower than the actual number because it is only within the last year or two that a comprehensive national system for reporting AIDS cases using standardised forms has been in place. On the other hand, this alarming rate of increase could be more a reflection of the recent improvement in reporting of the disease than an explosion of the new cases. In a June 1988 report by Uganda's AIDS Control Programme (ACP), the estimated HIV infection rate or seroprevalence

was between 7 and 12 percent of the rural adult Ugandans, with some areas still free of infection. 86 percent of the country's population is rural. For adults in Kampala, the infection rate is estimated at between 5 and 30 percent [*Kaheru 1989, Uganda MOH 1989*].

By December 1989, there were over 790,500 reported HIV positive individuals in the country [*WHO 1990*]. Again most of whom were heterosexual men and women. This is nearly 5 percent of the population of 16 million people. Results from specific regions showed that 29 percent of all urban adults in Western region were HIV seropositive and 12 percent of the rural adults in the central region [*Namaara and Plummer 1987*]. In villages along trading routes, the range is 5 to 15 percent [*Uganda MOH 1988*]. More precise figures have come from surveys among the apparently health blood donors within Kampala, the HIV infection rate was 16 percent, and among women attending an antenatal clinic it was 24 percent [*Carswell 1987*].

Unfortunately as regards to the spread of HIV infection, Uganda is situated in the heart of Africa along the equator. It is therefore a focal point of human interaction and trade. It is fairly heavily populated, especially the townships along the trans-African highway leading to the Indian Ocean ports. On the route studies

have implicated long distance truck drivers in the spread of the infection claiming that 35 percent of them were infected [**Carswell et al. 1989**].

At the start of the epidemic, AIDS in Uganda was basically a disease of the urban population, and was relatively rare in traditional rural villages where codes of morality forbid casual sexual relationships. However due to the political upheaval and civil wars which have left over half million dead, this traditional structure has been disrupted.

Uganda ACP studies, like those from other countries confirm an increased risk of HIV infection for those with multiple sexual partners or multiple episodes of STDs such as gonorrhoea [**Berkely et al. 1989, Konde-Lule et al. 1989**]. Studies from other African countries point to the possibility that prostitution is also an important factor in spreading of the HIV [**Kreiss et al. 1986, Mann et al. 1987**].

Injection needles are commonly re-used in this part of Africa and the frequency of injection abscesses in Uganda suggests that not only are injections common but also that needle sterility is often lacking [**Carswell 1983**].

1.7.6 Latin America and the Caribbean

As in North America and Europe, HIV infection and AIDS cases in Latin America and the Caribbean were first concentrated among urban homosexual men. However, in the Caribbean and to a lesser extent in Latin America, the epidemic is changing. Infection rates are increasing faster among heterosexuals than among homosexual men. [Gordon 1989]. In the Caribbean, by the end of 1989 heterosexuals accounted for over 60 percent of the 1,200 reported cases [Narain et al. 1989]. HIV infection may be spreading to heterosexual populations in the region largely through bisexual men. In Sao Paulo and Rio de Janeiro, for example, 28 percent of bisexual men tested in a 1987 survey were infected with HIV [Cortes et al. 1989]. The shift is also due to rising infection rates among intravenous drug users [Gordon et al. 1989, Narain et al. 1989]. For instance, among women who came to a Buenos Aires hospital for HIV testing, 89 percent of those who infected reported sharing needles for drug use [Cortes et al. 1989].

In many Latin American and Caribbean cities the rates of HIV infection are high among prostitutes, both male and female. Recent surveys report that over one-third of female prostitutes in Port-au-Prince, Haiti, and are

similar proportion of male prostitutes in Buenos Aires and Rio de Janeiro are infected [*Gordon 1989, Narain et al. 1989, Cortes et al. 1989*].

In Latin America and the Caribbean like in the other parts of the third world underreporting of HIV and AIDS cases is common feature. This is especially so in the Latin American countries where childhood prostitution among young boys is common [*Gordon 1989*]. These young boys are very unlikely to report for any medical attention even if they were to be infected. Also the size of the problem can overwhelm the system, that even the basic available facilities are not used to the maximum.

1.7.7 Asia.

Based on available figures, there have been few cases of AIDS in Asia, with exception of a few cities. By the end of 1989, just 494 cases had been reported [*WHO 1990*]. However, the World Health Organisation estimates that more than 500,000 Asians are infected with HIV and that the number is rapidly increasing [*WHO 1990*]. In Thailand, HIV prevalence among intravenous drug users is rising sharply. In late 1987 about one percent of the people attending drug abuse treatment centres in Bangkok were infected with HIV. By March 1988, 11 percent were

infected, and by September 1988, 31 percent were infected [*Thongcharoen et al. 1989*].

In India, in April 1986, six prostitutes in Madras were found to be HIV positive, These findings were followed by the official announcement from the Indian Health Minister, that AIDS had arrived in India [*WHO 1988*]. HIV infection in cities in India, while still comparatively rare, is increasing. The early suggestions that spread of the disease would be contained because Indian society is sexually conservative have proved to be self deluding. In Bombay, for instance, brothels are doing business as usual. Figures released recently indicate that the number of HIV positive individuals, especially among prostitutes is rapidly increasing. By mid 1990, in Bombay, HIV testing in a sample of 2,000 prostitutes revealed 150 HIV positive results, and there are estimated to be a total of around 100,000 prostitutes in the city [*WHO 1989(a)*]. While in New Delhi among men at STD clinics, 0.24 percent were infected in late 1987. One year later 0.89 were infected. Over the same period, prevalence among urban blood donors rose from 0.02 percent to 0.29 percent [*ICMR 1988*].

1.8 Control of the spread of the Human Immunodeficiency virus.

Any disease occurs because of the dynamic interaction between agent, host and environmental factors [Beck 1985]. Success in reducing transmission of HIV and containing AIDS will therefore continue to rely heavily on behavioural changes of host and possibly environmental factors involved with HIV transmission, certainly for the foreseeable future.

There seems to be no realistic prospect of an effective vaccine against HIV for ten years. Both anti-HIV agents and vaccines are currently being developed, with some success for the former but to date, little for the latter.

Presently, and perhaps for the near future, the available HIV/AIDS drugs may alleviate symptoms but none offers real cure.

As far as the development of a vaccine goes, it is beset with difficulties because of the nature of the virus; the surface lipoprotein envelope of the virus is subject to variation. There is a lack of suitable small laboratory animals that are susceptible to HIV infection. In

addition, antibodies to the structural components of the virus are present in infected people and often in high titres, making makes the task of detecting the response to the vaccine that more difficult [**Zuckerman 1988**].

Even if a breakthrough was made at this time, any candidate vaccine must be subjected to scrupulous evaluation. Premature unsubstantiated claims on efficacy may result in a loss of confidence by the public and may have a serious impact on other immunisation programmes. Because the interval between infection and serious disease averages ten years, it is unlikely that an HIV vaccine will be generally available for at least another ten years.

Given the resources put into the production of the vaccine, even if it was to be available, it would be very expensive and probably not affordable by many of the developing countries. In addition, the vaccine would most likely be of use to those people who are not infected already. But world wide there are millions of people including children who are infected, and therefore potential sources of infection for the next 50 or more years. Therefore even the production of a vaccine within the next few years cannot eliminate HIV.

In the absence of either a vaccine against or cure for HIV and AIDS, measures for prevention, and in particular public education, are the only weapons available to tackle this epidemic. Even if a vaccine or a cure for HIV is found, prevention will still play a very important role in HIV control. Indeed Brandt in his work in connection with halting the spread of HIV [**Brandt 1988**], derived the following lessons from the history of transmissible diseases:

1. Compulsory public health measures will not control the epidemic
2. The development of effective treatments and vaccines will not immediately or easily end the AIDS epidemic.

It is known without a shadow of doubt that HIV can be transmitted through unprotected sexual intercourse with an infected partner [**Harris et al. 1983, Curran 1985**].

What is again known with certainty, is that if every person abstained from sexual intercourse, then the HIV and AIDS epidemics would be controlled very easily [**Bradbeer 1987**]. If every person had sex with one, and only one other person who did the same, the sexual transmission of HIV would virtually stop. More realistically, if everyone who had sex with more than one

person avoided the exchange of body fluids, by avoiding penetrative sex or by using a condom, the transmission of HIV would be massively diminished. At present this is not the case. From the epidemiological evidence available, there is a real need for changes in sexual behaviour.

In order to understand fully the extent of behavioural change needed to stop the HIV epidemic, one needs to consider the basic reproductive rate of HIV infection as defined in biological terms [**May RM 1987**]. The basic reproductive rate " R_0 ", of an infection, is defined as the average number of secondary infections produced (new individuals infected) when an infected individual is introduced into a wholly susceptible population. HIV has a value of at least 5, and possibly more, as more evidence for this value is needed from all populations and transmission groups. The value of R_0 runs on the scale of 0 to 10. In view of the biological interpretation of R_0 [**Gordon 1989**], this is a disturbing finding. For an infection can establish itself endemically so long as R_0 remains above 1. The larger the original value of R_0 , the more difficult is the task of bringing about changes of magnitudes sufficient to bring R_0 below one, and thus eventually eradicate the infection. For HIV, this eradication requires changes in sexual behaviour.

It therefore follows from the above that the only way for individuals to protect themselves against HIV infection is to avoid those forms of behaviour which can lead to infection. The most important of these are:

1. Unprotected sexual intercourse, particularly between homosexual men, with persons who have injected drugs or for that matter with anybody whom they are not absolutely certain is free from infection. The latter is particularly important in those areas where heterosexual intercourse is the main route of transmission.
2. Using contaminated needles and syringes.

In order to avoid those forms of behaviour which can lead to infection, people must be fully informed. This is a challenging assignment. The behaviours in question are both compulsive and clandestine. Luckily enough, in virtually every country where HIV and AIDS have been reported, the national government has undertaken some effort to make people aware of HIV and AIDS [MKDIR 1989]. The aim of these programmes is basically the slowing of the epidemic by providing relevant and accurate information, and hopefully interrupting transmission through reduction in risk behaviour. In almost all cases mass media information and education programmes for the

general public and for people at high risk of HIV have often been the first step in national AIDS prevention efforts [*PH Reports 1989*]. The extent and timing of such efforts, the choice of media, and the content, style, and tone of messages have varied widely.

Developed countries have relied heavily on television, newspapers and magazines because these reach the largest audiences [*UKHEA 1988*]. A number of European countries for example, France, Poland, Sweden, Switzerland, the United Kingdom and West Germany have also mailed information brochures to most or all households. Developing countries have emphasised radio and various printed materials like, brochures, leaflets, and posters [*Rogers 1987*].

Despite the differences in approach, most of the educational programmes for general audiences have similar goals:

- * To provide essential information about HIV for example: cause, transmission, and general prevention,
- * To encourage people to recognize and change behaviour, especially sexual behaviour, likely to spread HIV infection,
- * To maintain the healthy behaviour,

- * To reduce groundless anxiety about transmission via casual contact,
- * To prevent discrimination against those infected with HIV, and
- * To mobilise public support for HIV/AIDS education and preventive programmes [*UKHEA 1988, Lehmann 1987, PH Reports 1988*].

The messages also vary in tone as well as content. For example, emphasis on condoms differs greatly. Some national campaigns in Europe emphasise consistent use of condoms, while many African campaigns stress keeping to one sexual partner and hardly ever mention the importance of the condom in the control of HIV. These variations in condom promotion will be discussed in more detail in the chapter on condoms. However, it can be mentioned here that in some countries, such as Sweden, Switzerland, and the Netherlands, condoms are promoted with open discussion in the mass media. In contrast, at least six countries in sub-Saharan Africa and four in southeast Asia have not promoted condoms at all [*Tarantola 1989*].

Different countries are at different stages in their HIV/AIDS education programmes. The following examples from several countries can throw some light on the progress which has so far been made in that direction.

1.8.1 United Kingdom.

When AIDS was first recognised in the United Kingdom, the initial response from the different sectors of British society was generally low-key. The general public simply dismissed it as the "gay-plague", a terrifying and sinister disease with mysterious origins which affected only the promiscuous [Plummer 1988], and according to Platt [Platt 1987] the early British medical approach to AIDS was characterised by a "well-meaning sloppiness". By 1983, one of the leading British experts on HIV and AIDS, Professor Michael Adler from the Middlesex Hospital had just set up an "informal discussion group of interested doctors". However, after an initial period of low-key activity, the British Government's response to HIV/AIDS was impressive. The government's measures were and still are being complemented by private and voluntary sector initiatives. In order to make the general public aware of how the infection can be avoided, the government launched a publicity drive based on newspaper advertisements in March and April 1986. This initiative was, however, widely attacked as unimaginative and for being conducted on too limited a scale to be effective [Anon 1986]. On November 21 1986, following the widespread criticism of the newspaper campaign the Secretary of State for Health

unveiled plans to spend 20 million pounds on an explicit AIDS education campaign aimed at dispelling myths about the ways HIV can spread. It employed television advertising and the distribution of leaflets to each of Britain's 23 million homes. The media too, began to take AIDS more seriously during 1986, and to portray it as a disease which could affect anyone, including heterosexuals. AIDS was already receiving unprecedented coverage in the two months before the Secretary of State's announcement on November 21, and the launch of the biggest ever public health education campaign. At about the same time, the Secretary of State also announced an enhanced role for the Health Education Council, and its reconstruction as a special health authority with full responsibility for public education about AIDS. Since then, much has been done.

Initially 7 million pounds were provided for treatment, care and counselling, 14.5 million pounds were given to the Medical Research Council for AIDS research, and 3 million pounds to the WHO's Global Programme on AIDS, officially launched in February 1987. In addition, the government contributed 500,000 pounds to the National AIDS trust when it was launched in May 1987.

Media attention reached a peak in a week of saturation coverage on both ITV and BBC Television during "AIDS Week" in February 1987. The impact of the week is reflected in subsequent studies which showed that 96 percent of the British population were believed to have felt the effect of the February 1987 AIDS Television week. But the Health Education Authority then observed signs of falling concern about the transmission of HIV among the heterosexuals. In January 1987, 12 percent felt that AIDS was a national issue, but by January 1988 it was down to 6 percent. In February 1986, 34 percent of the population were aware of HIV and AIDS. This was 83 percent in November 1986, but by February 1988 it was 55 percent [**DHSS 1988**]

According to another survey carried out by the Health Education Council in Feb 1987, 88 percent of district health authorities had set up groups specifically to deal with AIDS, while nearly half had nominated district AIDS co-ordinators and the figure has risen since then. More than half the districts said that there was a local AIDS helpline [**Garland 1988**]. A comprehensive enquiry into AIDS by the Social Services Committee of the House of Commons began on November 5th 1986, and the report "Problems with AIDS", was published a year after that [**SSC report 1987**]. This report was a milestone in the

history of HIV and AIDS in the United Kingdom. The report's 94 recommendations covered all aspects of the disease and its prevention, ranging from research and screening, to treatment, community care, health education, and the socio-economic implications of the disease.

In 1988, the Health Education Authority launched another major media campaign costing 4 million pounds to combat the spread of HIV. The campaign was targeted at heterosexuals. While it seems clear that, as in the United States of America, many homosexuals have changed their sexual behaviour [*Hirsch and Enlow 1984*], little change appeared to have taken place among heterosexuals [*Martin 1986*]. In October 1989, a new campaign specifically targeted at heterosexuals was launched in all the available forms of mass media. This campaign informed the general public that HIV is not confined to homosexuals and drug users only. Also education authorities throughout the United Kingdom have developed different materials for their schools [*Garland 1988*]. The efforts still continue in this field of AIDS education.

1.8.2 Switzerland.

Collaboration between public and private organization and all-out condom promotion characterize the Swiss AIDS education campaigns. The Federal Office of Public Health and the private Swiss AIDS Foundation, an organisation started by homosexual men, worked with marketing professionals to design comprehensive programmes for the general public and for specific audiences [*Lehmann et al. 1987*]. The programme began in 1986 with brochures mailed to every household. Surveys showed high levels of knowledge about AIDS before the mailing and some increase afterwards [*Lehmann et al. 1987*]. As a result, the planners decided to focus simply and directly on prevention. In addition to condom promotion, other preventive messages were added for more specific audiences: "Stay faithful to one partner", was aimed at married couples; "One hit is all it takes", aimed at drug users; and "Safety for the two of you", aimed at homosexual men.

1.8.3 Uganda.

The infrastructure in many African countries is generally inadequate to meet the increasing demand for relatively specialised services needed to respond effectively to the

AIDS epidemic. Uganda is one of those in such a situation. Though gravely short of resources to deal with the epidemic, the government has an open and frank policy on the problem. In May 1987, Uganda was the first African country to have a well-developed national AIDS control programme [*Okware 1987*]. Uganda's National Committee for the Prevention of AIDS (**NCPA or ACP**). This committee is entrusted with the task of containing the spread of HIV in the country, and provision of care for people with AIDS. It has tackled the HIV problem mainly through health education. Its health education programme entails making use of all facilities to disseminate information and education about HIV, AIDS and its transmission and prevention. Ugandan television and radio broadcast messages urging people to "love carefully" and to avoid indiscriminate sexual relations. They have also used the slogan "zero grazing". This metaphor implies that people should not stray from their own pasture into another. Posters and leaflets are also widely used to convey similar messages. The AIDS control programme has in addition organised regular supplies of sterile needles, syringes and blood screening equipment to most of the country's hospitals [*Uganda MOH 1988*]. Uganda's adult literacy rate is 55 percent [*Uganda MOH 1989*]. For the rural communities with little access to radio or newspapers, and no access to television, the political

and administrative set up is used. Church groups also pass on information about HIV.

Although a high percentage of people in Uganda know about AIDS and have a good level of accurate information on how it is transmitted, misconceptions continue to exist about casual transmission. Results of a study carried out in two semi-rural communities in August 1987 [*Konde-Lule et al. 1989*], showed that 88 percent of the adult respondents knew that HIV could be sexually transmitted. However, there were many incorrect beliefs about HIV transmission, including belief in transmission by insect bites (37 percent) and witchcraft (22 percent).

A team set up by the World Health Organisation (WHO) to review the performance of the Uganda AIDS programme after its first year, said that "although the mass awareness campaign has been effective in Kampala (the capital city) and among the more educated members of the rural population, its effect has been limited at the district level. This is partly because not everyone has a radio and partly because of "language difficulties." [*Uganda MOH 1988*]. There is a real difficulty in giving enough information about the sexual transmission of HIV, in the local languages and avoiding use of what may be termed as obscene language. Therefore, there remains an enormous

need for factually correct, easily understandable information at all levels of society.

1.8.4 Zaire.

Zaire is one of those African countries that are seriously hit by the HIV/AIDS epidemics. In Zaire, as in many other countries, the government AIDS prevention campaign are based on education through the mass media [**Bertrand et al. 1989**]. In 1987, the government began concerted efforts to educate the public about AIDS. There were public service announcements on television and radio, talk shows featured leading physicians and public health officials, and songs about AIDS in French and Lingala, the major local languages, were recorded by well-known Zairian singers like Franco Luambo [**Bertrand et al. 1989**]. Comic books about AIDS were widely circulated in Kinshasa, the capital city. AIDS exhibits were displayed at local fairs. Newspapers ran full-page advertisements and stories about AIDS. The campaign has used several slogans: "Everybody can get AIDS but everyone can avoid it", "Everyone must take care of himself". However, as in many African countries, condoms have not been particularly promoted.

This mass media campaign helped spread information in Kinshasa. In a representative sample survey of over 6,000 people in Kinshasa in 1988, over 95 percent of men and over 80 percent of women had heard about AIDS on the radio. Over 90 percent of respondents knew how HIV was transmitted [*Bertrand et al. 1989*]. On the other hand, less than 20 percent of single men who reported multiple sexual partners, including prostitutes, said they had used condoms with their partners.

1.8.5 Mexico.

In order to have an idea of some of the many problems which have got to be overcome by AIDS education programmes, one can take a look at what happened in Mexico. The Mexican AIDS education programme began in 1987. The campaign involved television, radio, and newspaper advertisements, talk shows, pamphlets, posters, and a National Centre for AIDS information [*Bond 1989*]. From the start the campaign generated controversy. A conservative national parents' organisation publically condemned the National AIDS Programme (**CONASIDA**), contending that condom promotion would lead to promiscuity. Another parents' organisation responded by publishing a large article in the national press supporting **CONASIDA** and public AIDS education. This

controversy was so serious that over 1,500 articles were published in the national press within a year. Thus the result of the controversy ended in success for the CONASIDA [*Sepulveda et al. 1989*].

1.8.7 AIDS/HIV education can make a difference.

Such a problem outlines the difficulties that exist for AIDS education programmes. The main ones are:

- * Developing messages for diverse audiences;
- * Developing messages acceptable in the face of political, social, or religious opposition,
- * Cost.

Drawing firm conclusions from HIV/AIDS education programmes is difficult, because only a few countries have fully evaluated their programmes. Nonetheless, it can be said that most of the lessons learned in other health education programmes are proving true for AIDS as well. As far as the impact on knowledge goes, many people have been exposed to the correct knowledge about HIV and AIDS, and most know the correct information [*UKHEA 1988, Lehmann et al. 1987*]. However, as regards the impact on behaviour, more striking differences are reported among different countries, and among different populations and specific groups within those countries. Examples of these

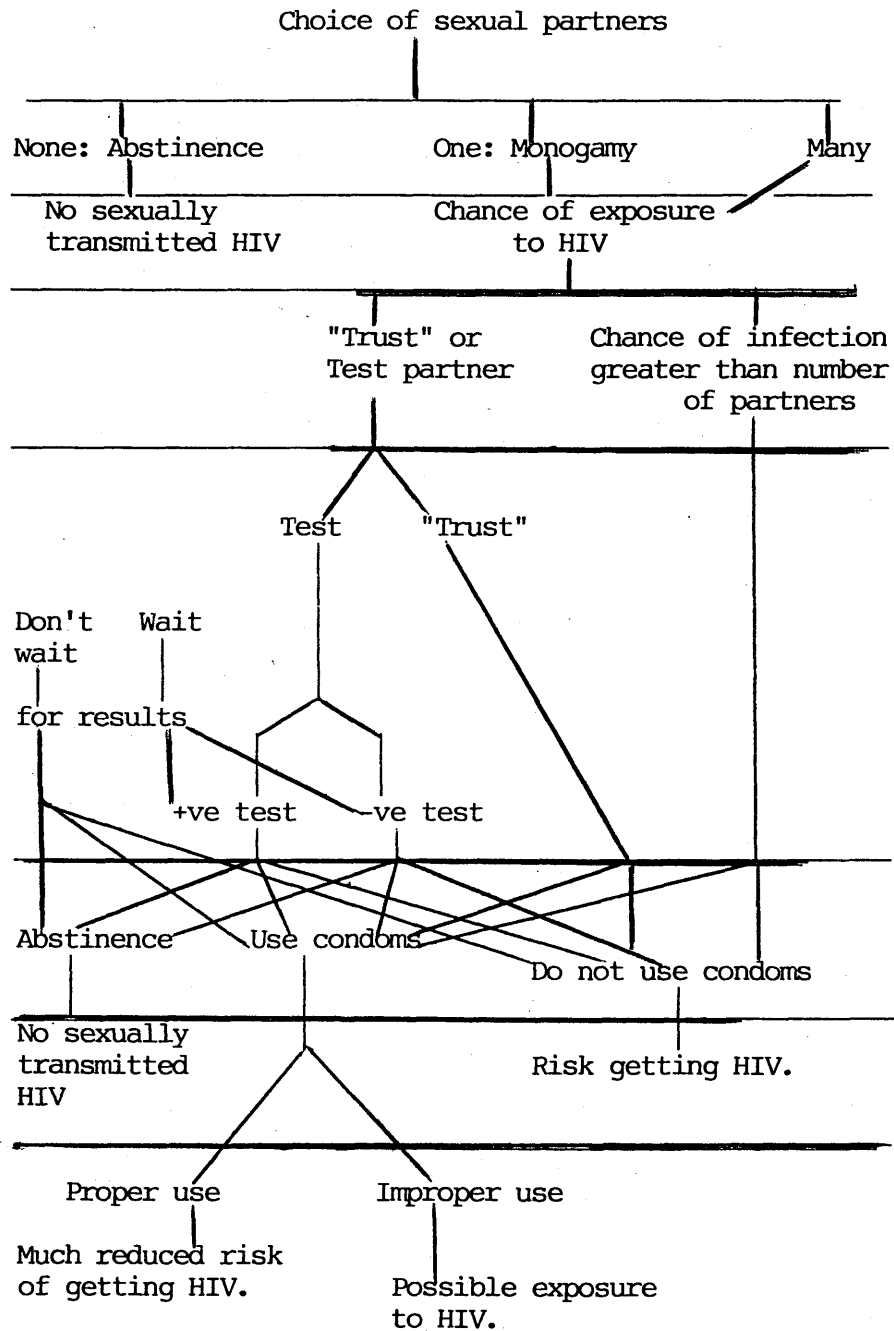
differences are many and some will be discussed within the next few pages.

The fact that changes in sexual behaviour have not followed knowledge is not surprising. Although there is some correlation between beliefs, attitudes and knowledge on one hand, and behaviour on the other, it is far from perfect. Information, it seems, is a necessary but not sufficient pre-requisite in the move from thought to action. Several reasons have been suggested to explain why sexual behaviour is notoriously difficult to modify [**Coxon and Carballo 1989**]. The fact that for the most part it takes place in private between two people, means that measures appropriate to public settings (involving monitoring and surveillance and applying social prohibition and legal sanctions) are inapplicable. As a result, attempts to legislate for sexual behaviour have in most cases failed. In many countries, including the United Kingdom, people have in recent times become used to the gradual removal of constraints on their sexual behaviour rather than the reverse. Reliable contraception relieved worries about unwanted pregnancy, and modern medical advances had largely controlled the old "venereal diseases", thereby removing some of the traditional constraints on free sexual expression. In addition, several countries have passed successive acts of

legislations liberating aspects of sexual behaviour. For example legalisation on homosexuality and abortion.

Sexual behaviour modification in general, and in connection with HIV in particular, involves several options and decisions to make. Some of the possible options are shown in the following diagram.

The web of possible sexually transmitted HIV decisions.



(Source: original diagram by author)

By looking at the previous diagram, one becomes aware that the individual person has to make complex choices in his or her approach to HIV, and perhaps lack of acknowledgement of this fact by those in charge of HIV education messages has led to less success.

Fortunately, evidence from research in connection with patterns of sexual behaviour in connection with HIV, do encourage optimism. One of the HIV "risk" groups whose behavioural responses in the light of the HIV epidemic have been studied extensively, is that of homosexual/bisexual men. Surveys of gay men in the United Kingdom such as those by Coxon [**Coxon 1988**], and Burton [**Burton et al. 1986**] for example, reveal reported reductions in number of sexual partners, decline in incidence of anal sex, and increased use of condoms. In order to assess the effects of the AIDS epidemic and of "safer sex" publicity on behaviour, a study [**Wellings 1988**], was carried out involving 326 gay men in pubs and clubs in Central London. This study revealed that of those interviewed, 95 percent had received information on safer sex and 77 percent said that AIDS had changed their sex lives. Although 53 percent of the men were continuing to engage in anal intercourse, 45 percent of these were using condoms. About 48 percent of respondents reported fewer sexual partners at the time than two years

previously. Of those who reported multiple sexual partners, 59 percent reported condom use. Similarly, Carne et al. [**Carne et al. 1978**]. documented changes in sexual behaviour among the first 100 members of a large cohort of homosexual/bisexual men originally recruited in late 1982 in London. Between 1984 and 1986, the median number of sexual partners per month declined from three to one; there was a 70 percent decline in the prevalence of anal intercourse with two or more partners in a typical month; and condom usage roughly doubled amongst those reporting receptive anal intercourse.

Like wise, in the United States, available evidence demonstrates that homosexual men have made significant modifications in their sexual behaviour in response to the threat of HIV. Research and Decisions Cooperation, surveyed a "probability" sample of gay men in San Fransisco in 1984, 1985 and 1986 [**RDC 1986**]. At each successive time, a farther decline was observed in the proportion of men engaging in risky practices. Similarly, the AIDS Behavioural Research Project who have been tracking trends in the sexual behaviour of gay men in San Fransisco since 1984 [**RDC 1986**], found that their respondents reported substantial modification in their sexual behaviour. Among the reported changes were: increased use of condoms during anal receptive

intercourse, and decreased monthly frequency of high risk sexual behaviour, for example anal unprotected receptive sex, oral-anal contact and swallowing of semen.

While these findings in the United Kingdom and the United States are based on self-reported behavioural change and therefore may be subject to recall error or purposeful misrepresentation, available data concerning rates of other sexually transmitted diseases also provide indirect evidence that widespread life-style changes have taken place within the gay community [*Schulz 1984, Carne et al. 1987*].

But, despite these encouraging findings, Weller et al.'s data [*Weller et al. 1984*] show that the changes began as early as 1983, long before the public education campaigns. There is a possibility that these changes in the gay population were prompted, not by public education, but by the visible, immediate and escalating nature of the problem as gay men started falling sick and dying. It is therefore possible that in this section of the population, behaviour changes may well have been triggered by fear. Though available evidence suggests that a curvilinear relationship exists between behaviour change and fear [*Janis and Mann 1977*], it is also true that increases in behaviour change will occur until the

stage of extreme panic is reached when it begins to plateau out and decline as people defensively avoid the evidence [Leventhal 1970]. Therefore, as the number of people dying from AIDS increases, it is probable that fear will also increase, leading to a stage of extreme panic where there will be no more noticeable behaviour change. This means that fear cannot be relied on to influence and sustain behaviour change. Indeed fear arousal as an agent for behaviour change has had little recorded success. Unfortunately though, one component of the United Kingdom government health education campaign on AIDS (phase 2) used targeted fear messages.

There are many examples of positive changes which may or may not have come about as a result of fear. According to surveys of randomly selected populations in Brazil [**Bond 1989**] and the Netherlands [**Ernest 1989**], 7 and 20 percent respectively, of the surveyed adult heterosexuals reported some changes in sexual behaviour: choosing fewer sexual partners, avoiding prostitutes, increasing condom use, or avoiding sex altogether. In countries with surveys before and after AIDS education campaigns, changes in specific behaviour have been reported. For example in Mexico, condom use was reported as follows:

	% users	
	1987	1988
University students	21	33
Health personnel	12	21
Female prostitutes	44	58
Homosexual men	27	43
Other sexually active adults	9	12

[Source: Sepulveda et al. 1989]

However, one must bear in mind that like all self-reported changes, it is not clear how accurate these results are.

Among the general population the United Kingdom, as far as knowledge of risk reduction goes, appears to have been successful. Several surveys show that people are well acquainted with the ways in which HIV is transmitted and how it can be avoided [*UKHEA 1988*]. For example, Kapila and Wellings [*Kapila and Wellings 1990*] in their evaluation of the United Kingdom AIDS public education campaign report an increase in condom use among the 18-24 year olds from 23 percent in December 1987 to 32 percent in December 1988.

Perhaps one of the most reliable and constantly updated data on AIDS-related behaviour, knowledge and attitude in the general population in the United Kingdom, is the Computer Assisted Telephone Interviewing (**CATI**) of adults aged 18-60, which has been in progress since July

1987. This is carried out by Professor McQueen and his colleagues at the Research Unit in Health and Behavioural Change at Edinburgh University. In their dataupdate of August 1989 [McQueen et al. 1989], a total of 12945 telephone interviews had been completed. About 16 percent of their respondents had changed something in their daily life due to what they knew about AIDS. Almost three-quarters of their respondents reported that they had a steady relationship. About 57 percent reported that they had had only one partner during the past five years. About 70 percent of the male respondents and over half of the female respondents reported condom use. Only about 9 percent of the respondents admitted doing something that would put them at risk of getting AIDS. Such findings are quite encouraging. Yet they are far from being satisfactory.

It seems therefore, in the long term, that motivating people to alter their sexual behaviour as opposed to simply giving it up will only be achieved by emphasising the benefits of the condom. This is as important as stressing the hazards of unsafe sex, if not more so. Therefore, with that in mind, it still remains true that raising awareness and persuading people of the seriousness of HIV, still has a very important place.

Once the information is given and awareness raised then behaviour change may gradually follow. The importance of this can be farther seen from the other indicators which suggest behaviour change or which may predispose one to behaviour change. These may include openly talking about HIV/AIDS and the condom. In one Zambian survey [**Chirwa and Phiri 1989**], 14 percent of adults had talked about sexual transmission of HIV with their spouses, and 11 percent with their children. Though this may be simple in Western society, discussions revolving around sex are taboo in African society. It is also encouraging to note that condom sales and or requests for condoms from donor agencies have increased world wide [**Boni 1989**].

Since the human immunodeficiency virus (HIV) is transmitted primarily through blood, seminal fluid, and female genital secretions, mainly through sexual intercourse, any barrier blocking exposure to these fluids should reduce HIV transmission. Now with the available evidence regarding all the possible HIV preventive measures, it seems that for the present and perhaps for the near future, the condom will play a very important role in the fight against HIV.

CHAPTER 2.

THE CONDOM

2.1 History of the condom.

Familiarity breeds, if not contempt, at least a lack of enthusiasm. Perhaps this has been the main disadvantage with the condom. The fact that the condom in one form or another has been around for centuries could be seen as proof of its value. However its history has been against rather than for its use in the eyes of potential users. As Free and Alexander [**Free and Alexander 1976**] put it "The condom is clearly not a symbol of our times."

Moreover an important beneficial effect of its use, namely protection against sexually transmitted diseases, which was in fact originally its primary function, has ironically been pointed to as a barrier to its acceptance through its association with disease, promiscuity and extra marital sex (**HIMES 1970**).

Even in the earliest recorded history, people sought ways to control fertility and prevent sexually transmitted diseases. The device used to help in both of these cases

was first mentioned in Egyptian papyri, and the subject has been investigated seriously. Crude sheaths of thin bark or woven leaves are common to many cultures [**Stokes 1980**]. Based on art from around 1350 BC, it is believed that upper-class Egyptian families had no more than two children. The same Egyptian art reveals that the men adorned their penises with decorative sheaths, though whether for fashion or contraception it is not known [**Potts 1982**].

No one knows who invented the condom. The first indisputable published material appeared in 1564. When the sheath was first described by the Italian anatomist Gabriello Fallopius (known for his study on the fallopian tubes that bear his name) [**Deys and Potts 1982**]. In this publication which appeared two years after his death, he wrote about a linen sheath moistened with lotion for protection against infections, particularly syphilis [**Potts 1982**]. The manner in which Fallopius's "small linen sheath" was to be applied - fitted over the glans but with the foreskin drawn over it, protection seems unlikely to have been guaranteed.

The origin of the word condom is unknown, although often mentioned story is that Dr. Condom a physician (French or English) to England's King Charles II, gave his name to

the penile cover he devised to curtail the number of the king's illegitimate children [**Himes 1970**]. There is also a possibility that the word may have been derived from the Latin word "condore" - which means to conceal, to protect or preserve [**Finch and Green 1963, Himes 1970**], or from a Persian word, kendu or kondu - a long vessel made from animal intestine used to store grain [**Bernales 1981**].

In colloquial speech these early condoms were called armour or machine. Even some influential people of those times like the writer Boswell recorded their own use of condoms by referring to them thus. For example in an article which first appeared in Boswell's London Journal of 1763 and reprinted in The Lancet in 1977 [**Barlow 1977**], Boswell in accounts of his adventures, states as follows: "At the bottom of the Haymarket I picked up a strong, jolly young damsel, and, taking her under the arm, I conducted her to Westminster Bridge, and then for the first time I did engage in armour (the condom), which I found but a dull satisfaction". By the 18th century, such writers as Casanova (1725 -1798) popularised the linen sheath and lambskin condoms. His memoirs indicate that condoms were used both for prophylaxis and contraception. "To put the fair sex under

shelter from all fear". He is also reputed to have tested them for holes by inflating them [**Himes 1970**].

During the 18th century condoms were manufactured and advertised in European cities, being usually made from sheep gut, but sometimes from fish intestine [**Free and Alexander 1976**]. Although supplied to ambassadors, foreigners and gentlemen, and captains of ships going abroad [**Himes 1970**], they were essentially used by rich men, and as Free and Alexander put it, these rich men cared less about what they would leave behind than what they might bring home to their wives [**Free and Alexander 1976**]. Smith [**Smith 1986**] reports that condoms were commonly used by young rich men pleasuring themselves among the diseased poor. In another report, reproduced by Barlow in the Guardian of March 25th 1987, an article by Martin Wright; entitled "Historic condoms proved fit for French King", Wright quotes a letter of 1749 from Colonel Joseph Yorke, a British diplomat in Paris in which he states that "Louis the XV to avoid bastards procured 300 or more of the machines (condoms), which were being made use of by the gallant, the prudent young gentlemen of his age. In London the chief suppliers were Mrs Philips, Mrs Perkins and Mrs Lewis, of whom Mrs Philips was the best known and widely recognised, not only in England but also in France [**Potts 1982**].

According to Dingwall [*Dingwall 1953*], in 1952 a locked box was discovered in a room, in a large English country mansion. The box contained a number of sheaths described as those of early type. They were in packets of eight, of three different sizes. The wrappers which were blue on the outside and white on the inside were apparently the ones in which they were originally delivered. They were made from an animal membrane, seamless, the edge of the open end being turned over and roughly stiched with cotton to form a hem through which a strip of silk was threaded. Their dimensions were: length 190mm, diameter 60mm, thickness 0.038mm (as compared with the thickness of a modern thin rubber sheath of 0.075 mm). These early condoms were found to be permeable to water and to a solution of salt and water. There is a possibility that there was some deterioration in their quality with the passage of time, given the conditions under which they had been stored. It is reported further that the condition of the wrappers of the condoms indicated that they were probably made before 1800, and that, with other features in the case suggested that the date of the condom manufacture was between 1790 and 1810. Another discovery of these early condoms specimens was made in 1986 at Dundley castle in a civil war deposit, where a bundle of the five condoms were discovered. These condoms

were made of fish or animal intestine and had been used by the occupants who surrendered the castle in 1646 [Ratkai 1986].

Medical views of the early condoms were strongly influenced by the use to which they could be put as preventive measures against venereal diseases. However, in its early days, like today there was opposition to the condom. Tunner [in *Dingwall 1953*] regarded the suggestion of using the condom as a method of preventing venereal diseases, as being immoral and which ought not be allowed in Christian countries like England. He went on to say that to advise mankind to use machinery and to fight in armour was merely to propagate wickedness. Others like Bourru [*Gardner 1974*] stated that condoms were subject to tears, and had many pores and therefore were of little use as a prevention of diseases and were invented only for the purpose of allowing people to engage in indiscriminate sex.

2.2 The modern condom: a quality product.

(i) Manufacture:

Today a few condoms are still made from animal membranes. World-wide only about 1 percent of condoms are made of skin but in the United States they account for around 2-4 percent [Duncan 1979]. These condoms, often called "skins" are produced from an intestinal membrane of sheep caecum, which has an average thickness of about 0.06mm [Free and Alexander]. In 1980, the last year London Rubber Cooperation Products Limited (LRC) marketed skin condoms, three skin condoms (Fourex) had a recommended retail price of 4.50 pounds as compared to latex condoms (Fetherlite) product at 49pence [Centers for Communication Programmes 1974].

At present, more than 95 percent of all the available condoms world wide, are made from latex rubber [Centers for Communication Programmes 1974]. The history of the latex condom is very much bound to the history of rubber itself. The rubber tree first identified in the 18th century as *Havea brasiliensis*, grew wild in South America, and by the end of the 18th century several tons of wild rubber were being used commercially, mainly for erasers [McHale 1965]. The first major technical

improvement was in the invention by Thomas Hancock in 1820 of the masticator, a machine which ground tough rubber into a soft mass [**Tannahill 1980**]. In 1839, Charles Goodyear developed a process called vulcanisation. This involved the addition of sulphur and other chemicals to raw rubber to make it stable [**Tannahill 1980**]. The earliest latex condoms were made in the 1870s. They were made from a latex processing method developed by Hancock and Goodyear [**Peel and Potts 1969**].

(ii) Liquid Latex Concentrate Condoms.

During the 1930s, the rubber industry and condom manufacture was again revolutionised by the plantation production of concentrated liquid natural rubber latex [**Peel and Potts 1969**]. This substance is the basic ingredient of modern condoms. Today the manufacturing process is highly automated and the manufacturing process differs somewhat from plant to plant. Japan, Great Britain and the United States are the major producers, although other countries like West Germany, Korea, China, India also produces substantial amounts [**Sherris et al. 1982**]. Few developing countries would have the market potential to justify purely local production.

In order to meet the psychological as well as the physiological needs of the potential buyer, a wide choice of styles is made available [**Sherris et al. 1982**].

Condoms may be:

- * opaque
- * transparent
- * coloured
- * plain ended
- * reservoir-ended
- * rippled or pagoda-shaped
- * strictured or contoured
- * flocked, with a rough rubber surface
- * dry (powdered)
- * lubricated
- * treated with spermicides.

Not all varieties are available in every country. Rubber condoms are also produced in various sizes. The limited data available show differences in average penile size between world regions as well as a wide range among men from the same region. In separate studies, the median erect penis length of Thai men was between 126 and 150 mm; of United States men, between 151 and 171mm. The median erect penis circumference of Thai men was between 101 and 112mm; of United States men, between 113 and 137mm [**Sherris et al. 1982**].

Having condoms of various sizes is very important. For example, when the United States started sending condoms to Asian countries, they were of the same size as those sold in the United States. It soon became apparent that they were too large for many Asian men. In Thailand the oversized condoms became a much publicised joke, with reports of men having to use strings to tie the condoms around their waists [**Davies 1974**]. Most large, international manufacturers now produce at least two basic sizes of condoms; one about 160 mm in length and 49 mm in flat width (1/2 circumference), officially called class II, and the other about 180 mm in length and 52 mm in flat width, officially called class 1 [**Quinn JJ 1979**]. For extra sensitivity, condoms are being made smaller in unstretched circumference than the median erect penis. With the appearance of HIV, condom use has been highly popularised among the homosexual men and as a result of this, strong condoms known as heavy duty which are able to withstand the forces involved in anal sexual intercourse are manufactured [**Gotzsche and Hording 1988**].

The most recent advance in condom manufacture is the making of a female condom [**Leeper et al. 1989, Drew et al. 1989**]. This condom is known as **WPC-333** (WPC = Wisconsin Pharmaceutic Company). It consists of a soft,

loose- fitting polyurethane sheath and two diaphragm-like flexible polyurethane rings. It has been shown that WPC-333 provides an important alternative to the latex male condom for reducing the risk of contracting STDs including HIV. In order to evaluate whether the design and materials used in the new female condom WPC-333 are safe and create an effective barrier as compared to the male condom, two separate clinical studies were completed. In one study 108 couples used 521 WPC-333 female condom devices and 516 latex condom devices. In the second separate study, 49 couples used 147 WPC-333 devices and 147 male condoms. The conclusions drawn from the results were that: WPS-333 had significantly fewer leaks than the male condom $p < 0.001$. and that the WPC-333 provides a better alternative to male condoms in reducing the risk of contracting STDs. Though these findings may suggest that WPC-333 is perhaps a better alternative than the traditional condom, one can not draw firm conclusions from the only two available studies. In fact it is still too early for anybody to think that WPC-333 will replace the traditional condom within the near future.

2.3 Quality Control

All major condom producing countries and a number of importing countries have national standards for condom quality [Riley 1984]. These standards generally require:

- * visual inspection for packaging defects,
- * measurement of length, width, thickness, and/or mass,
- * a test for holes,
- * a test of strength.

The specific tests required, the number of condoms to be tested and the percentage that must pass the tests vary from country to country. While standards differ somewhat, condoms made by the major manufacturers are of high quality and meet all national standards. Defects that could cause failure are extremely rare.

In the United Kingdom, the British Standards Institution (BSI) had the 1979 BS 3704 specification for rubber condoms [Monopolies and Mergers Commission 1982]. However, in 1987 in view of the urgency of perceived need for heavier duty grade of condoms, approved an amendment to the BS 3704 [Anon. 1987]. The amendment stated that condoms should be graded as either X (maximum double wall thickness 0.160 mm) or Y (minimum double wall thickness 0.165 mm) and that as well as being tested for holes and

tensile properties, condoms should also have their bursting volume and pressure tested on a special type of apparatus. This amendment followed a failure to reach the required standards and subsequent withdrawal of a type of condoms [Anon. 1987].

The various standards; Eg the International Standards Organisation (ISO), the British Standards, and others the world over start from a model of 1960 which was based on the technology available at that time [Anon 1987]. The primary requirement of security was evaluated by tests of mechanical resistance to breakage tested with constant deformation and for detection of such defects as leaks [Kish et al. 1983, Minuk et al. 1987]. The appearance of HIV led to the development of new methods which are thought to be more representative of the actual forces involved while the condom is being used. Among these are the Simulated Physiological test of Latex Condoms [Rietmeijer et al. 1988, Herman et al. 1989]. In this test, HIV is simulated by uniform polystyrene, fluorescent microspheres with a mean diameter of 0.11 nanometers. These microspheres are suspended in physiological phosphate buffered saline with surfactant. In one such test, of the 69 condoms tested from two manufacturers microphages leaked from six condoms. The leak rates correspond to hole diameters in the range 4

nanometers to 7 nanometers and the conclusion reached was that this test is sufficiently sensitive to reject those condoms that could not provide an effective barrier to HIV-size microspheres under physiological conditions.

Another modern test is that known as the Rheological Quality Test System or RQTS in short [*Torres et al. 1989(a), Torres et al. 1989(b)*]. This test is intended to evaluate both the condoms security and sensitivity at the same time. The evaluation of security is made with Rheological Test, using impacts caused by shock waves with water (non-constant deformation). The detection of leaks is carried out by means of a conductimetric method. The sensitivity is evaluated by comparing the condom being tested with the standard model. The testing plan has been claimed to be highly rigorous. The conclusions so far are that the RQTS standard may help to increase the reliability of the condom by bringing the testing methods closer to the real use by the consumer. These modern methods sound good, and if properly carried out and widely used probably could increase condom safety and use. However, the costs may be considerable making such tested condoms very expensive and unaffordable by many of the would be users.

2.4 Condom effectiveness.

Generally condom effectiveness can be classified as: 1. Material effectiveness: measures the effectiveness of the condom itself as a physical barrier, able to withstand the physical forces of sexual intercourse [*Free et al. 1980, Free et al. 1986*].

2. Use-effectiveness (or clinical effectiveness): This takes account of all periods of use, various irregularities of practice, and lack of ability or motivation to use the condom [*Wigersma and Oud 1987, Richwald 1988*].

In actual practice, condom effectiveness may depend on both. Traditionally, condom effectiveness has been measured in relation to its role as a contraceptive. For example, in his studies on the contraceptive efficacy of condoms, Miller [*Miller 1987*] gives the following figures based on use by couples for one year, for the typical effectiveness of condoms used for contraception, that is the condom ability to prevent pregnancy for every 100 couple-years of use, for couples who use condoms consistently: condom (good brand) plus spermicide, 95 percent; condom alone (good brand), 90 percent; condom alone (cheap brand), 70 percent.

There are various reasons which have been suggested why condoms are not 100 percent effective: Condoms can break [Gotzsche 1988], condoms can age , they can be damaged in their packages [Free et al. 1986] or even, as Kaplan suggests, secretions can get around and over a condom even if it does not break [Kaplan 1987]. The results of the above can range from leakages to total spillage of all the contents. Condoms have also been reported to fall off [Fiumara 1972], or even get pulled off during sexual intercourse [Wigersma and Oud 1987]. Sometimes the users do not pay enough attention, put them on or take them off improperly, can not read the directions [Richwald et al. 1988], or even fall asleep during sexual intercourse [Fiumara 1972]. The effects of alcohol, prescriptions and over the counter drugs, illegal drugs or even exhaustion, some of which may coincide with sexual intercourse may contribute to condom failure.

In the United Kingdom, results from Family Planning studies, show that the condom offers 97 percent effectiveness [Vassey et al. 1982]. Under the present quality control and national standards, rupture or tearing are even less frequent [Potts and McDevitt 1975]. Accidental pregnancy rates for older consistent condom users are low [Anon 1987]. Both pregnancy and discontinuation rates are higher for younger users

possibly because young couples, have intercourse more often, use condoms less consistently, and often switch to other methods [**Trussell et al. 1981**]. Combined results of British studies show rates of pregnancy resulting from broken condoms of 1.4/100 couple-years of use [**Vassey et al. 1982**]. In other selected populations in Britain, rates of 0.4 and 0.83 pregnancies per 100 couple years of use have been reported by couples who use condoms consistently [**Bone 1978**]. The lowest pregnancy rates were found among high parity couples with at least one live birth in the last 12 months. As age parity, socioeconomic status, and motivation increase, the failure rate with the condom decreases [**Laing et al. 1976**].

It is quite possible that as most of the studies carried out on condom effectiveness before the HIV epidemic were sponsored by condom manufacturers, much of the responsibility for condom failure was placed on "user failure" rather than "product failure", although without proof. Where such "proofs" are offered, they may be statistically flawed. For example, in one study which has found its way into medical literature [**Hart 1974**], condom usage completely prevented venereal disease in 55 soldiers. The study was based on about 170 exposures to prostitutes of unknown frequency of infection. The authors concluded that condom failure was very rare.

However, at a condom defect rate of, say, 0.4 percent, less than one condom failure would be expected in such a small sample. Consequently, the study was too small to exclude a significant rate of condom failure. While incorrect and inconsistent usage is an important factor, Jones et al. [**Jones et al. 1985**] speculate that the reason for using the condom may have a greater effect on the efficiency with which one uses the condom, than other variables such as religion, education, etc. For example, somebody who uses a condom to prevent a sexually transmitted disease may be more likely to use it more consistently than one who uses it to prevent pregnancy. Schirm et al. [**Schirm et al. 1982**] using multivariate life-table techniques with linear modelling tried to show which factors affect the efficiency with which people use the condom. These were age, race, religion, education and social class. Despite the arguments put forward in connection with various variables which may influence condom use, in discussing condom use as an HIV control measure, it is useful to refer to Duller and Hembree [**Duller and Hembree1987**]. They describe two different ways in which men and women can be involved in using condoms. They distinguish between the person who initiates the idea (male or female initiated) and the person whose action is necessary for compliance in order to have successful use of the condom. (male or female

compliance). Though it is generally assumed that for the successful use of the condom, male initiation or compliance play an important role, the reverse situation also applies. As Lampart [**Lampart 1986**] points out, female compliance in men's use of the condom is very important. She reports that ghetto girls in Jamaica do not like men using the condom. This is expressed as "Me no want man use 'boots' (here boots refers to the chemists who sell condoms) pon me! man fi come to me ital" and as a result of this there is very little condom use among the sexual partners of these ghetto girls.

Indeed it has been observed that the currently high use of condoms among female prostitutes depends on the females initiation and compliance [**Thomas and Plant 1990**]. In the United States one-third of condoms are sold to women [**Sherris et al. 1982**], and in Japan they are also mainly sold to women frequently by teams of door-to-door sales women selling the 'love box' [**Nishuichi 1986**].

Condom effectiveness, mechanical plus improper use, may be farther reflected in the role it plays in the control of sexually transmitted diseases including the Human Immunodeficiency Virus.

2.5 Condom protection against sexually transmitted diseases (STDs).

It is certainly not correct to apply the rates of condom failure when used to avoid pregnancy to their possible effectiveness for avoiding exposure to sexually transmitted diseases. The reasons for this are: 1) a recent WHO study [**Bonnar 1983**] indicates that for the whole population, fertilization can take place during only 9.6 days during every menstrual cycle with peak probabilities of pregnancy occurring over 6 days. 2) the possibility that the reduced numbers of sperm escaping through the condom, in case of condom tearing, may be insufficient for fertilization to occur; 3) an individual woman or couple may be less fertile than the general population. Thus, a condom failure or mistake in use occurring when the condom is used as a contraceptive would not show up in pregnancy statistics. Such a failure could, however, lead to STDs and HIV exposure, if one of the partners were infected. Of course exposure to STDs is not equivalent to infection with STDs. In the case of HIV, the latter depends on such factors as the number of viruses transmitted, their viability, and the kind and state of tissue onto which they are deposited [**Peterman and Curran 1986**]. It is possible that these factors compound to give a low probability of infection once

exposure has occurred. If infectivity could be shown to be very low, the concern about occasional condom failure would be less, and the success rates would probably be comparable with those seen when the condom is used as a contraceptive.

However, there is no doubt that, properly used, condoms provide considerable protection against sexually transmitted diseases, including sexually transmitted Human Immunodeficiency Virus. The evidence comes from both past and recent studies. The epidemiological evidence (in vivo) and laboratory evidence (in vitro) is abundant, although the epidemiological evidence is less impressive.

(i) Condom in Vitro.

Quite a lot of work has been carried out in various laboratories to assess the condom's protectiveness both as a contraceptive and against sexually transmitted diseases. By comparison the latex

Condom wall	is	38,000 nm. thick
Water molecule	is	20 nm. thick
HIV	is	100 nm. thick
Herpes virus	is	300 nm. thick
A sperm	is	45,000 nm. thick

A spirochete is 6,000 nm. thick
[*Gordon 1989*].

More efforts have been put into this research since HIV appeared. These tests have ranged from physical inspection to physiological simulations. For example, scanning electron microscopy of stretched latex condoms has documented surface irregularities but no pores which could allow the passage of particles the size of HIV [*Kish et al. 1983, Minuk et al. 1987*]. In a series of tests, latex condoms were filled with fluid containing a concentration of HIV 5,000 times greater than found in semen. These condoms were subjected to high pressure and left in a beaker of fluid for three weeks. None of the virus leaked through the condom into the surrounding fluid [*Conant et al. 1986*]. In vitro tests have been designed to mimic the trauma of intercourse. In one such experiment, the condoms were found to prevent the passage of herpes simplex virus, cytomegalovirus and HIV [*Van de Perre et al. 1987*]. In another study an attempt was made to simulate the stress coital movements exert on a condom. A condom containing Herpes virus was placed around the plunger of a syringe. Nutrient broth was then sucked in and out of the syringe 50 times. No virus was found in the broth [*Conant et al. 1984*].

Because skin condoms are animal membrane, they may transmit the HIV and are not recommended for protection against sexually transmitted diseases. [**Goldsmith 1987**]. Most recently, Lytle et al. carried out an experiment using natural membrane condoms to find out their effectiveness [**Lytle 1989**]. A mixture of two viruses, a bacteriophage, and the human pathogen, herpes simplex virus, were poured into condoms made from processed sheep caecum and suspended in beakers containing buffered solutions. The viruses were also in buffered solution. Aliquots from the beakers were analysed for leakage from the condoms. The conclusion they reached was that both large and small viruses can leak from natural membrane condoms.

(ii) Condom in Vivo.

Several studies among both men and women have shown a protective effect of condoms against bacterial STDs including gonorrhoea, mycoplasma, and pelvic inflammatory disease. One of the first published studies in connection with the condom and sexually transmitted disease, was in 1970 and involved 700 French men infected with gonorrhoea and trichomoniasis [**Sherris et al. 1982**]. This study revealed that of the 700 men, 302 claimed to have used condoms consistently with their regular partners but

paradoxically not with the casual sex partners (strangely, they feared infecting their regular partners, but did not fear getting infected themselves). Only one percent of their regular sex partners contracted gonorrhoea and only two percent contracted trichomoniasis. Among the regular partners of the 408 men who did not use condoms, 97 percent contracted gonorrhoea and 33 percent contracted trichomoniasis. In a retrospective study of 246 sexually active Australian soldiers who served in Vietnam, none of the 70 who said they always used condoms contracted a sexually transmitted disease. Of the 176 who did not use condoms 35 percent contracted a sexually transmitted disease [**Hart 1975**].

In the United States a study of 191 sexually active college students found that 43 percent of the men who did not use condoms were infected with ureaplasma urealyticum (T-mycoplasma), compared with 14 percent who said that they almost always used condoms [**McCormack 1984**]. These findings in favour of the condom are impressive enough, although more weight would have been added to them had the number of sexual partners, the frequency of sexual intercourse and their partners infection rates, been inquired into, and included in the results. Another United States study [**Kreiss et al. 1985**] followed twenty

four uninfected sexual partners of AIDS patients for twelve to thirty six months (median 24 months). Among ten couples who routinely used condoms, only one partner became infected with HIV. In the fourteen couples who did not use condoms, twelve partners became infected. In that study no seronegative person who abstained from sex with an HIV seropositive partner ever seroconverted. These findings however good they may appear, must be treated with caution, so that the lack of seroconversion among the couples who routinely used the condom, should not be solely attributed to the condom: the factors which influence HIV transmission from one infected partner to the other are many and varied. Peterman and Curran, who report 12 heterosexual transmissions in 485 exposures or a rate of 2.5 percent [*Peterman and Curran 1986*], believe that "HIV is probably less easily sexually transmitted than hepatitis B, which occurs in 20-27 percent of steady heterosexual partners with acute hepatitis B". They further argue: "Since HIV infection is transmitted to only about 10 to 50 percent of steady heterosexual partners [*Harris et al 1983, Redfield et al. 1985*], the likelihood of transmission to a partner with a single exposure must be quite low, probably less than 1 percent per contact". Luzi et al. [*Luzi et al. 1985*], and Selwyn [*Selwyn 1986*] suggest partner infections at 10 to 70 percent. In a study by Fisch et al. [*Fisch et al. 1987*],

study, 24 couples did not choose abstention from sexual intercourse after the index patient was diagnosed as seropositive. Of these, 14 did not use condoms, but went on having sexual intercourse for a total of 180 months before 12 of the spouses became infected. This is about 15 months on the average, or roughly 12 months to infection, allowing 3 months for development of measurable seropositivity. This study provides insufficient detail to show the complexity of sexual transmission of HIV with or without the condom. Among those factors which appear to influence HIV transmission from the infected partner is the stage of infection, be it clinical or immunological that he or she has reached [Quinn 1984, Vall et al. 1985] but this is not mentioned in their study. Nor is frequency of exposure, or the route, that is anal sexual intercourse as compared to vaginal intercourse, though there is good evidence that anal intercourse puts the partners at slightly greater risk than vaginal intercourse [Goedert 1986]. However, with all those shortcomings, plus the fact that very small numbers were included in the study, the study findings show some evidence of condom prophylaxis.

Prostitutes have been cited as a potential source of HIV directly to their clients and indirectly through these clients into the general population [Tirelli et al. 1985,

Barton et al. 1985, Schultz et al. 1986]. It is not surprising therefore that a number of studies have focused on condom use among prostitutes, and their HIV seroprevalence. In one study [**Krogsgaard et al. 1988**], 101 non drug using Danish prostitutes were interviewed and examined serologically for HIV. None was seropositive for HIV. These women reported that 68 percent of their episodes of vaginal intercourse involved condom use, with no anal episode without a condom. The low prevalence of HIV in this group was partly explained by the extent of condom use. In another study [**Smith and Smith 1986**], 399 licensed prostitutes in Nuremberg, West Germany were interviewed and examined serologically for HIV. Again none of them was seropositive and condom use was widespread, with over 97 percent reporting condom use during vaginal intercourse, Only 56 percent of the prostitutes reporting anal sex used condoms. The findings of both of these studies attribute the lack of seroconversion to condom use. Although this could possibly be true, it is also possible that the HIV prevalence rates among the prostitutes' clients were low, making transmission to the prostitute an unlikely event. In the case of the Danish prostitutes 32 percent of their episodes of vaginal intercourse were unprotected as were almost a half (44%) of the Nuremberg prostitutes episodes of anal sex. The United States Centres for Disease

Control HIV prevalence study of United States prostitutes found [*USCDC 1987*] that of 835 women tested 98 (11.7 percent) were HIV positive. It was reported that almost all of the 98 reported unprotected vaginal intercourse. None of the 22 prostitutes, (2.6% of the sample) who used condoms for every episode of vaginal intercourse was seropositive. The main weakness of this United States study is that the sample was made up of prostitutes from different areas of the United States, with varying prevalences of HIV, and it also included prostitutes who injected drugs and those who did not. These factors are not separately analysed.

Kamps et al. [*Kamps et al. 1989*] looked at the role of condom use in the control of heterosexual transmission of HIV among spouses of patients of the Bonn haemophiliac cohort study. They found that of the 150 HIV seronegative female partners of HIV seropositive haemophiliacs who were recruited to the study, six couples were lost to follow-up, seven stopped having sex, and 137 couples regularly used the condom. All the females tested negative at 6 and 12 months of the study.

One of the very few studies to come out of Africa looking at the condom's protection in the sexual spread of HIV, was carried out in 1985. About 380 female

prostitutes were involved in a study of sexual practices and HIV seroprevalence in Kinshasa, Zaire [*Mann et al. 1987*]. About 380 prostitutes responded to a questionnaire. 88 (23 percent) reported that at least one of their sexual partners during the previous year had used a condom. Of these 88, 85 categorised their partners' use of the condom. These 85's HIV serological findings were as follows, where HIV seropositivity is related to partner's category of condom use:

% of partners using condom	Partners using condoms	HIV seropositivity
Less than 25%	35%	(19 of 55)
26-49%	" "	" 32% (7 of 22)
50-74%	" "	" 0% (0 of 2)
75%	" "	" 0% (0 of 6)

The authors concluded that there was a significant difference in seropositivity among the eight women reporting condom use by 50 percent or more of their partners as compared with women reporting less frequent use 26 of 77 (34 percent). They also added that the two groups (0-49% and 50% or more) were similar with regard to other risk factors for HIV. By looking at the trend of change from 35 percent to 0 percent, one gets the impression that condom use was highly protective against HIV. However, even without considering the other factors

which may have influenced the results, for example the HIV status of the prostitutes clients, ^{the} small numbers in the groups reporting condom use with more than half of their clients make the differences not to be statistically significant. This means that no meaningful conclusions can be drawn from these findings.

2.6 Condoms and spermicides.

Spermicidally lubricated condoms may be more effective than plain condoms in preventing HIV transmission. It has been demonstrated that condom effects can be enhanced by the addition of spermicides. For example, in laboratory tests, nonoxynol-9, the spermicide most commonly used on condoms, was found to inactivate HIV. [**Feldblum and Fortney 1988**].

In vivo studies involving condoms and spermicides have also reported similar findings; that the treatment of condoms with spermicides can enhance their protective effect against a wide range of microorganisms including HIV. Among the studies so far carried out to determine the efficacy of condoms and spermicides in preventing HIV infection, is that carried out by Hira et al. [**Hira et al. 1989**]. They studied seronegative regular sexual partners of 47 male and 24 female HIV seropositive persons. After 3 months of constant spermicide and condom

use, no sero-conversion was detected. Of course this is a very short study and involving very small numbers and as such, one can not conclude from this study alone that spermicides offer any additional protection. Probably if they had used a control of couples who used condoms but without spermicides, the results would have been more credible. Unfortunately there are not many epidemiological studies in this field.

2.7 Condom lubricants.

Many condom users, especially the homosexuals, use various kinds of lubricants with the condom. Unfortunately some of these lubricants may damage the condoms. In an evaluation of the effects of various lubricants on latex condoms, Pugh and Englert [**Pugh and Englert 1989**] found that certain types of lubricants applied to latex condoms can cause sufficient deterioration to warrant concern about failure during use. They concluded that some personal lubricants sold in sex shops and other household items such as petroleum jelly, or vegetable oil, have a significant deleterious effect on the strength of condoms. This deterioration is severe enough and occurs rapidly enough that their addition to latex condoms as adjunct lubricants is likely to cause the product to fail during use. Only water based

or silicone based lubricants or those recommended by the condom manufacturer should be used. Similarly Voeller et al. [**Voellet et al. 1989**] looked at the use of lubricants among several hundred males who claimed to have had condom breakages. About 1/3 had vaginal intercourse and more that 75 percent knew very well how to use the condom properly. The only shortcoming they found was the type of lubricant they use. They also found that mineral oil lubricants can damage condoms and that the rapidity of the effect of these commonly used lubricants upon condoms is far greater than generally appreciated and may be the source of many condom failures during sexual intercourse.

Despite the imperfections of the foregoing studies, the overall conclusion is that individuals who claim to use condoms consistently are protected against most STDs, including HIV, to some extent. Widespread use is then likely to slow the rise in STD and HIV rates.

2.8 Promotion and advertising.

It is true that for condoms, like any other product, highly visible advertising and promotion campaigns nearly always increase sales. The problems associated with the condoms' poor image have been around for a very long time. Its history, associating it with disease and

prostitution has acted as the basis of its poor image [Himes 1970]. Another major problem associated with condom acceptability is that its application is directly related to the sex act. Use of the condom involves planning for intercourse, or interruption of love-making. Also the condom requires an erect penis before it can be properly applied. This direct association with sexual intercourse inhibits discussion of the condom in the media, by individuals in private conversations, and even by professionals.

Different countries have taken different steps in the promotion of condoms. Examples can be cited to illustrate the different methods used and the problems encountered.

(a) Developed countries.

(i) United Kingdom.

In the United Kingdom, condoms are promoted either through public education campaigns run by government sponsored agencies, or through advertising by their manufacturers. Both provision and promotion were relatively restrained until the recent outbreak of HIV and AIDS.

The Advertising Standards Authority (**ASA**), which covers all media except broadcasting, issues the British Code of Advertising Practice under which advertisements of contraceptive methods either in general or in particular allowed, provided they do not contain materials or visual presentation offensive to the standard of decency prevailing among those who are likely to be exposed to them. Here the standard at question is left to the discretion of the Advertising Practice Committee [**Bostock and Leather 1982**]. This means that in practice newspapers and magazines are able to accept or reject advertisements as they wish. At present, condom advertisers get around this problem by advertising it as a preventative health measure. As such, the condom now has a high profile in the media and other advertising routes and any possible embarrassment or offence caused have become less likely.

In the United Kingdom, extensive public information campaigning has increased the awareness of the general public and has effectively conveyed the messages about the dangers of promiscuity and the protective quality of the condom [**UKHEA 1988**]. In the United Kingdom, although from the start the condom was better promoted than in many other countries, the road to its success was not entirely smooth. The main obstacle paradoxically enough was from some members of the medical profession. Even as

late as the 1970s, there was still much opposition to the condom from many medical workers including some general practitioners. For example in a letter published in the British Medical Journal in 1973, a general practitioner in reply to the government's request that the General Practitioners should start giving out condoms, wrote that "It is surely the last straw if the government intends to insult us by filling our surgeries with lots of louts queueing up for the issue of condoms" [**Cantor 1973**]. Until recently the pill accounted for almost 90 percent of the contraceptives prescribed by general practitioners compared with only around 50 percent of those by the Family Planning clinics [**Pauncefort 1982**]. Even general practitioners who by the late 1970s wished to prescribe the condoms could not do so since they had all collectively decided not to in 1974 [**Brennan and Opit 1974**]. Richards suggested that the general practitioners who did not like to prescribe condoms were the same ones who found discussions revolving around erect penises a little unsavoury [**Richards 1973**].

Even as late 1984 some health workers were still saying that if men want condoms they should pay for them. The National Health Service should have to pay for health not pleasure [**Rowlands 1985**]. Despite a Department of Health and Social Security (DHSS) Memorandum of Guidance to the

contrary, this view was still frequently reflected by some Health Authorities and some Family Planning clinic staff [**DHSS 1970**]. In a clinics for women survey conducted in the United Kingdom in 1981 by the Birth Control Trust [**Chambers 1984**], the community physician for each district was asked to issue each Family Planning clinic in his area with a questionnaire on male attendance and condom provision. Completed questionnaires revealed a good deal of discrimination against men and against condoms in at least a half the districts. Some clinics refused to see men. some of the reasons given for refusal were: large numbers of men would turn up at clinics and this might intimidate women clients; the National Health Service would be caused unnecessary expenses; stock control impossible; and highly trained staff would be wasted [**Chambers 1984**]. Twenty districts did not provide free condoms to men. Forty of the other 150 districts surveyed would supply very small numbers of condoms, ranging from three to twenty-four per month. One reason for giving limited supplies was to prevent men obtaining them for resale. According to Howard and Whittaker [**Howard and Whittaker 1981**], a former medical student who bravely conducted a survey by presenting himself personally at twelve clinics and requesting condoms, was often asked to pay even though he was prepared to register.

Until the last two or three years when the condom has become the frontline as a means of HIV control, the situation regarding free condom supply was not straightforward, because although the Family Planning association was seeking to encourage more male involvement, and the **DHSS** guide-lines were that all clinic supplies were to be free, the government did not seem to welcome the idea of covering the costs of all condoms used in the country [**Cardy 1984**]. In fact despite the "Men too" campaign, discrimination against the condom if anything was becoming more pronounced [**Cardy 1984**].

According to a letter to a Guardian newspaper [**Lanyon 1985**], for example, the East Suffolk Health Authority had discontinued supplies of free condoms to save money. A report by the Monopolies and Mergers Commission [**DHSS 1970**], stated that: "One of the problems would appear to be that health authorities are paying more for their condoms than they need to". This was because most health authorities do not order in large enough quantities to enable them to buy at London Rubber Company (**LRC**)'s best discount terms.

However, during the last two or three years, both the government and the GPs approach to condom distribution

has changed to a very great extent. The government in September 1989 recommended that in order to fight the spread of HIV, family doctors (**GPs**) were to start supplying condoms and exchange needles [**DHSS 1988**].

(ii) Sweden.

In Sweden, success was the result of information backed up by desensitisation, so that the purchase and use of the condom was made less dramatic and less shameful. Swedish laws restricting distribution were changed in 1970 [**Ajax 1984**]. The initial campaign to encourage condom use especially among young people was started in 1970. As a result condom use rose by 40 percent over the two years 1970-72 [**Ajax 1984**].

Following the increase in condom use, there were striking decreases in the frequency of sexually transmitted diseases and hepatitis B in men between 1982 and 1987. The most striking decrease was in the incidence of gonorrhoea which fell by 20 percent despite its being constantly on the increase over the previous years [**Anon 1989**]. The Swedish campaign run by **RFSV**, the Swedish Association for Sex Education, a private body, used a humorous, frank and direct approach. They used some advertisements like: "Tonight 107 Swedes will get

gonorrhoea - the condom is the one way to protect against gonorrhoea". Since HIV appeared on the scene, the Swedish have exploited their traditionally liberal approach to sexual matters. All young people between 18 and 24 were sent a comic book about AIDS and condoms by the **RFSV**. The lead in condom promotion and distribution, has been taken by the National Authority for Health and Welfare, and the National AIDS Commission, which is part of the Health ministry. These organisations, and others, as well as regional administrations, have been producing a wide range of advice material for all age groups, advocating fewer sexual partners and use of condoms. Eight months after the 1987-88 campaign, the proportion of people aged 17-30 years who had casual sexual relationships had fallen, condom use had risen, and 85 percent of homosexual men claimed to have used condoms [**Anon 1989**].

(iii) Switzerland.

In Switzerland real condom promotion for the prevention of the spread of HIV began in 1987. The signs "**STOP AIDS**" and "**STOP SIDA**" with a picture of a rolled-up condom replacing the "O" in "STOP", became the campaign logo, familiar throughout the country. Many channels conveyed the condom message. Condom advertisements were broadcast on radio and television, and a song about condoms became

a hit. Posters, billboards, magazines, special brochures, tote bags, t-shirts, and other products were used to carry the "STOP AIDS" logo or other depictions of condoms [Anon 1989].

This very enthusiastic campaign paid off. By the end of 1987, condom sales had increased by 60 percent over 1986 sales [Martin 1988]. Surveys before and after the campaign among the 17-30 year old men and women having casual sexual relationships found that the percentage reporting consistent condom use tripled. Findings are shown in the following table.

Condom use among 17-30 year olds with multiple sexual partners before and after Swiss condom campaign.

	before Jan.1987	during Oct.1987	during Oct.1988
Always use condoms	8%	17%	29%
Sometimes use condoms	25%	45%	58%
Never use condoms	67%	38%	13%

[source Zeugin et al. 1989]

(iv) United States of America.

In the United States, in 1873, congress passed the Comstock law, whereby birth control devices were banned from store sales and all literature pertaining to them was classified as obscene. The Comstock law was not formally repealed until over a 100 years later in 1977 [Redford et al. 1984]. Naturally, this law had a forceful negative impact on attitudes to the condom, which has always been less popular in the United States than the United Kingdom. This was made worse by the fact that when regulations regarding condom thickness were introduced in the United States, they had the effect of making United States condoms the thickest in the world [Djerassi 1979].

Although journals had accepted advertisements for the diaphragm and contraceptive jelly since 1938, condom advertisements were not accepted until 1970 [Kushner 1976]. The condom was first allowed to be advertised in the Journal of the American Medical Association in 1970, after the results of a large multicentre case control study in which users of barrier methods (condom and diaphragm) had a relative risk of 0.6 for getting cancer of the cervix compared with users of all other contraceptives or no contraceptives. The same study also recommended condom use to prevent reinfection during the

treatment of trichomoniasis. The other and probably most important breakthrough came at about the same time in 1974 when a sports magazine accepted what was the first ever United States consumer advertisement for condoms. They did not actually mention them as such, it said "VD can be prevented, and your pharmacist is the best source for medically recommended products to prevent VD" [Brunner 1984]. However like anywhere else the HIV/AIDS epidemic has greatly increased condom promotion. Unfortunately, there is lack of published, more recent studies, to show this said increase in condom promotion.

(v) Japan.

Much of the success of the condom in Japan has been attributed to many factors, including the methods of information and distribution. The Japanese despite being considerably less willing to talk about sexual matters than many other cultures, have their own ways of promoting condom use. There are various channels of condom distribution including: through the health system, supermarkets, vending machines, and door to door sales women. However, the most interesting distribution system is the Japanese "Love Box". A smartly designed bag, the "love box", contains condoms and other sanitary goods. Customers select their requirements in the privacy of

their own home, pay for them by putting the money in a slot contained in the bag and then pass the "love box" on to the next household. This system of condom distribution has brought about a very dramatic increase in condom sales [**Nishuichi 1986**].

(b) Developing countries.

In the developed countries, condoms have generally been accepted as having a central role in the campaigns to prevent the sexual transmission of HIV. In the developing countries, condoms are not always available, nor are they always acceptable. It is in developing countries that the lowest condom usage rates in the world are found. There exist various methods of promotion mainly by leaflets and posters. Perhaps unlike in many developed countries, governments of the developing countries have to play a special role in condom promotion.

(i) Thailand.

Thailand stands out as a developing country which has gone a long way in the promotion and distribution of condoms. This was all started by Mechai Viravaidye and his Community Based Family Planning Services (**CBEPS**) [**Tak 1979**]. In Mechai's CBEPS there was a dramatic departure

from the tradition of having medical service users moving to the service providers. Instead it was the service providers who moved to the service users. With Mechai, a number of tactics were used to "normalise" the condom which had been moved from a medical setting and made into a multi-purpose product visible in the context of daily life. Hence condoms were used as balloons, rubber bands, water carriers, rice bags and tourniquets for snake bites.

The interest of the media was maintained through the events such as the "**Cops and Rubbers**" programme, whereby condom promotion girls presented Bangkok policemen with brightly coloured boxes of condoms with various messages written on them. A variety of distributors including tax drivers was also used. Mechai's own personal commitment to the project undoubtedly also played a large part in its success (hence use of his name to mean condom) [*Burintratikul and Samaniego 1978*].

(ii) Uganda

Modern, as opposed to traditional methods of family planning were introduced in Uganda about thirty years ago. These methods included the condom. But it was assumed from the start that men had little interest in

responsible parenthood. In fact, they were automatically assumed to oppose any form of contraception. This meant that the early family planning programmes did not try to reach men and as a result, condom usage has always been negligible.

For a very long time, contraceptive provision in Uganda including condoms has been by external donors, through the Uganda Family Planning Association's clinics, which are found only in urban centres. This further reduced the chances of condoms ever reaching a significant number of people. It is within the last five to seven years that the government has allowed condoms to be supplied from government run hospitals.

Uganda is one African country that has so far taken what may be described as a cool attitude towards the condom. Though it is not directly hostile to its use, the government does not see the condom as an answer to the country's AIDS problem. As a result, the government is very cautious about advocating condom use. The reason given being that it has not yet fully understood local cultural practices and attitudes [Okware 1988]. The government does not see the condom as an answer to the country's AIDS problem. There is no clear national policy on the use of the condom in the prevention of the spread

of HIV. The government believes that self-discipline is more important, and the politically popular advice is the unrealistic one of celibacy ("**Just say no**").

This means that although condoms do exist in Uganda, mainly through the Uganda Family Planning Association, they are not really being positively promoted because of continued uncertainty. A public awareness study carried out in 1988 [*Berkely et al. 1989*], adds more quantitative information on knowledge of condoms in Uganda. The survey was carried out in Kampala (where there is a high incidence of AIDS) and in a town and some villages in areas where the incidence of the disease is relatively low. Over 200 people were interviewed. Though all the men and almost 80 percent of the women had heard about the condom, fewer than 10 percent of the men and only 1 percent of the women used condoms to prevent AIDS. Therefore this unfortunately means that as regards the use of condoms in the control of the spread of HIV, the idea is still in its infancy.

2.9 Condom availability and distribution.

The picture regarding prevalence of condoms is not clear. There are several reasons for this:

1. Unlike pills, or other forms of contraception, condoms can be obtained privately as well as through "official" channels.

2. Although sales figures are available, these do not give any indication of how people use the condom. Therefore it is not also possible to estimate use based on these figures since not all purchasers will be using the condom let alone on every occasion of intercourse. In fact it has been claimed that recently the condom has become the most sold but unused product [**Lapham and Maulidin 1988**]. 3. Sales figures are most commonly given as thousands of gross, but sometimes in millions of condoms. Condom imports in many countries are expressed in weight. Thus, although comparison is possible, it is not easy.

4. Condom use has been conventionally expressed as per women of reproductive age (MWRA), or women "at risk" of conception. Men themselves are rarely used in the denominator and this generally leads to an underestimation of condom use. As seen from a survey of Swiss couples [**Hopflinger and Kuhne 1984**] where man and wife were separately questioned about their condom use, the authors concluded that the use of condoms may be systematically under estimated when only women are interviewed.

There is virtually no country or major city in the world where condoms are not currently available, but equally there are few countries where the channels of supply and distributing condoms are as efficient as for other consumer goods such as toilet articles, tobacco, soft drinks and the like.

For a long time, there have been four main ways by which condoms have reached the consumer:

- * Through established commercial channels like chemists, grocers, vending machines, and many other places.
- * Through family planning clinics or physicians,
- * Through community-based distribution (CBD) or household distribution projects,
- * Through social marketing programmes.

[*Sherris et al. 1982*].

With the present problem of HIV infection, many more routes by which condoms reach the general public are being opened up, for example the "Gay switchboard". Established commercial channels supply the majority of condoms users around the world. Traditionally in the United Kingdom, condoms are provided under the National Health Service through Family Planning Clinics, and supplied commercially through chemist shops and other retail outlets. At the present, only about seven percent

of the United Kingdom market for condoms is supplied through NHS clinics. The 93 percent which are sold commercially, are distributed as follows: 53 percent, retail chemists, 21 percent, other retailers, including supermarkets; 11 percent, vending machines, and others including mail order and the traditional barber's shop 5 percent [**Bone 1988**]. In the United Kingdom vending machine use is relatively low when compared with some other countries for example West Germany, where vending machines account for around 50 percent of the sales. It seems that the full potential of this outlet is yet to be exploited. The main reason for this low usage could be the siting of the machines. For the siting of condom vending machines in the United Kingdom is somewhat limited in scope, the majority being located on licensed premises [**Sherris et al. 1982**].

In the developing countries, where the cost of the condoms makes regular purchase difficult, the bulk of condoms used are supplied free to the users. Since 1987, USAID has been the leading provider of condoms for AIDS control programmes in the developing countries [**Boni 1989**]. However, current supply and demand are too low to have a significant impact on the HIV epidemic. The main channels of distribution are health service based, with family planning clinics supplying the bulk of the condoms

free in most of these countries. Also there exist community based distribution (**CBD**), house to house distribution and the social marketing programs. Social marketing can be described in terms of the 4ps; product, package, promotion and price. The fundamental notion of social marketing is that "there are people who will for a price, move products. They don't care if they are selling condoms or soap. Condom prices if they are to be sold, should be low enough to be affordable, but high enough to give the product a feel of quality. People attach greater value to something that they pay for themselves than something that is given to them free. Condoms easily available perhaps at a local shop rather than at a clinic. Most of these programmes distribute condoms donated by various agencies. Among the major free condom suppliers are: the United States Agency for International Development (**USAID**), the International Planned Parenthood Federation (**IPPF**), the Path-finder Fund, the United Nations Fund for Population Activities (**UNFPA**), The Swedish International Development Authority (**SIDA**), and the UK Overseas Development Administration (**ODA**). With the additional role the condom is deemed to play in the control of the spread of HIV infection, many more bodies and agencies and governments are coming forward in the contribution towards condom availability and use.

2.10 The Condom in use.

The advantage of the condom are many. The condom,

- * is a reliable contraceptive
- * is a reliable method of control of sexually transmitted diseases including HIV
- * is relatively inexpensive
- * is light, compact, and disposable
- * has no after-effects
- * requires no medical examination, supervision or follow-up
- * offers visible postcoital evidence of effectiveness

[**Tannahill 1980**]

Yet condoms are under utilised, in both developing and developed countries. Condom use is heavily concentrated in a few areas, with two-thirds of condom users being in developed countries. An estimated 40 million couples throughout the world rely on condoms mainly as a contraceptive [**Sherris 1982**]. Japan alone accounts for about 1/4 of the condoms used in the world and China for about 1/5. The most recent available figures show world condom users as:

Developed countries except Japan	38 percent.
Japan	27 percent.
China	18 percent.

Other Asia	13 percent.
Latin America and Caribbean	3 percent.
Africa and Middle East	1 percent.

[Morris et al. 1981].

There are few studies from which to draw conclusions about condom users in terms of conventional variables such as education or socioeconomic status. Social, economic, political, cultural and religious factors may influence the condom use, but the extent of availability is also crucial. Though the Roman Catholic doctrine does not recommend condom use, in Europe and North America, between a third and a half of the Roman Catholics interviewed in various surveys had at some time used methods of birth control other than rhythm or abstinence, including the condom [**Joyce 1981**]. Similar proportions were found in city populations in Latin America where Catholicism plays a very important part in everyday life [**Malooof 1982**]. Indeed many demographers and family planning workers accept that Catholic teaching has not always had much effect on condom use. Day says "The problem seems not to be one of Catholic teaching in predominantly Catholic countries, but lack of knowledge and availability of the condom [**Day 1989**]. The same view is shared by Miro and Rainwater. [**Miro and Rainwater 1986**].

Amongst the reasons that people cite for not using the condom are:

1. Decreased male and female sensitivity during coitus.
2. Inconvenience of the method, that is, the need to use a condom during every act of coitus, to put it on during love making, and to store and dispose of it.
3. The poor image of condoms due to their traditional association with prostitutes.
4. Misconceptions about condom effectiveness and side effects [**Gardner 1974, Free and Alexander 1976**].
5. The nature of instructions given to condom users have been also cited as a deterrent to would be users. The kind of instructions which accompany the condom can be seen from an example of those given by a reputable condom manufacturer. These run as follows:

The necessary rules to be obeyed without exception

- i. The condom must be recently acquired from a reliable source (not carried about for long periods in the users pockets)
- ii. Must be put on before any contact has occurred between the penis and the vulva.
- iii. Empty space must be left between the end of the sheath and glans penis (If none is left by the manufacturer)

iv. After ejaculation and complete separation of the penis from the vagina, the sheath must be carefully removed and set aside.

v. The whole process must be repeated before any new contact.

A glance at these rules (instructions) makes it clear that obedience denies spontaneity and therefore as Helena Wright [**Wright 1981**] puts it: "*Condom use involves paying a high price for safety.*"

Overall, the impression is that in the United Kingdom and the United States use of the condom began to decline from the mid 60s [**Laing et al. 1976**]. In a 1960 United States survey 50 percent of married women aged 18-44 reported that at sometime they and their partners had used condoms. Similarly, in a 1959-60 survey in the United Kingdom, 49 percent of couples had used condoms. In the United States the percentage of couples using condoms fell to 22 in 1965, and then to 11 in 1976. In the United Kingdom, a similar shift occurred, but slightly later. For in the United Kingdom in 1970, 28 percent of people using contraceptives were using the condom, but by 1983, only 15 percent were still relying on the condom [**Redford 1974, Gordon 1989**].

However, with the onset of the HIV and AIDS epidemic, there has been a world-wide boost in condom sales. Reported sales figures from the United States of America increased from 300 million condoms in 1975 to 500 million in 1985 [**Moran and Janes 1990**]. In 1986, the United States Surgeon General warned of the risk of HIV and recommended the use of condoms as well as other measures, to prevent its sexual transmission. As a result of this warning, annual sales of condoms in drug stores rose by 20.3 percent between 1986 and 1987. The largest annual increase in condom sales of more than 30 percent occurred in 1988 and is still increasing [**Moran and Janes 1990**].

In the United Kingdom though by 1983 only 15 percent of the couples were reported to be relying on the condom, by 1986 the figure had risen to 17 percent. In addition Family Planning clinics have reported an increase of 18 percent in attenders opting for the condom, and sales figures are up by 10 percent [**Black 1986**]. The London Rubber Company which supplies at least 90 percent of all the condoms sold in the United Kingdom, gave their United Kingdom sales for the year ending 31st March 1980 as 757,000 gross, rising to 785,000 gross with 2.8 million users in 1981 and 858,000 gross in 1984 with 3 million users in 1984 [**LR industries 1988**]. Most recent figures show that condom sales for year ending 31 March 1990 were

over 1,200,000 gross [*LR industries 1990*]. Despite these encouraging results, in countries in sub-Saharan Africa, which seem to be worst hit by HIV infection, condom use remains slight. In fact, in a majority of these countries current condom use is less than 1 percent of all available methods of contraception, and yet in many of these countries less than five percent of all eligible couples use contraceptive [*Sherris 1982*].

CHAPTER 3.

AIMS AND METHODS.

3.1 Aims of the study.

It has been stated over and over again that prevention, will likely remain the world's primary weapon against HIV for at least the next decade [*Anon. 1988, PHR. 1988, McGuire 1989*]. Educational measures still remain the best available preventive alternative despite the shortcomings in the various HIV education programmes which have so far been carried out here in the United Kingdom and in other parts of the world.

In order to develop appropriate educational and public awareness campaigns and thereby possibly control the spread of HIV, it is necessary to understand patterns in the relationship between knowledge of and attitudes towards HIV and the sexual behaviour of those individuals and groups that are potentially at risk of HIV.

This research attempts to contribute to that process by investigating knowledge of and attitudes to HIV, and

sexual activity, including condom, use among population groups at increased risk of HIV infection.

Therefore, the study had several aims:

1. To assess and compare knowledge about HIV transmission and prevention among potential HIV risk subgroups.
2. To collect and compare information on "Sources" of information regarding HIV, AIDS and the condom among these subgroups.
3. To assess and compare the attitudes to and use of the condom among these subgroups.
4. To assess and compare the sexual behaviour as reported by these subgroups.
5. To examine the hypothesis that knowledge and positive attitude to the condom positively influence its use.
6. To identify any possible independent contribution to condom use of variables including high risk sexual behaviour, HIV knowledge and attitudes to and knowledge of the condom.
7. In case of the Uganda study, to provide baseline information against which National AIDS education programmes can be evaluated.
8. In case of the United Kingdom studies, to provide valuable information regarding condom use among those at potential risk of HIV.

3.2 Subjects.

An ideal method to satisfy the aims of the study would be to carry out an extensive cohort study, preferably in as many different areas as possible, where at least two samples of each group are matched for: (a) personal factors that may determine acquisition of knowledge about HIV,

(b) socio-economic factors that influence attitudes, and
(c) all environmental factors likely to influence the chances of condom use.

A careful and continuous follow-up of the two groups should be carried out at relatively short intervals over a sufficiently long time to cover a period during which knowledge is transformed into action. This kind of approach would be not only very expensive, but would also need a carefully planned experimental design and a well organised large team of workers including epidemiologists, trained field researchers and statisticians. The survey would also have to continue for several years.

For these reasons, a more feasible method, as adopted in this study was to carry out cross-sectional surveys

involving samples from those groups believed to be at increased risk of getting HIV. These groups were:

3.2.1. Patients attending a Sexually transmitted disease (STD) clinic.

Sexually transmitted disease clinics are important sites for studying HIV related knowledge and behaviour because they serve persons who practise behaviours known to be associated with the transmission of HIV. In the western world, HIV and AIDS have been reported principally among homosexual and bisexual men and among intravenous drug users and their heterosexual partners [**Biggar et al. 1984, Morgan and Curran 1986**]. In addition to those in risk behaviour groups, heterosexually active men and women who seek diagnosis and treatment of STDs are likely to have engaged, knowingly or unknowingly, in risk behaviours that increased their exposure to HIV as well. Such behaviours include having multiple sex partners, having sex with persons not known to them and not using condoms [**Quinn et al. 1988, Loveday et al. 1989**].

In this study, the sample of such a group was obtained from patients attending the Genito-urinary medicine (GUM) clinic at the Glasgow Royal infirmary. These were included in the study because:

(a). Of the large number clients and variety of social class subgroups served by the clinic,

(b) As already mentioned in the previous paragraph, most of such patients attend this clinic for the diagnosis or treatment of a sexually transmitted disease. They therefore represent a group whose behaviour would place them at a high risk of acquiring HIV infection.

(c). AIDS education had been going on at this clinic for quite sometime, and it was hoped that its effects would be reflected in the responses.

(d) The patients' waiting time before they saw the doctor was long enough to enable them to complete the questionnaire.

(e) Permission was granted by the consultant to carry out the research, and the willingness of the clinic staff members to participate in the study, by way of giving out the questionnaires.

3.2.2. Ugandan University students.

In Uganda like in all African countries, HIV transmission is largely through heterosexual contact. Therefore everybody who is sexually active with multiple sexual partners is at increased risk of HIV [*Berkely et al.1989, Konde-Lule 1989, Foster and Furley 1989*]. Such a sample

was obtained from; Ugandan University students. These were included in the study because:

(a) It was felt that they would be reliable in completing a self-administered questionnaire as they all could understand English well.

(b) A sample frame could be obtained.

(c) They are a group of sexually active people, and some of them were likely to have multiple sexual partners.

(d) They form part of the Uganda's elite who are supposed to easily understand the health education provided about the HIV and therefore the findings from this group could be interpreted to mean the maximum HIV knowledge and condom use for the control of HIV in the country.

(e) Since the author was member of staff of the University, it was relatively easy to gain access to the students, and ensure a good response rate.

3.2.3. Male homosexuals attending gay bars and discos.

Human immunodeficiency virus is transmissible by sexual contact between homosexual and bisexual men as well as through heterosexual activity by bisexual men and women.

In the United Kingdom since the start of the HIV/AIDS epidemic, the gay men comprise the majority of HIV

seropositives or AIDS patients [*Carne et al. 1987, Jones et al. 1987*]. Many reports have been published indicating that their HIV and AIDS related knowledge and behaviour have considerably improved, but they still make a big HIV "at risk group". This study looked at those gay men who attend gay bars and discos in Edinburgh and Glasgow, during the period of the survey. These were included in the study because:

(a) Gay bars and discos are among the few places where gay men can be found in reasonably large numbers, and therefore offer the possibility of getting a large sample.

(b) Gay bars offer the opportunity for meeting new partners and thus may attract gay men most likely to have a high rate of sexual partner change.

(c) Both American and British studies [*Stall et al. 1986, Trocki 1988, Stokes 1989*] have shown that alcohol consumption in conjunction with sex, especially among the gay men, increases the possibility of engaging in high-risk sexual behaviour, and that subjects who meet their partners in bars or night clubs are more likely to get involved in high-risk sexual behaviour.

(d) The atmosphere in the bars and discos is more relaxed perhaps encouraging gay men to answer the questions more freely.

(e) Scottish AIDS Monitor who assisted the author in data collection for this part of the study, were willing to recruit volunteers to go around gay bars and discos in Edinburgh and Glasgow.

3.2.4. Intravenous drug users.

Intravenous drug users are the second most important group as regards HIV and AIDS prevalence in the United Kingdom [*Follet et al. 1987, Power et al. 1988, Public Health Labs. 1989*]. It is from intravenous drug users that there has been an increase of HIV transmission among heterosexuals [*Moss 1987, Hart et al. 1989*]. They are therefore a very important HIV "at risk group". In this study, the sample was obtained from; the Intravenous drug users attending needle exchange schemes at Ruchill hospital and Easterhouse Health Centre, Glasgow. Before this group was chosen, a lot of fruitless effort had been put in by the author and his supervisor to get in touch with any representative sample of intravenous drug users. This was in part because drug use is illegal.

This group was therefore chosen because:

(a) At the time it was the only place where a reasonable number of intravenous drug users could be contacted by the author.

(b) The staff at the schemes were more co-operative with the author than at any other place where drug users can usually be found.

(c) When the study was carried out, the Easterhouse Health Centre scheme had been open for less than three months, and many clients had not been in contact with any services which deal with drug users before. This meant that their responses were unlikely to be biased by experience gained from answering questions in other studies.

(d) The Easterhouse Health Centre scheme was used as a training centre for nurses, who agreed to help in the distribution of the questionnaires.

3.2.5 Other possible samples: Prostitutes.

Early in the AIDS epidemic, it was suggested that prostitutes would be a means by which AIDS would spread into the general heterosexual population [*USCDC 1986*]. Obviously, prostitutes are at high risk for HIV infection because they have many sexual partners, and may often have sexually transmitted diseases, and in developed countries, many be using intravenous drugs.

The prevalence of HIV in America and European non-IV-drug using prostitutes is low [*Krogsgaard et al 1986, Smith*

and *Smith 1986, USCDC 1987*]. Existing studies suggest that prostitutes who use intravenous drugs are at the same risk for HIV exposure as other intravenous drug users in the same geographical area [*USCDC 1987*].

On the other hand, studies carried out in Africa among prostitutes confirm that they are at particular risk for HIV infection [*Piot et al. 1984, Kreiss et al. 1986*]. Prostitutes, like people attending genito-urinary medicine clinics, gay men, and intravenous drug users, therefore deserve special educational efforts, both for their personal safety and for the safety of their partners, should have been included in this study.

Unfortunately, this was not possible. It was the author's initial intention to have a sample of prostitutes complete a relatively similar questionnaire to those used in the present studies. The author contacted several groups and individuals known to be working with prostitutes in order to obtain a sample, but without success. A number of research projects involving prostitutes were already underway and it was thought that further exposure to researchers could endanger the services to prostitutes all of which were still in their infancy.

3.3 Questionnaire.

The data for all the four studies were collected by self administered questionnaire containing up to a maximum of fifty questions.

During all the stages of planning and designing the questionnaires for the different studies, extensive consultations and discussions were carried out with individuals and groups working in the relevant fields. This was to make sure that even before the pilot studies, the questionnaires were up to a good standard and correctly worded for that particular group of people. In the case of the genito-urinary medicine questionnaire, Dr. Ivan Tait, the senior consultant physician in charge of the Department of Genito-urinary medicine at the Glasgow Royal infirmary and the sister in charge of the clinic were involved from the very start. For the gay men questionnaire, members of the Scottish AIDS Monitor (SAM), members of the gay community themselves, and Dr. Alison Richardson, Clinical Psychologist from Edinburgh made various very important contributions towards its development. In fact it took several months of many meetings both before and after the pilot study to emerge with a questionnaire that was agreeable to all parties involved. That for the intravenous drug users equally

involved several meetings with the people involved with drug users at the Ruchill counselling clinic, especially Mr. Jim Black, the senior counsellor, the physicians in charge of AIDS patients at the same hospital, and Mr John Cameron, the clinical nurse specialist in charge of Easterhouse needle exchange scheme. For the Uganda questionnaire, the author relied upon his experience with the Uganda students to design the appropriate questionnaire.

In all the studies, the questionnaire was tested in pilot surveys following which modifications were made accordingly. The questions covered general personal characteristics about sex, age, occupation and education. Sexual activity, attitudes to and use of the condom were also covered. Except for the gay men study, other questions included were: marital status, sexual orientation and knowledge of spread and prevention of HIV. Respondents who reported using the condom, were asked about their own and their partners frequency of use of the condom.

Questions directly related to HIV and its spread came at the end of the questionnaire. This was done in an attempt to avoid influencing responses to questions about the condom. Occupation was stratified into social class using

the 1980 registrar generals "Classification of occupation". For education, the length of formal education rather than qualification was used.

As regards sexual activity, the respondents were asked to state the number of different partners with whom those sexual activities occurred during the preceding 12 month period. This period was chosen because the time frame was short enough to constitute an assessment of recent behaviour, with less recall inaccuracy than if a longer retrospective period was used.

Other additional modifications were necessary to the gay men questionnaire because following the gay men pilot study, it was found that many of the respondents only completed part of the questionnaire, and that their HIV knowledge was very good. (the very good HIV knowledge is also supported by other published work [*McCusick et al. 1985, Carne et al. 1987, Adrien et al. 1987*]). In order to encourage the gay respondents to complete the whole questionnaire, its size was reduced by leaving out those parts which did not offer any new information. Therefore, the questions related to knowledge about HIV and its spread were altogether excluded from the gay men questionnaire. The gay men questionnaire mainly dealt with assessing practical knowledge about HIV risk

behaviour. The questions asked about high-risk practices and risk reduction steps. These included unprotected anal and oral intercourse, and anal and oral intercourse using condoms. Vaginal intercourse with a female partner was also assessed. (but this was reported very infrequently in the sample and was therefore not analysed in greater detail).

The final versions of the questionnaires as used in the studies are given in the Appendices.

Emphasis was placed on confidentiality and no name or address appeared on the forms. The answers to most questions were precoded, but several were coded retrospectively. These were questions where the answer had been written in long hand by the respondent. The reason was that even after the pilot studies, it was not possible to predict the answers to some questions sufficiently to pre-code the possible replies. This was particularly true of questions about perception of the HIV/AIDS epidemic and behavioural change.

The questions contained internal checks on the consistency of responses. For instance the answers to questions about the frequency of sexual intercourse, the frequency of condom use and the number of condoms used

had to agree. These were used just to check consistency rather than as "lie detectors". For in practice, it is often impossible to tell whether inconsistent responses are due to deliberate falsehood, or to a failure of recall or understanding. Because of anonymity it was not possible to assess repeatability. In some situations the author had the impression that a respondent was being unco-operative or deliberately withholding information, for example in cases where respondents wrote down rude remarks to questions. There was no way of confirming this.

An appropriate space was provided on the questionnaire to enable those who did not want to participate in the studies to indicate that they did not wish to do so. This was to allow calculation of the response rates, but unfortunately the characterisation of nonparticipants could not be carried out.

3.4 Pilot studies

Pilot surveys were carried out for all the four studies. the object of the pilot surveys was to test the feasibility and acceptability of conducting HIV/AIDS related studies among the "HIV at risk groups". They were also intended to test the questionnaires for content validity, comprehension, and reliability of questions. It was feared that the questionnaires might take too long to complete, for anything more than 20 minutes would be excessive. All the pilot surveys were carried out in the same or similar settings, and using the same methodology as the actual studies. (this will be explained in detail later). In all the studies, the respondents were clearly informed that the purpose of the survey was to find out about their HIV and AIDS knowledge and the use of the condom and that their responses would be totally anonymous. Each respondent was requested to complete the questionnaire or indicate that they did not wish to do so.

It was hoped that the initial analysis of the pilot studies, would lead to conclusions regarding the sample sizes, and likely power of these studies.

3.4.1. Genito-urinary medicine study.

The pilot survey was carried out at the genito-urinary medicine clinic of the Glasgow Royal infirmary during the first two weeks of June 1988. Questionnaires were handed out to 107 people who attended the clinic during that time. These included 73 men and 34 women and the response rates were 96.2 percent for the men and 93.8 percent for the women. They were asked to complete the questionnaire as they waited to see the doctor.

After the pilot study, it was found necessary to make minor modifications to the questionnaire.

After the analysis of the results, the desired sample size was calculated.

3.4.2. Ugandan University students study.

The pilot like the real study was carried out in the university's ten halls of residence. Using random numbers, ten students were randomly chosen from each hall using the names on the halls list of residence. This included 70 men and 30 women. Questionnaires were handed out to the students in their rooms to be completed and returned to the author within half an hour or so. The response rate was 100 percent. After the pilot study, it

was found that there was no need to make any changes to the questionnaire.

After the analysis of the results, the desired sample size was calculated.

3.4.3. Intravenous drug users study.

It had originally been thought that both the full study and the pilot study was to be carried out at the Ruchill AIDS counselling clinic, and 30 drug users, 20 men and 10 women were thought to be sufficient for the pilot study. After about two months, less than ten questionnaires had been fully completed. The main reason was that people who attend the counselling clinic are worried about their HIV status and are unwilling to complete questionnaires.

It was therefore decided to have the study carried out at a needle exchange scheme at Easterhouse. Because time was running out, the number to be included in the pilot study was reduced to 15, ten men and five women. After two weeks, twelve questionnaires were completed by 9 men and three women. Any calculation of response rates from a such small number would be statistically invalid.

After the pilot study, it was found necessary to make minor modifications to the questionnaire.

Because of the small sample in the pilot study, it was not possible to estimate an appropriate sample size and therefore, the sample size was limited to that which could be obtained in the available times.

3.4.4. Gay men study.

The pilot study for the gay men was carried out during Scottish AIDS Monitor (**SAM**) fund raising gay discos. One of these was in Edinburgh and another in Glasgow. These were chosen because they provided an opportunity to get a very large number of gay men on one evening, and thereby possibly get a big number of questionnaires completed. For the pilot study, it was thought that if 30 gay respondents could be obtained from each disco, this would be sufficient to provide enough information to fulfil the objectives of the pilot study.

After informing them of the purpose of the questionnaire, and that their responses would be totally anonymous, each respondent was given a copy of the questionnaire by the volunteers who had been recruited by **SAM**. Prepaid envelopes were available and were offered to those who

for one reason or other could not complete the questionnaire immediately. Perhaps because the questionnaire was very long, all the respondents opted to use the prepaid envelopes. After six weeks seventeen questionnaires from Edinburgh and five from Glasgow had been returned, all partially completed, with the knowledge part well, and correctly completed.

The results of the pilot study were then discussed at length with representatives of Scottish AIDS Monitor, including two gay men. As a result, major changes in the questionnaire were made with the aim of reducing its length.

There was no time for a second pilot study. Though the numbers of returned questionnaires were small, it was possible to estimate the required sample size, but not the likely power of the study.

3.5 The power of the studies

By calculating the power of the study, one can determine whether the sample size is sufficiently large to avoid a type 2 error (accepting the null hypothesis when it is in fact false) for a particular variable. For example, because effective use of the condom involves both

partners, in the Genito-urinary medicine (GUM) study, focused mainly on possible differences in responses between men and women. Therefore, in the light of the results of a GUM pilot study, using Fleiss' tables [Fleiss 1981] for relating statistical power to sample size, a minimum sample size of 800 was chosen to ensure that at least 300 women were included. This would give the study 90 percent power at 0.02 probability to detect a 15 percent difference in response between men and women.

For the Ugandan University students study, After the genito-urinary medicine study, the findings of a pilot study, and the available time, a sample size of 1000 was chosen, with the aim of including around 300 women. This would give the study 90 percent power at the 0.02 level of statistical significance to detect a real difference of 15 percent between male and female responses.

In the Intravenous drug users study, though the authors' intention was to give this study the same power as the other studies, it was not possible to estimate the sample size from the results of the pilot study. Considering the difficulties that were encountered in getting a near representative sample of intravenous drug users, time available for the study and the time taken to

carry out the pilot study, the choice of the sample size was taken by considering the number of respondents that could be obtained during a fixed period of time of about eight weeks, other than a fixed number of respondents. Therefore, a sample size of 130 consisting of 100 men and 30 women was chosen.

For the gay men study, after the results of the pilot study, plus the findings of other comparable studies, a sample size of 800 was chosen, with the aim of including 400 gay men from each city of Edinburgh and Glasgow. However, due to the poor responses got during the pilot, it was not possible to calculate a likely power of the study.

3.6. Representativeness of the samples.

The author is well aware of the difficulties and limitations of questionnaire surveys, which may result in an under or overestimation of the true situation. The most important difficulty may arise from the unrepresentativeness of the samples. Their possible implications on the results of the study will be discussed later.

3.7 Execution.

The time taken in administering the questionnaires in each study depended very much on: 1. the available time the author had to complete his PhD, that is three academic years, 2. The co-operation of the respondents, which at some occasions was not very good, and 3. the co-operation between the members of staff, at the various study places, and the author. The co-operation between the author and members of staff on the whole was excellent, though they always preferred to have the study ended as quickly as possible.

3.7.1. Genito-urinary medicine study.

All the nine hundred patients, 550 men and 350 women attending the clinic over an 11 week period between September and November 1988 was included in the study. (None of the patients was known to have HIV/AIDS.) They were asked to complete the questionnaire as they waited to see the doctor. They were informed that the questionnaire's purpose was to find about their HIV knowledge, and their use of the condom and that their responses would be totally anonymous. After completing the questionnaire, they deposited it in the cardboard box which was provided at the reception. Those who felt

that they did not want to complete the questionnaire, were requested to indicate this, in an appropriate space on the form and deposit the into the same box. On average the questionnaire took ten minutes to complete. The author was always available to answer any queries that arose.

3.7.2. Ugandan University students study.

The study population included all undergraduate students in residence at Makerere University, which until two years ago was the only university in the country. The sample of 1,000 students, 700 males and 300 females was selected taking every fourth name on an alphabetical list of each of the University's ten halls of residence. As during the pilot study, questionnaires were handed out to the individual students in their rooms by the author. They were clearly informed that the purpose of the survey was to find out about their HIV and AIDS knowledge and use of the condom and that their responses would be totally anonymous. Students were requested to complete the questionnaire or indicate that they did not wish to do so. In either case, they were asked to put it in the envelope provided and hand it back to the author within half an hour or so. On average the questionnaire took ten minutes to complete. The author was always available to

answer any queries that did arise regarding the questionnaire. The study was carried out in February and March 1989.

3.7.3. Intravenous drug users study.

Because of the laws against drug use, many of the drug users will always be suspicious of anybody asking them to complete forms. However, the drug users involved in this study were informed that the questionnaire's purpose was to find about their HIV knowledge, and their use of the condom and that their responses would be totally anonymous. In light of that, few refused to complete the questionnaire.

The study population was intended to include all the clients, men and women attending the needle exchange at Easterhouse on each of the two evenings per week when it is open, over an 8 week period during April and May 1989. However, because of the administrative difficulties, the questionnaires could only be administered only when the student nurses were around to assist in the exercise. This was not very often and so the study went on for four months.

Questionnaires were handed to individual clients by the scheme coordinator, and the student nurses, as they registered. Like in the other studies, they were clearly informed that the purpose of the survey was to find out about their HIV and AIDS knowledge and the use of the condom and that their responses would be totally anonymous. Each participant was requested to complete the questionnaire or indicate that they did not wish to do so. Those who accepted, completed them as they waited for their turn to exchange syringes and needles. After completing the questionnaire, they deposited it in the cardboard box which was provided at the reception. Those who felt that they did not want to complete the questionnaire, were requested to indicate this, in an appropriate space on the form and deposit the into the same box. On average, the questionnaire took about ten minutes to complete. The author and the scheme coordinator were always available to answer any queries that arose.

3.7.4. Gay men study.

This study was carried out with the help of two teams of thirty volunteers, one in Glasgow and one in Edinburgh, recruited by Scottish AIDS Monitor. In order to avoid duplication of responses, all the volunteers went out on

the same evenings in each city, visiting all the known gay bars and discos. The management of all the establishments had been contacted in advance and had agreed for the survey to be carried out on their premises.

In each city three volunteers were assigned to visit one establishment and spent the whole evening there. Customers were approached and asked to complete the questionnaire. As in the other studies, potential respondents were informed that the questionnaire's purpose was to find about their HIV knowledge, and their use of the condom and that their responses would be totally anonymous. Prepaid envelopes were available and were offered to those who for one reason or other could not complete the questionnaire on that very evening.

Due to the poor response obtained from the gay men themselves, the exercise had to be repeated on two different occasions, two months apart in Edinburgh, and on four different occasions over a period of six months in Glasgow. The same volunteers were used, and those respondents who reported having completed the same questionnaire before, were excluded on any subsequent occasions. Questionnaires completed on the spot were

handed back to the volunteers, while others were sent by post, using the prepaid envelopes that were provided.

3.8 Statistical analysis.

All data were coded, entered into a computer, and analysed using the Statistical package for Social scientists-x (SPSS-x) [**SPSS Inc. 1986**], the BioMedical Programmes (BMDP) [**Dixon 1985**], Minitab [**Ryan et al. 1985**], and SuperCalc4 [**Assoc. Inter. 1986**].

For each of the four studies, the descriptive statistics for the individual characteristics of the respondents were obtained. Further analysis involved calculation of chi-square statistics. A probability value of less than or equal to 0.05 was considered significant.

Following calculation of the chi-square statistics, a multivariate analysis, using a logistic-regression model, was conducted on those variables which had a highly statistically significant association with use of the condom. The logistic-regression model was used to determine the independent contribution to condom use of those variables covering high risk behaviour, HIV knowledge and attitudes to, and use of the condom. As not the same variables were highly statistically significant

in all the studies, different variables used were as indicated in the appropriate section of each study.

After the four studies were considered separately, the data were compared with respect to high risk behaviour, HIV knowledge and attitudes to, and use of the condom. Once again the calculation of chi-square statistics was used. However, multiple comparisons of independent samples frequently yields apparently statistically significant differences which have to be treated with great caution. In part this is because the simultaneous multiple comparison procedure compounds any error associated with all the studies used in the comparison rather than the error for each study. To correct for this, an overall chi-square test was first performed to give a single test statistic for any difference between the four groups. If, and only if, this test indicated that some statistical difference existed, then further chi-square analysis was performed to identify the sources of the difference. At this point, a correction known as Bonferroni's correction [**Waleenstein et al. 1980**], was used to obtain modified chi-square values that would be more representative of any statistical differences between the four groups. Though in most cases, the Bonferroni value can be obtained from conventional tables [**Waleenstein +earlier 1980**], in the study it was corrected

(and rightly so) by multiplying the obtained chi-square value by the number of comparisons made. For example, if the variable to be compared was common to all four studies, then the number of comparisons was six. It was after this correction that differences were considered significant if the probability value was less than or equal to 0.05.

CHAPTER 4.

UGANDAN UNIVERSITY STUDENTS STUDY.

4.1. Results: Text.

The questionnaire was fully completed by 661 of the 700 male students (94%) and 270 of the 300 female students (90%) to whom it was offered giving a male : female ratio of 2.4:1. Although no student refused to complete the questionnaire outright, 69 questionnaires were excluded because they were improperly completed. The male respondents had a mean age of 23.9 years (SD 2.5) and the females 22.3 (SD 2.2) years. The age distribution of the sample is shown in Table 1 and Figure 1. Respondents came from all of Uganda's 33 districts.

Table 2 shows the respondents' faculties of study. All the eleven faculties were represented, with about 20 percent of the respondents studying for a social science degree, and less than 4 percent studying in the faculty of statistics and applied economics. All the possible five years of undergraduate study were also represented. Table 3 shows the respondents' years of study. The year of study distribution of the sample was similar to that of University as a whole.

About ninety percent of the respondents were single or separated and 10 percent were married or living with a regular partner. With 87.6 percent of the men and 90 percent of the women being single or separated.

The mean age of first sexual intercourse was 15.3 years (SD 2.9) for men and 17.4 years (SD 3.3) for women. Table 4 and Figure 2 show the reported age at first sexual intercourse. Over 95 percent of males and about 93 percent of females reported previous sexual intercourse. About 2 percent of respondents reported intercourse before the age of 10. Less than 10 percent of the men and about 30 percent of the women had not had intercourse by the age of 20 years.

Figure 3 shows the cumulative percentage of respondents with age at first sexual intercourse. Over 90 percent of all respondents reported intercourse by the age of 20.

The lifetime total of different sexual partners reported by the respondents is shown in Table 5. A much higher proportion of men reported multiple sexual partners. About two thirds of the men reported having had at least six different sexual partners compared with only 11.2

percent of the women. About 20 percent of all the respondents had had none or only one sexual partner.

The number of different sexual partners in the last 12 months reported by respondents is shown in Table 6 and Figure 4. These show that the male students were generally more sexually active than the female students. Over 60 percent of men and about 37 percent of women had had more than one sexual partner during the previous 12 months with 14 percent of men, but less than 2 percent of women, reporting more than five partners.

On the whole, increasing age was associated with an increasing number of reported sexual partners (Chi-square = 32.4 $P < 0.001$). Figure 5 shows the reported number of sexual partners by sex and age. There was a significant difference between the two sexes in the number of reported partners in the age group 20-24 years where more men reported a higher number of sexual partners (Chi-square = 61.9 3df, $p < 0.001$).

About 62 percent of all single or separated respondents reported having more than one sexual partner during the previous twelve months, compared with 51 percent of those who were married or living with a regular partner (Chi-square = 8.5, $p = 0.04$). With about 68 percent of men and

43 percent women who were single or separated reporting more than one sexual partner (Chi-square = 49.1 1df, $p < 0.001$). Table 7 and Figure 6 show the reported number of sexual partners in the last 12 months by sex and marital status. The significant difference among the two sexes was among those respondents who were single or separated where once again the men reported a higher number of partners than women (Chi-square = 63.8 3df, $p < 0.001$).

Table 8 shows the reported number of sexual partners during the previous 12 months by condom use. About 74 percent of condom users reported more than one sexual partner, compared to about 52 percent of non users (Chi-square = 56.3 3df, $p < 0.001$).

About 19 percent of male respondents and 17 percent of females admitted to at least one episode of a sexually transmitted disease in the past 12 months.

Over 20 percent of the male respondents but only 7 percent of the females thought they were at risk of catching HIV due to their behaviour (Chi-square = 29.3 1df, $p < 0.001$). Of these, 75 percent of the males and 96 percent of the females said that as long as they still continued having sexual intercourse, they could never totally trust their partners. The remaining 25 percent of

the men and four percent of the women said that they were at risk because they had had more than one sexual partner (Chi-square 54.6 1df, $p < 0.001$).

Figure 7 shows the reported change in behaviour due to the HIV epidemic. Almost 65 percent of the males and 43 percent of the females said that their lifestyles had been affected by the HIV epidemic (Chi-square = 35.4 1df, $p < 0.001$). Of these, 41 percent of the males and 72 percent of the females said that they had reduced the number of their sexual partners (Chi-square = 35.9 1df, $p < 0.001$); 52 percent of the men and 15 percent of the women had started using the condom (Chi-square 51.9 1df, $p < 0.001$); and 7 percent of the men and 13 percent of the women said they had stopped sex altogether.

Knowledge.

Responses to questions about HIV transmission and its prevention are given in Table 9. Transmission of HIV was associated with heterosexual intercourse by almost all respondents, although there was a statistically significant difference between the male and female respondents (chi-square = 11.1, $p < 0.001$). The majority of respondents correctly answered the other questions, although slightly more men than women associated HIV

transmission with non penetrative sex. There was no clear cut majority regarding the oral transmission of HIV. Abstention from sex was seen by most respondents as a way of preventing HIV infection, whereas less than half believed that the condom was an effective HIV control method.

Slightly more men (85.9%) than women (84.4%) recalled seeing or hearing about the condom in the previous two years. The sources and context of information about the condom in the previous two years are shown in Table 10. In particular, posters and radio were more frequently reported as sources of information by males than females.

More than half of the respondents who recalled seeing or hearing about the condom in the previous two years, could recall that the condom was mentioned in connection with AIDS. Around 15 percent of both sexes spontaneously volunteered that the publicity had referred to the condom's unreliability.

When all respondents were asked to give a reason in favour of using the condom, their spontaneous responses were as shown in Table 11 and Figure 8. Contraception was cited by 40 percent of both sexes. Only about 30 percent

of the males and 20 percent of the females replied that the condom could protect against AIDS.

When all respondents were asked to give a reason against using the condom, their spontaneous responses are as shown in Table 12 and Figure 9. More than one third of the men and half the women believed that the condom is not safe enough. When asked why they thought the condom was unsafe, most respondents said it could burst too easily. Almost one third of all respondents thought that the condom encouraged promiscuity.

Condom use.

Only about 27 percent of the men approved of the condom, 13 percent were uncertain and 60 percent disapproved, compared with 25 percent, 15 percent and 60 percent respectively of the women. Nearly 27 percent of the males and 21 percent of the females disapproved of the condom on religious grounds.

Thirty-three percent of the male students and 22 percent of the female students (chi-square 11.2 1df, $p < 0.001$) indicated that they had used the condom. The reasons they cited for using the condom were as follows: prevention of AIDS, 52.3 percent males and 18.3 percent females;

contraception, 38.2 percent males and 65.0 percent females; prevention of other sexually transmitted diseases, 9.5 percent males and 16.7 percent females (Chi-square 21.9 2df, $p < 0.001$).

About one third of male users and 71 percent of female users had used the condom for less than one year, while 31 percent of male users and no females had used it for more than five years (Chi-square = 16.9 1df, $p = 0.005$).

Table 13 shows the reported frequency of condom use. About one third of condom users, which is only 9 percent of all respondents reported using the condom always. Although females were more likely than males always to use the condom, with about 42 percent of females and 27 percent of males indicating that they always used the condom, the difference was slightly statistically significant (chi-square = 4.6 1df, $p = 0.03$).

For those who only used the condom sometimes, the reasons they gave for doing so were: forgetfulness, 42.1 percent men, 19.0 percent women; run out, 34.9 percent men, 14.3 percent women; and partner doesn't allow, 23.0 percent men, 66.7 percent women (chi-square = 17.3 2df, $p < 0.001$).

Among condom users, about 70 percent of the men and 60 percent of the women indicated that condom use adversely affected their enjoyment of sex. The effects were reported as: reduces sensation, 78.9 percent male users, 76.5 percent female users; inconvenient, 16.8 percent men, 7.7 percent women; and unnatural, 4.3 percent men, 15.8 percent women (chi-square = 12.2 2df, p = 0.002). Over 78 percent of the male condom users provided the condom themselves compared with 2.9 percent females (Chi-square = 112.3 1df, p <0.001).

Table 14 shows the responses when condom users were asked if they thought they could be persuaded by their partners not to use the condom. Women were less likely to be persuaded by their sexual partners than men, with 30 percent of men and about 17 percent women saying that they would be persuaded by their sexual partners not to use the condom.

Table 15 shows those condom users who could be persuaded by their partners, by their reported frequency of condom use. About 17 percent of the men and 10 percent of the women who reported always using the condom felt that they could be persuaded by their sexual partners not to, rising to 44 percent in men and 60 percent in women among those who reported using the condom sometimes.

Condom use appeared unrelated to age, age at first sexual intercourse or the weekly frequency of sexual intercourse. However, condom use appeared to be significantly associated with 11 other variables and these were used to construct a logistic regression model. The eleven variables were:

1. Reported number of sexual partners during the previous twelve months (Chi-square = 56.3 3df, $p < 0.001$)
2. The number of sexual partners since respondent's first sexual intercourse (Chi-square = 53.2 4df, $p < 0.001$)
3. Stated reasons for using the condom (Chi-square = 33.0 4df, $p < 0.001$)
4. The respondents who had had sex with anybody considered risky for HIV (Chi-square = 20,0 1df, $p < 0.001$).
5. Whether respondents had directly exchanged sex for money (Chi-square = 14.7 1df, $p < 0.001$)
6. Whether the respondent had seen or heard any literature about the condom during the past two years (Chi-square = 12.4 1df, $p < 0.001$)
7. Respondents' attitude towards the condom (Chi-square = 11.4 1df, $p < 0.001$)
8. Believed that the condom could prevent the spread of HIV (Chi-square = 9.9 1df, $p = 0.001$)
9. Respondent's sex (Chi-square = 9.5 1df, $p = 0.002$)

10. Whether the AIDS epidemic had affected the respondents lifestyle (Chi-square = 8.4 ldf, $p < 0.001$)

11. Knowledge that HIV could be spread heterosexually (Chi-square = 6.0 ldf, $p = 0.01$).

Table 16 shows that six of the variables emerged as being independently associated with condom use. These included:

1. Number of sexual partners in lifetime (Odds Ratio 4.6, 5.0, 7.3).

2. Number of sexual partners in last twelve months (Odds Ratio 1.3, 1.8, 2.0).

3. A positive attitude to the condom (Odds Ratio 2.0).

4. Respondent had had sex with 'risky' sexual partner (Odds Ratio 1.7).

5. Respondent's lifestyle had been affected by AIDS epidemic (Odds Ratio 1.5).

6. Unexpectedly, respondents who claimed not to have seen official publicity about the condom were more likely to use the condom than those who had (Odds Ratio 2.3).

The reasons for not using the condom given by non condom users are shown in Table 17 and Figure 10. Being unsafe was the most important reason given for not using the condom. More than half the respondents thought condoms were unsafe. When asked why they thought the condom was

unsafe, most respondents, especially the women said it could burst too easily.

4.2 Tables and Figures.

Table 1.

The respondents age distribution by sex.

Sex of respondent	Age distribution				Total
	below 20	20-24	25-29	Over 29	
Male	2	474	151	34	661
%	0.3	71.7	22.8	5.2	100.0
Female	6	237	23	4	270
%	2.2	87.8	8.5	1.5	100.0
Total	8	711	174	38	931
%	0.9	76.4	18.7	4.1	100.0

Chi-square = 42.1 (3df) p less than 0.001

Figure 1.

The respondents' age distribution by sex.

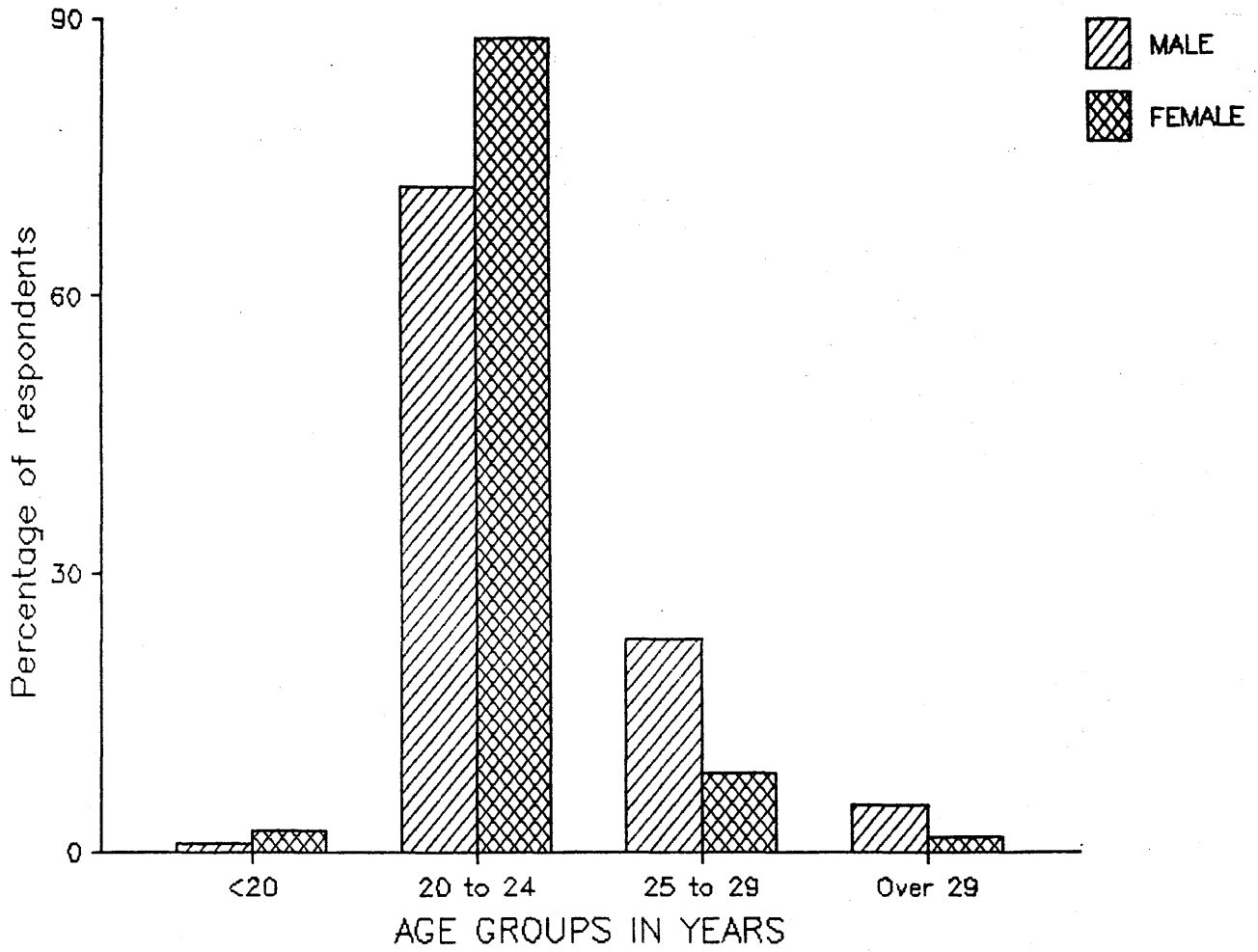


Table 2.

Respondents faculties of study by sex.

	Sex of respondent				Total	
	Male		Female		No.	%
	No.	%	No.	%	No.	%
Social Science	118	17.9	62	23.0	80	19.3
Arts	88	13.3	38	14.1	126	13.5
Science	96	14.5	13	4.8	109	11.7
Medicine	58	8.8	30	11.1	88	9.5
Education	52	7.9	30	11.1	82	8.8
Agric & Forestry	38	5.7	34	12.6	72	7.7
Technology	62	9.4	7	2.6	69	7.4
Law	34	5.1	30	11.1	64	6.9
Veterinary Medicine	50	7.6	12	4.4	62	6.7
Commerce	39	5.9	6	2.2	45	4.8
Statistics and economics	26	3.9	8	3.0	34	3.7
Total	661	71.0	270	29.0	931	100.0

Table 3.

The respondents year of study by sex.

	Year of study					Total
	1st	2nd	3rd	4th	5th	
Male	180	219	199	53	10	661
%	27.2	33.1	30.1	8.1	1.5	100.0
Female	65	98	78	21	8	270
%	24.1	36.3	28.9	7.8	1.9	100.0
Total	245	317	277	74	18	931
%	26.3	34.0	29.8	7.9	1.9	100.0

Chi-square = 3.5 (4df), P= NS

Table 4.

Respondents' reported age at first sexual intercourse.

	Age at first sexual intercourse in years					Total
	Had not started	below 10	10-14	15-19	Over 20	
Male	29	15	229	346	42	661
%	4.4	2.3	34.6	52.3	6.4	100.0
Female	18	2	50	121	79	270
%	6.7	0.7	18.5	44.8	29.3	100.0
Total	47	17	279	467	121	931
%	5.0	1.8	30.0	50.2	13.0	100.0

Chi-square = 100.6 4df, p less than 0.001

Figure 2.

Respondents' reported age at first sexual intercourse.

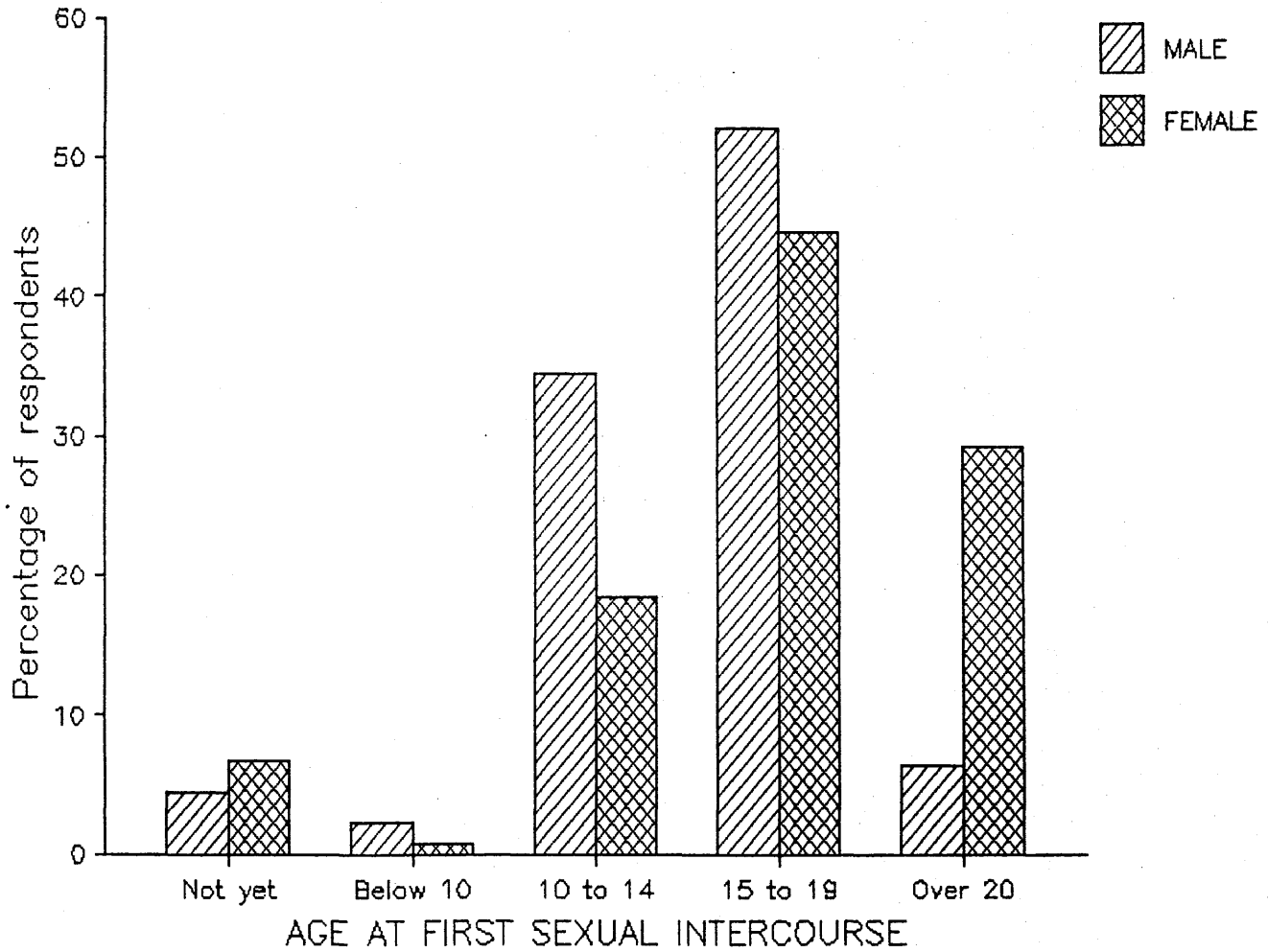


Figure 3.

The cumulative percentage of respondents by age at sexual intercourse.

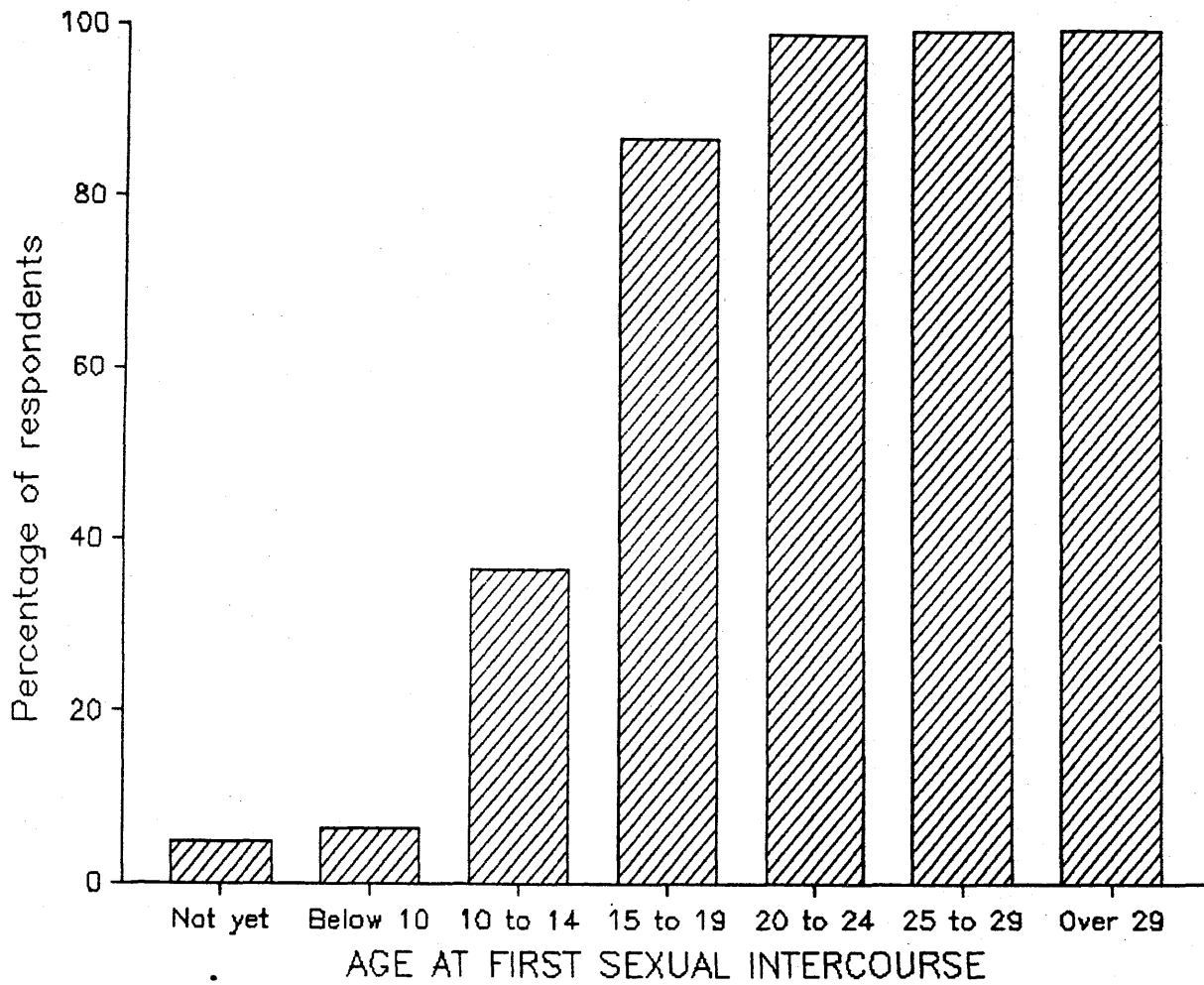


Table 5.

The lifetime total of different sexual partners reported by the respondents.

	Number of partners					Total
	0	1	2-5	6-10	Over 10	
Male	29	59	149	197	227	661
%	4.4	8.9	22.6	29.8	34.3	100.0
Female	18	94	128	25	5	270
%	6.7	34.8	47.3	9.3	1.9	100.0
Total	47	153	227	222	232	931
%	5.1	16.4	29.8	23.8	24.9	100.0

Chi-square = 235.13 (4 df) P less than 0.001

Table 6.

The reported number of different sexual partners in
the last 12 months.

	Number of sexual partners					
	0	1	2-5	6-10	Over 10	Total
Male	116	129	323	73	20	661
%	17.5	19.5	48.9	11.0	3.0	100.0
Female	92	79	94	3	2	270
%	34.1	29.3	34.8	1.1	0.7	100.0
Total	208	208	417	76	22	931
%	22.3	22.3	44.8	8.1	2.4	100.0

Chi-square = 67.43 (4 df) p less than 0.001

Figure 4.

The reported number of different sexual partners in the last 12 months.

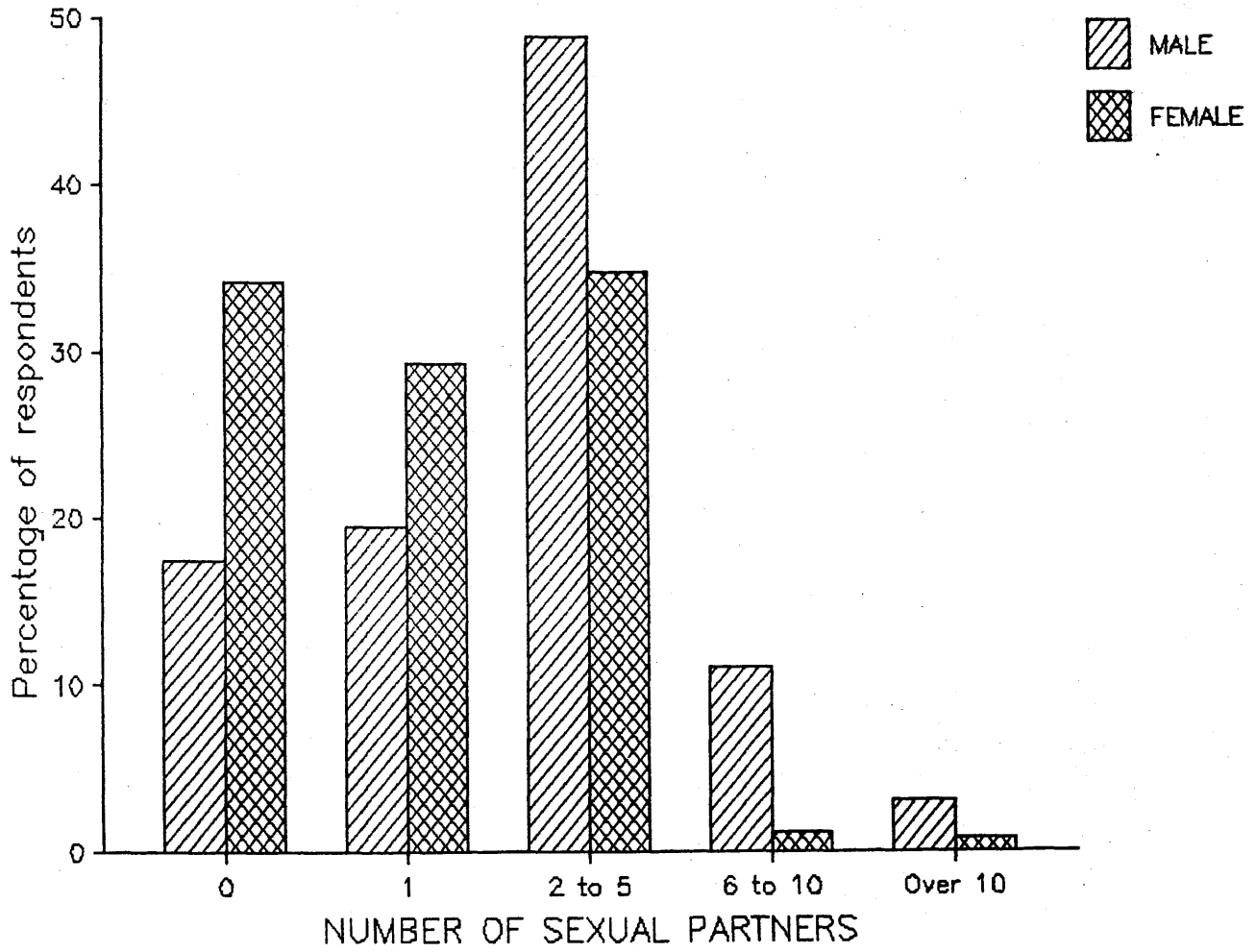


Figure 5.

The reported number of different sexual partners in the last 12 months by sex and age.

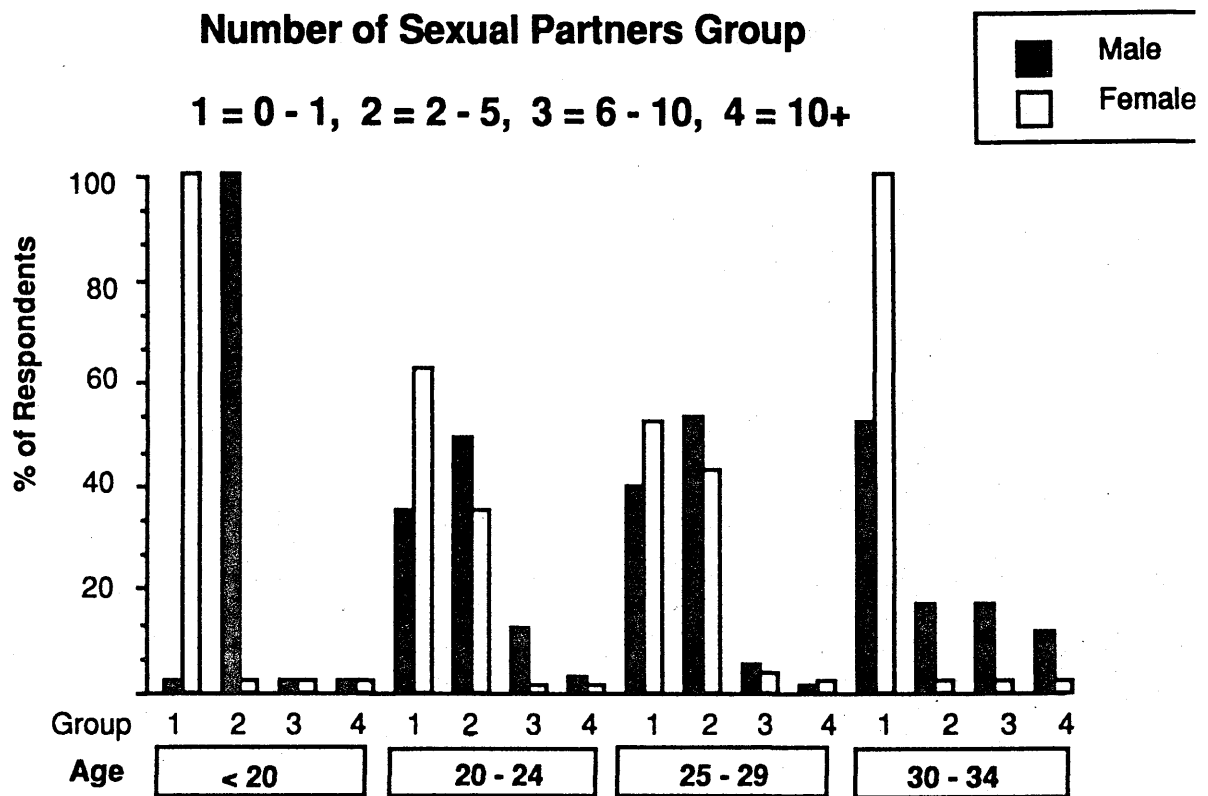


Table 7

The reported number of sexual partners in the last 12 months by sex and marital status.

sex and marital status of respondent		Number of sexual partners				Total
		0-1	2-5	6-10	Over 10	
Single						
Male		202	293	67	17	579
%		34.9	50.6	11.6	2.9	100.0
Female		152	86	3	2	243
%		62.6	35.4	1.2	0.8	100.0
Chi-square = 63.8 3df, p less than 0.001						
Married						
Male		43	30	6	3	82
%		52.4	36.6	7.3	3.7	100.0
Female		19	8	0	0	27
%		70.4	29.6	0.0	0.0	100.0
Chi-square = 4.4, 3df, p= NS.						
Total		416	417	76	22	931
%		44.7	44.8	8.1	2.4	100.0

Figure 6.

The reported number of different sexual partners in the last 12 months by sex and marital status.

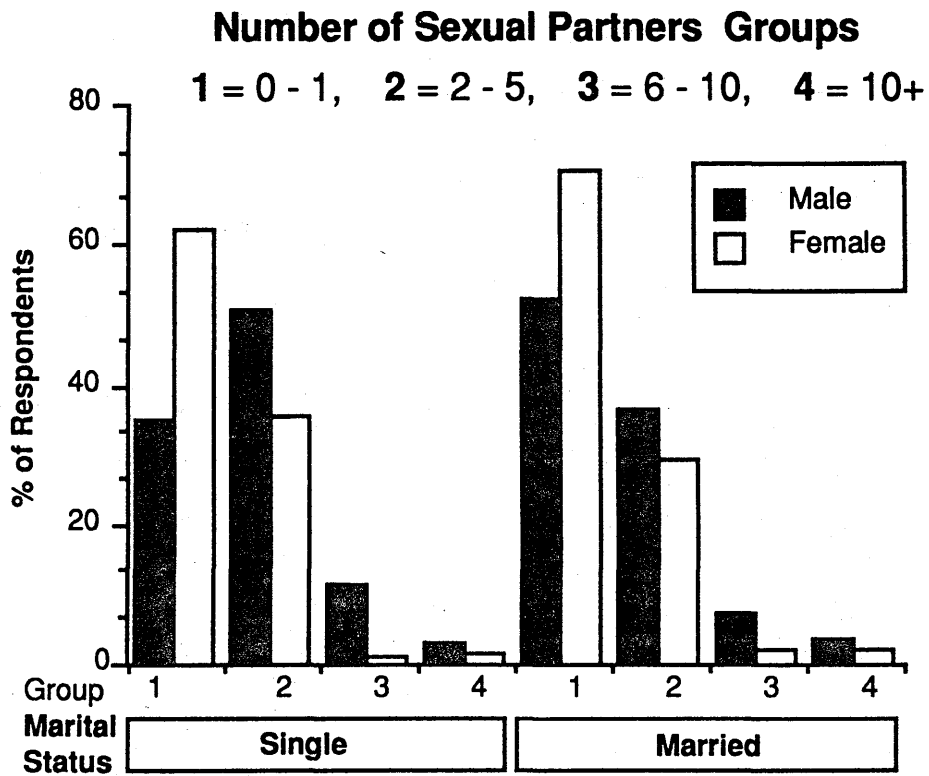


Table 8.

The reported number of different sexual partners in the last 12 months by condom use.

	Number of sexual partners				Total
	0-1	2-5	6-10	Over 10	
Condom users	73	166	32	9	280
%	26.1	59.3	11.4	3.2	100.0
Non users	343	251	44	13	651
%	47.6	38.6	6.8	7.1	100.0
Total	416	417	76	22	931
%	44.7	44.8	8.1	2.4	100.0

Chi-square = 56.3 (3df) p less than 0.001

Figure 7.

Respondents' reported change in behaviour due to the HIV/AIDS epidemic.

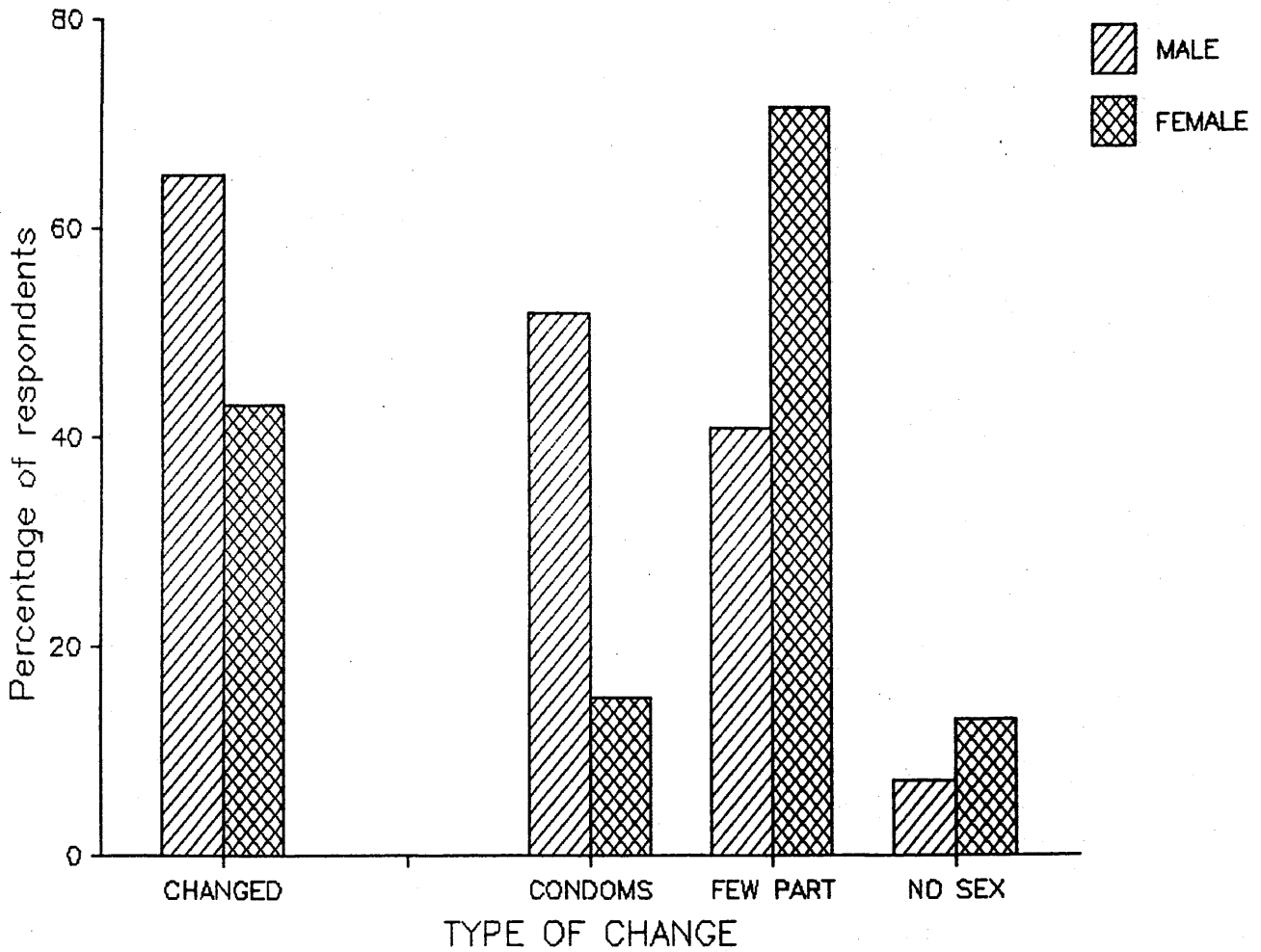


Table 9.

Responses to questions about HIV transmission and its prevention.

	% Male (n= 661)	% Female (n= 270)	χ^2	p value
<u>HIV can be spread by</u>				
Heterosexual sexual intercourse	92.7	85.9	11.1	0.001
Unsterile needles	82.1	85.2	1.4	NS
Male homosexual sexual intercourse	74.2	78.5	1.1	NS
Female homosexual sexual intercourse	55.8	51.1	1.7	NS
Oral sex	49.8	50.0	0.04	NS
Sex without full penetration	46.8	43.7	0.06	NS
Dry kissing	42.9	26.3	22.5	0.001
Petting	38.2	25.6	15.2	0.001
<u>The spread of HIV can be prevented by</u>				
Abstinence from sex	85.5	88.5	1.5	NS
The condom	47.9	43.0	1.4	NS
IUCD (coil)	4.6	3.4	1.5	NS
The pill (oral contraceptive)	0.8	4.8	14.6	0.001

* Respondents were free to give more than one answer. That is why the percentages add to more than 100.

Table 10.

Sources and Context of information about the condom
in the past 2 Years.

	% Male (n= 568)	% Female (n= 228)	χ^2	P value
<u>Source</u>				
Posters	72.6	59.8	15.1	0.001
Newspapers	60.6	60.4	0.01	NS
Radio	58.3	39.6	26.7	0.001
Television	55.2	48.5	3.5	0.06
Magazines	47.4	39.5	4.6	0.03
No information	14.4	15.6	0.2	NS
<u>Context</u>				
AIDS	54.5	57.8	0.9	NS
General Information	24.7	20.4	2.0	NS
Condom's unreliability	17.0	14.4	0.9	NS
Contraception	3.8	7.4	5.5	0.02

n= only those respondents who recalled seeing or hearing about the condom in the previous two years.

In case of sources some respondents gave more than one source, that is why the percentages add to more than 100.

Table 11

Respondents stated reasons in favour of the condom

	Contra ception	AIDS	STDs	None	Total
Male	262	213	100	84	659
%	39.8	32.3	15.2	12.7	100.0
Female	116	61	59	34	270
%	43.0	22.5	21.9	12.6	100.0
Total	378	274	159	118	929
%	40.7	29.5	17.1	12.7	100.0

Chi-square = 11.62 P = 0.009

Missing observations = 2

Figure 8.

Respondents' stated reasons in favour of the condom.

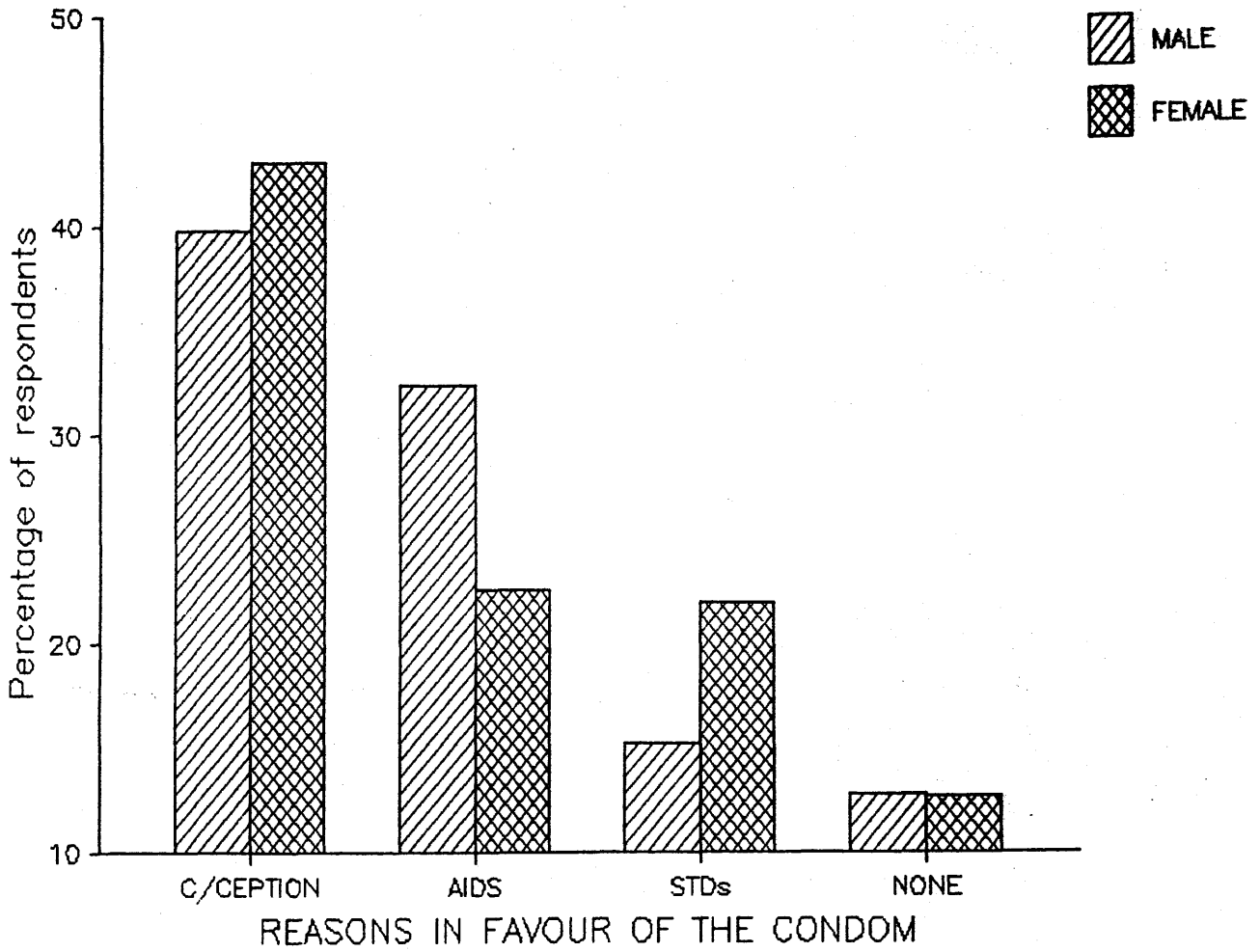


Table 12.

Respondents stated reasons against the condom

	unsafe	encourage promiscuity	reduce sensation	un natural	Tot.
Male	226	206	165	62	659
%	34.3	31.3	25.0	9.4	100.0
Female	138	79	37	16	270
%	51.1	29.3	13.7	5.9	100.0
Total	364	285	202	78	929
%	39.2	30.7	21.7	8.4	100.0

Chi-square = 28.16 P less than 0.001

Missing observations = 2

Figure 9.

Respondents' stated reasons against the condom.

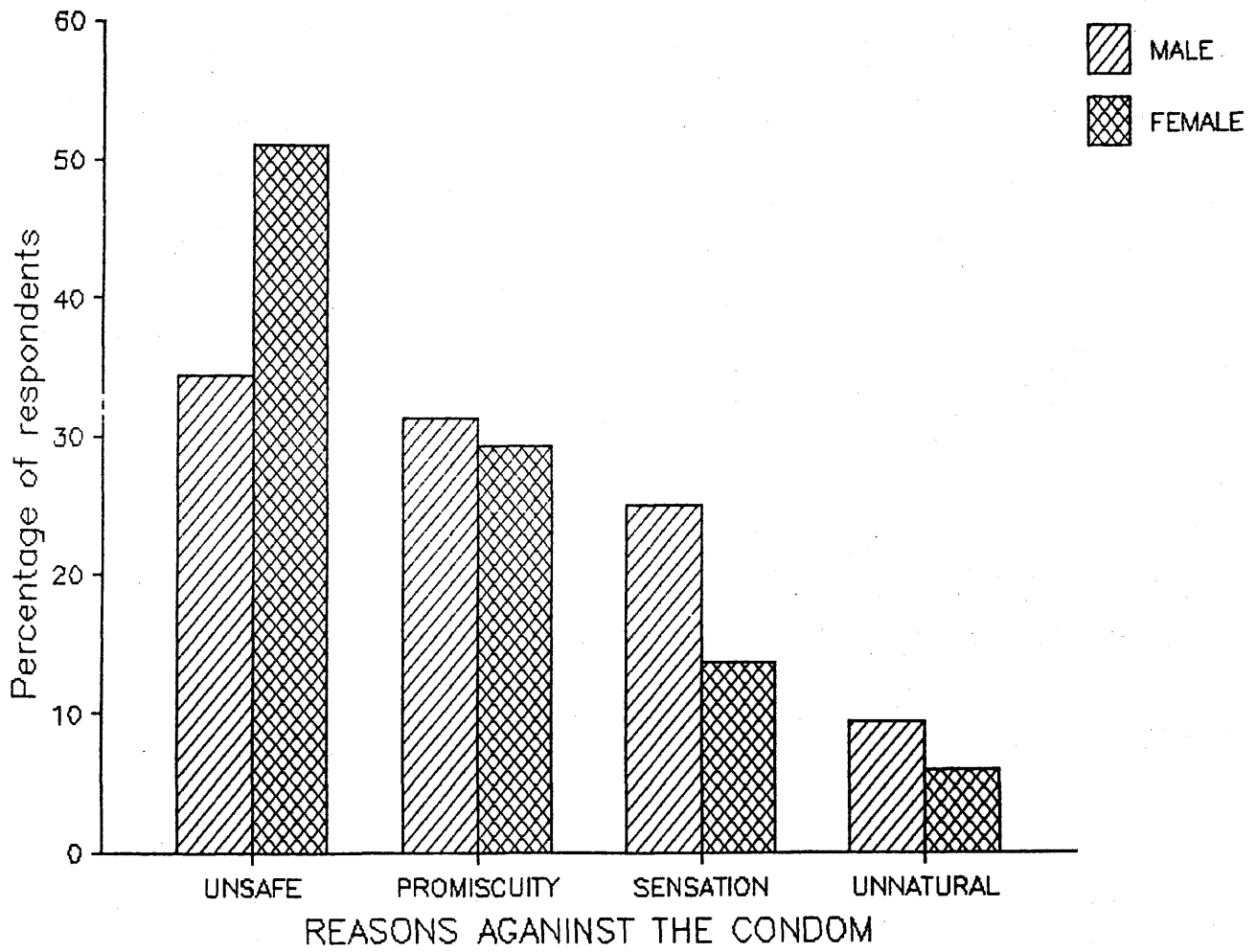


Table 13.

The respondents frequency use of the condom.

	Always	frequency use Mostly	Sometimes	Total
Male	60	55	105	220
%	27.3	25.0	47.7	100.0
Female	25	13	22	60
%	42.4	22.0	35.6	100.0
Total	85	68	127	280
%	30.3	24.3	45.4	100.0

Chi-square = 4.7 (2df) p = NS

Table 14

The condom users reponses regarding being persuaded by their partners not to use the condom.

	Yes	No	Don't know/ not sure.	Total
Male	66	147	7	220
%	30.0	66.8	3.2	100.0
Female	10	44	6	60
%	16.7	73.3	10.0	100.0
Total	76	191	13	280
%	27.1	68.2	4.7	100.0

Chi-square = 8.1 p = 0.02

Table 15

Condom users by frequency of use, who felt they could be persuaded by their partners not to use the condom.

	frequency always	of mostly	condom sometimes	use Total
Male	11	26	29	66
%	16.7	39.4	43.9	100.0
Female	1	3	6	10
%	10.0	30.0	60.0	100.0
Total	12	29	35	76
%	15.8	38.2	46.0	100.0

Chi-square = 0.9 p = NS

Table 16

The variables associated with condom use.

VARIABLE	ODDS RATIO	95% C.I	2 X	p value
Number of partners since first sexual intercourse:				
2-5	4.6	1.6-12.9		
6-10	5.0	1.9-13.7	53.2	½0.001
11+	7.3	2.5-21.5		
Not seen or heard about the condom				
	2.3	1.4-3.7	12.4	0.001
Positive attitude to condom				
	2.0	1.3-3.0	11.4	0.001
Had had sex with risky sexual partner				
	1.7	1.2-2.6	20.0	0.001
Number of sexual partners in the past twelve months:				
2-5	1.3	0.4-4.5		
6-10	1.8	1.1-2.9	47.0	0.001
11+	2.0	0.9-4.5		
AIDS epidemic had affected respondent's lifestyle				
	1.5	1.0-2.3	8.4	0.004

Table 17

The reasons for not using the condom given by non condom users.

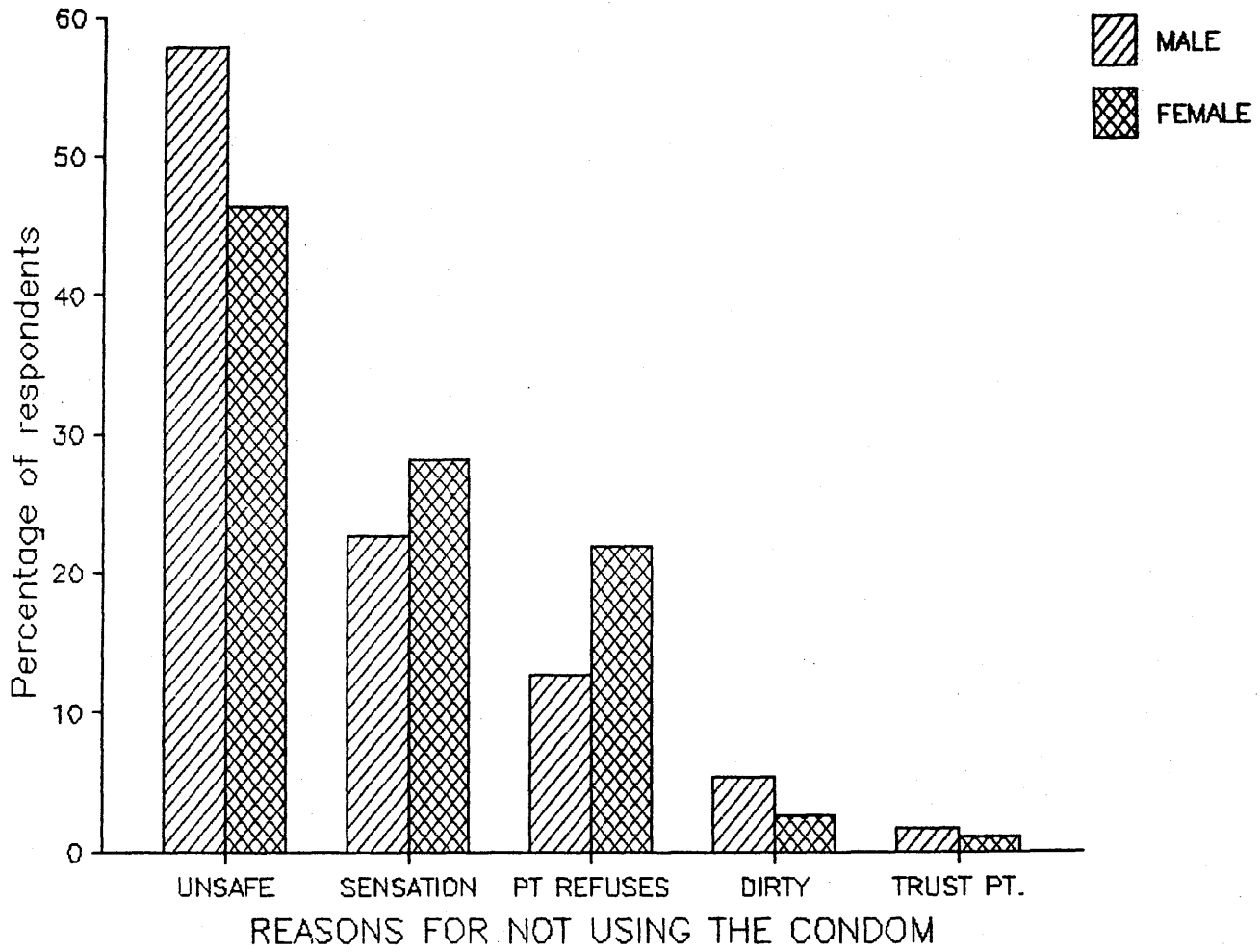
	They are not safe	Reduce sensation	Partner does't allow	They are dirty	No need/ I trust my partner	Total
Male	238	93	52	22	7	412
%	57.8	22.6	12.6	5.3	1.7	100.0
Female	89	54	42	5	2	192
%	46.4	28.1	21.9	2.6	1.0	100.0
Total	327	147	94	27	9	604
%	54.1	24.3	15.6	4.5	1.5	100.0

Chi = 14.6 4df p = 0.005

Missing 47; 29 men and 18 women (these were not sexually active)

Figure 10.

The reasons for not using the condom given by non condom users.



4.3 Discussion.

Enrollment of the students who participated in this study was not done in a random fashion. Attempts were made to include students from each faculty and year of study to represent the entire undergraduate student population. The best sampling frame to achieve this was the University halls of residence, as over 90 percent of all undergraduate students stay in the ten halls of residence, to which they are randomly allocated. This means that students of different faculties and years of study are randomly represented. It is most unlikely that by taking every fourth name on the alphabetical list of names of the residents in each of the ten halls, any bias may have been introduced. The findings of the sex, age, faculty and year of study distribution of the participants suggest a representative sample of the university student population. Therefore, information gained about knowledge, attitudes and behaviour concerning HIV and AIDS is most likely to be representative of those of the general student population.

However, because this study concentrated on a particular group of young people, who by their standard of education make up less than one percent of all the young people in

Uganda [*Uganda MOH 1989*], it is not possible to make inferences about Uganda's young people in general, and certainly not about the entire Uganda population.

Although that is the case, data from other studies carried out about knowledge, attitudes and practices concerning AIDS in Uganda [*Berkely et al. 1989(a), Berkely et al. 1989(b), Konde-Lule et al. 1989*], have shown marked similarities with some major findings of this study.

The response rates of 94 percent for the males and 90 percent for the females were very satisfactory. The very high response perhaps suggests a high level of interest in the topic. Although it is impossible to be sure that all the replies were honest, responses were internally consistent and conveyed the strong impression that the students had understood the questions, and were honest with in their responses.

This study demonstrated that many Ugandan students remain at apparently high risk of acquiring or transmitting HIV infection. It was found that by secondary school entry at around 14 years of age, about 40 percent of the male respondents and about one quarter of the female respondents had already had sexual intercourse. This is

very important as regards the sexual transmission of HIV. A similar observation has been made by Sarah Forster and Kemlin Furley [**Foster and Furley 1989**] in their study on AIDS awareness in Uganda. Among the factors which they identified as being important in the spread of HIV infection in Uganda, was that in Uganda sexual relationships begin when people are very young.

The literature on sexual behaviour among young Africans is extremely limited, with only a few studies focusing on factors influencing the initiation or continuation of sexual activity among young people. However, the finding that many Ugandan students started sexual intercourse at an early age, is similar to that of Leshabari et al. [**Leshabari et al. 1986**], in their study of heterosexual behaviour among 650 adolescents in Dar-es-Salaam, Tanzania, which showed that two-thirds of males and slightly less than 40 percent of females reported they had already engaged in sexual intercourse. Lemma in Nairobi [**Lema 1987**] found that 78 percent of secondary school girls had had sexual experience by the age of 17 years. However, the present study and all those reported from Africa, were carried out in an urban setting where sexual relations are thought to occur at an earlier age than in the rural areas, especially among girls. This is because of changes in sexual behaviour imposed on these

young people by conditions in urban areas. Young people who come to the city from rural areas often have little or no supervision from relatives. In addition, they have meagre financial support to handle the basic necessities of urban life. This situation leads to sexual exploitation of these young people, especially girls, by business men who provide them with money. Probably different findings would have emerged had the study been carried out in a rural area where traditional barriers, including sexual regulation are known to still exist especially among the unmarried young. On the other hand, this same finding compares favourably with those reported in similar studies in other countries. For example, in the United Kingdom, sexual behaviour of young people has been undergoing a number of changes in recent years, as a comparison of earlier surveys published in 1965 and 1976 clearly demonstrates. In 1965, 16 percent of Schofield's sample of 15-19 year olds claimed to have had sexual intercourse at least once [**Schofield 1965**], compared with 51 percent of respondents in Farrell and Kellaheer's study conducted in 1974-75 [**Farrell and Kellaheer 1980**]. Forman and Chivers in 1989 [**Forman and Chivers 1989**], reported a figure of 66 percent. Cameron and Ford [**Cameron and Ford 1989**] who surveyed 400 16-21 year old people in Somerset in 1989, 27 percent of whom were students, found that nearly half (47%) of the 16 year olds had engaged in

sexual intercourse, rising to 89 percent by the age of 21. In all cases, boys were more likely than girls to be sexually experienced. In the United States on America similarly high percentages of sexually active young people have been reported. For example, Barbara et al. [**Barbara et al. 1990**] in their study of sexual behaviour of college women, reported women who were sexually experienced as 88 percent in 1975, 87 percent in 1986, and 87 percent in 1989.

In the present study, males had more sexual partners than females which is a similar finding to other studies in Uganda [**Berkely et al. 1989(b)**, **Konde-Lule et al. 1989**]. Among the male respondents, around one third reported a lifetime total of more than 10 sexual partners. Around two thirds reported at least two sexual partners in the previous 12 months compared with only 9 percent of adults in the rural district of Rakai [**Serwada et al. 1989**]. In the study of adults in semi-rural areas near Kampala [**Konde-Lule et al. 1989**], 40 percent of males (all ages) reported having at least 2 partners during the previous six months. Though the semi-rural study reported partners for only the previous 6 months, it is clear that numbers reported in this study are much higher than those reported in the other studies in Uganda, The reasons for this is not clear; it is not known if there is over-

reporting by the participants, whether sexual habits are different in this population (being educated and urban), or if health education about the risk of HIV has not influenced this group of people.

Among the male respondents, older respondents reported a significantly higher number of sexual partners, with 30 percent of those in the age group 30-34 years reporting more than five partners, compared with 15 percent in the 20-24 age group, and none in among respondents under 20 years (chi-square = 53.7, 2df, $p < 0.001$). In part this could have resulted simply from the fact that with increasing age there had been more opportunity to accumulate partners. These findings are similar to those of another African study carried out in Zimbabwe based on 700 male respondents in semi-urban areas [**Adamchak et al. 1990**], where 37 percent of those in the 30-34 age group, and 12 percent of the 20-24 age group reported more than five partners in the previous year.

About 60 percent of all single or separated respondents reported having more than one sexual partner during the previous twelve months, compared with about 50 percent of those who were married or living with a regular partner. The lack of a big difference in the number of partners between single and married people is not surprising,

considering the reported high infidelity within marriage in Uganda [**Forster and Furley 1989**]. This suggests that marital status is not a good marker for HIV high-risk heterosexual behaviours in Uganda.

More than half the respondents of each sex in the present study reported having sexual partners whom they suspected of having sex with others. This risk taking behaviour seems to result from a gap in knowledge about the presentation of HIV infection. Many Ugandans have not realised that one can be infectious with HIV, without showing any signs of the disease. They believe that whoever has not lost weight, is free of HIV infection and therefore safe to have sex with.

Almost one in five respondents reported having had at least one episode of sexually transmitted disease in the last 12 months. This reporting of sexually transmitted diseases, could perhaps be used as another indicator of the possible HIV risk. For in Uganda as any elsewhere, sexually transmitted diseases have been suggested as a cofactor in the spread of HIV infection [**Berkely et al. 1989(b), Konde-Lule et al. 1989**].

Sixty-five percent of the men and 43 percent of the women indicated that they changed their behaviour to avoid

contracting HIV. Of these, 41 percent of the men and 72 percent of the women reported that they had reduced the number of their sexual partners. Since the reduction in the number of partners was not quantified, it could have been for example from 10 sexual partners to say five. That being so, it could be assumed that in many cases the behavioural change would at best reduce the risk of HIV very slightly. Indeed, the reported frequency of partner change, particularly among men, remains disturbingly high.

The great majority of the respondents in this study appeared well aware of the main ways in which HIV could be spread, including heterosexual transmission. However, gaps still exist in their AIDS knowledge of the transmission of HIV, a prominent feature in other studies in Uganda [*Foster and Furley 1989, Konde-Lule et al. 1989, Serwada et al. 1989*]. Many in the present study thought that HIV could be spread by types of sexual contact where there is little evidence that transmission can occur, for example female homosexual sexual intercourse, and dry kissing. While over 85 percent of all respondents understood that HIV infection could be prevented by abstention from sex, less than half thought it could be prevented by use of the condom. It is worth remembering that of those who reported changing their

behaviour because of AIDS, only about 8 percent had resorted to sexual abstinence, while 44 percent had started using the condom. The contradiction between the high percentage of respondents who believe that HIV can be prevented by sexual abstinence, and the few who apparently practise it must not be forgotten when designing HIV/AIDS education materials. What good is knowledge without its application?

Most respondents had come across publicity about the condom in the past two years on posters, radio, television and the newspapers. This finding agrees with that found by the WHO/Ugandan evaluation committee on AIDS publicity [*Uganda MOH 1988*] which found that knowledge about AIDS was widespread in Kampala, through television, radio, posters and newspapers. The report went on to say that most rural people were poorly informed. They had none of the above sources of information, and the government brochures were not printed in local languages.

More than half of those who had come across this publicity about the condom associated the publicity with AIDS, while only 4 percent of men and 7 percent of women associated the publicity with contraception. This is

probably due to changes in emphasis on condom use by the Uganda Family Planning Association.

Paradoxically however, when they were asked to give good reasons in favour of using the condom, contraception was mentioned much more frequently than AIDS. Eighty percent of women and more than 60 percent of men felt that condoms were either unsafe or encouraged promiscuity, with women pointing out that the condom could easily burst during sexual intercourse, and it would go directly into the uterus, and require major surgery to have it removed. Indeed from this study, it is clear that the sort of information given out regarding the condom has many shortcomings, and is likely to discourage many would be users.

Sixty percent of both men and women said that they disapproved of the condom, with around a quarter of all respondents doing so on religious grounds. This objection on religious grounds must be examined with great care, especially when dealing with condom promotion, in order not to antagonise the Uganda Catholic Church. World wide, the stand of the Catholic Church on the condom is well known. The Catholic Church teaches that "The use of condoms degrades the morality of people, encourages promiscuity, and this results in the abuse of womanhood

and deterioration of the sacred institution of marriage" [Apelo 1976]. Though in Uganda, about 60 percent of the population are nominal Catholics [Uganda MOH 1989], very few people and much fewer still among the university students, are practicing Catholics. Certainly judging from the number of reported sexual partners, this group is far from being religious. Although the students appear to have much more positive attitude towards condoms than respondents in the rural [Serwada et al. 1989], and semi-rural studies [Konde-Lule et al. 1989], negative attitudes to the condom appear to be well entrenched.

In the present study, one third of the men and about one quarter of the women said that they had used the condom. This compares with only 3 percent of respondents in both the Konde-Lule et al. semi-rural study [Konde-Lule et al. 1989], and the Serwadda et al. Rakai district (rural) study [Serwada et al. 1989], and still considerably higher than the 1988 survey in Uganda [Forster and Furley 1988], which reported that 22 percent of men in Kampala, and 11 percent of rural men had used the condom at least on one occasion. In the present study, it was encouraging to note that over half of the men and about 20 percent of the women who used the condom had done so to avoid contracting HIV. Thus, although use of the condom in the present study remained probably too low to have a major

impact on HIV transmission, its acceptance among students appears greater than among other groups.

However, compared with condom use reported by students in the United Kingdom and the United States of America, the Ugandan students still have a long way to go. In a 1989 study of 500 students in the United states [**Coxon and Carballo 1989**] reported condom use by 41 percent. In United Kingdom, Cameron and Ford [**Cameron and Ford 1989**] in 1989 found that 73 percent of the male respondents, and 75 percent of the female respondents had used condoms, although only 36 percent of either sex had used a condom in the most recent sexual intercourse.

The students in the present study appeared to have much clearer views on the condom than respondents in the semi-rural study [**Konde-Lule et al. 1989**]. In the semi-rural study, over half the respondents said that they had no particular reason for not using the condom, while one third said that they did not like them and about 10 percent indicated that their partners were opposed to using condoms. In the present study 54 percent of non-users said they thought the condom was unsafe and a further 25 percent felt condoms interfered with the pleasure of intercourse with 16 percent giving the partners refusal as the reason for not using the condom.

Whether this difference is due to differences in academic education or acceptance of the condom itself, it is not possible to tell.

About 30 percent of condom users of both sexes in the present study reported using condoms always, but some of these admitted that they could be persuaded by their partners not to. These were about 15 percent of those who always used the condom compared with 46 percent of those who used it sometimes. As only 30 percent of all respondents reported condom use, of whom only one third of them used it always, and of these 15 percent could be persuaded not to use it, this leaves only about 8 percent of respondents who always used the condom and could not be persuaded not to. This still compares very well with other Uganda study. For example in the Konde-Lule et al. [**Konde-Lule et al. 1989**] study the corresponding figure was only one percent. The relatively high frequency of condom use among the students gives some grounds for optimism. However, it is clear that sexual intercourse in the student population continues to provide countless opportunities for the spread of HIV.

Many respondents appeared to be using the condom as a result of concern about HIV infection. Using logistic regression analysis, it was found that condom use was

more likely among those who had a positive attitude to the condom, those who claimed to have changed their lifestyle as a result of the AIDS epidemics, who reported having sex with a 'risky' sexual partner (risky partner included prostitutes, bar maids and casual partners), or who had had large numbers of sexual partners. Of particular concern was the finding that condom use was less likely among those who said they had seen official publicity about the condom. In addition, about 16 percent of respondents volunteered that they remembered the publicity about the condom had referred to its unreliability. The generally negative message about the condom contained in government publicity material does seem to have had an effect. This further emphasises the need for a proper, clear and positive programme for advertising and promoting the condom in Uganda.

Despite the intensive publicity campaigns by the AIDS Control Programme in Uganda and other organisation, it is clear from this study that too many individuals still regard HIV as remote and irrelevant to them personally.

While most of these students appear to have sufficient knowledge about HIV infection, many appear apparently not to have used that knowledge for their protection. Indeed, only 22 percent of the men and 7 percent of the women

thought that they were personally at risk from HIV infection due to their own behaviour. The findings of this study have added weight on what others like Quinn et al. [*Quinn et al. 1986*], have suggested, that despite the high AIDS knowledge among the educated Africans they do not seem to responded appropriately. Also these same findings seem to support what Adamchak et al. [*Adamchak et al. 1990*] have pointed out that in Africa the educated and professional-technical groups, are disproportionately affected by AIDS, and it is the loss of such professionals which could negatively affect the already fragile economic system. Among the reasons they give for this lack of appropriate actions is that education enables men to increase their status and influence in society such that they can afford to be promiscuous. Yet still the Uganda government continues with its advice of abstention from sex, as the best way to protect oneself from HIV infection. It is clear from this study that the government's advocacy of abstention from sex is failing.

4.4 Conclusion

The purpose of this study was to contribute to the development of appropriate HIV/AIDS educational and public awareness campaigns and thereby possibly assist in the control of the spread of HIV. As set out in the introduction to this thesis, the overall aim of the study was to extend our knowledge of, attitudes and behaviour towards HIV, and sexual activity, including condom use among population groups studied.

It seems apparent from the results obtained in the study that this overall aim was achieved.

This study was carried out among 1000 Ugandan university undergraduate students, of whom 931 completed the questionnaire. The 931 respondents included of 661 males and 270 females. This study concentrated on a particular group of young people, and therefore it is not possible to make inferences about Uganda's young people in general. However, this choice of respondents should not be treated as a limitation on the conclusions to be drawn from this study.

Given that these students make up a substantial proportion of Uganda's educated class, and the leaders of

tomorrow, it can be concluded that the study has attempted to highlight some distinctive features of the Uganda AIDS epidemic from a knowledge and behaviour perspective. On the whole, the results of the study offer little comfort in the current attempts to control the spread of HIV. Despite the intensive publicity campaigns by the government and other organisations, it is clear from this study that too many individuals still regard HIV as remote and irrelevant to them personally.

The study found that the knowledge of the HIV risk factors was very good, with over 90 percent of the respondents correctly indicating that HIV could be heterosexually transmitted. This showed that correct information about HIV transmission and prevention had reached the majority of the respondents.

However, though correct information about HIV transmission and prevention had reached the majority of the respondents, there were still important gaps in knowledge especially with regard to the role of the condom in the prevention of HIV. Worse still, in this study like all other studies on AIDS related behavioural change, there was no corresponding behaviour change amongst many of the respondents.

A number of factors which have been identified as risky for sexual transmission for HIV, for example multiple sexual partners, were evident among the respondents of this study. Many of these Ugandan students first have sexual intercourse at relatively young age. This means that they may be exposed to HIV well before they acquire sufficient knowledge to protect themselves. The majority of respondents irrespective of sex, appeared to be at risk of sexually transmitted HIV, due to their sexual behaviour. A large percentage of respondents still reported multiple sexual partners, and sexually transmitted diseases continue to occur. This as already mentioned proves that these respondents are at risk of sexually transmitted HIV.

It is clear from this study that the government's advice about the condom in the control of HIV, has had negative effects. Those who had received the information about the condom were less likely to use the condom, and the government's advocacy of abstention from sex is failing. This has serious implications for the Ugandan government's general attitude to the condom in the control of HIV.

Although there have been attempts to make condoms available, they have not been generally accepted by these

students. With a small percentage approving of their use, and only 33 percent of men and 22 percent of women reporting they had ever used them. Therefore condoms are probably contributing very little to reducing the risk of HIV infection in this study population, and most likely amongst all the Ugandans.

The logistic-regression analysis showed that a positive attitude to the condom greatly influenced its use. Therefore, if condom use is to be a weapon against HIV, this study suggests that condom knowledge and attitudes of this population (and perhaps other populations in Africa), need to be altered in order to bring about condom use.

The study showed that more than half of the respondents did not use the condom because the condom was said to be unsafe. This is a very disappointing finding. Apart from showing the negative impact of the information about the condom on the Ugandan people, is also bad for would be users to be officially discouraged.

4.5 Recommendations.

1. Although Uganda has the largest total of reported AIDS cases of any African country, and a national control programme for AIDS has been in existence since early 1987, very few data are available on the Ugandan population's knowledge of HIV and related behaviour including sexual practices. The present study concentrated on a particular group of young people, and therefore can only be seen as a pointer to the state of knowledge and behaviour of Uganda's young people in general. Recommendations for the design and implementation of an effective AIDS education campaign for the whole country are thus difficult to make.

Therefore, 1. a study should be carried out to evaluate the impact of the AIDS education carried out so far. Two communities should be studied; one should receive intensive AIDS education, while the other should receive the education planned at national level. A baseline survey to assess pre-intervention knowledge, attitudes and behaviour of the populations in the two groups should first be carried out. Then a follow-up study be carried after intensive education in one of the communities; the other community serving as a control community.

2. As the present study found that knowledge of the HIV risk factors was very good, but there was little corresponding behaviour change, the main thrust of the education effort will now have to be towards encouraging individuals to apply that knowledge to themselves, and to change their sexual behaviour accordingly.

3. Because of the dangerous misconception as to when an individual infected with HIV is capable of transmitting the virus, too many individuals still regard HIV as remote and irrelevant to them personally. The AIDS education planners should develop a flip chart that graphically illustrates every aspect of HIV and AIDS so that people are aware of the clinical progression from HIV infection to AIDS.

4. Though the Ministry of Education has taken steps towards teaching about AIDS in schools and in the process mentioning the condom, a lot more needs to be done if the current negative picture the condom has in the country is to change. Campaigns to encourage use of condoms must also overcome people's beliefs that they are not safe. The concern that increased availability and use of condoms probably will encourage promiscuity, should be countered with statements emphasising the consequences of HIV infection.

5. Many young people in Uganda are not in school. The government and voluntary organisations should reach out to these people through anti-AIDS clubs, letting young people be teachers for their peers, teaching girls how to say no to sex, and teaching sexually active young people, especially boys, how to use condoms and where to get them from.

6. The results of the present study suggest that a uniform educational strategy to reduce the sexual transmission of HIV is inappropriate, even amongst a group as homogeneous in age and educational background as university students. Therefore as many different kinds of AIDS education materials must be developed. For example those for nonreaders, and those engaging in high risk sexual behaviour. Where the intended audience differs markedly from the educators, extra efforts must be made to work closely with the audience and pre-test materials.

7. There must be a new approach to the way the condom is projected all over the country. If the promotion of condom use is to succeed, it will need much more political motivation within the government. The government should come out with a more positive policy towards the use of the condom without appearing to go against the cultural norms and religious beliefs.

8. The government through donor agencies should ensure that condom supplies are sufficient to meet the demand created by promotional programmes.

