

**THE LONG-TERM EFFECTS OF BEHAVIORAL INTERVENTIONS ON
CONDOM USE AND SEXUALLY TRANSMITTED INFECTIONS AMONG
FEMALE BROTHEL-BASED SEX WORKERS IN SINGAPORE, 1990-2002**

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SUMMARY

Background: Sex workers are a major source of transmission of human immunodeficiency virus (HIV) infection, acquired immunodeficiency syndrome (AIDS) and sexually transmitted infections (STIs) in Asia. As there is no cure for major viral STIs and HIV, prevention efforts must promote condom use.

Objectives: We evaluated the effects of behavioral interventions - the condom promotion program for vaginal sex implemented in 1994, and the condom program for oral sex implemented in 1996 - over a period of 8 and 6 years respectively, among female brothel-based sex workers in Singapore.

Methods: The first program was evaluated in 1994 on its short-term effects with a quasi-experimental pretest-posttest comparison group design. Sex workers (n=124) from one site were assigned to the intervention which focused on developing their condom negotiation skills; mobilizing support from brothel management and health staff in condom promotion for vaginal sex; and educating clients. A comparable site without the intervention (n=122) was the comparison group. A time series design, using serial independent cross-sectional surveys between 1990 and 2001, was used to assess the program's long-term effects. The condom promotion program for oral sex was evaluated with an interrupted time series combined with a retrospective pretest-posttest matched control group design. Oral condom use and pharyngeal gonorrhea trends were compared across independent cross-sectional samples of sex workers over time (1994 to 2002) before and after program implementation in 1996; and when

brothel-targeting interventions, comprising talks and administrative measures, were withdrawn and subsequently applied. The independent effect of brothel-targeting interventions was assessed by comparing oral condom use and pharyngeal gonorrhea incidence among 120 sex workers receiving the brothel intervention with 120 matched sex workers from a preceding cohort without the intervention.

Findings: For the first program, the intervention group at 5-month follow-up improved significantly in negotiation skills for condom use for vaginal sex and were almost twice as likely as the comparison group to always use condoms with their clients (adjusted prevalence ratio 1.90, 95% CI: 1.22-2.94). Cervical gonorrhea incidence declined by 77.1% ($p < 0.05$) in the intervention group compared to 37.6% ($p = 0.051$) in the comparison group. Consistent condom use for vaginal sex increased from less than 45% before large-scale program implementation in 1995 to 96.4% in 2001 ($p < 0.001$), with a corresponding significant decline in cervical gonorrhea from more than 30 per 1000 person-months pre-intervention to 4 per 1000 person-months in 2001. Adjustment for temporal changes in socio-demographic characteristics did not materially alter the trends. Consistent oral condom use increased significantly from less than 50% before 1996 (pre-intervention period) to 93.6% in mid-2002 ($p < 0.001$), with a corresponding significant decline in pharyngeal gonorrhea incidence from more than 12 to 3 per 1000 person-months. Sex workers receiving brothel-targeting interventions showed a 10.8% absolute increase in oral condom use, compared with an 11.7% decrease in the control group. The pharyngeal gonorrhea incidence rate was

significantly lower in the intervention group than in the control group (adjusted risk ratio: 0.22; 95% CI: 0.06-0.78).

Conclusion: The interventions increased condom use for vaginal and oral sex, with a corresponding decline in cervical and pharyngeal gonorrhoea.

Chapter 1

INTRODUCTION

1.1 Disease burden of sexually transmitted infections, human immunodeficiency virus and acquired immunodeficiency syndrome

Sexually transmitted infections (STIs), human immunodeficiency virus (HIV) infection, acquired immunodeficiency syndrome (AIDS) are major contributors to the morbidity and mortality of populations in both developed and developing countries. By the end of 2001, an estimated 65 million people worldwide have been infected with HIV; 25 million had died and 40 million were living with HIV or AIDS.¹ The AIDS pandemic is the worst ever faced by mankind with 5 million new infections in 2001 and 4,000 new HIV infections occurring every day around the world. In high income countries like the United States and England, there is evidence of a rebound and increase in STIs and HIV, after having seemingly declined in the late eighties and early nineties, This is partly attributed to the introduction of antiretroviral therapy in 1996 to these countries; the wide access to antiretroviral therapy could have encouraged misperceptions that there is now a cure for AIDS and hence led to a rise in unprotected sex. HIV/AIDS is now the fourth biggest killer in the world and the leading cause of death among males in Sub-Saharan Africa.¹

AIDS affects the young and economically productive group and hence has a profound impact on the economy through lost productivity. It is estimated that heavily affected countries could lose more than 20% of GDP by 2020. AIDS has also led to higher costs in insurance, benefits, absenteeism and illness at the workplace. A recent survey

of 15 firms in Ethiopia showed that, over a 5-year period, 53% of all illnesses were AIDS-related.¹

STIs are a major global cause of acute illness, infertility, long-term disability and death. The World Health Organization (WHO) estimated that 340 million new cases of syphilis, gonorrhoea, chlamydia and trichomoniasis have occurred in the world in 1999 in men and women aged 15-49 years.² Another report estimated that 333 million new cases of these four curable STIs occur every year. The largest numbers of new infections are found in South and Southeast Asia.³ STIs are the second most important cause of disease, death and healthy life lost in women of childbearing age after maternal morbidity and mortality.⁴ The high burden of morbidity and mortality caused by STIs is directly through their impact on reproductive and child health and indirectly through their role in facilitating transmission of HIV.

1.2 The interrelationship of STIs and AIDS

STIs enhance the sexual transmission of HIV infection; genital ulcer diseases like chancroid, syphilis and herpes increase the risk of HIV infection by 1.5 to 7 times⁵ and non-ulcerative diseases like gonorrhoea, chlamydial infection and trichomoniasis increase the risk by 6 to 34 times.⁶ STIs and HIV/AIDS also share the same epidemiological risk factors. The improvement in the management of STIs through early detection, treatment and condom promotion has been found to reduce the incidence of HIV-I infection by 40%⁷ to 60%.⁸ Hence, STI prevention and treatment is an important component in the HIV prevention strategy.

1.3 Determinants of transmission of STIs, HIV and AIDS

The rate at which STIs and HIV spread in a population depends upon (i) the efficiency of transmission, that is, the probability that transmission occurs when an uninfected person encounters an infected person; (ii) the mean rate of change of sexual partners, and (iii) the average duration of infectiousness of the person with the disease. Each of these determinants is significantly influenced by host susceptibility, the infectious virulence of the pathogen, mode of transmission, individual sexual and health seeking behavior, availability and accessibility of diagnostic and treatment facilities, and patterns of social and sexual relationships.

The rapid spread of HIV in poor countries has been attributed to frequent change of sexual partners, unprotected sexual intercourse, presence of STIs and poor access to treatment, lack of male circumcision, social vulnerability of women and young people, and economic and political instability of the community.¹

1.4 Sex workers as a source of transmission

The modes of HIV transmission vary among countries. In high income countries like the United States of America the main mode of transmission is men having sex with men and this accounted for 53% of new HIV infections there in 2000.¹ Another major route is an overlap of injecting drug use and heterosexual sex.

In Asia, Africa and many countries in the developing world, the main mode of HIV transmission is heterosexual intercourse, largely related to the common practice of male

patronage of female commercial sex workers.⁹⁻¹² Recent surveys in Asia showed that from 9.6%¹³ to between 30¹⁴ and 86%¹⁵ of adult men reported having visited a sex worker in a given year. These men subsequently transmit the infection to their female partners, leading to an increase in maternal-infant HIV transmission.¹⁶⁻¹⁷

Very high HIV and STI rates have been reported among sex workers, with HIV rates reaching 40 to 50% in Bombay¹⁸ and Cambodia;¹⁹ 65% in Chiangmai in the early nineties;²⁰ and around 80% in Nairobi²¹ and Kenya.²² The major risk behavior for acquiring STIs and HIV among sex workers is non-condom use during vaginal sex with clients or non-paying partners. Other factors included absence of effective cures for major viral STIs and HIV, delay in seeking treatment due to the social stigma attached to these diseases and the lack of treatment and diagnostic facilities. Unprotected sex via the anal route appears to double the risk of HIV acquisition over vaginal sex. Fortunately, the prevalence of anal sex among female sex workers in Asia is relatively low ranging from none in India¹⁸ and Indonesia²³ to 18.5% in Thailand.²⁴

1.5 Rationale for directing interventions at sex workers

Most countries have responded to the AIDS/HIV/STI epidemic by targeting high-risk groups. Sex workers, being the main source of these infections in Asia, are often the focus of STI and HIV/AIDS control programs. Two main strategies are adopted to control STIs and HIV among them: promotion of condom use to reduce the efficiency of transmission and treatment of treatable STIs to reduce the duration of infectiousness. The second strategy is less feasible due to a lack of diagnostic and

treatment facilities in many countries in Asia. Interventions designed to promote condom use offer at present the best chance of limiting the spread of the epidemic in these countries.

Condoms have been found to be effective in preventing HIV transmission by 87%, with a range from 69%²⁵ to 96%.²⁶ Modeling exercises have shown that interventions focused on groups at high risk of contracting and transmitting HIV and STIs are more cost effective than interventions aimed at the general population.²⁷⁻²⁸ A study in Nairobi found that a program of condom promotion and STI treatment for sex workers cost much less (between US\$8.00 and US\$12.00 for each case of HIV infection prevented) than a medical care program for a person with AIDS, which was estimated to be between US\$800 and US\$1600.²⁸ A recent simulation model indicated that 100% condom use in commercial contacts lowers the incidence of HIV by between 45% and 80%.²⁹

Although it is often argued that prevention and health education efforts should target clients of sex workers, as they are the ones in control of condom use, many practical problems are encountered in trying to reach clients. First, they are more diffuse, mobile and difficult to locate as compared to brothel-based sex workers. Second, cultural sensitivities in many countries, particularly in Southeast Asia, make it unacceptable to use the mass media to tell men to use condoms with sex workers. In addition, mass media messages cannot be personalized to accommodate the different reasons for non-condom-use among clients or clarify their misconceptions. A more

feasible and effective way to reach clients is through brothel managers and sex workers. Other benefits of directing preventive strategies at brothel-based sex workers is that we can fairly easily monitor this group and act on the workplace environment to promote condom use.

1.6 Rationale for targeting interventions at sex workers in Singapore

In Singapore, HIV has risen rapidly from 0.8 per million population in 1985 to 29.0 per million in 1994 and 71.4 per million in 2001.³⁰ Sex workers have been found to be an important source of infection, accounting for 48.8% of notified cases with gonorrhea and 50.5% of notified cases of syphilis in 1994,³¹ with the main risk factor being unprotected vaginal intercourse. Intravenous drug use is very low among them with less than 1% engaging in this risk behavior. In view of the rapid rise in HIV and AIDS and sex workers being identified as a main source of infection, I developed behavioral intervention programs in 1994 to promote consistent condom use among brothel-based sex workers so as to control the spread of STIs and HIV among them.

It is important to evaluate the effectiveness of the interventions, particularly their long-term effects. This will help STI program planners and policy makers understand what is effective and sustainable and why, in order to guide future efforts in Singapore, and to allow these interventions to be adapted to the local HIV transmission epidemiology in neighboring countries.

1.7 Gaps in existing research on interventions for sex workers

Although many behavioral intervention programs focusing on condom use have been developed for sex workers, very few were evaluated to assess their effectiveness, probably because of the difficulty in following up the highly mobile sex workers in the real world. In addition, the concept of evidence of effectiveness of community-level interventions is more complex than that of medical interventions conducted in the clinical or individual-level setting. The use of randomized controlled trials (RCTs), the gold standard for assessing evidence of effectiveness of medical or surgical interventions, is often not feasible for evaluating behavioral interventions for sex workers at the community or institutional level because of ethical and logistic problems in maintaining randomization of sex workers over long periods, absence of experimental conditions in the real-world setting and cross contamination of experimental conditions. In addition, the RCT may not be appropriate for multifaceted behavioral interventions employing brothel policies to create a supportive environment for condom use promotion; and providing screening and treatment facilities for STIs, as randomization of individuals ignores the influence of the environment on their behaviors. Recognizing these limitations, health promotion experts³² and researchers now consider study designs which employ a control or comparison group equivalent at baseline to the intervention on socio-demographic and outcome variables and which report on pre- and post-intervention outcome data as rigorous designs for providing sound evidence.³³

There are few rigorous studies^{18,34-36} on intervention programs and these programs have been found to be effective with regard to their short-term effects, that is, the change within 3 to 6 months of the intervention. It is not known, however whether these effects could be maintained. In other studies, self-reported behavior on condom use is not validated with biological measures.³⁷

Thirteen studies^{8,10,22,35,37-46} have evaluated the long-term effects ranging from a period of more than 1 to 8 years. In some of these studies, the small sample size (n<50),³⁷⁻³⁸ high attrition rates (>50%) and the non-equivalence of the comparison group³⁹ make it difficult to draw sound conclusions on the effectiveness of the interventions. Generally, the behavioral effects of the more rigorously evaluated programs were mixed ranging from relapse to non-condom use³⁷ to a sustained positive increase in condom use.^{8,10, 35,37, 38}

Among the successful interventions, the highest level of condom use attained was less than 80% for all but one intervention. The 100% condom policy program in Thailand was the only one that achieved a condom use rate of more than 90% with a concomitant 79% decline in STIs after 4 years in 1993.^{10,45} However, subsequent evaluations showed that this high level was not maintained in some areas in Thailand, with condom use reaching a plateau of 80%, and showing no difference from the control area.³⁵ In 1997, 8 years after implementation of the national 100% condom policy program, HIV-prevalence remained high with seropositive rates of 26% among brothel-based sex workers nationwide and 34% in northern provinces.⁴⁷ HIV

seroprevalence was also found to be higher among sex workers who began sex work since 1994 (12.5%) compared to those who began similar work before 1989 (8%).⁴⁸ HIV prevalence may be a less valid indicator than HIV incidence, but after 8 years one would expect a drop in prevalence as well. Some studies, which have used HIV incidence to evaluate their program effectiveness, also found high HIV seroconversion. One prospective study in Thailand that followed up brothel-based sex workers from 1991 through 1994 found a high incidence of HIV seroconversion of 20.3 per 100 person-months during the first year of follow-up.⁴⁹ A study in Indonesia⁴¹ also found high levels of STIs among sex workers despite achieving high condom use levels of between 65% and 78% after implementation of a condom promotion program. In view of the high prevalence of HIV and STIs among sex workers, their sheer number of partners, and the possibility that the minority of clients who persist in unprotected sex may be HIV positive and potentially infect more sex workers, it is important to increase condom use levels to as close as possible to 100% to break the chain of transmission. Otherwise, these sex workers may infect other clients who would in turn spread the infection to their wives.

Evaluation of the long-term behavioral intervention programs on condom use in different countries has shown mixed responses. Reasons for these differential effects are unclear. Could the differential effects be attributed to the different strategies used in the programs? Strategies have ranged from health talks to brothel policies and free screening and treatment for curable STIs. What is the relative contribution of the specific component or strategy in the multifaceted programs to the behavior change? It

is difficult to find answers to the second question as behavior change is very complex and is probably due to the synergistic effects of the multiple components in the programs.

Qualitative research and process evaluation are needed to understand why the majority of condom promotion programs for sex workers failed to reach 90% or more. Qualitative data also complement quantitative evaluation in allowing for a fuller interpretation of the differences found between control and intervention groups. Most studies have focused on quantitative evaluation, emphasizing the association between the program and the outcome of behavior change or STI and HIV reduction. The process to explain why the program failed or succeeded in achieving its intended effects has seldom been described and evaluated. This information would help STI/HIV/AIDS program managers plan better programs. For example, detailed information of interventions such as how and why they work in a particular context will enable program managers to replicate or adapt successful sustainable interventions to their own setting. Only the studies in Thailand^{36,38,45} and another study in Africa⁴⁰ have documented the process in detail. The success of the program in Thailand was attributed to a nation-wide free condom distribution program, a public mass media campaign advising men to use condoms with prostitutes and sanctions against non-compliant sex establishments. The authors' concern then was the sustainability of the high level of condom use as the 100% condom promotion program relied heavily on the cooperation of the police. Subsequent evaluations a few years later showed that condom use in some areas was not sustained. It reached a

plateau of 80%³⁵ and was not significantly higher than the control area. Another concern is that the mass media strategy to advise men on condom use for commercial use may not be culturally acceptable in other countries. Other strategies to increase condom use among sex workers and more importantly, to sustain condom use among them have to be developed and evaluated.

As condom use and sexual behavior among sex workers can be influenced by a complex interaction of individual, socio-cultural, environmental and political factors, would a comprehensive pre-program needs assessment and continual needs monitoring to identify the important factors influencing condom use contribute to sustained condom use? The program in Indonesia,⁴¹ was the only study that reported basing their program design on local needs assessment and application of a comprehensive theoretical framework. Condom use in this program did not achieve a high level of condom use after reaching a plateau at 77%. The authors attributed this plateau effect to the lack of client education. Further research is required to assess the effects of client education. The condom promotion program in Thailand^{35,36,38,45} has a very comprehensive mass media program directed at clients, yet condom use in some areas has not increased beyond 80%.³⁵ None of these longer-term studies reported building in a continuous quality improvement mechanism to monitor progress, identify operational problems and find ways to improve the program activities. Could the lack of this monitoring mechanism contribute to the failure of these interventions to sustain condom use of more than 90%? What are the barriers, systemic constraints

and non-modifiable environmental factors that were encountered in sustaining program efforts to improve outcomes?

Behavioral change is known to be complex. Did programs that succeeded in increasing condom use for vaginal sex lead to a similar concurrent increase in condom use for oral sex or did they cause unintended effects such as an increase in unprotected oral sex? None of the studies has reported whether the increased condom use for vaginal sex was associated with similar changes in condom use for oral sex. This information is important in view of the well-established evidence of spread of STIs⁵⁰⁻⁵² by oral sex and the increasing evidence of HIV spread by oral sex.⁵³⁻⁵⁴

In conclusion, very few behavioral interventions for sex workers have been evaluated. The majority of studies that used rigorous evaluation designs evaluated the short-term effects of the program. Of those few studies that evaluated the long-term effects over a period ranging from 1 to 8 years, results were mixed even in the same country setting,^{35,38} with effects ranging from relapse to non-condom use to an increase in condom use. Among those successful interventions, the increase in condom use also varied widely with the majority achieving less than 80%. Only the national 100% condom policy program in Thailand achieved consistent condom use of more than 90% after 4 years. Even for the latter, subsequent evaluation 4 years later in 1998, showed that condom use was not sustained and HIV rates remained high among the sex workers.³⁵ Reasons for the differential effects of the long-term behavioral interventions are unclear, as process evaluation was not conducted in most of the studies. A

combination of qualitative process and quantitative outcome evaluation methods would provide a fuller picture to STI/HIV program managers who want to learn from other countries' experiences in order to replicate or adapt successful interventions to their own setting. None of the studies reported building in a continuous quality improvement mechanism to continually monitor progress and improve program activities to achieve a lasting increase in condom use to as close as possible to 100%. It is important to sustain high levels of condom use as ongoing transmission could occur even with a low level of non-condom use due to the high number of partners among sex workers and the findings of higher HIV infection rates among their clients compared to other men.⁵⁵ In addition, none of the studies evaluated whether an increase in condom use for vaginal sex would affect other risk behaviors such as oral sex.

1.8 Rationale and objectives of the present study (How they address gaps in existing research)

To address the abovementioned gaps in the existing research, this study aims to evaluate both the immediate and the long-term intended and unintended effects of behavioral intervention programs for brothel-based sex workers on condom use and gonorrhea incidence over an 8-year period from 1994 through 2002. The main hypothesis to be tested is that a comprehensive behavioral intervention program that incorporates a continuous quality improvement and monitoring mechanism will achieve a lasting increase in condom use to at least 90% and a sustained reduction in gonorrhea incidence among sex workers. As it is important to understand the process

involved in designing a program, this study also combines process with outcome evaluation to give a fuller picture as to how and why the program works or fails.

Chapter 2

LITERATURE REVIEW

2.1 STIs, HIV, AIDS and sex workers in Singapore

2.1.1 STIs

STIs are notifiable in Singapore under the Infectious Disease Act 1976. The notifications, pooled from private and government sources, are collated by the Department of STI Control, which is run by the National Skin Center for the Ministry of Health. In 2001, 6,686 cases of STIs were notified in Singapore. There has been a progressive and marked decline in the incidence of STIs over the last 2 decades from an incidence rate of 1,013 cases per 100,000 population in 1980 to 162 cases per 100,000 population in 2001. The three most common STIs notified were non-gonococcal urethritis (incidence of 41 per 100,000) followed by gonorrhoea (37 per 100,000) and syphilis (24 per 100,000).⁵⁶ The significant decline in STIs has been attributed to early treatment, effective antibiotics, treatment guidelines and health education and prevention programs.

2.1.2 HIV and AIDS

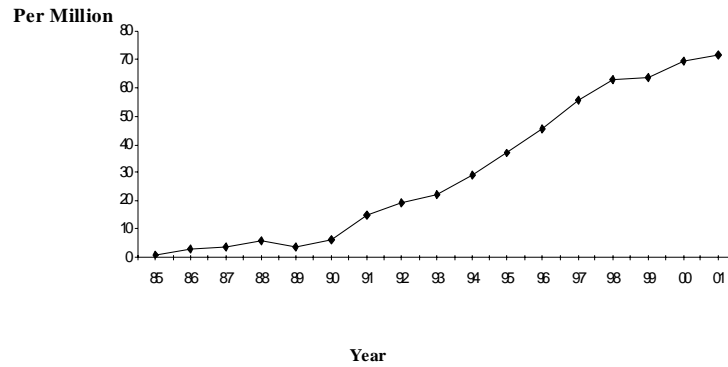
HIV and AIDS were notifiable since 1985 after the detection of the first AIDS case in May 1985. The National AIDS Control program was also established in the same year and its activities included public education on AIDS, legislation, protection of national blood supply through the routine screening of blood and blood products, case

management of the HIV-infected, counseling, disease surveillance, training and research.

As at 31 December 2001, 1,599 Singaporeans were reported to be HIV positive. Among them, there were 628 asymptomatic carriers and 381 with full-blown AIDS. Five hundred and ninety persons have so far died of AIDS. The total number of reported AIDS cases in 2001 was 152, a 6.3% increase from the 143 cases reported in 2000.

There has been an increasing trend in HIV/AIDS infection in Singapore over the past 2 decades. The number of reported cases of new HIV/AIDS infection has increased from 2 in 1985 to 111 cases in 1995 and to 237 cases in 2001.⁵⁷ The HIV incidence rate has increased markedly by almost 40-fold from 0.8 per million population in 1985 to 29.3 per million population in 1994.⁵⁸ This upward trend still continues, reaching an incidence of 71.4 per million population in 2001,⁵⁷ but the rate of increase appears to have slowed down by 2.4 times from 1995 to 2001 compared to the earlier 40-fold increase (Figure 2.1).

Figure 2.1: HIV Incidence rates in Singapore, 1985-2001



The main mode of HIV/AIDS transmission among Singaporeans is sexual intercourse, which accounted for 96.4% of the HIV-infected cases. Very much smaller proportions contracted the infection through intravenous drug use (2.0%), perinatal route (0.9%), renal transplant overseas (0.2%) and blood transfusion (0.2%). The transmission pattern has changed from one that was predominantly homosexual or bisexual to one that is increasingly heterosexual. The proportion infected through heterosexual transmission has increased from 29.4% in 1990 to 71.9% in 2000⁵⁹ and 81% in 2001.⁵⁷ The highest prevalence was found in the 30-39 year age group. Service and sales workers formed the highest proportion (19.6%) of all HIV infected persons.

2.1.3 Sex workers in Singapore: background information

Sex workers in Singapore have been identified as an important core group for the transmission of STIs, HIV and AIDS in Singapore. In Singapore, 9.6% of men (6.0% married and 13.3% unmarried men) surveyed in the community in 1987 reported having engaged in sex with commercial sex workers.¹³ There are two main types of sex work in Singapore. They either work from brothels (Figure 2.2) or are freelance sex workers. Brothel-based sex workers work from regulated brothels situated in geographically defined areas. Freelance (indirect sex workers) generally solicit clients from a variety of settings such as the streets, karaoke lounges, bars, night clubs, massage parlors or have pimps or agents to solicit clients for them. They would engage in sex with their clients in hotels, ‘rent-a-room brothels’ or in private homes of their pimps or agents.

Figure 2. 2. Brothels in Singapore



Front of a brothel



Back alley of a brothel where clients gather



The interior of a brothel



A room in the brothel

Brothel-based sex workers

An estimated number of 1,100 brothel-based workers work in 6 geographically defined 'red-light' localities in Singapore. The number seemed to have shown a slight decline from 1,681 in 1990 to 1,100 in 2001. The localities differ to a certain extent by type and class of brothel establishment, and ethnicity of the sex workers. Between 10 and 30 sex workers are housed in each brothel and they are under the control of the brothel owners. The fees charged per client range from US\$5.5 for low-class brothels to US\$140 for exclusive class, with the majority (65.5%) charging a fee of around US\$30. The majority (86%) of their clients are locals with the rest being Malaysian, Caucasian, Japanese, Taiwanese, Bangladeshi, Thai or Indonesian. The ethnic composition of the sex workers has changed over the years with more Thais being recruited as sex workers in the last few years. In 1990,⁶⁰ the majority were Chinese (76.2%), followed by Malays (17.1%), Indians (3.6%) and Thai (3.1%). In 2001, Chinese sex workers have decreased to 57% while Thais increased to 27%; the percentage of Malays (13.3%) and Indians (2.7%) have not changed much. Those of the same ethnicity and social class tend to 'cluster' together. For example, Thai sex workers work from 'higher-class' brothels in a locality that has more foreign clients.

Brothel-based sex workers are required by the Medical Surveillance Scheme, which was set up in 1976, to attend the only public STI clinic at the Department of STI Control and designated general practice clinics for their regular screening for STIs (Figure 2.3). The Anti-Vice Unit works closely with the Department of STI Control to ensure that the brothel owners send the sex workers regularly for their screening tests.

The Anti-Vice Unit is also empowered to suspend sex workers from work in the brothels, deregister them from the medical scheme and deport them to their home country if they do not comply with the screening tests or treatment. Alcohol consumption is also not permitted in the brothels.

When the scheme was first set up in 1976, sex workers were required to undergo fortnightly cervical cultures for gonorrhoea and three-monthly serological tests for syphilis. In 1985, three monthly serological tests for HIV antibody were introduced. In 1992, monthly cervical smears for chlamydia antigen detection were introduced. Cervical, pharyngeal and anal cultures are used for the diagnosis of *Neisseria gonorrhoeae*, the enzyme immunoassay (EIA) test for *Chlamydia trachomatis*; and serological tests for HIV and syphilis. Syphilis is screened with the rapid plasma reagin (RPR) test, positive results are confirmed by the *Treponema pallidum* particle agglutination test (TPPA). HIV screening is by EIA and confirmed by the Western blot test. Sex workers found to have STIs are treated immediately to prevent dissemination of the disease. Staff members at the clinic also conduct regular health talks to the brothel-based sex workers and brothel-owners on STIs, AIDS and condom use.

Since 1994, behavioral intervention programs to promote condom use were developed for the sex workers. Details of the development of the program are described in the methods section.

Figure 2.3. Sex workers attending the Department of STI Control Clinic for their regular screening for STIs



Freelance sex workers

Freelance sex work is illegal in Singapore. The Anti-Vice Unit conducts regular raids on massage parlors and arrests sex workers caught soliciting along the streets. A survey conducted by my colleagues and me in 1996 to 1997 on freelance sex workers⁶¹ showed that about two-thirds (61.6%) were non-locals with many coming regularly to Singapore on a social visit pass as tourists or were brought in by agents or pimps. Freelance sex workers were younger, better educated and had significantly fewer clients than brothel-based sex workers. The majority (91.6%) reported fewer than 6 clients per day with half having fewer than 3 clients per day. More than three-quarters (82.4%) of freelance sex workers did not go for regular monthly medical check ups for STIs, with one third (37.5%) who had never gone for medical check-ups. More than half (59.8%) did not use condoms consistently.

Since 1997, the Department of STI Control, with support from the Ministry of Health, and in collaboration with a local non-governmental organization, Action for AIDS (AFA) has been conducting outreach health education activities on condom use and STI for freelance sex workers. Pocket-sized health education booklets in different languages were produced and distributed to them. Health workers and volunteers from AFA were trained by the Department of STI Control to conduct health talks and presently, most of the health education activities for this group of sex workers have been taken over by AFA.

Since 1995, the Department of STI Control has also been giving talks on STIs and AIDS and disseminating health education materials to managers/owners and hostesses from licensed 'entertainment' establishments such as night clubs and bars under the 'Project Masseur'. Lounge hostesses were offered free syphilis and HIV tests after the talks. In a survey carried out by the Department of STI control in 1995, only 7.9 % of lounge hostesses reported engaging in sex with their clients of which only 27.6 % reported consistent condom use.⁶²

2.1.4 Epidemiological and behavioral studies related to STIs among female brothel-based sex workers in Singapore

Prior to planning condom promotion programs for female brothel-based sex workers in Singapore, I conducted comprehensive needs assessment studies, using quantitative and qualitative methods, among them to determine risk factors for STIs and behavioral

factors associated with condom use. The findings, summarized in the following pages, were used to guide development of the interventions.

2.1.4.1 Factors associated with STIs among prostitutes in Singapore⁶⁰

A survey was conducted in 1990 on 806 female brothel-based sex workers registered with the STI surveillance program in Singapore for regular screening for STIs, to determine their socio-demographic profile, condom use for vaginal sex and incidence of STIs and their associated risk factors. The majority of the sex workers were non-locals (92.7% Malaysians, the majority of whom were Chinese, and 3.1% Thais). The reported mean number of clients was 38 per week. About half (50.5%) were single and 42.9% divorced. A very low percentage (17.1%) had non-paying clients. All of them practiced vaginal sex and 27.2% practiced oral sex. Anal sex (0.4%) and intravenous drug use (0.9%) were rare.

About half of the clients (56.1%) used condoms spontaneously. Further analysis showed that consistent condom use was significantly higher among younger sex workers. It was not significantly associated with class, educational level or duration of prostitution. On average, sex workers negotiated for condom use with the majority (85.5%) of their clients, but they only succeeded in persuading about half of them (54.4%) to use condoms. Less than half (42%) always used condoms with their clients.

The incidence rate of STIs among the sex workers was 47.7 per 100 persons in 1989, with significantly higher rates among sex workers who were younger, Malay, and had

more clients and higher percentages of non-condom-using clients. There was no significant association of STIs with educational level, class or duration of prostitution. Multivariate analysis showed an inverse relationship between condom use and STI risk. Sex workers who reported condom use with less than 40% of clients were twice as likely (adjusted relative risk: 2.13; 95% confidence interval: 1.09-4.19) to have STIs compared to those who reported condom use with all clients.

2.1.4.2 AIDS/ HIV-related knowledge and sexual behavior among female sex workers in Singapore⁶³

Sex workers' knowledge on the seriousness of AIDS and attitudes towards condom use were also assessed in the same survey. The majority (>90%) were aware of the seriousness of HIV and AIDS and the effectiveness of condom use. Hence, the sex workers, on average, negotiated for condom use with most (85.5%) of their clients but they succeeded in persuading only half of them to use condoms. Comparison of the negotiators with the non-negotiators found that both groups had similar high levels of awareness of the seriousness of AIDS (81.8% vs 87.4%) and the effectiveness of condoms in preventing AIDS (93.9% vs 96.5%). Perceived barriers such as fear of annoying clients and lack of confidence in their ability to get clients to use condoms (low self-efficacy), rather than lack of knowledge, were found to be significantly associated with the practice of not negotiating condom use with their clients. This study highlighted the need to equip sex workers with condom negotiation skills and to help them overcome barriers to negotiating condom use.

2.1.4.3 Condom use negotiation among sex workers in Singapore: Findings from qualitative research⁶⁴

I subsequently conducted in-depth interviews with 40 sex workers with varying degrees of success in condom negotiation to explore their perceived barriers and approaches in negotiating condom use with clients. The interviews showed that many factors deterred them from negotiating condom use with clients. These included perceived barriers such as fear of annoying clients and loss of earnings, perceived loss of support from peers and brothel owners; low self-efficacy; lack of alternatives to take in the event of client refusals; and misconceptions that regular clients are safe.

Five different patterns of condom negotiation were identified: unsuccessful, misinformed, passive, uninterested, and successful. Unsuccessful negotiators experienced problems such as inability to resist clients' pressure or respond to their queries. They identified 4 groups of difficult clients: (i) the young unmarried carefree clients who did not think about the repercussions of not using condoms, (ii) the older clients who did not worry about death, (iii) the regular client, and (iv) those who felt they could not function with condoms. The misinformed sex workers group believed that regular clients were safe and hence they did not need to negotiate condom use. The passive group did not negotiate condom use due to their perceptions of lack of support from their peers and brothel keepers, and the uninterested group was apathetic with fatalistic perceptions of AIDS. Successful negotiators could get difficult clients to use condoms by using ingenious approaches that could be categorized as follows: (i)

positive approach, (ii) assertive approach, (iii) fear arousal approach and (iv) peer pressure approach.

Positive approach: Those who used the positive approach generally made clients see the immediate benefits and relevance of condom use. For example, they would use this approach with young and unmarried clients: “Come on, handsome guy. You are young, capable and have potential and a bright future ahead. It is not worth it if you die from AIDS. Using a condom is good for you and me”.

Assertive approach: Successful negotiators would override difficult situations posed by clients by using the following approach: “If my client challenges me as to why I am scared of dying, when he is not, I will tell them ‘Yes, I am scared of dying because I still have children to support. If you want to die from AIDS you go ahead but please do not drag me into it’. Invariably this works and they agree to use condoms”.

Fear arousal approach: Sex workers used the fear approach by explaining to clients the dangers of AIDS and their vulnerability to it: “My previous client looks unwell. I am not sure whether he has spread AIDS or STI to me. It is better for you to use a condom to protect yourself”.

Peer pressure approach: The less aggressive but more experienced sex workers used peer pressure to persuade their clients: “Most of my clients used condom nowadays. You better use it too”.

This qualitative study provided relevant, specific and practical information for designing health education messages to develop the sex workers’ negotiation skills. It

also helps us segment target groups and design health messages that are appropriate for each segment.

2.1.4.4 Study on acceptability of the female condom (femidom) *(Unpublished data)*

Sex workers may not have full control over the use of male condoms, especially if clients are aggressive or under the influence of alcohol and hence cannot be persuaded to use condoms. The femidom offers an additional option alongside the male condom and gives the sex workers more control as they themselves use the device. A study conducted by us in 1994 found that only 4.3% (13/304) reported ever using femidoms. In-depth interviews were held with femidom users to get insight on their experiences with the use of femidoms and their intentions to continue use. The majority (81.8%) did not intend to use femidoms again. The main reasons given for discontinuing use were that clients complained about its unaesthetic appearance (90.9%), they themselves had difficulty inserting the femidom into the vagina (63.6%) and the femidom was expensive (27.3%). According to the sex workers, the clients complained that the femidom looked strange and unsightly, it caused a lot of noise and hence 'spoiled their mood'. The femidom was also found to be too big and uncomfortable by the sex workers. Notwithstanding the small sample size of this study, the findings suggest that sex workers and their clients did not like to use the femidom. The femidom, though a promising female-controlled device, may not be a viable option to the male condom at the moment. To increase the acceptance of the femidom, it needs to be made more appealing to men, smaller sizes should be made

available to cater for Asian women of smaller build and the cost of femidoms has to be reduced.

2.1.4.5 Survey of owners of brothel establishments
(Unpublished data)

An estimated total of 350 brothel owners work in 250 brothel establishments in Singapore. About two-thirds were males and their mean age was 53 years (range: 29 to 82 years). About one third (31.1%) had no formal education and 54.4% had worked as a brothel owner for more than 10 years. Prior to planning the condom promotion programs for the sex workers, I conducted a survey on all licensed brothels owners in 1994 to assess their attitudes towards 'a condom use policy' in brothels. The majority (92% and 89% respectively) were aware that a person can get AIDS from vaginal and anal sex without a condom but only 67.5% knew that AIDS is incurable. Almost all (99.6%) reported it was their responsibility to get sex workers to use condoms with their clients but only about half (52.1%) felt that they could get their sex workers to use them. The brothel keepers felt that it was not within their control to insist on condom use, as they would not know 'what goes on in the room between the sex worker and her client'. In addition more than half (57.2%) were concerned that insistence on condom use would drive clients away and about two thirds (61.3%) felt that clients would prefer brothels without a 100% condom policy.

2.1.5 Summary of literature review of local studies

In summary, my earlier studies on sex workers in Singapore highlighted the knowledge practice gap, in which the majority (>90%) were aware of the seriousness of AIDS and the need to use condoms but less than half (42%) actually used condoms. The low condom use despite their high level of knowledge was due to their inability to persuade clients to use condoms and their fear of annoying the brothel owners. Hence, if we have to get the majority of sex workers to use condoms, there is a need to develop behavioral interventions to act on these root causes of non-condom use.

2.2 Behavioral interventions for sex workers

A comprehensive search was conducted to identify studies that evaluated behavioral interventions on condom use for female sex workers, where the main risk factor is unprotected sex with their clients. Interventions that targeted intravenous drug use among sex workers, the main risk factor for HIV among sex workers in the United States and the West,⁶⁵⁻⁶⁶ were not included in this review. Studies on the evaluation of condom promotion programs for sex workers are few and almost all were conducted in Asia and Africa. Table 2.1 summarizes the intervention programs and their effects.

2.2.1 Methodological quality of the studies

While most of the short-term programs (evaluated within 6 months of its implementation) have a control group, most of the long-term programs^{8,38,40,42,43-46,} except for those in India,¹⁸ Indonesia,⁴¹ Ghana,³⁷ and Nairobi³⁹ did not have one, probably due to logistic and ethical reasons in keeping a control group for long

periods. The majority of the studies that evaluated the program over a period of more than 3 years used serial independent cross sectional surveys.^{10,43,44} The limitation with this method is that each independent survey is affected by sampling error. However, there are limitations as well with following up the same cohort over long periods and these include attrition bias, testing effects and decreasing sample size with time. For instance, the follow-up evaluation studies in Ghana³⁷ and Chiang Mai³⁸ were based on small sample sizes (<45). The use of convenient samples in the former and the high attrition rate (>57%) in the latter also made it difficult to draw conclusive evidence on the impact of the interventions. The post-intervention condom use rates may be overestimated because of testing effects from repeated measures and increasing attrition of 'less motivated' participants.

The behavioral outcome measure used in most of the studies was self-reported consistent condom use in the week preceding the interview. In some studies however, condom use was not clearly defined as the time frame and frequency of condom use was not given. Thus it is unclear whether it refers to some or consistent condom use.

One issue in the evaluation of behavioral interventions is the validity of self-reported condom use. Some studies attempted to overcome this problem by validating self-reported condom use with biological measures such as incidence of HIV and STI.^{8,43-44,46} The study in Chiang Mai³⁸ used simulated clients rather than self-reported behavior to enhance the validity of the measure on sex workers' behavior of refusal of unprotected sex but this study did not include biological outcome measures.

2.2.2 Characteristics of the interventions

The programs differed substantially in size, content, approaches, length of follow-up and the type of organization initiating the program development. They ranged from small interventions implemented by non-governmental organizations to national programs. Most of the interventions were multifaceted and incorporated both biomedical and behavioral approaches ranging from regular screening and treatment of STIs; condom promotion with health education and free condom distribution; and administrative measures targeting brothels.

Some programs had strong governmental support to ‘enforce’ condom use in the brothels. Thailand³⁸ was the first country to implement the national 100% condom policy with government support to enforce condom use in brothels. Thailand also used the mass media to give health education to men to use condoms. Very similar features of this program were subsequently adopted in Cambodia in 1998.⁴²

A variety of health education and behavioral change methods were used to provide factual information, motivate and impart skills. The methods included talks, group sessions, video presentations to teach safer sex negotiation and correct condom use skills, video-depicted narrations to explore sex workers’ concerns, role-play and peer education. Some programs^{34,36} also applied a theoretical framework to design the activities such as Bandura’s social cognitive theory⁶⁷ and the Health Belief Model.⁶⁸ The interventions were delivered in the clinics, brothel or outreach community sites.

2.2.3 Effectiveness of the interventions

Most of the published studies^{6,34, 37, 38} on the short-term evaluation of the programs, that is, within 6 months of intervention, showed favorable intervention effects on condom use. A few studies, which measured disease outcomes, found significant reduction in HIV and STIs in the intervention group compared to the control group. However, behavior change may take much longer to become routine.⁶⁹ It is unknown whether these intervention effects could be maintained.

Thirteen studies evaluated the long-term effects, that is, 1 year or more after the intervention. All measured the effects on condom use; a few on HIV or STI prevalence and 4 studies^{8,18,22,46} examined the impact on incidence of HIV seroconversion or STIs. The effects on condom use and disease outcomes were mixed, ranging from increase in condom use to no change to relapse to non-condom use. Similar effects on disease outcomes were also noted with no to significant reduction in some programs.

Most of the intervention programs in Africa have shown a positive impact on condom use. In Zaire, regular condom use increased from 11% to 68% after 3 years of intervention⁸ and this led to a significant decline of HIV incidence from 11.7 per 100 women-years during the first 6 months to 4.4 per 100 women-years over the last 6 months 3 years later. The intervention in Abidjan⁴³ for brothel-based sex workers that was evaluated over an 8-year period, increased consistent condom use from 20% to 78% and it led to a decline in HIV prevalence from 89% to 32%, gonorrhea from 33%

to 11%; genital ulcers from 21% to 4% and syphilis from 21% to 2% among sex workers attending the STI clinic for the first time. This decline was independent of shifts in the socio-demographic characteristics of the sex worker population. The intervention in Benin⁴⁴ increased consistent condom use from 62.2% in 1992 to 80.7% in 1998-1999. There were significant declines in HIV (53.3% to 40.6%); syphilis (8.9% to 1.5%); gonorrhea (43.2% to 20.5%) and chlamydia (9.4% to 5.1%) over the same period. After controlling for age and country of origin, HIV prevalence was stable over time but the downward trend remained significant for syphilis and gonorrhea. The authors concluded that the time trends were partly due to the changing sex work milieu, with sex workers in the later years being younger and coming predominantly from other countries such as Nigeria.⁴⁴ An intervention program in Ghana, that increased condom use from 6% to 71% after 6 months of its implementation, was not fully sustained. After 4 years of its implementation, condom use decreased to 56%.³⁷

Intervention programs in Asia also showed mixed effects. A 2-year evaluation of an intervention program for sex workers in Indonesia,⁴¹ showed no significant increase in condom use in the intervention area compared to the comparison area with low program effort activities. Condom use seemed to plateau at 80%. However, there was a significant reduction in the prevalence of syphilis though levels of other STIs were still high, being attributed to the high turnover of sex workers. The authors explained that it would be difficult to increase condom use to higher levels without increasing efforts to educate clients.

The Thai AIDS epidemic⁴⁵ and effects of the intervention program, implemented since 1989, on the epidemic have been one of the best characterized in the world due to the country's excellent HIV sentinel interventions, well established AIDS case reporting, a sound public health infrastructure, and an active research community. Thailand was also the only country in the world that succeeded in increasing condom use to almost 100%. Sentinel surveillance of all provinces in Thailand showed a marked increase in condom use among sex workers from 14% in 1989 to 94% in 1993^{10,45} with a concomitant substantial decline within 2 years in HIV incidence from 2.48 to 0.55 per 100 person-years and an even greater decline in STI incidence from 17.0 to 1.79 per 100 person-years.⁷⁰ Another study in northern Thailand showed that condom use increased substantially to more than 95% with a significant decline in the prevalence of cervical gonorrhea and chlamydia.⁷¹ However, the high levels of condom use in this case were not corroborated with low HIV seroconversion. Extremely high rates of HIV seroconversions (20 seroconversions per 100 person-years of follow-up) were documented in a prospective cohort study of brothel-based sex workers in the same population.⁷² There are many possible explanations for the differential rates in STIs and HIV. First, some STIs such as gonorrhea are treatable while HIV is not.⁷¹ Hence, improvement in diagnosis and treatment of curable STIs will lead to fewer infectious persons in the population that can spread the disease. Other reasons include the large number of exposures among sex workers, the lower levels of consistent condom use with boyfriends or regular partners who may have a relatively higher prevalence of HIV infection,¹⁰ and the varying effects of condom use on STIs and HIV agents with different transmission probabilities. In addition, the prevalence of some STIs may fall

faster than HIV because while the prevalence of curable STIs primarily represents recent incidence, HIV prevalence represents long-term cumulative incidence.

Although the national 100% condom program in Thailand^{38,45} showed success in increasing condom use to 94% in 1993 after the first 4 years of its implementation, subsequent evaluations showed that condom use might not have been sustained in some areas. A study in central Thailand in 1996³⁶ showed lower post-intervention condom use rates in low income versus high-income areas (86% versus 97%). A pretest post-test comparison group design to evaluate the effectiveness of an intervention program in southern Thailand in end 1994 showed no significant increase in condom use in the intervention area (72 to 75%) compared with the comparison area (72% to 80%) with similar HIV seroconversion rates in both areas (4 per 100 persons). Condom use rates appeared to reach a plateau of 80%.³⁵ There was a more pronounced increase in knowledge and perceived vulnerability in the intervention area than in the comparison area but this did not translate into a greater increase in condom use. The authors attributed this to the lack of support from brothels and poor condom negotiation skills of the sex workers. In 1997, HIV prevalence among brothel-based sex workers nationwide remained high at between 26% and 34% in northern Thailand.⁴⁷ Another study on sex workers in Bangkok found significantly higher HIV seroprevalence rates among sex workers who began sex work after 1994 (12.5%) compared to those who began work before 1989 (8%). Their condom use rates were not reported in the studies.⁴⁸ The explanation given by the authors was that men who continued to patronize sex workers were more likely to be infected than other men.

Thus while the 100% condom program was effective in sustaining condom use over the 4 –year period from 1989 to 1993, subsequent studies in the mid-nineties showed that it may not have been sustained in some areas. Thus it remains unclear whether the high levels of condom use will be sustained for longer periods.

The varied degree of effectiveness of the Thai national program on HIV and STIs in different areas in the country suggests the need to understand the complex transmission routes of HIV and STIs. As mentioned earlier in the first chapter, the rate of transmission of HIV depends on the efficiency of transmission, which is influenced by the transmission mode, the mean rate of change of sexual partners and the average duration of infectiousness. Although high condom use has been achieved among female commercial sex workers, the low condom use rates among intravenous drug users,⁷³ male commercial sex workers,⁷⁴ and men having sex with men⁷⁵ could have contributed to the high prevalence of HIV in some regions in Thailand.

In other studies in Cambodia, the national 100% condom use program that was implemented in 1998 increased condom use among direct sex workers in the intervention site from 53.4% to 78.1% within a year with a concomitant significant decline in their HIV prevalence from 42.6% in 1998 to 31.1% in 2000.⁴² Although there is a positive impact on HIV/STI prevention among these sex workers, it stills needs to be further investigated why condom use has still not achieved the set target of 90%.

2.2.4 Process evaluation

Only two studies reported some aspects of process evaluation.^{36,40} Another study⁴⁵ conducted a qualitative analysis at macro or ‘program’ level of the factors contributing to the success of the national 100% condom program in Thailand but it did not report the behavioral change process at the personal level among the sex workers. A few studies described the program activities in detail^{18,38} but there was no systematic process evaluation. The success of the 100% condom promotion program in Thailand was attributed to a combination of the mass advertising campaign to men on condom use in commercial sex, political commitment with sanctions against sex establishments that did not use condoms, free distribution of condoms and a good infrastructure of STI screening and treatment facilities.⁴⁵ However, it may not be feasible or culturally acceptable in other countries to broadcast explicit TV commercials on condom use. In addition, as the 100% condom promotion program relied to a greater extent on the cooperation of the police, it may be difficult to sustain it. This was evident from a subsequent evaluation in late 1994 when condom use in the intervention area reached a plateau of 80%³⁵ and was not significantly higher than the control area.

Process evaluation in Ngugi’s study in Kenya and Zimbabwe⁴⁰ focused on the coverage of the outreach peer education program. She described the program activities in detail, which include formative needs and ethnographic needs assessment; use of key informants and informal contacts to establish communication networks and leadership patterns; training of peer educators; and individual and group counseling. A large majority of the 1,472 sex workers in the intervention area have received one-to-

one peer education (83%), attended community AIDS meetings (80%) and received condoms (90%). The authors also explained why the small successful community programs for sex workers were not scaled up to nationwide activities. The reasons included inadequate political commitment; deficiencies in planning, management and human resources; and insufficient funding.

Ford's study³⁶ provided a more structured process evaluation in which the acceptability of the health education activities by sex workers and problems encountered in the implementation of the intervention program were described. The use of video-depicted open-ended narratives was found to be ideal in helping sex workers explore their personal and work-related concerns and hence in motivating them to take protective action. The researchers also found it much easier to conduct education sessions in the better-equipped high income than smaller low-income sex establishments where it was often difficult to assemble groups and find private areas. Managers of sex establishments were universally supportive of the 100% condom use policy though they raised problems of ensuring that their sex workers always used condoms and of the use by the police of displays of condom promotion materials as evidence in the prosecution of sex establishments. Some practical problems encountered in educating the sex workers in northern Thailand were linguistic barriers due to increasing numbers of young sex workers from Myanmar. However, the process evaluation was based on a new program that had been implemented for 6 months. The factors or process that lead to sustained condom use may be quite different.

Table 2.1. Review of effectiveness of interventions for sex workers

Study, Country	Evaluation design (Setting)	Intervention activities	Timing of post-intervention assessment	Effect change
Africa				
Ngugi et al (1988) ³⁹ Nairobi, Kenya	Pre-test post-test comparison group design (n ₁ =67, n ₂ =94, n ₃ =205)	Group health talks and discussion Individual counseling Free condom distribution	2 years '85 to '86	Condom use increase [§] : Individual counseling: 10-81% Group meetings: 9-70% None of the above: 7-58%
Moses et al (1991) ²² Nairobi, Kenya	Prospective cohort study No control group (n=500)	Group health talks and discussion Individual counseling Free condom distribution	3 years '86 to '89	Mean annual gonorrhea incidence decline: 2.85 to 0.66 cases per woman
Laga et al (1994) ⁸ Zaire	Pre-test post-test design Prospective cohort study (n=531) No control group)	Health education Free condom distribution Monthly screening for STI 3-monthly HIV screening. Free treatment for STI	3 years '94- '96	Condom use increase [§] : 11% to 68% HIV incidence decline: 11.7% to 4.4% per 100 women-yrs
	Pre-test post-test design (n<75)	Outreach health education Peer education activities Free condom distribution in first 6 months	6 months '87- '88	Consistent condom use increase [§] : 6% to 71% ^a
Asamoah-Adu et al (1994) ³⁷ Ghana	Prospective study of intervention cohort with comparison group (n=74)		4 years '87- '91	After 4 years, consistent condom use ^a decreased to 56%, same as new recruits (55%) Condom use not validated with biological measures High attrition rate: 43% at follow -up

[§]Condom use in last week before interview.

^aNo time frame given for condom use

Study, Country	Evaluation design (Setting)	Intervention activities	Timing of post-intervention assessment	Effect change
Ngugi et al (1996) ⁴⁰ Kenya & Zimbabwe	Pre-test post-test design No control group (n=299) (n=149)	Conducted formative needs assessment Peer education for sex workers and clients Public meetings (Baraza) and training sex workers on safer sex negotiations Free condom distribution STI and AIDS counseling	1 year '89-'90 2 years '90-'92	Consistent condom use increase ^a : Kenya: 4.6% to 36.5% Zimbabwe: Consistent condom use increase ^a : 18% to 66% Significant decline in clinic attendance of STD patients from pre to post intervention
Ghys et al (2002) ⁴³ Abidjan, Cote d'Ivoire	Serial bi-annual cross-sectional surveys (n>300 for each round)	Health education Peer education Diagnostic and treatment services for STI HIV counseling/testing Free condom distribution (including female condoms)	8 years '91-'98	Condom use increase ^b : 20% to 78% Decline in: HIV prevalence: 89% to 32% gonorrhoea: 33% to 11%; genital ulcers: 21% to 4% syphilis: 21% to 2%
Alary et al (2002) ⁴⁴ Benin	Serial 6 monthly cross-sectional surveys (n>350 for each survey round)	Peer education activities Free screening and treatment of STI	7 years '93 to '99	Condom use increase ^{s&} : 62.2% to 80.7% No decline: HIV prevalence Decline in prevalence of: gonorrhoea: 43.2% to 20.5% syphilis: 8.9% to 1.5% chlamydia: 9.4% to 5.1%

^aNo time frame given for condom use

^bMost recent client

^sCondom use in last week before interview

[&]Based on mean percentage of condom use with clients

Table 2.1 (continued). Review of effectiveness of interventions for sex workers

Study, Country	Evaluation design (Setting)	Intervention activities	Timing of post-intervention assessment	Effect change
Asia				
Hanenberg et al (1994) ¹⁰ Rojana-pithayakorn et al (1996) ⁴⁵ Thailand	Serial 6-monthly cross sectional STD testing and interviews of sex workers from 12 provinces at start of the sentinel surveillance (number not reported) n=500?	National 100% condom policy program Government sanctions against non-compliant brothels with closure Free condom distribution Free STI screening for sex workers Public media condom campaign to men	5 yrs ('89-93)	Consistent condom use increase ^c : 1989: 14% 1990: 55% 1991: 85% 1992: 93% 1994: 94% Decline in STI >79% in men (army conscripts) >85% (gonorrhea & chancroid) Decline in HIV: 2.6% to 1.6%
Visrutaratna et al (1995) ³⁸ Chiengmai Northern Thailand	Pre-post intervention design, no control group (n ₁ =24; n ₂ =78; n ₃ =85) Different sample sizes taken at baseline, 2 months and I year follow-up	Superstar peer educators Small group training Condom negotiation skills Free condom distribution	1 year '91 –'92	Refuse sex without condom ^d : 42% (n=24) to 92% (n=78) at 2 months to 78% (n=85) 1 yr later
Griensven et al(1998) ³⁵ Southern Thailand	Pre-test-post-test Comparison group study (n=300 in each group)	Information and education campaign Peer Educator training	6 months End '94	Consistent condom use ^e : No significant increase in intervention vs comparison area Intervention area: 72% to 75% Comparison area: 72% to 80%. Similar HIV seroconversion rates in both areas (4 per 100 persons).
Ford et al (1999) ³⁶ Central Thailand	Pre-test-post-test intervention and Control group quasi-experimental design Intervention: n=62 Control: n=68	Apply theoretical framework Primary themes: finding personal value and self-respect Video clip demonstration Training of health staff	6 months '96	Condom use change ^f : Low SES intervention area: 66% to 86% Low SES Control area: 83% to 74%. High SES Intervention area: 92% to 97% Process evaluation done

^cLast day before the interview

^dSimulated client, ^eAll three last clients

^fPreceding month

Table 2.1 (continued). Review of effectiveness of interventions for sex workers

Study, Country	Evaluation design (Setting)	Intervention activities	Timing of post-intervention assessment	Effect change
Bhave et al (1995) ¹⁸ Bombay, India	Controlled pre-post intervention trial (n=334)	Factual information talks, skills development, educational videos, small group discussion, pictorial educational materials Free condom distribution	1 year '92-'93	Condom use increase ^a : 3% to 28% Incidence densities: (per person year of follow-up) in intervention vs control gp HIV : 0.05 vs 0.16 Syphilis : 0.08 vs 0.22 Hepatitis B: 0.04 vs 0.12.
WHO 2001 ⁴² Cambodia	Regular Cross-sectional surveys (n>400)	100% condom policy Health education to clients and sex workers. Outreach peer education Regular checking and treatment of STI, Condom supply Administrative brothel measures/ regulations	2 years '98-'00	Condom use increase ^a : 53.4% to 78.1% Decline in HIV prevalence 42.6% to 31.1%
Ford 1996 ³⁴ Indonesia	Controlled pre-post intervention trial (n=334)	Apply theoretical framework Assess local needs prior to program planning	6 months '94-'95	Condom use increase ^c : Intervention gp 1 :18-75% Intervention gp 2: 29-62% Control gp: 47-60%
Ford 2002 ⁴¹ Indonesia	Regular 6-mthly cross sectional behavioral surveys and STD testing of sex workers in intervention and comparison area. (n>600)	Health education talks for sex workers Pimp training Condom distribution, Printed brochures for clients STI treatment	2 years '97-'99	Condom use increase at 2 yrs ^c : Intervention area: 77.1-77.7% Comparison area: 65.4-74.4% Decline in syphilis: Intervention area: 9.0 to 2.6% Comparison area: 5.9 to 4.3%
Ma 2002 ⁴⁶ China	Prospective cohort study (n=996) No control group	Group or individual counseling on HIV/STI transmission and condom use skills Free STI testing and treatment	1½ years Mar 98-Oct 99	Condom use increase ^e : 30 – 81% Decline in incidence rate per 100 person-years: Gonorrhea: 17.5 to 5.1 Trichomoniasis: 22.4 to 3.0 Chlamydia: 22.4 to 16.1

^aNo time frame given for condom use ^cLast day before the interview

^e Preceding 2 months

2.3 Conclusion

Sex workers in Singapore were found to have high STI rates and to be a main source of infection. Hence, there is a need to develop behavioral interventions to promote condom use among them. Findings from evaluation of the intervention programs in other countries are encouraging in that most of the rigorous studies showed favorable outcomes in increasing condom use and reducing STI and HIV incidence. It is difficult to compare the extent of success in condom use across the different studies as the definition of condom use differed from one study to another. Some studies used self-reported consistent condom use with clients in the week before the interview while others used preceding day or last client. In some studies, the time frame was not given. There is probably some publication bias which could have led to overestimation of positive effects. Notwithstanding this limitation, it was observed that only the short-term studies (evaluated between 3 and 6 months post-intervention), showed a positive effect in almost all the interventions. It is not known whether these intervention effects can be sustained as behavior change may take much longer to become routine.^{69,76} In addition, most of the studies on effective programs, other than the national program in Thailand, were in the context of relatively small demonstration programs undertaken by dedicated individuals or organizations. It is unclear whether the same effects would be seen if such programs are expanded to large-scale nationwide programs for sex workers.

Of those studies that evaluated the long-term effects ranging from 1 to 8 years, the effects were mixed ranging from no change to relapse to non-condom use to an

increase in condom use to levels between 65% and 94%, with the majority at levels of less than 80%. The politically supported and comprehensive program in Thailand appeared to be the most successful, being the only one that achieved condom use of more than 90% after 4 years in 1993. However, subsequent evaluations showed that this high level was not sustained in some areas in Thailand, where condom use reached a plateau of 80%, with no difference from the control area. It is important to maintain condom use levels to as close as possible to 100% in view of the high prevalence of HIV and STIs among sex workers, their having multiple partners and the possibility that the minority of clients who persist in unprotected sex are HIV positive and will potentially infect more sex workers. More research is needed to identify effective interventions to increase and sustain condom use to higher levels.

The factors influencing the sustainability of condom use are also unclear as none of the studies conducted a comprehensive process evaluation to explain the outcome of condom use. The sustainability of condom use among sex workers may be influenced by the environment (structure), program factors as well as by personal factors (sex workers themselves). While some of the studies have described the program and environmental factors in detail, none have described the personal factors or behavioral processes that led to sustained condom use among the sex workers. Thus it is unclear as to how or which aspects of the condom promotion program reinforce sex workers' behaviors to use condoms with all their clients. Do they need to initiate condom use at all and do they face resistance from clients after the implementation of the 100% condom use policy? How do they overcome client resistance? In-depth information

from the sex workers themselves will help us understand the process that leads to their empowerment and sustained behavior; such information will enhance the planning of sustainable programs. The present study attempts to address these gaps in knowledge.

2.4 Specific objectives of the study

The specific objectives of the present study are to:

- (i) assess the effects of behavioral interventions on consistent condom use and gonorrhoea incidence at five months and over a long-term period from 1994 to 2002
- (ii) assess any unintended effects of the behavioral interventions on other sexual behaviors
- (iii) evaluate the process and program activities, using qualitative and quantitative methods
- (iv) conduct an in-depth analysis of how the program's input factors, process and the context in which it take place relate to the intended outcomes of sustained condom use

Chapter 3

METHODS

3.1 Participants and setting

This research was undertaken from 1990 to 2002 among female brothel-based sex workers in Singapore. About 1,100 female sex workers currently work in 250 brothels concentrated in 6 geographically defined 'red light' localities in Singapore. All brothel-based sex workers are registered under the medical surveillance scheme and are required to maintain contact with the only public STI clinic at the Department of STI Control and designated general practice clinics for regular fortnightly screening for gonorrhoea and chlamydia and 3-monthly screening for HIV and syphilis. Background information of the sex workers have been described earlier in Chapter 3. Most (95.6%) of the brothel-based sex workers are non-locals, being Malaysian or Thai.

3.2 Hypothesis

The study is designed to test the hypothesis that a comprehensive behavioral intervention program that incorporates a supportive environment for condom use and quality improvement principles will achieve a lasting increase in condom use to at least 90% and a sustained reduction in gonorrhoea incidence among the sex workers.

Two specific behavioral intervention programs implemented consecutively to the sex workers were evaluated on their effectiveness (outcomes) by using a combination of quasi-experimental pretest-posttest comparison group and interrupted time-series

designs. The condom promotion program for vaginal sex, first implemented in 1994 as a pilot project, was evaluated between 1994 and 2001 and the subsequent condom promotion program for oral sex was evaluated between July 1996 and June 2002. The latter program was implemented in 1996 due to a marked increase in the practice of oral sex and pharyngeal gonorrhoea. Trends in condom use and gonorrhoea for both programs were compared with pre-intervention trends from 1990 to just before the abovementioned dates of their implementation to all sex workers. The two intervention programs differed somewhat in overall design because of different targeted behaviors and the need to modify the evaluation design for the latter program due to ethical and practical constraints. Hence, they will be described separately by their (i) evaluation design, (ii) background information and development of the intervention, (iii) measurement of program effects and (iv) statistical analysis. The overall designs of the two programs are summarized in Table 3.1. The schedule of the research phases and the implementation of the interventions for the two programs is summarized in Figure 3.1.

Table 3.1. Objectives, intervention activities, evaluation design and outcome measures of the condom promotion programs for vaginal and oral sex

3.1.1 Condom promotion program for vaginal sex

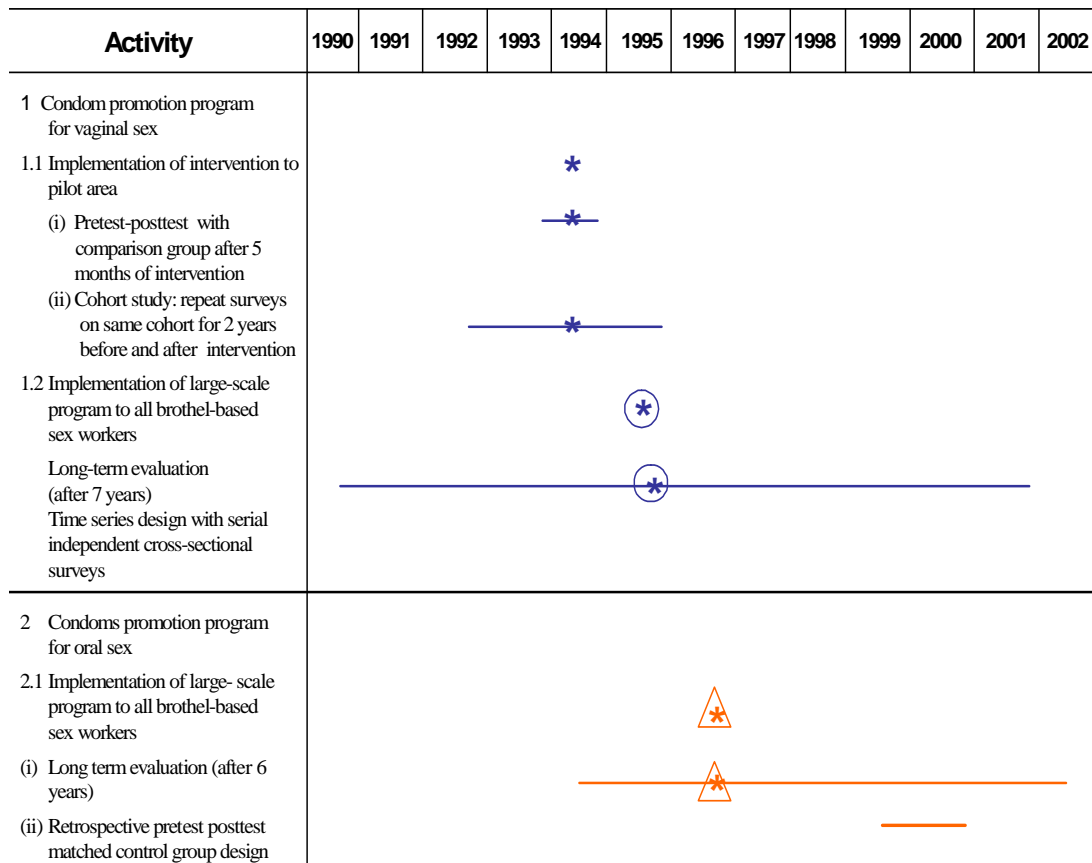
Objectives	Intervention activities	Evaluation design	Outcome measures	
			Behavioral Measures	Disease Incidence
Increase condom use for vaginal sex Reduce cervical gonorrhoea	For sex workers: -Talks -Brochures, comic scripts -Video demonstrations -Condom negotiation skills training -Booster group problem-solving sessions -Individual counseling For brothels: -Talks -Administrative measures on non-compliant brothels -Brothels educate clients For staff -Quality improvement activities -Regular meetings -Feedback sessions	Phase 1:1994-1995 Pretest-posttest with comparison group for five months (1994) Prospective cohort study: repeated surveys on same cohort ('94-'95) for two years Phase 2:1995-2001 Time series design: serial independent cross-sectional surveys at 6-month post-intervention on successive cohorts recruited to program (1995-2001) compared with cross sectional surveys (1990-1994) before large-scale program implementation	Condom negotiation skills (success rate in getting clients to use condoms) Consistent condom use for vaginal sex Consistent condom use for vaginal sex	5-month* cumulative gonorrhoea incidence (per 100 persons) 5-month cumulative gonorrhoea incidence (per 100 persons) Cervical gonorrhoea incidence density (per 1000 person-months)

The 5-month* cumulative gonorrhoea incidence figures for the 2 year-post intervention period was compared with those from the 2-year pre-intervention period

3.1.2 Condom promotion program for oral sex

Objectives	Intervention activities	Evaluation design	Outcome measures	
			Behavioral measures	Disease Incidence
<p>Increase condom use for oral sex</p> <p>Reduce pharyngeal gonorrhea</p>	<p>-Same as 3.1.1 in addition to:</p> <p>- Skills training sessions on condom negotiation for oral sex</p>	<p>Only 1 phase (Mid 1996-Mid 2002)</p> <p>Interrupted time series design:</p> <p>Serial independent cross-sectional surveys at 6-month post-intervention on successive cohorts recruited to program (July 1996- Dec 2001) compared with cross-sectional surveys before large scale program implementation (1994-1995)</p> <p>Retrospective pretest posttest matched control group design (1999-2000)</p>	<p>Consistent condom use for oral sex</p> <p>Consistent condom use for oral sex</p>	<p>Pharyngeal gonorrhea incidence density (per 1000 person-months)</p> <p>Pharyngeal gonorrhea incidence density (per 100 person-months)</p>

Figure 3.1. Schedule of research phases and intervention programs for brothel-based sex workers



* Intervention activities for condom promotion program for vaginal sex:

- for sex workers: included 1 2-hr talk on AIDS and STIs
 - 2 2-hr skill development sessions (video demonstrations and role-play on condom negotiation)
 - 4 booster group problem-solving sessions within 2-year follow-up period
 - Individual counseling for gonorrhoea positives and non-condom users
- for brothels: talks and administrative measures on non-compliant brothels
- for staff: meetings, feedback sessions to solve problems and quality improvement activities



Same as above except booster sessions have been reduced from 4 to 2 sessions



The condom promotion program for oral sex consisted of the following activities that were incorporated into the condom promotion program for vaginal sex:

- Talks on risks of oral sex
- Skills training on condom negotiation for oral sex and how to put the condom on with the mouth

3.3 The intervention program on condom use for vaginal sex

3.3.1 Evaluation design

Two different evaluation designs were used for the two phases (1994-95; 1995-2001) of the study due to logistic and ethical constraints:

Phase 1 (1994-1995)

(Summarized from published articles:

*Wong ML, Chan RKW, Lee J, Koh D, Wong C. Health Educ Res 1996; 11:423-432⁷⁷;
Wong ML, Chan RKW, Koh D. Prev Med 1998; 27: 891-900⁷⁸).*

For this phase, the quasi-experimental pretest-posttest comparison group study was maintained for 5 months followed by a prospective cohort study design to follow up the same intervention cohort for 2 years. One intervention site and one comparison site were chosen from a total of 6 locality sites. All 128 sex workers from a central locality with high gonorrhea rates were assigned to the new intervention program. In the selection of a comparison site, I used available socio-demographic data of the sex workers from our earlier studies and the clinical records of gonorrhea from the Department of STI Control. A locality, about 2 km away, which was judged to be reasonably comparable to the intervention group in ethnicity and socio-economic class of sex workers, type of clients and brothel establishment was chosen as the comparison group. This locality was also found to be closest to the intervention group in gonorrhea rates. All 125 sex workers from this locality were assigned to the comparison group. The comparison group did not receive the new intervention; instead they received the existing program, which consisted of a talk on STIs and HIV.

Brothels were not randomized because brothels in the same locality are situated close together as rows of attached units. Hence, diffusion of intervention effects and flow of clients might occur across brothels within the same locality. Sex workers were also not taken as units of randomization as this might result in sex workers from the same brothel being selected for the comparison and intervention group. This would cause bias, as sex workers from the comparison group would be exposed to the brothel intervention. Whole localities were not randomized due to limited number of similar localities (n=6) and inter-cluster variation arising from sex workers of different ethnicity working in different localities.

Sample size. The sample size of each group was estimated to be 130 to give a statistical power of 80%, at a level of significance (alpha) of 0.05 (two sided) for detecting a proportionate 60% reduction in gonorrhoea from an estimated cumulative incidence of 20% in the 5-month period prior to intervention to 8% in the 5-month period after intervention, compared to no change in the comparison group. After the 5-month follow-up, the comparison group was no longer retained in the study for ethical and logistic reasons. The prospective cohort study design was used to allow for a more detailed analysis of trends in condom use and gonorrhoea incidence in the intervention group from 20 months before to 20 months after the intervention.

Phase 2 (1995-2001)

In 1995, the intervention program was institutionalized and extended to all currently working brothel-based sex workers. Starting in 1996, all newly recruited sex workers

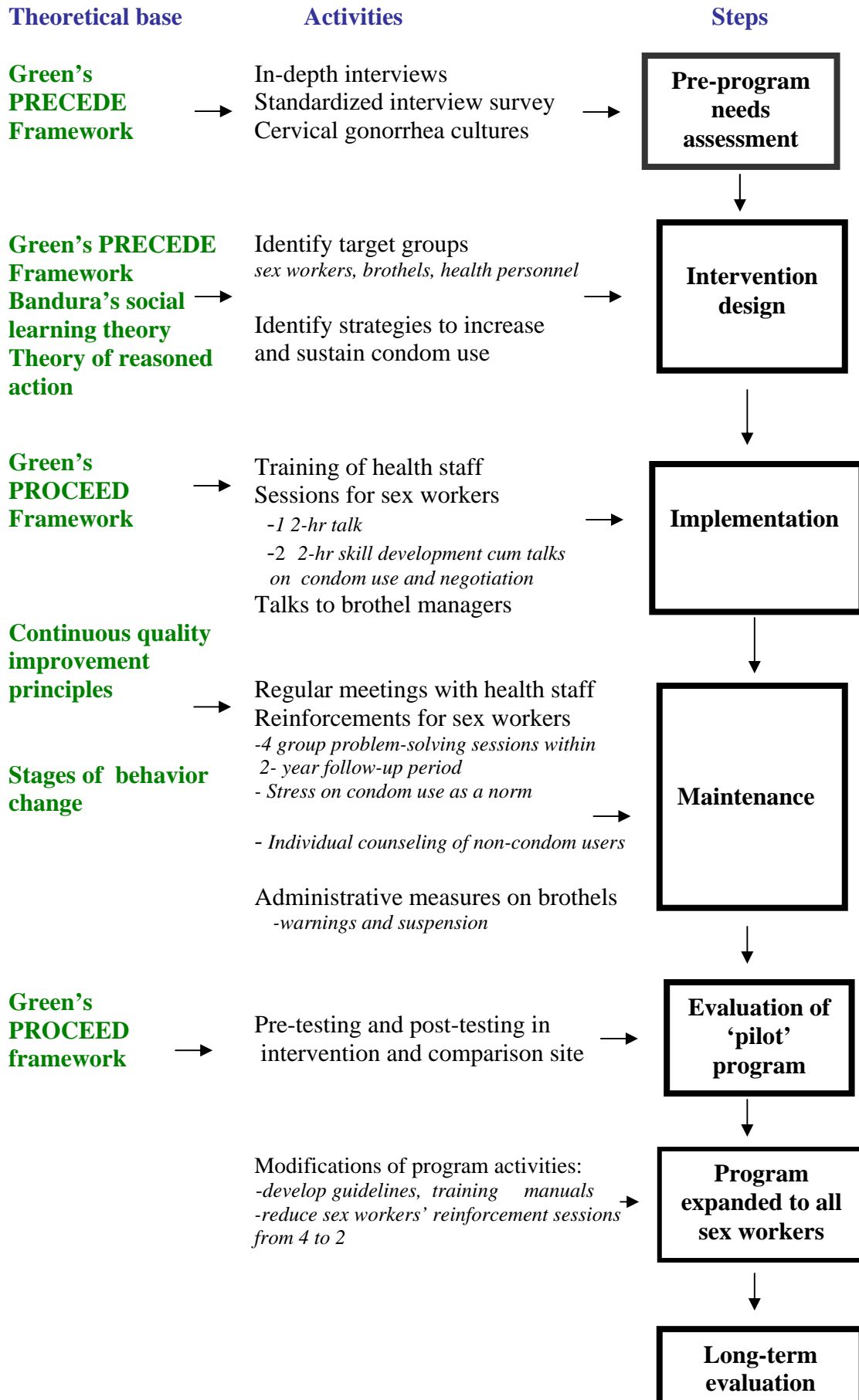
were enrolled at monthly intervals to the intervention program and they were followed up for 6 months for consistent condom use and the occurrence of cervical gonorrhea. The time series design was used to compare trends in condom use and cervical gonorrhea incidence over time (1990-2001) across cross-sectional samples of newly recruited sex workers before and after implementation of the large-scale program to them. To ensure comparability of the sex workers, only sex workers who have worked for 6 months or less for the earlier cross sectional surveys (1990 –1995) were included in the analysis of trends in condom use and gonorrhea in the time series design. Consistent condom use for all currently working sex workers in 1995, after their enrolment in the intervention, was also computed.

3.3.2 Description of the intervention program

Summarized from published article: Wong ML, Chan R, Koh D, Wong CM Int Q Community Health Educ 1995; 15:405-421⁷⁹).

The steps involved in the development of the program are summarized in Figure 3.2.

Figure 3.2. Steps in program development



Theoretical base. The intervention was developed, based on a combination of (i) the comprehensive Green's PRECEDE PROCEED framework⁸⁰ which focused on changing risk behavior and creating a supportive work environment to facilitate behavior change; (ii) the self-efficacy components of Bandura's social learning theory⁶⁷ and (iii) findings from our earlier qualitative and quantitative studies on condom use for vaginal sex among female sex workers^{60,63,64} and brothel owners. The intervention program, which targeted sex workers, health staff, clients and brothel owners, also considered local cultural and political sensitivities. Multifaceted interventions were developed to (i) motivate sex workers to use condoms by relating safe sex to what they value, which is, being able to work and support their family; (ii) develop their negotiation skills and increase their self-efficacy to always refuse sex without a condom if the negotiation fails; and (iii) provide support to them by getting brothel owners to display posters and talk to clients on condom use. Health staff from the public STI clinic followed up on the brothels' compliance.

During the maintenance phase of the program, the Theory of Reasoned Action⁸¹ was applied to sustain behavior change. The Theory of Reasoned Action proposes that the intention to act depends on subjective normative beliefs about what others think one should or should not do. Thus in the later phase of the intervention, when about three-quarters were using condoms, the message on condom use was promoted as the norm. Non-condom-using sex workers thus feel pressured to change if they did not want to face social disapproval from their peers. Bandura's social learning theory⁶⁷ was applied to build their self-confidence and improve their skills to deal with problems

arising from condom use and to negotiate with non-supportive brothel establishments. This was achieved by getting them to meet regularly in small groups to share problems, receive encouragement by hearing about the positive experiences of others, practice skills through role-play, and model each other's success in dealing with problems specific to condom use.

Intervention activities for sex workers. Sex workers participated in two 2-hour small group sessions on condom negotiation skills conducted by trained health staff and myself in the public STI clinic after receiving talks on STIs and AIDS. Instructional methods during the first session included video presentations, with local sex workers as actresses to demonstrate techniques to negotiate condom use with clients (Figure 3.3); role-play and peer group discussions. The video presentations, consisting of 6 video clips (running time: 3 minutes per clip), covered the following topics: (1) First week at work; (2) How to persuade a young client to use condoms; (3) How to persuade an old and regular client; (4) How to use alternatives such as massage in the event of client refusals; (5) The right to refuse sex without a condom; and (6) A healthy peer's advice. In summary, the messages focused on specific ways to negotiate condom use with different clients; alternatives to take in the event of client refusals and the importance of peer co-operation so that none of them would lose their clients to others. Their rights to safe sex were emphasized, and it was made clear to them that if all of them insisted on condom use, clients would have no choice but to use condoms. They were subsequently asked to keep a log book of clients

who refused to use condoms, for three days, with regard to their reasons for not doing so and the difficult queries posed by them when asked to use condoms.

Figure 3.3. Sex workers watching video demonstrations on condom negotiation skills



One scene from the video clip demonstrates how a sex worker negotiates condom use with a client

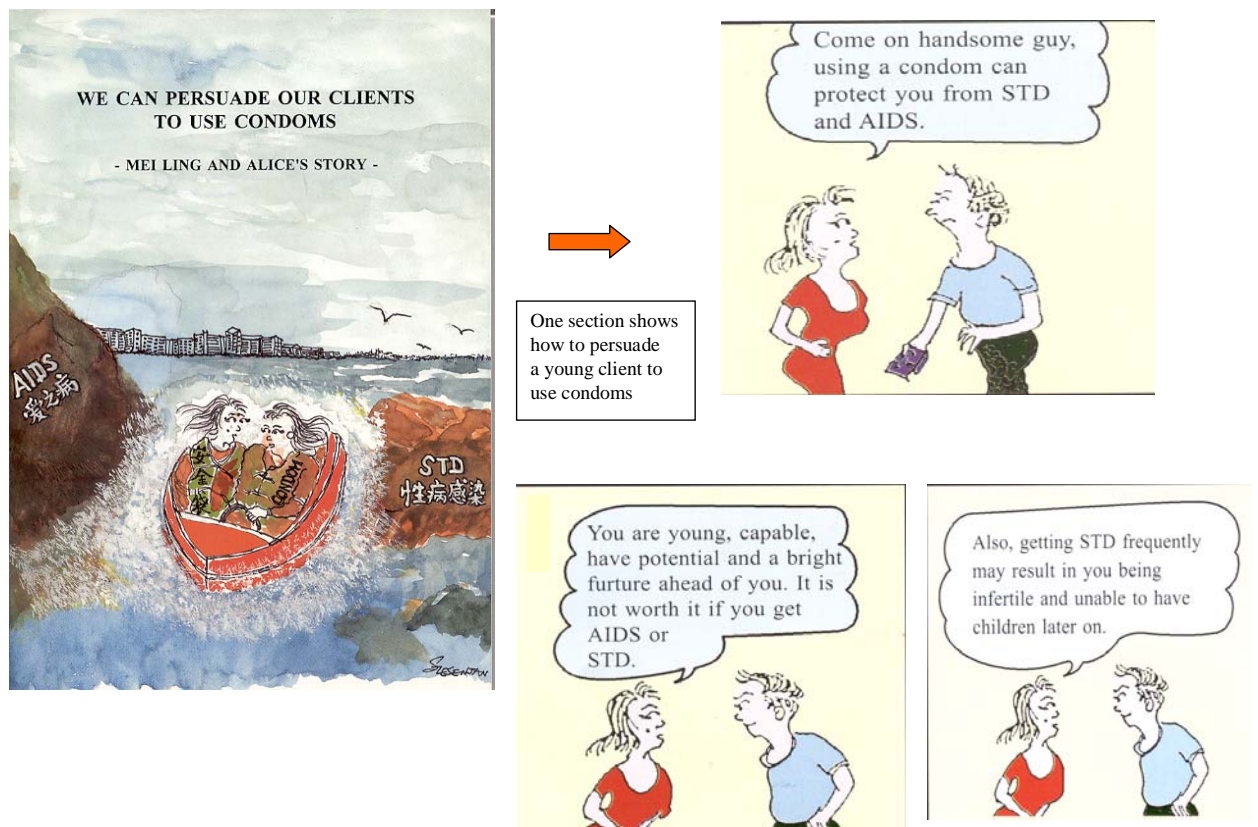
During the second session, health facilitators and peer educators led the group to discuss problems in persuading clients to use condoms arising from their self-monitoring of condom use. Experienced peers shared their personal experiences in handling difficult clients and non-supportive brothel owners. Sex workers were also given free condoms and stickers (depicting "100%: condoms must be used here") for display in their brothel-rooms to facilitate their negotiation task (Figure 3.4).

Figure 3.4. Stickers on 100% condom use for display in brothels



Comic books designed in an entertaining format were also distributed to the sex workers. Focusing on common problems encountered with clients and their solutions, the comic books were meant to reinforce the video clips as sex workers may not recall certain workable approaches (Figure 3.5).

Figure 3.5. Comic book on how to persuade clients to use condoms



Intervention activities for brothel management. Brothel owners and managers were given talks on STIs and AIDS and the benefits of a STI-free brothel (Figure 3.6). Discussions were also held with them to encourage them to support sex workers in condom negotiation and refusing sex without a condom. Discussion was highly interactive and focused on possible solutions to problems raised by them. Some brothel keepers expressed their inability to control the negotiation process between sex workers and their clients. They were assured that skill development sessions would be conducted for sex workers to increase condom use among them.

Figure 3.6. A health staff talking to brothel owners on the benefits of a STI-free brothel and the need to support sex workers to use condoms



Maintenance phase and continuous quality improvement. Quality improvement activities were incorporated into the maintenance phase to monitor progress, identify problems and respond promptly to them. A booster session for sex workers was held three months after the initial program activities to reinforce messages on condom use and discuss problems encountered by them. Congratulatory messages were disseminated to all compliant and non-infected participants. Three booster sessions were subsequently held 6 months to a year apart over the two-year intervention period.

Regular meetings and problem-solving sessions were also held during the two-year period with health staff and peer leaders of the sex workers to get feedback on problems encountered and discuss possible solutions. Some problems encountered were non-supportive brothel owners who recommended clients to non-condom-using sex workers; acceptance by some sex workers of clients who were refused by their peers for not using condoms; decrease in clients because of condom use; and problems related to condom use such as slippage, breakage, pain, and clients' complaints of failure to ejaculate from condom use.

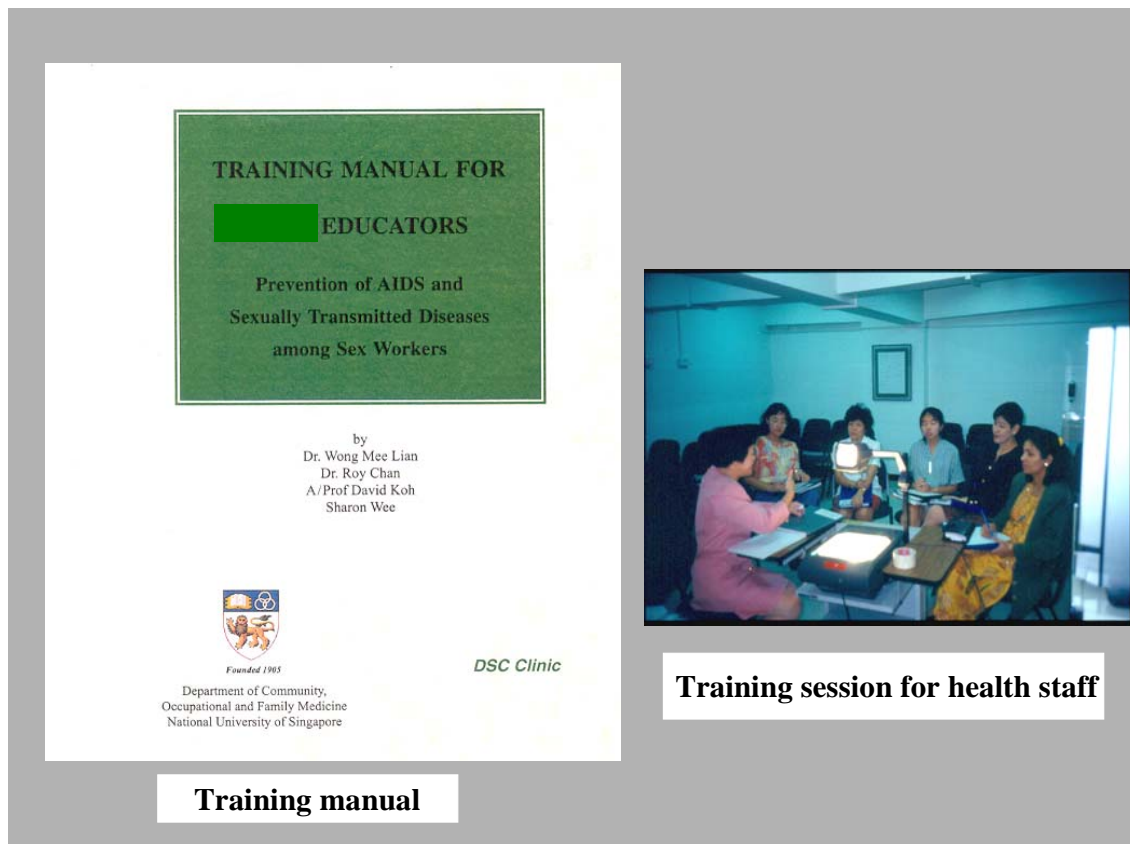
Prompt action was taken on these problems. Brothels found recommending clients to non-condom-using sex workers were given warnings. Individual counseling was provided to non-condom-using sex workers who were identified by the peer leaders. They had found out from their clients who the non-condom-using sex workers were. The stages of behavior change theory⁸² was applied to assess the sex worker's readiness to use condoms and identify their reasons for not using condoms so that

advice could be matched to their needs. Experienced sex workers shared practical tips on how to deal with problems related to condom use. They also reassured their peers that the initial decrease in clients was temporary, as many of them would return and use condoms.

Scale-up of program to all brothel-based sex workers. The program was scaled-up and expanded to all currently working sex workers in 1995 and to all new recruits in July 1996 under its new name 'Expanded Project Protect'. Specific goals were set to increase condom negotiation skills and condom use for vaginal sex to more than 90%. Clear standardized guidelines on program activities and job aids such as training manuals (Figure 3.7) and video clips with teaching points were disseminated to health staff. The program still consisted of three main strategies: skills development and health education targeting sex workers; administrative measures targeting brothel management to support 100% condom use and activities targeting health staff to monitor and continually improve program activities. However, slight program modifications were made to ensure feasibility of its implementation. The booster sessions were reduced due to manpower constraints in conducting the sessions. All newly recruited sex workers have to attend two sessions at the Department of STI Control on recruitment and two reinforcement sessions - one at 6 months and another one year thereafter. Posters on 100% condom use were distributed to all brothels and health staff and the Anti-Vice unit checked on the brothels' compliance to ensure that the posters were displayed prominently in three areas in the brothels namely, the waiting area, toilets and bedrooms. Brothel managers who did not display posters or

were found to be recommending clients to sex workers who did not use condoms were given warnings, and those brothels with high gonorrhoea incidence rates of more than 10% were temporarily suspended from business. The continual interest and commitment of health staff were obtained by giving them regular feedback of the program's progress and involving them in discussing problems and solutions so that they could see the impact of their work. Letters of commendation were sent to health staff and the peer leaders to praise them for their hard work.

Figure 3.7. Health staff at the Department of STI Control receiving training from the researcher (Wong ML) on intervention activities for sex workers



3.3.3 *Measurement of program effects*

Questionnaire. Participants from the intervention and comparison groups were requested to come to the Department of STI control in groups to complete a self-administered questionnaire on demographics and condom use. For the first phase of the study, the same questionnaire was administered to the intervention group just before the educational sessions and at 5 months, 1 year and 2 years after the intervention. The comparison group received the questionnaire at baseline and 5 months. The 5-month period was chosen because it would allow sufficient time for behavior change to take place and the attrition rate within a 5-month period was not expected to be high. Starting in 1996, the same questionnaire was administered to all newly recruited sex workers just before and 6 months after the educational sessions.

Using a group format of about 20-30 participants per group, trained health staff, using overhead transparencies, took participants through the questions, by reading aloud one question at a time and requesting them to mark responses privately for that question. The questionnaire was kept brief and translated into simple, colloquial terms in Mandarin, Malay and Thai to facilitate understanding. Almost all could fill up the questionnaire by themselves. Where there were illiterate respondents (3% of the total respondents), they were assisted individually by trained interviewers who read the questions and the range of responses to them and the participants marked the answers themselves. This programmed instruction of measures has been found effective in facilitating accurate responses to HIV risk assessments in low literacy populations.⁸³

To promote candid self-reporting and avoid over-reporting of condom use to please the health staff, the health staff stressed the confidentiality of the information and explained that the results would be used to plan a better program to help protect them from STIs. They also explained to the participants that they were aware of the difficulties faced in getting clients to use condoms and that '100% condom use' answers were not expected. Names of the sex workers were not recorded and a code number was used to match the participants' responses across assessment occasions.

Laboratory methods. Monthly routine endocervical culture tests were carried out on the sex workers. Endocervical secretions were cultured on Thayer-Martin medium for *Neisseria gonorrhoeae*.

Outcome measures.

The three outcome measures were (i) negotiation skill (ii) consistent condom use and (iv) gonorrhoea incidence.

Negotiation skill was measured by the self-reported average success rate in persuading clients to use condoms in the last working week preceding the interview. Sex workers were asked on an average out of ten how many of their clients were persuaded to use condoms following negotiation. These questions were pre-tested, used in our previous surveys, and found to be well understood by the sex workers who could relate better to units of 10 rather than a percentage. Most of them also reported about 10 clients per day.

Consistent condom use was defined as using a condom with every act of vaginal sex with clients in the last working week preceding the interview. To increase the validity of self-reporting, the question was asked as a 5-point frequency rating scale (never, seldom, half of the time, most of the time and all the time) rather than as a leading question such as ‘Do you always use condoms with your client?’ After pilot testing, the 5-point rating scale was reduced to a 3-point scale: never, sometimes and always as the sex workers found it difficult to understand and respond to the 5-point scale.

Cervical gonorrhoea incidence. Two measures of gonorrhoea incidence were used: the 5-month cumulative gonorrhoea incidence per *100 persons* in the first phase of the study (quasi-experimental study) and the 6-month post-intervention gonorrhoea incidence rate per *1000 person-months* (density) in the second phase (time series design to assess long term effects by comparing trends in 6-month post intervention gonorrhoea incidence across independent cross-sectional samples of sex workers).

Cervical gonorrhoea incidence was chosen as a biological indicator of the impact of intervention on condom use in view of the short incubation period and short duration of the infection, high specificity and sensitivity of the diagnostic test, and rapid and effective response to treatment. HIV was not used as an outcome measure due to the very low incidence rates of HIV. In addition, sex workers who contracted HIV were deregistered from the surveillance program and were thus not available for follow-up. The 5-month cumulative gonorrhoea incidence, defined as the percentage of the fixed cohort that developed gonorrhoea in the stated 5-month period of the study, was used in

the pre-test post-test comparison group study, as it was more readily interpretable. Also as this study was conducted on currently working (both old and new) sex workers, the objective of this phase was to compare change in outcome measures – percentage of new gonorrhoea infections and consistent condom use - in two time periods before and after intervention in the intervention and comparison groups. The 5-month cumulative gonorrhoea incidence was calculated by dividing the total number of sex workers with new occurrences of gonorrhoea within the specified period i.e. either the 5-month period before the intervention or the 5-month period after the intervention by the total number of sex workers enrolled to the study. The proportion is then expressed as a percentage. For example, if 100 gonorrhoea-free sex workers were enrolled at the beginning of the 5-month period prior to the intervention program, and 20 of them subsequently developed gonorrhoea within this period the pre-intervention cumulative gonorrhoea incidence would be 20%.

For the long-term time series study, the 6-month post-intervention cervical gonorrhoea incidence rate was used to determine the occurrence of gonorrhoea for the cohorts of new ‘disease-free’ sex workers who were recruited monthly from July 1996 to December 2001 and who were followed up for 6 months. The 6-month post-intervention cervical gonorrhoea incidence rate was calculated by dividing the number of new cases of gonorrhoea by the sum of the *time periods* of observation for all sex workers (person-months) who completed follow-up. This proportion is then expressed as number of cases per 1000 person-months. In computing the time period during the 6-month follow-up, the observation period for each sex worker terminates when she

develops gonorrhoea. For example, if 100 gonorrhoea-free sex workers were recruited for the intervention and 10 cases of gonorrhoea occurred at the third month of follow-up, the sum of the time-periods of observation of this cohort, that was followed up for 6 months, is 570 person-months. The incidence rate of cervical gonorrhoea in this cohort is 10 divided by 570, that is, 17.5 per 1000 person-months. None of the newly recruited sex workers had gonorrhoea before the intervention and none contracted more than 1 episode of gonorrhoea during the 6-month follow-up period.

Process evaluation

The main aim of the process evaluation was to examine the educational and skill development activities as well as the administrative and organizational aspects of the intervention program so as to help us understand better the dynamics and process of how the program works. This will add more detail and context to the findings of the quantitative outcome on condom use. Sex workers' rating of the health education methods and messages with regard to their clarity, relevance, cultural acceptability and persuasive appeal were obtained by using a simple self-administered questionnaire. The researcher also observed the educational and skill development sessions, paying special attention to the level of interaction between health staff and sex workers. Data were also collected on the organizational aspects of the program with regard to the number of brothels that received warnings or were closed because of their non-compliance with the program activities.

In order to gather detailed information on the process at individual level that has led to sustained condom use among the sex workers, the researcher conducted in-depth interviews with 22 randomly selected participants who used condoms consistently with their clients. Focus groups were also held with the health staff to get feedback on the labor-intensive small group skill development sessions, and administrative measures directed at brothels with regard to their feasibility and acceptability.

3.3.4 Statistical analysis

Quasi-experimental pretest-posttest comparison group study. The primary goal of the data analysis was to statistically determine the change in negotiation skills, consistent condom use and gonorrhoea incidence from prior to intervention (baseline) to after intervention between the comparison and intervention groups. The paired t-test was used to compare the success rate in persuading clients to use condoms between baseline and post-intervention separately for the comparison and intervention groups. Multiple covariance analysis was used to compare the mean follow-up success rate between comparison and intervention groups statistically adjusting for baseline success rate, ethnicity and age difference of the sex workers. As the "success rate" for each subject is bounded by 0 and 100 percent, statistical analysis was based on the arcsine transformed data of baseline and follow-up success rates.⁸⁴

In the univariate analysis, the chi-square test was used to compare proportions of the nominal variables (condom use and gonorrhoea incidence) between intervention and comparison groups. A modification of Cox's proportional hazards regression model

for cross-sectional data was used to estimate the (i) observed and adjusted prevalence ratios (and their 95% confidence intervals) of consistent condom use and the (ii) observed and adjusted 5-month cumulative gonorrhoea incidence ratios (and their 95% confidence intervals). Although Cox's regression model is specifically developed for prospective cohort studies, it was recently adopted to analyze data from cross-sectional studies.⁸⁵⁻⁸⁶ The 5-month cumulative incidence (in percent) of gonorrhoea of the intervention group at 2 points in time, that is the 5-month period before intervention and the 5-month period after intervention was computed and compared with the respective incidence (in percent) of gonorrhoea in the comparison group as incidence ratios. The post-intervention gonorrhoea incidence ratio was adjusted for potential confounders such as ethnicity, age, class, educational level and baseline gonorrhoea rates. The observed and adjusted prevalence ratios of consistent condom use were computed in a similar manner. This approach yields the cumulative incidence ratio for gonorrhoea and prevalence ratio for condom use as the effect measures rather than the odds ratios, if the logistic model was used. The odds ratio is less meaningful, and it is not applicable in this situation as the outcome measures are not rare events.

Prospective follow-up of intervention group. Trends in condom use and gonorrhoea incidence in the same intervention cohort from baseline through the 4 survey rounds over the 2-year follow-up period were analyzed using generalized estimating equation (GEE) for longitudinal data to correct for dependency between measurements.⁸⁷

Time series design with independent samples. The chi-square test for linear trend was used to compare proportions for each of the outcome variables (consistent condom use and gonorrhea incidence) in the independent cross-sectional samples over time from 1990 to 2001, using the time period of the survey round as an ordered independent categorical variable. Data on the outcome measures, after large-scale implementation of the intervention program in 1995, were based on those who completed the 6-month follow-up period after the intervention.

The one- to two-yearly survey rounds were also divided into time blocks for comparison. Four different time periods were compared: 2 time periods (1990-1992 and 1993-1994) before the intervention, and 2 time periods (1995-1998 and 1999-2001) after the intervention. The time periods were divided into blocks as cross sectional surveys were conducted only once in two years before the implementation of the intervention program. It was only after program implementation that surveys were conducted monthly for all new recruits.

As age, class, ethnicity, number of clients and other characteristics of the sex workers might have changed across the different time periods, multivariate analysis, using Cox's proportional hazards regression model,⁸⁸ was performed to control for the abovementioned confounders, while assessing whether there is any independent effect of the year of the survey on the linear trend in the gonorrhea incidence rates. The observed and adjusted risk ratios (and their 95% confidence intervals) of the cervical gonorrhea incidence rate of each time block were hence computed, using the

first time block (1990-1992) as the referent group. The independent variables entered into the regression model included the time period of survey (time block), and all other factors that could be potentially associated with the survey round and gonorrhoea incidence such as socio-demographic characteristics. The Cox regression model modified for cross-sectional data⁸⁵⁻⁸⁶ was used to estimate the adjusted prevalence ratios (and their 95% confidence intervals) of vaginal condom use, statistically adjusted for the same confounders as mentioned above. Significance for both multivariate Cox's regression analyses was based on Wald's test.

A P value of less than 0.05 was considered significant. All P values were two-tailed. All data analyses were performed with use of the Statistical Package for Social Science (SPSS), version 11.0 (SPSS, Chicago, IL).

3.4 The intervention program on condom use for oral sex

The condom promotion program for oral sex was implemented in 1996 due to the marked increase in oral sex and pharyngeal gonorrhoea. Oral sex among female brothel-based workers increased markedly from 27.1% in 1992 to 70.8% in 1996 with a concomitant rise in pharyngeal gonorrhoea incidence from 0.4 episodes per 100 person-months in 1992 to 1.3 per 100 person-months in 1996.⁸⁹ The rapid increase in oral sex ran parallel to the increase in consistent condom use for vaginal sex. Subsequent investigations with the sex workers found that clients had demanded unprotected oral sex, often perceived to be safer sex, when pressured to use condoms for vaginal sex.

3.4.1 Evaluation design

From published article: Wong ML, Chan RKW, Koh D. Sex Transm Dis 2002;29:311-8⁹⁰).

Two types of evaluation designs were used to evaluate the condom promotion program on oral sex. First, the interrupted time series design was used to compare trends in oral condom use and pharyngeal gonorrhoea across independent cross-sectional populations of newly recruited sex workers over time (from 1994 to 2001), before and after implementation of the intervention program which was started in July 1996, and when brothel intervention activities targeting brothel owners were withdrawn and subsequently applied over a specific time period. Second, the pretest-posttest matched control group design was applied later, in end February 2000, to assess the independent effect of brothel intervention activities. One hundred and

twenty sex workers taking part in intensified brothel intervention activities which were implemented in February 2000, were matched retrospectively by ethnicity and age (within 2 years) and condom use at baseline with 120 sex workers recruited from the preceding cohort between January and August 1999 in which interventions were temporarily withheld from the brothels.

The sample size was calculated to be 120 to provide 80% power at a 0.05 (two-sided) level of significance for detecting a proportionate 16% increase in condom use from 81.7% to 95% in the intervention group compared to no change in the control group.

3.4.2 Description of the intervention

(Summarized from published article: Wong ML Chan RKW, Koh D S Q, Wong S, Wee S, Lee E. Int Quarterly of Community Health Education 1999-2000; 19: 321-339⁹¹).

Theoretical base. Like the earlier condom promotion program for vaginal sex, the intervention program for oral sex was also developed based on earlier research on condom use and oral sex,⁹²⁻⁹⁴ theoretical frameworks and consideration of the local cultural context, values, beliefs and community norms of target groups. Our research showed that their main reasons for not using condoms for oral sex among sex workers when they would do so for vaginal sex included perceptions of oral sex as safe sex, misconceptions that pre-ejaculatory fluid does not contain bacteria or viruses, lack of negotiation skills, no support from brothel keepers and peers, and barriers to their use such as the unpleasant taste and throat itchiness.^{93,94} Brothel owners were also found to be less likely to remind sex workers to use condoms for oral sex than for vaginal

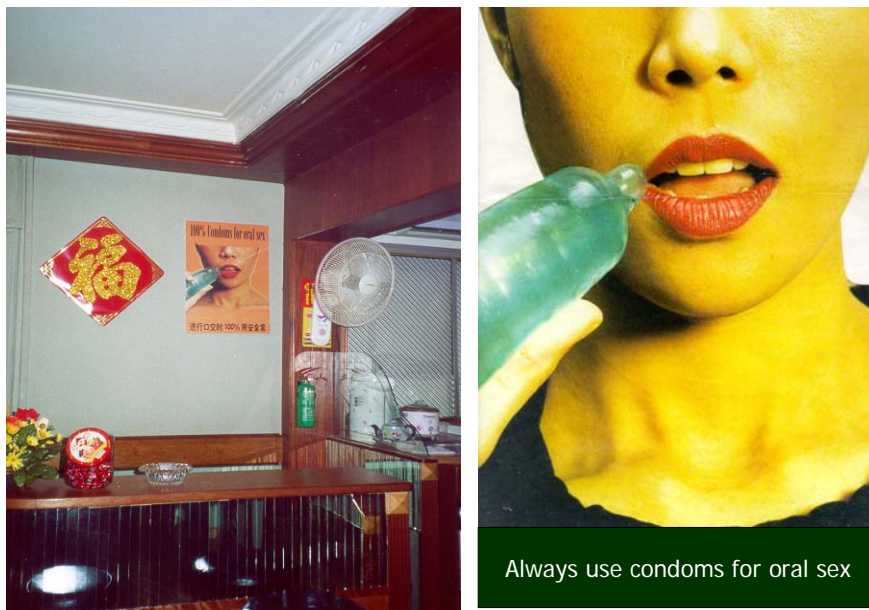
sex (77.9% vs 90.1%, $p < 0.05$). Hence the intervention focused on developing sex workers' skills to negotiate condom use and to put the condom on the client's penis with the mouth and on helping them to overcome barriers to oral condom use.

Program activities. The intervention activities, consisting of two 2-hour educational sessions, were incorporated into existing activities on condom use for vaginal sex. Health staff conducted the first session, which consisted of talks, slide shows, video demonstrations of negotiation skills and techniques on how to put the condom on the client's penis using the mouth. Local data on the increasing trend in pharyngeal gonorrhea among sex workers were summarized and presented to the sex workers to personalize risk situations. They were also provided with practical tips to overcome barriers to condom use such as unpleasant taste of condoms and throat itchiness. The second session was more interactive in which peer educators and health staff provided practical tips to problems brought up by the sex workers when they attempted to practice the skills taught in the first session.

Interventions targeting all brothels, which have been implemented with the condom promotion program for vaginal sex since 1995, were maintained. These included annual talks to brothel keepers and administrative measures with temporary closure of brothels with high STI rates. In addition, brothel owners were requested to remind clients to use condoms for oral sex and to support their sex workers. Posters and stickers on condom use for oral sex (Figure 3.8) were distributed to all brothel owners and sex workers for display in the brothels to remind clients to use condoms. As a

result of logistical changes, reinforcement talks and surveillance of brothels were not conducted in 1999, but this was followed by intensification of activities since February 2000, with new posters on oral condom use distributed to brothels and written circulars sent to them to support and enforce condom use. Health staff visited brothels regularly, at least every four months, to check that posters on condom use were displayed prominently in the waiting area, rooms and toilets, and that condoms were available in the reception area.

Figure 3.8. Display of posters on condom use for oral sex in the brothels



Poster displayed in brothel

Close-up view of poster

Quality improvement. Quality assessment and improvement activities were incorporated into the program. Specific targets on condom use for oral sex were set and the researcher met regularly with peer educators and health staff to give feedback on the program's progress and findings, to analyze problems and to develop solutions.

3.4.3 Measurement of program effects

Like the condom promotion program for vaginal sex, a self-report structured questionnaire and laboratory testing were used to collect data on outcome measures at regular intervals. Data were collected at baseline, when they were first recruited to the program and just before their health education sessions, and later at 6 and 18 months respectively after the intervention.

Outcome measures. The outcome measures were (i) self-reported consistent condom use for oral sex and (ii) pharyngeal gonorrhoea incidence density (incidence rate).

Post-intervention self-reported consistent condom use for oral sex. A sex worker was defined as a consistent condom user for oral sex if she always used condoms with her clients in the last working week. Oral sex was defined as receptive oral sex in which the client's penis was inserted into the sex worker's mouth.

Pharyngeal gonorrhoea incidence density (incidence rate). Pharyngeal swabs have been taken monthly from all sex workers for culture for *Neisseria gonorrhoeae* since 1992 under the routine surveillance program. Pharyngeal gonorrhoea incidence was chosen as a biological indicator of the impact of intervention on condom use in view of the short incubation period and short duration of the infection, high specificity and sensitivity of the diagnostic test, and rapid and effective response to treatment. Like the cervical gonorrhoea incidence rate, the pharyngeal gonorrhoea incidence rate for the 6-month post-intervention period was also calculated by dividing the number of new

cases of gonorrhoea by the sum of the time periods of observation for all sex workers who completed follow-up. This proportion is then expressed as number of cases per 1000 person-months in the time series design and as number of cases per 100 person-months in the retrospective pretest-posttest matched control group design. None of the newly recruited sex workers contracted more than 1 episode of gonorrhoea during the 6-month follow-up period.

Process evaluation

A survey, using a self-administered questionnaire, was conducted on a randomly selected cohort of 89 sex workers in 1996 to assess their understanding of the messages and rating of the different types of health education materials such as the posters, video clips and the health education messages with regard to their clarity and acceptability. The researchers also observed the health education sessions to assess the level of participation of sex workers.

Focus group discussions were held with four groups of sex workers with eight sex workers in each group, a week after the educational intervention to get feedback on the video clips.

Data were also collected on the organizational aspects of the program with regard to the number of brothels that received warnings and were closed because of their non-compliance with the program activities.

3.4.4. Statistical analysis

Interrupted time series design. The long term impact of the intervention was evaluated by analyzing trends in the 6-month post-intervention outcome measures – namely, condom use and pharyngeal gonorrhoea incidence rate - across independent cross sectional populations of new sex workers recruited to the intervention program from 1996 to 2001, rather than by assessing before/after changes within cohorts for the following reason. Sex workers did not participate in educational sessions immediately following recruitment because classes were conducted only when approximately 30 to 40 sex workers had been recruited. The majority (85%) were found to have worked for 2 months (median: 1.5 months) before attending class. Thus, they would have already been ‘exposed’ to the intervention effects from their peers and brothel owners before baseline data were collected from them at the time of their enrolment in the classes. The change in post-intervention condom use for the independent population groups across different time periods would reflect the combined effects of health educational sessions, diffusion of education from their peers and brothel support. Second, it was not possible to follow up the same cohort over extended time periods because of their high attrition rates. As fewer than 30 sex workers were enrolled every month, data from monthly surveys and screening were grouped into half yearly groups to ensure sufficient numbers for meaningful analysis.

The Chi-square test for trend was used to assess the statistical significance of changes in proportions for each of the outcome measures (condom use and gonorrhoea

incidence) over time. Data analyses were done only for those who completed the 6-month follow-up period.

Pretest-posttest retrospective matched control group. For this evaluation design, the primary goal of the data analysis was to statistically determine the change in consistent oral condom use from pre to post-intervention between the control and intervention groups and to compare gonorrhea incidence rates, 6 months after the intervention, between the intervention and control groups. The McNemar chi-square test was used to compare the change in consistent condom use from pre to post intervention within groups. Cox's proportional hazards regression model⁸⁸ was used to estimate the observed and adjusted risk ratio (and their 95% confidence intervals) of contracting pharyngeal gonorrhea in the intervention compared to the control group over the 6-month follow-up period, with statistical adjustment for other factors that were not matched, such as number of clients, educational level and class of sex workers. Because information on self-reported condom use was obtained only at 6-month post-intervention and not at monthly intervals like gonorrhea for logistic reasons, the percentage of consistent condom users at two points in time: baseline and the 6-month period after intervention was computed and compared with the respective percentages in the control group as prevalence ratios. A modification of the Cox's regression model for cross-sectional data⁸⁵⁻⁸⁶ was used to estimate the adjusted prevalence ratios (and their 95% confidence intervals) of consistent oral condom use, with statistical adjustment for number of clients, educational level and class of sex workers. All data analyses were performed with the Statistical Package for Social Science (SPSS), version 11.0 (SPSS, Chicago, IL).

Chapter 4

RESULTS

4.1 Effects of condom promotion program for vaginal sex

4.1.1 Outcome evaluation

4.1.1.1 Five-month effects on condom use and cervical gonorrhoea incidence

Cohort enrolment and baseline comparability. Two hundred and fifty three female brothel-based sex workers (128 in the intervention group and 125 in the comparison group) were enrolled in the study and all participated with no refusals. Four (3.1%) from the intervention group and 3 (2.4%) from the comparison group did not complete the 5-month follow-up due to 1 death from the comparison group and the other 6 quitting work. The dropouts were similar to the 246 participants who completed follow-up in socio-demographic characteristics. To assess whether the intervention and comparison groups were equivalent at baseline, a number of socio-demographic characteristics and condom-related variables were compared (Table 4.1). Both groups were similar with regard to age, nationality, class, educational level, number of clients, negotiation skills and behavior of consistent condom use. Almost all the sex workers in both groups were non-Singaporeans and the majority (63%) were Malaysian Chinese with the others being Malaysian Indian or Malay.

Table 4.1. Comparison of the characteristics of the 246 sex workers in the intervention and comparison groups, Singapore, 1994.

Characteristic	Intervention group n=124	Comparison group n=122
Mean age in years (SD*)	37.0 (8.7)	37.8 (8.6)
Percentage non-Singaporean	91.8	83.1
Percentage middle class [†]	100.0	99.2
Percentage with less than 7 years of schooling	90.6	87.7
Mean number of clients per day (SD)	9.0 (2.9)	8.5 (3.1)
Mean [#] success rate (%) in condom negotiation	66.1 (20.8)	68.4 (19.0)
Percentage who always used condoms	44.4	40.2

*SD=Standard deviation

[†]Middle-class workers are those who charged between US\$10 and US\$30 per client.

[#]The mean success rate refers to the mean of the success rates of all the sex workers in that group. The success rate of each sex worker refers to the reported percentage of clients out of 10 who used condoms following negotiation. For example, if 3 of 10 clients used condoms, the success rate would be 30% for that woman.

There was no statistically significant ($p < 0.05$) difference in all the above characteristics.

Changes in negotiation skill. Table 4.2 shows the changes in the success rates in persuading clients to use condoms at baseline and 5 months after the intervention for the intervention and comparison groups. The intervention group showed a considerable improvement in negotiation skills, with the mean success rate in persuading clients to use condoms rising from 66.1% at baseline to 80.2% post-intervention, a 14.1 % difference ($p<0.001$). This is in contrast to a small improvement of 3.2% for the comparison group ($p=0.051$). After adjusting for baseline difference in success rates, ethnicity, age, class and educational level of the sex workers, the mean success rate in condom negotiation was 20.7% higher in the intervention group compared to the comparison group.

Table 4.2. Negotiation skill of sex workers at baseline and at 5 months after intervention in the intervention and comparison groups

Outcome	Intervention group n=124	Comparison group n=122
Mean success rate^a in persuading clients to use condoms (%)		
Pre-intervention (SD ^b)	66.1(20.8)	68.4(19.0)
Post-intervention (SD)	80.2(25.8)	71.6 (25.2)
Observed difference ^c	14.1	3.2
Adjusted difference ^d	22.7	2.0
Net adjusted difference (intervention – comparison)		20.7 ^e

^aThe mean success rate refers to the mean of the success rates of all the sex workers in that group. The success rate of each sex worker refers to the reported proportion of clients of 10 who used condoms following negotiation. For example, if 3 out of 10 clients were persuaded by the sex worker to use condoms, the success rate would be 30% for that sex worker.

^bSD refers to standard deviation

^c Post-intervention minus baseline by the paired t-tests based on arcsine-transformed data

^d Statistically adjusted for baseline success rate, ethnicity, age, class and educational level of the sex workers by multiple covariance analysis based on arcsine-transformed data.

^eThe adjusted difference i.e. $20.7=22.7-2.0$ is statistically significant ($p<0.0001$)

Consistent condom use. Table 4.3 shows the percentages, and the observed and adjusted prevalence ratios of sex workers who consistently used condoms with clients in the intervention to the comparison group at baseline and 5 months after the intervention. The proportion of sex workers who reported always using condoms increased considerably by 20.8% from 44.4% at baseline to 65.2% post-intervention in the intervention group. In contrast, the comparison group showed a decline of 5%, from 40.2% to 35.2%. The net increase (intervention comparison group difference corrected for baseline condom use percentage) was 26.5%. Before the intervention, condom use in the intervention group was very similar to the comparison group (prevalence ratio:1.10; 95% CI: 0.75-1.62). Following the intervention, sex workers exposed to the intervention were significantly almost twice more likely (prevalence rate ratio:1.85; 95% CI: 1.25-2.76) than those in the comparison group to always use condoms. Adjustment for baseline difference in condom use, ethnicity, age, class and educational level did not materially affect the results (adjusted prevalence ratio: 1.90, 95% CI: 1.22-2.94). In order not to lose a client, a high proportion of sex workers in the intervention group resorted to helping clients to masturbate (69.8%) and providing massage (40.9%). Sex workers in the comparison group were less likely to use alternatives such as masturbation (39.6%, $p<0.001$) or massage (18.6%, $p<0.005$) (data not shown).

Table 4.3. Consistent condom use among sex workers at baseline and at 5 months after intervention in the intervention and comparison groups, Singapore, 1994

Outcome	Intervention group n=124 n (%)	Comparison group n=122 n (%)	Observed^a prevalence ratio (95% CI)	Adjusted prevalence ratio (95% CI)
No. (%) always using condoms				
Pre-intervention	55 (44.4)	49 (40.2)	1.10 (0.75–1.62)	1.11(0.68-1.81) ^b
Post-intervention	72 (65.2) ^d	37 (35.2)	1.85 (1.25–2.76)	1.90 (1.22–2.94) ^c
Change within group, P value	<0.05	0.104		

^aObserved prevalence ratio is the ratio of percentage always using condoms in the intervention group to that in the comparison group.

^bAdjusted for ethnicity, age, class, and educational level of the sex workers.

^cAdjusted for baseline percentage of condom use, ethnicity, age, class, and educational level of the sex workers.

^d Excludes missing responses . There were 17 missing responses in the intervention group and 14 missing responses in the comparison group for this question.

Cumulative gonorrhea incidence. Table 4.4 shows the 5-month cumulative gonorrhea incidence in the intervention and comparison group before and after the intervention. The 5-month cumulative gonorrhea incidence in the intervention group declined significantly by a relative percentage of 77.1% from 10.5% pre-intervention to 2.4% post-intervention, compared to a non-statistically significant decline of 37.6% from 19.7% to 12.3% in the comparison group. Before intervention, the 5-month cumulative gonorrhea incidence of the intervention group was about half that of the comparison group with no significant difference (observed incidence ratio 0.53; 95% CI: 0.27–1.05). After intervention, the 5-month cumulative gonorrhea incidence in the intervention group was only 0.2 times that of the comparison group (observed ratio 0.20; 95% CI: 0.06 - 0.68). The cumulative incidence ratio remained unchanged after adjustment for ethnicity and baseline differences in gonorrhea rates in the comparison and intervention groups (adjusted ratio: 0.21; 95% CI: 0.06-0.73), implying that the significantly much lower gonorrhea rate in the intervention group was unlikely to be confounded by the baseline difference in gonorrhea rates. None of the sex workers were HIV positive.

Table 4.4. Cumulative incidence of gonorrhoea among sex workers in the 5-month period before intervention and the 5-month period after intervention in the intervention and comparison groups, Singapore, 1994

Outcome	Intervention group n=124 n (%)	Comparison group n=122 n (%)	Observed^a cumulative incidence ratio (95% CI)	Adjusted cumulative incidence ratio (95% CI)
No. (%) with gonorrhoea				
5-month period before intervention	13 (10.5)	24 (19.7)	0.53 (0.27–1.05)	0.75 (0.32-1.78) ^b
5-month period after intervention	3 (2.4)	15 (12.3)	0.20 (0.06–0.68)	0.21 (0.06–0.73) ^c
Change within group, P value	<0.05	0.151		

^aObserved cumulative incidence ratio is the ratio of % with gonorrhoea in the intervention to the comparison group. The term ‘rate ratio’ was not used so as to differentiate cumulative incidence ratio (per 100 **persons**) from incidence rate ratios (per 100 **person-months**).

^bAdjusted for ethnicity, age, class and educational level of sex workers

^cAdjusted for cumulative gonorrhoea incidence at baseline, ethnicity, age, class and educational level of sex workers

4.1.1.2 Long-term effects on condom use and cervical gonorrhoea incidence (1994-2001)

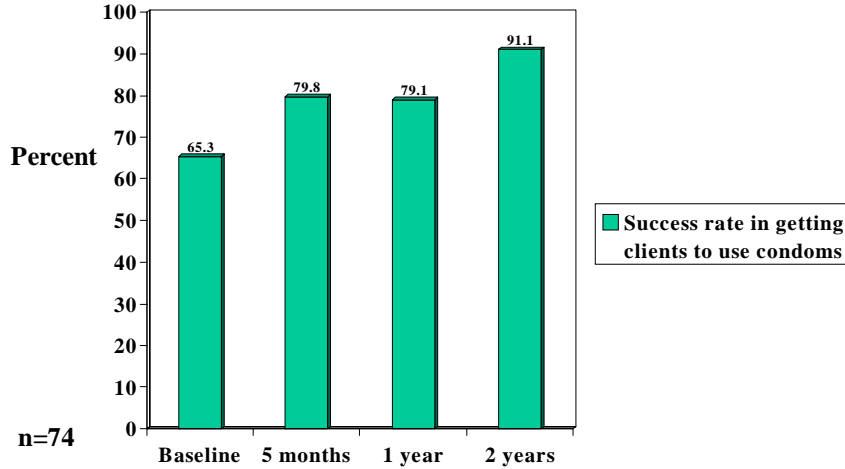
Effects after two years: repeated surveys within the same cohort

Attrition rates at follow-up. The 124 sex workers in the intervention group were followed up for 2 years. At 1 year, 77% (n=96) of the sex workers in this cohort could be interviewed and this decreased to 60% (n=74) at 2-year follow-up with 33 quitting prostitution and 17 not turning up for the interview. The 17 sex workers did not respond because they were away on 'leave' from Singapore at that time and these factors are independent of condom use. There were no discernible differences in age (35.7 years versus 37.7 years), number of clients (9.0 versus 9.1) and proportion with no schooling (37.3% versus 38.8%) between those followed up and those lost to follow-up.

None of those still working defaulted the routine gonorrhoea tests; hence gonorrhoea results were available for 73% (n=91) of the original cohort. It was not possible to follow up the same cohort for longer than 2 years as more than 50 % have dropped out.

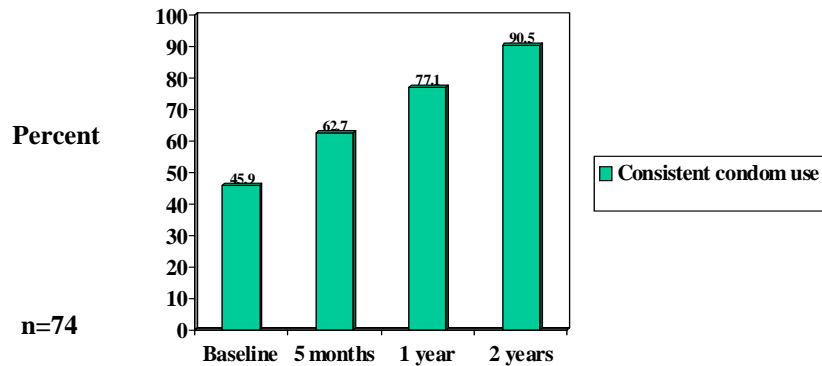
Negotiation skills. Figure 4.1 shows changes in negotiation skills over the 2-year follow-up period within the intervention group. The negotiation skill, which was assessed by the success rate in getting clients to use condoms, increased from 65.3% at baseline to 79.1% after 1 year and 91.1% after 2 years ($p < 0.001$).

Figure 4.1. Change in condom negotiation skills among sex workers at follow-up within the intervention group, Singapore 1994-1995



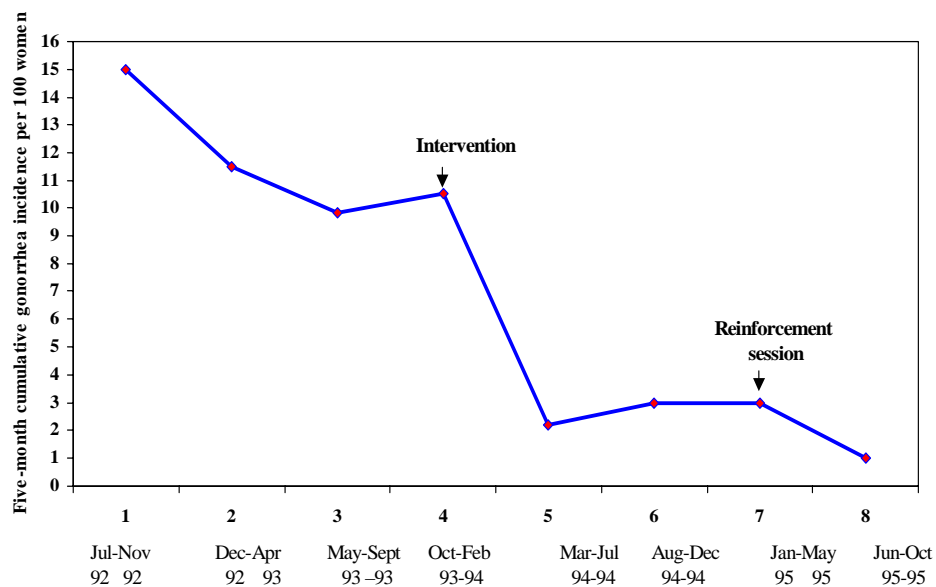
As shown in Figure 4.2, consistent condom use increased steadily from 45.9% at baseline to 90.5% 2 years after the intervention ($p < 0.001$). The proportion who reported ever having condom breakage and slippage in the past year (not shown in Figure) decreased from 45% and 44.0% at 1-year follow-up to 22% and 19.0% respectively at 2-year follow-up ($p < 0.001$).

Figure 4.2 Change in consistent condom use among sex workers at follow-up within the intervention group, Singapore 1994-1995



Gonorrhea incidence. Figure 4.3 shows the trend in the 5-month cumulative gonorrhea incidence from 20 months before to 20 months after the intervention. Gonorrhea records were available for all the 91 sex workers still in sex work at 2-year follow-up, which comprised 73.4% of the original cohort. On comparing the temporal trend in the 20 months before and after the intervention, the decline in gonorrhea incidence over the pre-intervention period was slow and insignificant ($p=0.236$) compared with the steep and significant decline ($p<0.05$) in the first 5-month period after the intervention. The low incidence was maintained around 3 per 100 women and this was followed by another dip to 1 per 100 women after the reinforcement session at 1 year post-intervention.

Figure 4.3. Trend in 5-month cumulative gonorrhea incidence in the intervention group from 20 months before to 20 months after intervention



Effects after 7 years: independent cross-sectional and cohort samples

The long-term effects of the program was assessed by comparing trends in the 6-month post-intervention consistent condom use and gonorrhea incidence across independent cross-sectional samples of sex workers enrolled in the program from 1995 with the trends from 1990 to 1994 before large-scale program implementation. As mentioned earlier, the program was implemented to all currently working sex workers (both old and new) in 1995 and to all newly recruited sex workers in 1996. Each intervention cohort from 1996 to 2001 was also followed up for one and a half years.

Recruitment to the condom promotion program and follow-up. Since the implementation of the condom promotion program in 1995 till December 2001, 2,522 sex workers, including both currently working and new recruits, have been enrolled in the program. Their mean age was 25.1 years and they saw on average 10.7 clients per day. The majority (>90%) were non-locals from neighboring countries and they were mainly Malaysian Chinese and Thais.

From July 1996 to December 2001, 1,771 newly recruited sex workers were enrolled in the program, with a mean of 27 sex workers per month. Of these, 570 (32.2%) quit sex work before 6-month follow up. Of those 1,201 persons still in sex work, 93.5% (n=1,123) completed the follow-up assessments. They did not differ significantly from those who quit or did not participate in follow-up assessments in age (25.1 vs 24.9 years), number of clients per day (10.7 vs. 10.2) and percentage who were Malaysian Chinese (49.6% vs. 43.5%). They also did not differ significantly in baseline condom

use for vaginal and oral sex, overall and by year of recruitment. The primary reason for loss to follow-up was due to their going back to their country and not due to refusals or other reasons that may influence the outcomes.

Socio-demographics of cross-sectional samples. Table 4.5 shows the socio-demographic characteristics of cross-sectional samples of sex workers, who have worked 6 months or less, over four time periods from 1990 to 2001. The percentage of Thai sex workers increased markedly from less than 5% in 1990-1992 to 56% in 1999-2001 while the proportions of Malaysian Chinese and other ethnic groups have decreased. The mean number of clients also showed a significant and progressive increase from less than 7 clients per usual working day to about 10 in 1999-2001. Educational level of the sex workers has also increased but there has been no change in the paying class composition with about two-thirds being in the middle class. The percentage of sex workers who engaged in sex with non-paying partners has decreased significantly from 17.1% in 1990-1992 to 7.3% in 1999-2001.

On closer examination, the socio-demographic characteristics in the last two time periods were very similar, except for a change in ethnic distribution. The most marked changes were between the time period 1993-1994 and 1995 onwards. Examination of the socio-demographic characteristics among only the Chinese sex workers showed similar trends with an increase in the number of younger and better-educated sex workers with time. In addition, the proportion of higher-class sex workers has increased markedly from less than one-third to about 75%.

Table 4.5. Temporal variations in characteristics of sex workers in Singapore, 1990-2001

	1990-1992	1993-1994	1995-1998	1999-2001
Overall	n=526	n=620	n=927	n=641
Ethnicity (%)				
Chinese [@]	79.8	70.8	58.3	42.0*
Malays and Indians [@]	17.2	26.2	9.3	2.3
Thais	3.0	3.0	32.4	55.7
Percent non-local	95.1	89.1	99.0	98.6
Mean age (SD) in years	27.5 (6.5)	27.0 (6.4)	25.5 (4.6)	24.7 (3.5)*
Mean clients (SD) per day	6.6 (3.1)	7.6 (3.1)	9.4 (3.0)	9.7 (3.1)*
Median clients per day	6.0	7.0	10.0	10.0
Years of school (%)				
Nil	12.4	11.0	2.3	4.5*
1-6	63.9	58.4	61.2	56.9
>6	23.7	30.6	36.5	38.5
Class[#] (%)				
Middle	70.5	69.8	65.0	69.4
High	29.5	20.2	35.0	30.6
Sex with non-paying partners	17.1	22.7	14.5	7.3*
Malaysian/Singaporean Chinese	n=420	n=439	n=540	n=269
Mean age (SD) in years	32.9 (8.9)	35.4 (8.5)	25.8 (5.6)	25.6 (4.5)*
Mean clients (SD) per day	5.6 (2.8)	7.5 (3.2)	8.4 (2.5)	7.8 (2.4)*
Years of school (%)				
Nil	20.1	34.5	2.6	1.5*
1-6	64.0	57.7	54.5	43.5
>6	15.9	7.8	42.9	55.0
Class[#] (%)				
Middle	67.5	100.0	26.1	28.7*
High	32.5	0.0	73.9	71.3
Sex with non-paying partners	19.0	18.7	16.2	15.2

*p<0.001, [@]The majority (>90%) were non-locals (Malaysians).

[#]Middle-class sex workers charged between US\$10 and US\$30 per client, high class>US\$30 per client.

Surveys of independent cross-sectional surveys

Consistent condom use and gonorrhea incidence rates among sex workers.

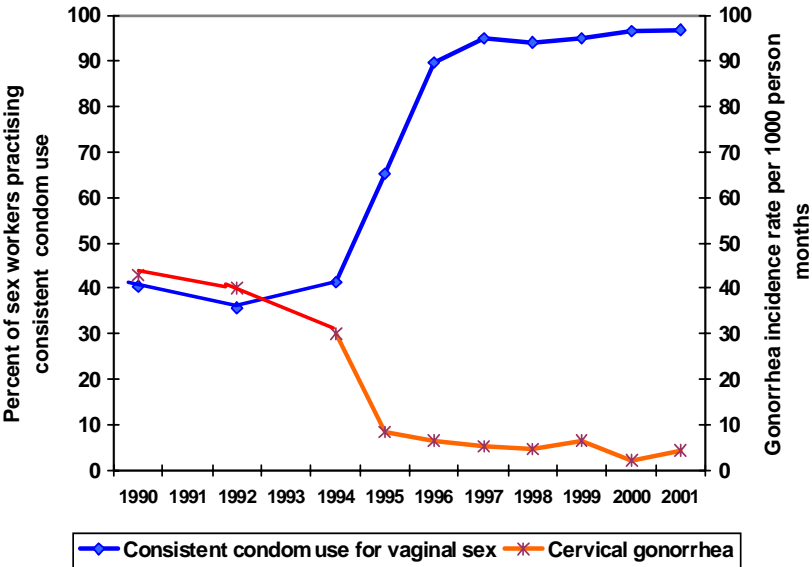
Figure 4.4 shows trends in consistent condom use for vaginal sex and cervical gonorrhea incidence rates across independent cross-sectional samples of newly recruited sex workers (meaning those who have worked 6 months or less), from 1990 to 2001. Figures before 1996 were taken from cross sectional samples of sex workers who have worked for 6 months or less to ensure comparability with the new recruits. Data on condom use before 1995 represent condom use before implementation of the intervention program. Figures on condom use from 1995 onwards represent the 6-month post-intervention condom use for each yearly cohort after their mandatory enrolment in the program in 1995.

As shown in Figure 4.4, consistent condom use for vaginal sex with clients among new recruits showed a statistical significant increase by slightly more than 2-fold from less than 45% before implementation of the program to all sex workers in 1995 to more than 90% after 1997 (chi-square trend, $p < 0.001$), with rates ranging from 93.9% to 96.4%. In 2001, self-reported consistent condom use was 96.4%. The increase in condom use was corroborated by a significant and marked decline in cervical gonorrhea incidence rates. Prior to 1995, the gonorrhea incidence rates ranged from 30 to 42 per 1000 person-months. After the implementation of the large-scale condom promotion program for vaginal sex in 1995, there was a significant decline to less than 10 per 1000 person-months. In 2001, the gonorrhea incidence rate was 4 per 1000

person–months. Stratification by ethnicity shows similar trends for Chinese and non-Chinese sex workers. It was not possible to analyze trends among the Thais due to their small numbers in the early nineties.

Consistent condom use for vaginal sex for the first cohort sample of 424 sex workers, comprising new recruits as well as those who worked more than 6 months, who were enrolled in the intervention program in 1995, was 86.6% with no significant difference between new recruits and those who worked more than 6 months (85.6% vs. 89.8%). The negotiation skill, measured by the percentage of clients who were successfully persuaded to use condoms, showed a statistical significant increase ($p < 0.001$) from 49.4% in 1992 to 84.5% in 1996 and 95.8% in 2001 (not shown in Figure). Prior to the implementation of the intervention program, the success rate in persuading clients to use condoms ranged from 49 to 54%.

Figure 4.4. Trends in consistent condom use for vaginal sex and cervical gonorrhoea incidence rates among sex workers in Singapore, cross-sectional surveys 1990-2001



*The condom promotion program was implemented to all currently working sex workers in 1995 and to all new recruits in 1996. The condom use percentages from 1996–2001 represent the 6-month post-intervention condom use, i.e. 6 months after enrolment of new recruits to educational sessions in the condom promotion program for vaginal sex. Figures before 1996 were based on cross-sectional samples of sex workers who have worked 6 months or less to ensure comparability with new recruits after 1996.

Multivariate analysis

Condom use. Due to the changes in the socio-demographic characteristics of the sex workers over time, multivariate analysis was used to control for these factors in the analysis of trends in condom use and gonorrhoea incidence across independent cross-sectional samples of sex workers. The results of the multivariate analysis (Table 4.6) showed a significant increase by more than two-fold in condom use over time following the intervention, after controlling for age, ethnicity, class, educational level and number of clients. Compared to the first time period (1990-1992) before the intervention, consistent condom use was significantly higher in the subsequent two time periods after the intervention. In contrast, consistent condom use in the second time period before the intervention did not show a statistically significant increase from that in the first time period.

As the proportion of Thai sex workers has increased quite markedly after 1995, time trends in condom use and gonorrhoea incidence were also examined after stratifying by ethnicity. Only the multivariate analysis of Chinese sex workers are shown here (Table 4.6) as their numbers for each time period were sufficiently large for meaningful analysis, in contrast to the small numbers of Thais ($n < 30$ before 1996) and non-Chinese locals ($n < 15$ in 1999-2001). For Chinese sex workers, the increase in consistent condom use after the intervention still remained statistically significant after controlling for age, class, educational level, and number of clients. Condom use increased by 2.5 times after implementation of the intervention program among the Chinese compared to an increase of 2.7 times for all sex workers.

Table 4.6. Time trends in the prevalence of consistent condom use for vaginal sex among sex workers in Singapore, 1990-2001: multivariate model

	1990-1992	1993-1994	1995-1998	1999-2001
Overall	n=526	n=620	n=927	n=641
Consistent condom use	35.3	41.5	78.3	95.3
Unadjusted prevalence ratio (95% CI)	1	1.18(0.91-1.53)	2.22(1.98-3.16)	2.70(2.13-3.42)
*Adjusted prevalence ratio (95% CI)	1	1.13(0.78-1.64)	2.29(2.04-3.29)	2.70(2.05-7.76)
Chinese only	n=420	n=439	n=540	n=269
Consistent condom use	35.0	40.0	79.1	91.4
Unadjusted prevalence ratio (95% CI)	1	1.08(0.82-1.43)	2.26(1.89-3.17)	2.52(1.94-3.27)
#Adjusted prevalence ratio (95% CI)	1	0.98(0.55-1.77)	2.23(1.78-3.61)	2.50(1.77-3.53)

*Adjusted for age, class, educational level, numbers of clients and ethnicity

#Adjusted for age, class, educational level and number of clients

Gonorrhea incidence rates. The 6-month (i) cumulative gonorrhea incidence and (ii) gonorrhea incidence rates (density) were also compared by time periods (Table 4.7). The decline in gonorrhea incidence rates was statistically significant for the two time periods after program implementation as compared to the first time period. In contrast, there was only a slight and insignificant decline in the second time period, just before the implementation of the program, when compared to the first time period. Adjustment for potential confounders did not materially affect the results. When the analysis was confined to the Chinese only, the findings were very similar.

Table 4.7. Time trends in cervical gonorrhoea incidence rates among sex workers in Singapore, 1990-2001: multivariate model

	1990-1992 n=526	1993-1994 n=620	1995-1998 n=927	1999-2001 n=641
Overall				
6-month cumulative gonorrhoea incidence (per 100 persons)	22.0	15.4	3.1	2.8
6-month gonorrhoea incidence density rate (per 100 person-months)	4.1	3.0	0.5	0.5
Crude gonorrhoea incidence risk ratio	1	0.73 (0.63-1.33)	0.14 (0.09-0.22)	0.13 (0.08-.0.21)
*Adjusted gonorrhoea incidence risk ratio	1	0.68 (0.58-1.38)	0.13 (0.07-0.22)	0.12 (0.06-0.21)
Chinese only				
	n=420	n=439	n=540	n=269
6-month cumulative gonorrhoea incidence (per 100 persons)	22.7	15.4	2.7	2.8
6-month gonorrhoea incidence density rate (per 100 person-months)	4.2	3.1	0.5	0.5
Crude gonorrhoea [@] incidence risk ratio	1	0.74 (0.64-1.32)	0.12 (0.06-0.23)	0.13 (0.06-0.26)
#Adjusted gonorrhoea incidence risk ratio	1	0.65 (0.60-1.38)	0.13 (0.06-0.27)	0.13 (0.06-0.27)

*Adjusted for ethnicity, work duration, age, class, educational level and number of clients per normal day. #Adjusted for same variables as above except ethnicity

[@]Incidence risk ratio is the ratio of the gonorrhoea incidence rate (density) in the second, third or fourth time period to the first time period

The 6-month cumulative gonorrhoea incidence is number of sex workers who developed gonorrhoea within the specified period divided by the number of sex workers in the study cohort.

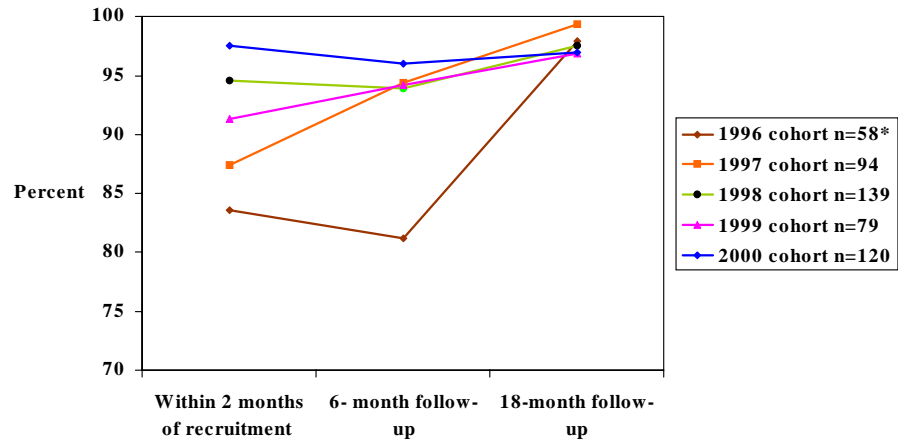
The 6-month gonorrhoea incidence rate is the number of sex workers who developed gonorrhoea by the sum of the *time periods* of observation for all sex workers (person-months) who completed follow-up.

Repeat surveys within cohorts

All the five yearly serial cohorts of female brothel-based sex workers recruited between 1996 and 2000 were followed up for one and a half years, with surveys on condom use conducted within the first two months of recruitment followed by repeat surveys at 6 months and one and a half years. The overall cohort attrition rate at one and a half years was 72%. Dropouts were significantly more likely to be younger, Thai, middle class and were more likely to practice consistent condom use for both oral and vaginal sex. These differences were consistently found for all the cohort samples. Approximately 86% of the cohort survey dropouts were because of their quitting work and not refusals.

Consistent condom use at the first round of survey, just before the sex workers' enrolment in the health education and condom skills development, was high ranging from 83.5% in the 1996 cohort to 97.5% in the 2000 cohort (Figure 4.5). This is probably because sex workers have already been exposed to the intervention activities targeting brothel management since late 1995, to support 100% condom use. Follow-up of the 1996 cohort showed that condom use was maintained at 81.1% at 6-month follow-up and it increased significantly to 97.9% after one and a half years. For the subsequent cohorts, condom use was also maintained or continued to increase to more than 95% after one and a half years. The highest level of condom use was achieved in the 1997 cohort, when it increased from 87% at baseline to 99% after one and a half years.

Figure 4.5. Consistent condom use for vaginal sex among sex workers at 6- and 18- month follow-up within cohorts, Singapore 1996-2002



Verification of findings: survey on consistent condom use among clients.

A separate survey was conducted in 2000 on a sample of 82 clients who had visited brothel-based sex workers in Singapore and were attending the STI clinic at the Department of STI Control for work permit screening requirements, doctor referral, asymptomatic referral and asymptomatic STI check-up. The self-reported condom use for vaginal sex by these clients was high at 92.7% and this was only slightly lower than the high level of 96.3% reported by the sex workers in our study in 2000.

A survey was also conducted on a random sample of 90 clients visiting brothels in Singapore between June and December 2001. Self-reported consistent condom use with brothel-based sex workers in the last 6 months among this group was 98.7% out of a total of 155 encounters with brothel-based sex workers. This corresponded very closely with the self-reported condom use of 97.3% among the brothel-based sex workers surveyed during the same period. In contrast, consistent condom use in the last six months among clients surveyed in the same area, but who had visited freelance or street-based sex workers was reported as 86.4%.

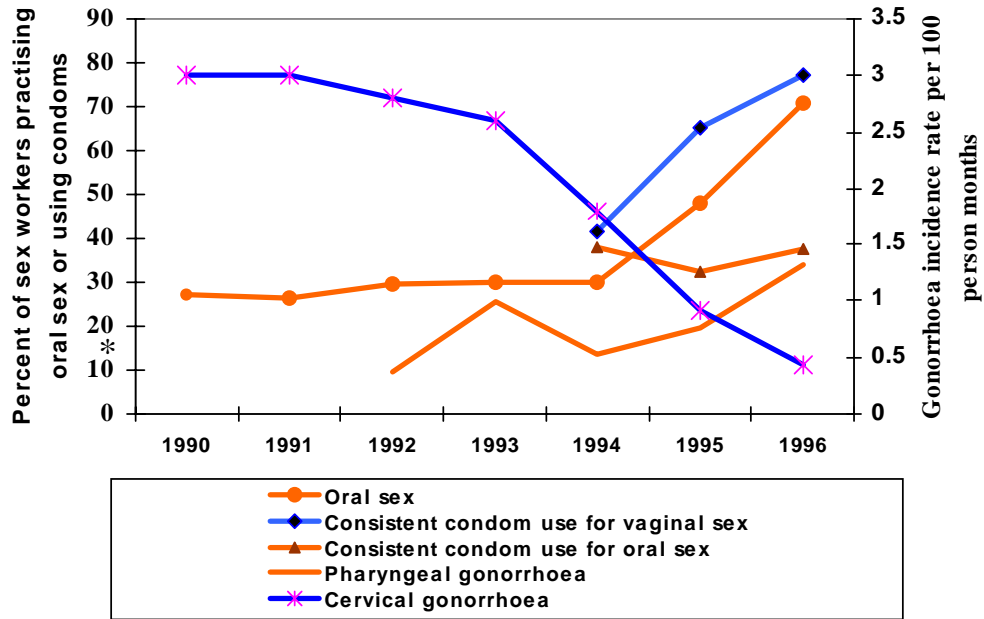
4.1.1.3 Unintended effects on oral sex and pharyngeal gonorrhoea incidence

Figure 4.6 shows the trends in oral sex and pharyngeal gonorrhoea following the implementation of the condom promotion program for vaginal sex from 1990 to 1996. There was a marked increase in oral sex from 27.4% in 1994 to 70.8% in 1996. From 1990 to 1994, oral sex remained relatively low at levels around 27%. Consistent condom use for oral sex was much lower than for vaginal sex. The incidence of pharyngeal gonorrhoea rose steadily from 0.53 episodes per 100 person-months in 1994 to 1.32 per 100 person-months in 1996. In contrast, cervical gonorrhoea declined markedly with increasing consistent condom use for vaginal sex, following a condom promotion program for vaginal sex. The rapid increase in oral sex appears to run parallel to the increase in consistent condom use for vaginal sex, suggesting that clients have demanded unprotected oral sex, often perceived to be safer sex, when pressured to use condoms for vaginal sex. This was confirmed subsequently by in-depth interviews with the sex workers.

As the ethnic and age distribution have changed with time, and oral sex have been found to be more common among younger sex workers and those who were Chinese or Thai, the rapid rise in oral sex might have been due to temporal changes in socio-demographic characteristics. Stratification by ethnicity and age group however showed a temporal increase in oral sex across all ethnic and age groups, with the most marked increase among younger Chinese and Thai sex workers. Among the Chinese, oral sex in the 20-29 year age group increased from 60.5% in 1990 to 95.5% in 1998, it also rose rapidly from 23.8% and 5.7% in the 30-39 and >40 age groups to 88.1%

and 50% respectively in the same time period. Among the Malays, the prevalence of age-adjusted oral sex increased from 8.7% in 1990 to 30.5% in 1998. Anal sex (0.4% in 1990, 1.6% in 1997) and sex with non-paying partners (17.1% in 1990, 21.7% in 1997) showed little change.

Figure 4.6. Trends in oral sex and pharyngeal gonorrhoea incidence among sex workers in Singapore following implementation of condom promotion programme for vaginal sex, 1990-1996



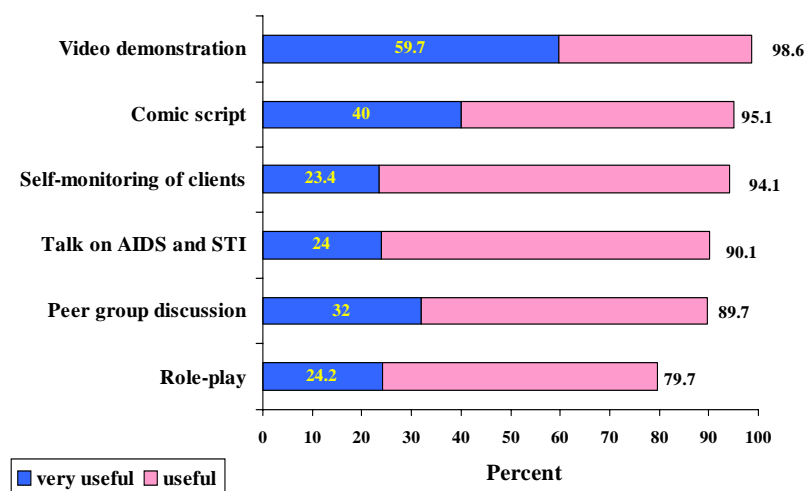
*Percentages were based on both old (currently working) and newly recruited sex workers

4.1.2 Process evaluation

4.1.2.1 Interviews with sex workers

Rating of health education sessions. The majority (86.7%) of the 316 sex workers surveyed found the whole course useful, 12.7% were not sure of its usefulness and only 0.6% did not find it useful. Sex workers were asked to rate the usefulness of each of the health education methods on a 4-point scale ranging from (1) very useful; (2) useful; (3) not useful to (4) do not know. The most highly rated educational method was the video clips followed by the comic book, self-monitoring of clients on the reasons given by them for not agreeing to use condoms; talks on AIDS and STIs; peer group discussion and role-play. All but one (98.5%) found the video demonstrations useful and they were rated as very useful by more than half compared to less than 40% for other educational methods. The video clip, which depicted an experienced and respected sex worker giving reasons for condom use and sharing tips on how to give counter-arguments to uncooperative brothel owners and clients, was most highly rated.

Figure 4.7. Rating of health education methods by sex workers



Perceived reasons and process leading to sustained condom use. In-depth interviews were held with 22 randomly selected sex workers in the intervention group in the first phase of the study at 2-year follow-up to gain a deeper insight on how they were able to sustain their efforts in consistent condom use with their clients. The sex workers cited several reasons for the sustained condom use with their clients. These included the effectiveness of the strategies to negotiate condom use and prevent condom slippage and breakage; regular reminders from health staff and encouragement from peers. The most effective condom negotiation technique to persuade older clients who did not fear death was to tell them about the pain and disability from AIDS and the shame of getting AIDS from extramarital sex and their burden on the loved ones. Another effective method was to draw the client's attention to the posters depicting '100% condom use: condoms must be used here.' This was perceived by the clients as mandatory. As clients, particularly foreign workers, did not want to be arrested in a brothel they readily complied with the brothel 'policy.' When some sex workers encountered problems such as condom slippage, pain or clients' complaints of failure to ejaculate, they used some of the techniques learnt from their peers in the group problem-solving sessions. The effectiveness of the techniques was confirmed by a decrease in condom breakage from 44.8% at 1-year follow-up to 22.3% at 2-year follow-up.

The sex workers also reported that their fears about a reduction in the number of client if they insisted on condom use had proven unfounded and that even though the numbers had initially declined, they later returned to normal. In addition, their

confidence was restored when former clients returned and agreed to use condoms. Finally, condom use had become easier over time as clients accepted the norm of condom use. In fact, all 22 sex workers interviewed reported that they did not even need to always negotiate condom use for vaginal sex about a year after the intervention as they had the confidence and learned the skills to put the condom on their clients without even asking them as the clients had already accepted it as a normal practice.

4.1.2.2 *Interviews with health staff*

The 7 health staff involved in conducting the educational sessions for the intervention program were interviewed on the feasibility of conducting small group skill development and problem-solving sessions. All reported that they get more satisfaction conducting small group sessions than giving talks to big groups. When asked for the reasons, 5 (71.4%) reported that small group sessions were more effective in changing behavior and 2 (28.6%) said that they could interact and build rapport with the sex workers. All of them felt it would be feasible to continue with the sessions with 4 expressing that they should be continued with no modification, and 3 suggesting less follow-up interviews.

4.1.2.3 *Checks on brothels*

Spot checks in 2002 found that only three (1.6%) out of the 185 brothels did not display posters on condom use. Five percent did not display posters in one to two of the three specified areas. None of the brothels were temporarily closed, because of high gonorrhea rates, after 1996 compared to about 2 every 6 months in 1995 and 1996.

4.2 Effects of condom promotion program for oral sex

4.2.1 Outcome evaluation

4.2.1.1 Long term effects on oral condom use and pharyngeal gonorrhoea incidence

Independent cross-sectional surveys

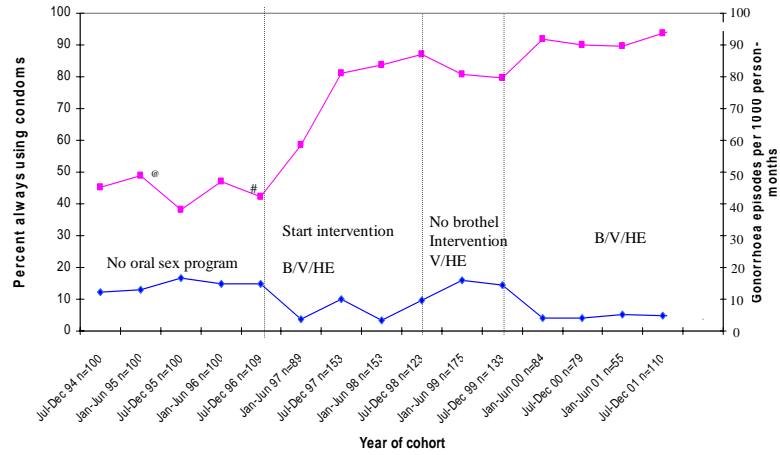
Consistent condom use for oral sex. Figure 4.8 shows the trends in post-intervention consistent condom use in relation to the intervention activities. Four different time periods were compared: (i) 2 years before intervention, (ii) during intervention with implementation of activities to sex workers and brothels, (iii) withdrawal of brothel activities in 1999 and finally (iv) the 2-year period (January 2000-December 2001) when brothel intervention activities were started and intensified. The demographic characteristics of the sex workers who practiced oral sex remained relatively stable during the period from 1996 to 2001. Their median age (25 years) remained the same and the number of clients (range from 10 to 11) and proportion of Chinese (range from 39% to 45%) did not differ significantly by year of recruitment. As shown in Figure 4.8, consistent condom use remained around the same level at below 50% for two years before intervention. With the implementation of the intervention program in 1996, condom use showed a significant steady increase to 87% in 1999 (chi-square trend $p < 0.001$). Simple regression analysis of the percentage of condom users on the sequence number of the five 6-monthly intervals during this post-intervention period showed an increase in consistent oral condom users estimated at 11.5% per 6-monthly interval, which was significantly different from a zero slope ($p < 0.001$). When activities were withheld from brothels in 1999, condom use leveled off and decreased

slightly to 79.7% ($p=0.081$). In early 2000, when activities to brothels were intensified, condom use increased significantly to 91.7% ($p<0.05$). The high level has been maintained at 85% and more and it was 93.6% by June 2002.

Pharyngeal gonorrhoea incidence. The changing trend in condom use was corroborated by changes in pharyngeal gonorrhoea incidence rates. Before the intervention, pharyngeal gonorrhoea incidence rates remained high at between 12.4 and 16.6 per 1000 person-months. The significant increase in condom use during the first 2 years of the intervention was corroborated by a corresponding marked decline in the pharyngeal gonorrhoea incidence rate to less than 3.3 per 1000 person-months. The decrease in condom use with the withdrawal of the brothel activities was accompanied by an increase in pharyngeal gonorrhoea. The significant increase in condom use between the periods of July –December 1999 and January-June 2002 (79.7 to 97.2%, $p<0.05$) was accompanied by a significant and major decline in the pharyngeal gonorrhoea incidence rate from 14.4 to 4.7 per 1000 person-months over the same period.

The first serial cohort recruited to the intervention also had a significant within-group increase in oral condom use from 33.7% at baseline to 56.2% ($p<0.005$) at 6-month post intervention. The within-group changes for subsequent serial cohorts were not compared because of their exposure to intervention effects from their brothels and peers before being enrolled in the educational sessions.

Figure 4.8. Effects of interventions on trends in consistent condom use and pharyngeal gonorrhea, 1994 - 2002



B-brothel intervention activities eg talks, brothel checks
 V-video sessions for sex workers
 HE-health education talks for sex workers

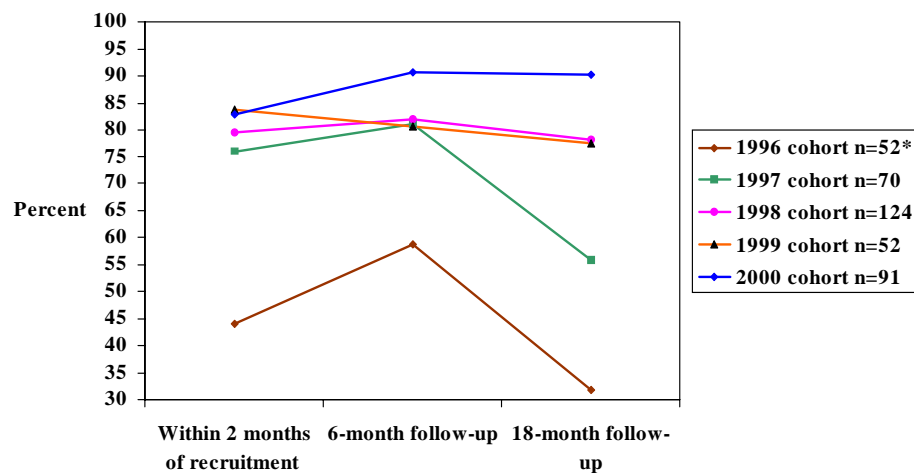
— Consistent condom use for oral sex — Pharyngeal gonorrhoea

@Cross sectional samples from 1994 to June 1996 were group matched by ethnicity and work duration with overall group of sex workers recruited from 1996-2002 to ensure comparability with sex workers recruited to the program starting from July 1996
 #This point represents pre-intervention condom use. The 6-month post intervention condom use for this cohort is 56.2%. After this cohort, all condom use percentages were taken 6 months post-intervention. This means that the condom use percent for the last cohort (Jan to June 2001) was taken from July to Dec 2002.

Repeat surveys within cohort

Each of the serial cohorts from 1996 to 2000 after their enrolment in the oral condom promotion program was also followed up for one and a half years (Figure 4.9). The overall cohort attrition rate after one and a half years was 75%. Condom use for oral sex was not maintained for the first two cohorts enrolled in the study in 1996 and 1997. Condom use for oral sex decreased significantly from 58.6% at 6-month post-intervention to 31.8% ($p<0.05$) after one and a half years in the 1996 cohort and from 81.2% to 70% respectively in the 1997 cohort. For the 1998 and 1999 cohorts, condom use at 6-month post intervention of about 80% was maintained after one and a half years at around 78%. The 2000 cohort showed a bigger increase from 83% to 90.7% at the 6-month follow-up and this was maintained at 90.2% even after one year.

Figure 4.9. Consistent condom use for oral sex among sex workers at 6- and 18-month follow-up within cohorts, Singapore 1996-2002



*Based on half-yearly cohort

4.2.1.2 Comparison of effects in the intervention group with brothel measures versus control group without brothel measures

Table 4.8 compares the group of sex workers with the brothel intervention with matched controls. Both were similar in class and educational level.

Table 4.8. Comparison of socio-demographic characteristics of sex workers enrolled in the brothel intervention program on oral sex and the matched control group, Singapore, 1999-2000

Variable	*Intervention Group n=120 [#]	Matched control group n=120 [#]
Ethnicity	54.2	54.2
% Chinese		
Mean age in years (SD)	24.8 (3.2)	24.4 (3.3)
Class[@](%)		
Middle	63.3	59.2
High	36.7	40.8
> 6 years of schooling (%)	38.3	43.3
Mean number (SD) of clients per day	10.1 (3.4)	10.2 (3.9)

*The intervention to the brothels included written reminders to display new posters on oral condom use and to enforce condom use with regular checks by health staff to ensure their compliance. Brothel keepers were also reminded to talk to clients on condom use.

[#]Refers to number of sex workers.

[@]Middle class workers are those who charge US\$10-\$30 per client.

High-class workers are those who charge >US\$30 per client.

Changes in outcome measures in intervention versus control group. Table 4.9 shows the changes in oral condom use and the pharyngeal gonorrhoea incidence rates in the group receiving the brothel intervention and the control group. The intervention group showed a statistically significant increase in consistent condom use of 10.8% (from 81.7% to 92.5%) compared to a significant decrease of 11.7% in the control group. Hence, the net increase in consistent condom use in the intervention group was 22.5%. This increase was corroborated by a significantly lower 6-month pharyngeal gonorrhoea incidence rate in the intervention group compared with the matched control group. The control group was about 5 times more likely to contract pharyngeal gonorrhoea compared to the intervention group. Fourteen sex workers (11.7%) contracted pharyngeal gonorrhoea in the control group compared to only 3 (2.5%) in the intervention group (not shown in table) at 6-month follow-up. The preventive proportion (absolute difference in incidence divided by the incidence in the control) was 78.6%. This means that the brothel intervention has prevented 78.6% of the potential cases of pharyngeal gonorrhoea.

Consistent condom use for vaginal sex was high at more than 93% in both intervention and control groups before and after brothel-targeting interventions. Less than 2% of sex workers in both groups contracted cervical gonorrhoea.

Table 4.9. Consistent condom use for oral sex and pharyngeal gonorrhoea incidence rates among sex workers at baseline and at 6 months after intervention in the intervention and matched control groups, Singapore, 1999-2000

Outcome measure	Intervention Group [@] n=120	Control Group [#] n=120	Intervention versus control group	
			Observed [§] rate/risk ratio (95% CI)	Adjusted ^{&} rate/risk ratio (95% CI)
% sex workers who consistently use condoms for oral sex				
Pre-intervention	81.7	81.7	1	1
Post-intervention	92.5	70.0	1.32 (1.16-1.50)	1.31 (1.00-1.75)
Absolute difference (pre to post intervention)	+10.8	-11.7		
Change within group, P value	<0.05	<0.05		
Incidence rate of gonorrhoea from pre-intervention to 6 months post intervention (per 100 person months)	0.42	1.94	0.21 (0.06-0.72)	0.22 (0.06-0.78)

[@] The intervention group was taken from the cohort exposed to intensified brothel interventions that were implemented since February 2000

[#] Subjects for the control group were taken retrospectively from the cohort January to August 1999, with 6 month follow-up from August 99-January 2000.

[§]The observed rate ratio of condom use is the ratio of the percentage of sex workers who used oral condoms in the intervention to that in the control group. The observed risk ratio of pharyngeal gonorrhoea is the risk (incidence rate) of contracting gonorrhoea in the intervention compared to the control group.

[&]Rate or risk ratio adjusted for 'class', education and number of clients of sex workers using Cox's model.

4.2.2 Process evaluation

The majority found the video clips on oral sex and oral condom use very useful (71.2%) or useful (16.9%) and only 11.9% found them not very useful. All but one of the 89 sex workers (98.7%) surveyed found the messages easy to understand and almost all (96.2%) found the messages believable and realistic. About three-quarters found the messages interesting (74.9%) and convincing (72.9%). When asked to rate the usefulness of the different sections of the video clips, sex workers found the section of the video clips on negotiation strategies most useful (49.5%) followed by the section on misconceptions of oral sex (42.5%).

Focus group discussions were held with 4 groups of sex workers with 8 sex workers in each group, a week after the educational intervention, to get feedback on the video clips. Some of them have used the negotiation strategies demonstrated in the video clips to persuade clients to use condoms. Many sex workers have resorted to other strategies to get their clients to use condoms such as just putting the condom on the client's penis in a seductive and arousing manner without their consent. They reported that this was an easy and effective way with foreign clients who did not question them because of language barriers. However, they took about a week to master the skill.

4.3 Summary of findings

The program promoting consistent condom use for vaginal sex was evaluated with a quasi-experimental (a pretest-posttest comparison group) design combined with a time series design. At 5-month post-intervention, the intervention group improved significantly in condom negotiation skills and were almost twice more likely than the comparison group without the new intervention program to always use condoms with their clients (adjusted prevalence ratio 1.90, 95% CI: 1.22-2.94). Gonorrhea incidence declined by 77.1% in the intervention group compared to 37.6% in the control group. At 2-year follow-up, the intervention cohort showed an almost 2-fold increase in consistent condom use from 45.9% to 90.5% (GEE trend, $p < 0.001$). Consistent condom use for vaginal sex among serial independent cross sectional samples of sex workers increased from less than 45% before large-scale program implementation in 1995 to 96.4% in 2001 (Chi-square trend, $p < 0.001$), with a corresponding significant decline in cervical gonorrhea from more than 3.0 per 100 person-months pre-intervention to 0.4 per 100 person-months in 2001 ($p < 0.01$). Adjustment for changes in socio-demographic characteristics of the sex workers over time did not materially affect the results.

However, the successful program led to an unintended effect of an increase in unprotected oral sex and pharyngeal gonorrhea incidence. Hence, a condom promotion program for oral sex was implemented in 1996, 2 years after the implementation of the program for vaginal sex. The time series design was used to compare condom use and pharyngeal gonorrhea trends before and after program implementation, and the

retrospective pretest-posttest matched control group design to assess the independent effect of brothel interventions on sex workers. Consistent condom use for oral sex increased significantly from less than 50% before 1996 (pre-intervention period) to 93.6% in mid-2002 ($p < 0.001$), with a corresponding significant decline in pharyngeal gonorrhea incidence rates from more than 1.2 to 0.3 per 100 person-months ($p < 0.05$) compared to no significant changes before the implementation of the intervention. Among sex workers working in brothels with interventions, there was a 10.8% absolute increase in oral condom use, compared with an 11.7% decrease in the control group. The pharyngeal gonorrhea incidence rate was significantly lower in the intervention group than in the control group (adjusted risk ratio: 0.22; 95% CI: 0.06-0.78).

Chapter 5

DISCUSSION

5.1 Main study findings

Sustained high levels of consistent condom use for vaginal and oral sex were found among female brothel-based sex workers in Singapore after their enrolment in condom promotion intervention programs that combined condom negotiation skills training for sex workers, with administrative measures directed at brothel establishments, and continuous quality improvement efforts targeting health staff. The sustained high levels of condom use were associated with a corresponding marked decline in cervical and pharyngeal gonorrhoea incidence. Consistent condom use for vaginal sex almost doubled in the intervention group in the two years following the intervention and the high level of condom use of more than 90% (range 94-97%) has been maintained across independent cross-sectional samples of sex workers for five years till now (1997-2001), with a corresponding decline in cervical gonorrhoea incidence to less than 0.5 per 100 person-months.

Consistent oral condom use also increased markedly from less than 50% before implementation of the oral condom promotion program to more than 90% after its implementation, with a corresponding decline in pharyngeal gonorrhoea. However, it took a longer time to achieve this level, when compared to the condom program for vaginal sex (4 years versus 2 years) and its level is still fluctuating between 85% and 94%. Another important finding was a significant increase in consistent condom use

for oral sex with a corresponding significantly lower pharyngeal gonorrhea incidence rate in the intervention group with intensified administrative measures directed at brothel management. In contrast, the control group of sex workers without the brothel intervention reported a significant decrease in condom use with a correspondingly higher pharyngeal gonorrhea incidence rate.

5.2 Interpretation of results: effectiveness of interventions

5.2.1 Evaluation of program effectiveness: Did the interventions work?

Some other explanations could have accounted for the increase in condom use for both programs as the (i) non-randomized comparison group design, used to evaluate the first five months of the program for vaginal sex, and the (ii) time series design without a control group used for the long-term evaluation of both programs may not be able to control for other factors that may influence condom use. Hence, I have assessed the evidence of the programs' effectiveness by using multiple methods to interpret the data, which include (i) combining the quasi-experimental design in the short-term evaluations with the time series design in the longer term evaluations (ii) using multivariate analysis to assess the independent effect of the intervention program (iii) integrating qualitative with quantitative survey findings and (iv) examining data from other sources. As far as possible, findings from both *within* and *across independent* cohort samples were used to help in drawing valid conclusions. The strength of using data within cohorts is that the same individuals are studied within each cohort while

the advantage of using independent samples is that biases arising from attrition, maturation, or testing effects are reduced.

5.2.1.1 Condom promotion program for vaginal sex

In the short-term evaluation of the program on condom use for vaginal sex, the intervention group showed considerable improvements in outcomes, with an increase of around 20% in negotiation skills and consistent condom use as well as a significant decline in gonorrhea incidence, compared to negligible changes in the comparison group. Adjustment for baseline differences between the comparison and intervention group had little effect on the impact estimates, thus indicating that non-equivalence of the groups is unlikely to be an important contributory factor to the observed improvements in outcomes in the intervention group. The change in outcomes is also unlikely to be due to attrition bias as less than 5% dropped out from each group at 5 months. Other supportive findings on the program effectiveness came from the data, which showed significantly higher proportions of sex workers from the intervention group compared to the comparison group who used alternatives like massage and masturbation in the event of negotiation failures.

The sustained increase in condom use for vaginal sex (1995 – 2001) across cross-sectional samples of sex workers may have been due to changes in the socio-demographic characteristics of the sex workers and sexual behavior of clients over time. However after stratifying by ethnicity and adjusting for age, class and other demographic characteristics of sex workers that could have influenced condom use,

the increase in condom use after the intervention remained significantly higher than condom use in the two pre-intervention time periods, with little change to the adjusted prevalence ratios. This suggests that the increased condom use was independent of the socio-demographic changes.

The increase in condom use over the years may be explained by other factors such as changes in social and community norms over time or maturation, that is, sex workers and clients have, over time, become more aware of the need to use condoms to protect themselves from STIs and AIDS. However, there was negligible change in condom use in the two time periods before the intervention as compared to the marked and statistically significant increase in the two time periods after the intervention. If sex workers or clients have changed their sexual behavior with time, we would expect more or less the same degree of change over the pre-intervention period as well. The increased condom use over the two post-intervention time periods is thus likely to have been attributed to the intervention, although we cannot completely discount changing community norms or maturation to be contributory factors.

Sex workers and clients may have been exposed to public health campaigns or other sources of information present at the same time as the intervention program. However, public education is unlikely to have contributed a major part to the sustained condom use over the years as there was no public education program directed specifically at clients or sex workers due to political and culturally sensitivities in Singapore. The public health education posters on HIV and AIDS stressed on staying faithful to one

partner rather than using condoms with sex workers as the latter was perceived to morally inappropriate, although health messages on condom use could have been depicted sometimes in magazines and newspapers. More importantly, our outcome measures such as skills to negotiate condom use and prevent slippage and breakage were specific to the intervention on condom use for vaginal sex for sex workers. These skills were not the targets for change in the public education programs as they were too culturally sensitive. These findings provide further evidence of the plausible effect of the intervention. Other important findings that support the intervention as the major explanatory variable for the sustained high levels of condom use came from in-depth interviews with the sex workers. They attributed their increased condom use to the skills learnt from the intervention, posters provided to them and the continual support from health staff and peers. Additional supportive findings came from 2 separate surveys in 2000 and 2001 on clients who engaged in sex with brothel-based sex workers in Singapore. The self-reported condom use among them was more than 90% and the majority (80%) reported that the sex workers initiated condom use and provided condoms.

5.2.1.2 Condom promotion program for oral sex

For the program on condom use for oral sex, which was implemented later than the program for vaginal sex, I faced even more logistic constraints in the evaluation design. First, unlike the program for vaginal sex, it was not possible to have a comparison group even in the initial phase of the study due to the ‘institutionalization’ and expansion of the program to all sex workers, following the success of the condom

promotion program for vaginal sex. Second, manpower and logistic constraints made it difficult to collect baseline data from new sex workers on the day of their recruitment and before their exposure to brothel interventions or peer influence; sufficient numbers of sex workers had to be recruited first before their enrolment in the baseline survey that was conducted just before the educational sessions. In view of these constraints, I had to use an evaluation design that was quite different from the earlier program for vaginal sex.

My conclusion on the effectiveness of the condom promotion program for oral sex was also based on examining data from multiple sources: the interrupted time series design, the retrospective pretest-posttest matched control group design and qualitative research. The time series design applied over an 8-year period (1994 –2002) with 15 observation points enabled me to compare trends in consistent condom use for oral sex before and after implementation of the program intervention and when brothel intervention activities were withdrawn and subsequently applied over a specific time period. The pretest-posttest matched brothel intervention control group design enabled me to assess the independent effect of the brothel interventions. Consistent condom use for oral sex increased from less than 50% before the implementation of the program in 1996 to 94% in mid-2002, with a corresponding decline in pharyngeal gonorrhoea among the female brothel-based sex workers. Further supportive evidence of the program's effectiveness came from our findings on the significant within group increase in condom use for the first serial cohort enrolled in the program. In addition, intensified measures directed at brothel management were found to make a significant

independent impact in increasing consistent condom use by 23% and in reducing gonorrhoea by 5 times in the intervention group. The decrease in condom use in the control group of sex workers, without the brothel intervention, could be explained by their relapse to non-condom use in the absence of reminders from brothel management. It also suggests that interventions targeting only sex workers -without brothel interventions- may be ineffective in a situation where condom use has been adopted by the majority (87% in this study). It is likely that the remaining 13% could be more resistant to change and would require brothel management to remind them and their clients to use condoms.

The observed increase in condom use for oral sex over time is unlikely to be due to the confounding effect of changes in the socio-demographic characteristics of sex workers recruited over the 6-year period as they were found to be very similar in age, ethnicity and number of clients. Before the intervention period, samples were taken from sex workers that were grouped matched by ethnicity (Chinese and Thais combined versus non-Chinese) and duration of sex work to ensure their comparability with new sex workers recruited after June 1996. Although one third quit sex work before six months, with the median duration of work being 3.8 months, selection bias from attrition is unlikely to have accounted for the findings, as there were no discernible differences in socio-demographic characteristics and baseline oral condom use among those followed up and those lost to follow-up. Sex workers were not likely to quit because of monthly testing as they were briefed and were thus aware of the mandatory monthly screening procedures by the health department on their enrolment. On

comparing the two-month cumulative pharyngeal gonorrhoea incidence among those followed up in the interviews with those lost to follow up, it was higher in the group that completed follow-up (2.1% vs. 0). This gives further evidence that sex workers did not quit because of gonorrhoea infection.

There is no local public education program on oral sex, which is still considered illegal in Singapore that could have accounted for the rise in condom use. Other important findings that supported the intervention as the major explanatory variable for increased condom use came from in-depth interviews with the sex workers. They attributed the increased condom use to the skills learnt from the intervention, posters provided to them and the continual support from health staff and peers.

5.2.2 Explanations for 'discrepancies' in findings

Discrepancies in some findings warrant explanation. A relative 37.6% reduction in cervical gonorrhoea incidence was found in the comparison group without the condom promotion program for vaginal sex, although condom use has not increased. This comparison group also has higher baseline gonorrhoea incidence than the intervention group although both groups were very similar in socio-demographic characteristics, number of clients and condom use.

These discrepancies could be explained by the complex and multi-factorial causes of gonorrhoea infections; one cannot assume a simple linear relationship between condom use and incident gonorrhoea. The impact of condom use on reducing gonorrhoea

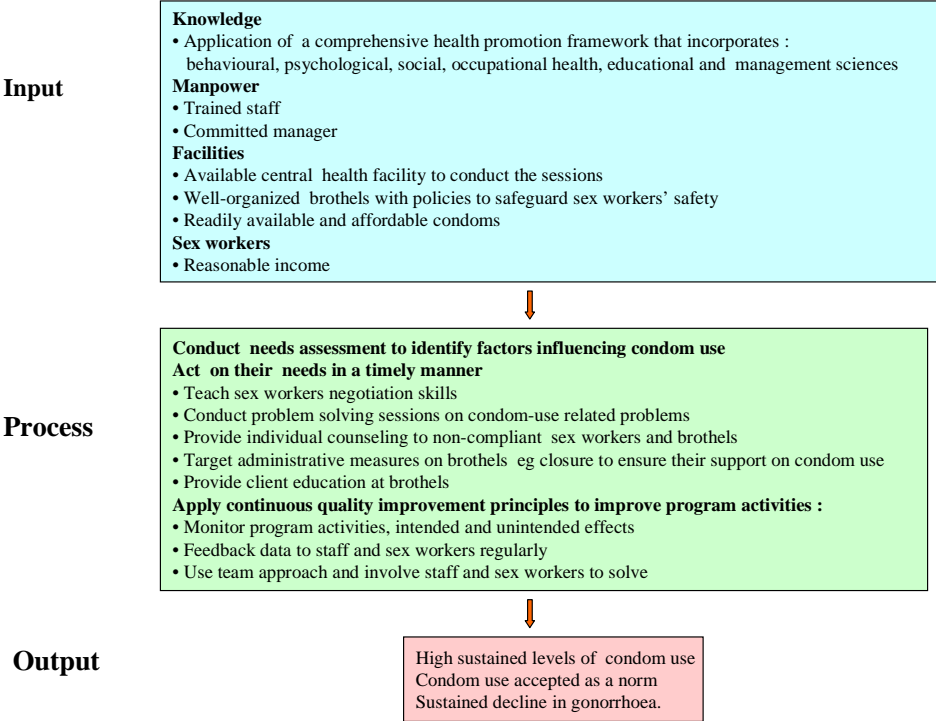
infection among sex workers also depends on their clients' characteristics such as the prevalence of gonorrhoea among them, the length of time a client is most infectious, their number of clients, the efficiency of transmission and characteristics of the sex workers such as their susceptibility to infections.

There was also a rather marked increase in pharyngeal gonorrhoea in light of the gradual decline in condom use in 1999, following withdrawal of the brothel interventions. This could be explained by other factors that were not included in my study, such as an increase in the high prevalence of gonorrhoea among clients of non-condom-using sex workers. Even if the percentage of sex workers who did not use condoms in a serial cohort is small, gonorrhoea incidence could be high among them, if they did not use condoms mainly with infected clients. As mentioned earlier, one cannot assume a simple relationship between condom use and gonorrhoea incidence. In view of this, it is more valid and reliable to look at the overall trend over time rather than focusing on isolated individual time points. The overall trend in Figure 4.8 clearly shows a marked increase in consistent oral condom use from 1996 to 2000 with a corresponding decline in pharyngeal gonorrhoea.

5.2.3 What makes it work? Factors contributing to program effectiveness

An in-depth analysis on why the intervention programs in our study achieved sustained high levels of condom use for both oral and vaginal sex would enable STI program managers to replicate or adapt our programs to their settings. The input and process factors that led to the sustained condom use are summarized in Figure 5.1.

Figure 5..1. Factors leading to sustained condom use among female brothel-based sex workers, Singapore, 1994-2001



Input factors. Inputs that facilitated condom use included the (i) application of a comprehensive theoretical health promotion framework that incorporated principles from the behavioral, psychological, social, occupational health and educational sciences to assess and act on modifiable factors influencing condom use; (ii) application of management sciences to overcome resistance to change from health care providers and motivate them to sustain and improve their health education efforts and (iii) structural factors such as an available central health facility to conduct educational sessions; well-organized brothels with a captive group of sex workers and a conducive workplace environment to display posters and remind clients on condom use; commitment and leadership of the STI program manager; and readily available and affordable condoms. Condoms were available at the public STI clinic, provision shops, pharmacies, Chinese medicine shops and were even sold in brothels by peddlers.

Process factors. What specific processes contributed to the sustained condom use? These included (i) targeting interventions on groups that influence sex workers' behavior such as brothel management to create a supportive workplace environment to maintain condom use; (ii) continually assessing needs of both sex workers and brothel owners prior to and during program implementation; (iii) involving sex workers themselves in designing messages and solutions; and (iv) applying continuous quality improvement activities to monitor progress, provide feedback to staff and involve them in problem solving.

Sex workers' and brothel establishments' needs were regularly assessed, using quantitative and qualitative methods, prior to program planning and during program implementation itself. This helped to develop timely and appropriate solutions specific to their problems. When the problems encountered by sex workers in the initial stage were non-acceptance of condoms by clients and lack of negotiation skills, program activities focused on teaching sex workers negotiation skills, getting support from brothel owners and educating clients through posters. At 5-month follow-up, the majority could persuade clients to use condoms and were motivated to refuse unprotected sex with non-compliant clients. The problems faced now were different and were related to condom use such as condom breakage and slippage; pain; clients' failure to ejaculate; acceptance by a few resistant sex workers of clients that have been refused by their peers for not using condoms; and non-compliant brothel managers who were introducing clients to non-condom-using sex workers. Interactive group discussions were organized for sex workers to share and learn practical ways to deal with condom slippage and other condom-related problems. Individual counseling was provided to non-condom-using sex workers and administrative measures such as warnings and closures were directed at non-compliant brothel owners.

The continual needs assessment enabled us to see the need to design oral condom promotion approaches that have to be quite different from that for vaginal sex as problems encountered by sex workers with regard to oral condom use were quite different. For example, sex workers using condoms for oral sex faced (i) more client resistance, as they perceived this practice would protect the sex workers rather than

themselves; (ii) side effects such as throat itchiness and dryness and unpleasant taste of condoms; (iii) more misconceptions about the safety of oral sex and (iv) less support from brothel owners. Hence, specific approaches were developed to increase condom use for oral sex. These included helping sex workers learn new skills to put the condom on the client's penis in an arousing and enticing way without negotiating; making available more varieties of oral condoms with different flavors such as strawberry or mint to give clients and sex workers more attractive choices to use oral condoms; addressing misconceptions about the safety of oral sex and intensifying interventions targeting brothels. More frequent on-site checks at brothels were required to ensure their support to sex workers on oral condom use and counseling sessions were conducted for all brothel owners whose sex workers tested positive for STIs. Finally, posters on condoms for oral sex were designed separately and made more explicit. In-depth interviews with sex workers and brothel owners showed that posters with general messages to use condoms were generally perceived by sex workers, brothel owners and clients to refer to vaginal sex. Thus, posters have to be designed specifically for oral sex by depicting a sex worker with a condom at her lips.

The other important reason for the sustained condom use was the multifaceted approach of the intervention programs. In addition to activities directed at the personal level to develop sex worker's negotiation skills, administrative measures were directed at 'brothel establishment' level to ensure their support for 100% condom policy and continuous qualitative improvement efforts directed at health staff to monitor and continually improve program activities. I motivated health staff to sustain their health

education efforts by giving them regular feedback on the programs' progress and their good performance and by involving them in identifying problems and discussing solutions. In addition, their time constraints in conducting many small group sessions were acknowledged and the number of sessions was reduced. To make their job easier, they were also given clear guidelines and job aids such as training manuals. Client education was delivered informally by brothel owners and posters were displayed in all brothels to remind clients on condom use.

With time, condom use became widespread and was accepted as a norm by sex workers, brothel managers, and, more importantly, the clients. Sex workers not using condoms were subjected to pressure and 'sanctions' from their peers. Thus, an informal self-regulating system was put in place to promote condom use. Nevertheless, a small proportion (<10%) of sex workers were still not always using condoms for vaginal or oral sex. They were the older sex workers with fewer clients and lower negotiation skills and were found to be more amenable to individual counseling than group approaches. In addition, condom use for oral sex has to be closely monitored because the high level has not stabilized yet and is fluctuating between 85% and 94% compared to condom use for vaginal sex where levels of more than 90% have been maintained for five years now.

5.3 Study limitations and strengths

5.3.1 Study limitations and methodological issues

Before comparing our study with other studies and considering the public and clinical implications of our findings, the following methodological issues and limitations in our study should be noted and addressed.

Non-use of randomized controlled trial The randomized controlled trial provides the best evidence that the outcome improvements, namely increase in condom use and decline in gonorrhea, were due to the intervention and not to other factors such as historical trends, unplanned events, maturation effects, confounders and attrition bias. However, it may not be appropriate to use this design because both our condom promotion programs employed multifaceted activities such as specific health education and skills development sessions for the sex workers, brothel ‘policies’, and mobilization of support from peers and health staff. Randomization of individual sex workers would ignore the influence of a ‘supportive brothel environment’ on the behavior of sex workers as both control and intervention sex workers may come from the same brothel. The intervention program also encouraged peer support and it would be impossible to avoid ‘cross contamination’ of sex workers from the control or intervention group through diffusion of information by interpersonal communication from the intervention group. Our intervention programs focused on participation and individual behavior change, thus our sex workers must be motivated and were aware

that they are participating the interventions, so it is not possible to use blinding techniques often used in randomized controlled clinical trials.

It was also not feasible to randomize brothels or sites because of their limited number and non-comparability. As there are only six designated sites with brothels in Singapore, there would not be sufficient numbers of sites to conduct a well-controlled trial with sufficient statistical power. Brothels could not be used as randomization units as close physical proximity of the brothels (shops attached in rows, Figure 2.2) and inter-brothel work movement would lead to diffusion of effects across brothels. It was common for brothel managers to deploy sex workers from one brothel to another brothel under the same management. Finally, the main objective of this study is to evaluate long-term effects of the intervention programs and it is not feasible to maintain experimental conditions for long periods in the real world setting due to logistic and ethical reasons.

Recently, health promotion experts⁹⁵⁻⁹⁷ and WHO,³² recognizing these limitations, advocated the use of multiple methods to evaluate evidence of community interventions. They further recommended that non-randomized trials meeting all the following four quality criteria were considered to provide the strongest evidence for a causal relationship between the intervention and any change in outcomes measured: (i) employing a control/comparison group equivalent at baseline to the intervention group on socio-demographic and outcome variables; (ii) reporting pre-intervention outcome

data for each group; (iii) reporting post-intervention outcome data for each group and (iv) reporting on all outcomes targeted at individuals in the study.

The quasi-experimental design used in the first evaluation phase of the condom promotion program on vaginal sex met all the abovementioned criteria except for one: non-equivalence of the comparison group with the intervention group on one outcome variable: gonorrhea incidence. However, it should be noted that the comparison group was equivalent to the intervention group in the key outcome variables that are expected to be influenced directly by the intervention namely, - consistent condom use; negotiation skills; and socio-demographic characteristics most likely to influence these behavioral outcomes such as age, socio-economic class, and educational level. Although the acquisition of an incident infection of gonorrhea is an important outcome measure to validate behavioral intervention trials, it should be noted that the impact of the increased condom use on new sexually transmitted infections is not a direct one. As explained earlier, STI acquisition by a sex worker is also dependent on other factors such as the prevalence of infection among her clients and their duration of infectiousness and the susceptibility of the host or sex worker. Considering the complexity of factors influencing acquisition of infection, it may be difficult to find a comparison group that could be matched with the intervention group on all outcome variables and factors influencing them. As was demonstrated in my study, although both groups were very similar in condom use (44% vs. 40%) and number of clients (9 vs. 8.5) and class (100% vs. 99% middle class), the 5-month cumulative gonorrhea incidence was higher in the comparison than the intervention group (19.7% vs.

10.5%). I was also constrained by real-world conditions in Singapore, with a limited number of comparable sites. In addition, the small numbers of sex workers in the comparison site makes it impossible to group match sex workers in the intervention with the comparison site on all outcome measures.

In addition, I could not maintain the quasi-experimental design for long-term evaluation for both programs. Hence, I attempted to overcome this limitation and evaluated the evidence of the effectiveness of the interventions by triangulating the results (combining multiple methods) from a variety of methodological approaches and data sources and assessing the plausibility of the interventions.

Validity of self-reported behavior on condom use. The behavioral outcomes of consistent condom use were obtained by self-reports and a sensitive area such as this may lack validity. The intervention group might report more desirable behaviors after the intervention to please the health staff, hence leading to an overestimation of behavior change. I took steps to minimize this bias by using a self-administered questionnaire, assuring confidentiality and anonymity, and stressing the importance of honest answers for planning better programs to protect them from STIs and AIDS. In addition, rather than asking condom use as a leading ‘yes’ or ‘no’ question, sex workers were asked on the frequency of condom use. The close rapport that has developed between the sex workers and the health staff from the group sessions also encouraged them to tell the truth. The issue of validity of self-reported sexual behavior has been discussed extensively.⁹⁸ To date, there is no acceptable method to validate

self-reports of condom use.⁹⁹ Nonetheless, available literature suggest that behavioral self-reports - even those concerning sensitive sexual behaviors - can be accurate and valid if proper procedures like those mentioned above are followed. It should be noted that our study also included objective biological measures such as culture diagnostic tests for cervical and pharyngeal gonorrhoea. In addition, I collected multiple outcome measures, especially in the first phase of our study, such as condom negotiation skills, condom slippage and condom breakage. In the later phase of my study, I also collected data from clients of sex workers on condom use to verify and supplement the self-reported data from sex workers.

Attrition bias. Increased attrition with long-term follow-up could lead to selection bias, thus affecting outcome measures. If attrition occurs at a greater rate in either the intervention or the control group due to a risk related factor, this confounding would affect the validity of the study. To reduce this problem, I built in a short term and long term evaluation. For the short-term evaluation, I compromised on a follow-up period of five months to allow time for behavior change to take place and reduce possible selection bias arising from attrition.

The significant increase in condom use for vaginal sex within the same intervention cohort (45.9% to 90.5%) at follow-up after 2 years is unlikely to be due to an overestimation of condom use arising from attrition bias as there were no discernible differences in socio-demographic characteristics between those followed up and those lost to follow-up. Hence, the attrition rate of about 40% at 2-year follow-up is unlikely

to grossly bias my results on condom use. In addition, the 17 sex workers, who did not respond, were on holiday or away from the country at that time and these factors are independent of condom use. I was not able to determine the reasons for those who had stopped working. Gonorrhoea infection records were however available for all those who were still working after two years, which comprised 73.4% of the original cohort.

Generalizability of findings. This study, confined to brothel-based sex workers, may not be applicable to street-based sex workers in Singapore who differ in socio-demographic characteristics and working conditions.⁶¹ Nevertheless, this study provided us with a better understanding of the nature of commercial sex and the process of sustaining behavior change. These findings could be used as an entry point to gain access to the less easily defined group of street-based sex workers.

5.3.2 Strengths of the study

Notwithstanding the above limitations, this study has many strong points. The participation rate of sex workers in the baseline studies was 100%, probably due to the mandatory attendance in the health education sessions. The attrition rate from the 5-month follow-up in the evaluation of the condom promotion program for vaginal sex was less than 5% in both the intervention and comparison groups. Self-reported behavior on condom use was validated by biological outcomes and studies on clients. In addition, qualitative and process evaluation was built into the study to give a fuller interpretation of the quantitative findings on outcomes. Hence, despite the limitations,

many of which are inevitable in the long-term evaluation of community interventions involving sex workers, and considering the study strengths and the fact that multiple methods, including qualitative ones, were used to evaluate the evidence of program effectiveness, my conclusion of the programs' effectiveness remains valid.

In addition, I was able to assess the independent contribution of brothel administrative measures to the overall program impact. I acknowledge though that I did not examine the specific effects of each of the components of my multifaceted program. For example, it would be useful and more meaningful to use the factorial design to examine the effects of health education and negotiation skills development alone, brothel interventions alone, and other combinations of the different components in my multifaceted program. However, I was constrained by the limited number of sites and the comparatively small population of sex workers in Singapore as compared to other countries.

Finally, findings on the program's long-term effectiveness were based on a large-scale condom promotion program for vaginal sex that has been expanded to all brothel-based sex workers in Singapore. In addition, replication of the main principles from this program, with adaptations of message contents and activities, to the condom promotion for oral sex, led to similar improvements in condom use for oral sex. This consistent finding provides further support to my conclusion on the effectiveness of the programs.

5.4. Ethical issues

Some may argue whether it is ethically appropriate to withhold the new intervention program from the comparison group for five months during the first phase of the study. It should be noted that the comparison group was provided with ongoing routine health education activities. In addition, there was no evidence that the new intervention program was more effective than the routine program. Hence, we need to assess its effectiveness before expanding this new intervention to all sex workers. It may be argued too that it may not be ethically justifiable to implement a new intervention program which has not been found to work.

Others may also argue whether it is ethically appropriate to address the captive target group for sex workers without addressing the wider social issues of ill-health or addressing the root causes of prostitution, which disproportionately affects women in lower social classes. The government in the United Kingdom, for instance, has recently started to advocate a shift in emphasis from health education directed at individuals and small groups to focus on wider determinants of health such as employment, the environment and education to tackle social inequalities. While this should be the long-term approach to address wider issues of women's health, something needs to be done in the interim period to protect women who are in sex work to keep them healthy while working out alternative employment policies for them. In reality, with the current economic recession, it would be idealistic to expect women's social inequality to be addressed within a short period of time. While working on the longer-term issues, interventions and empowerment strategies

targeting sex workers are needed as short-term measures to address their current problems of STI and HIV infection. The health education sessions conducted for the sex workers to develop their negotiation skills have not only empowered them to successfully get clients to use condoms and retain them without loss of earnings (as compared to refusing sex with non-compliant clients), but they have also increased their sense of control over their work circumstance and this would prepare them for future efforts to improve their self-reliance and welfare. It is interesting to note that a few of our sex workers have left their work to sell insurance. I received feedback from them that the negotiation skills learnt had helped them in persuading their clients to buy insurance from them.

5.5 Comparison of study results with other studies

5.5.1 Comparison of program effectiveness

I was not able to compare our program on oral sex with other studies, as there were no published data on evaluation of oral condom promotion programs. Hence, my comparison was based on the condom promotion program for vaginal sex. Consistent with other behavioral intervention programs for sex workers,^{8,10,18,22,35-36,38,41-44,49,57} our study shows that interventions directed at sex workers and brothel establishments can bring about a sustained increase in consistent condom use for vaginal sex. The level of sustained condom use (96%) achieved in our program was much higher than the level of 66 to 81% achieved in other studies and is comparable to the high level of

94% achieved in Thailand's program.^{10,45} Thailand is well known for its success in achieving a marked increase in condom use with a sharp decline in HIV and STIs within a short period of 4 years. It should be noted though that the time frame for defining consistent condom use in the latter was based on the last working day while my study was based on the last working week. The figure in Thailand's study may have been lower if it has used the last working week. In addition, subsequent evaluations in Thailand showed mixed results with condom use not maintained in Southern Thailand,³⁵ where it reached a plateau of 80% with no difference from the control area. In Central Thailand³⁶ it appears to have been maintained but level of condom use achieved in a low-income area was below 90% (86%) compared to 97% in a high-income area.

The 8-year follow-up period in our study was one of the longest and only two other studies⁴³⁻⁴⁴ have follow-up periods of similar duration. The majority of other studies followed up their interventions for two^{39,40,41,42,46} to three⁸ years and the level of consistent condom use achieved was between 66 and 81%. I acknowledge though that some of these programs started with much lower baseline levels of condom use of less than 10% compared to our baseline level of 35% and some have achieved impressive results with an absolute increase of almost 60%. However, it is not known whether condom use would be maintained if the programs were followed up for longer periods as studies elsewhere^{37,38} have shown a decrease in condom use with time.

Nonetheless, I could compare the effect change in my study at 2-year follow up with other studies with similar follow-up periods. The net difference in condom use increase between the control or comparison and intervention group would give a more valid indication of the effects of the intervention. Except for Ngugi's study in Kenya³⁹ and Ford's study in Indonesia⁴¹ none of the other studies with a 2-year follow-up^{40,42,46} have a control group. The net increase in consistent condom use in our study was 26.5% and this is comparable to the net increase of 23% in Ngugi's study³⁹ and is higher than the net increase of less than 5% in Ford's study.⁴¹

On comparing the 8-year effects of our program with the other two studies in Africa,^{43,44} which followed up the interventions for similar periods, the level of condom use in our program (96%) was higher than the 78% and 81% achieved in the latter programs. As the baseline levels were different in all three studies, it would be more appropriate to compare the relative percentage rather than the absolute increase. The program in Cote d'Ivoire in Africa⁴³ achieved a 3.9-fold increase from 20% to 78% while our program achieved a lower 2.7-fold increase from 35% to 95% (adjusted for temporal change in socio-demographic characteristics). However, the study in Cote d'Ivoire⁴³ was based on condom use for the most recent client while our study was based on consistent condom use in the last working week. In addition, the level of more than 90% was achieved in our study within 2 years of its implementation and this was maintained for the subsequent years. The program in Cote d'Ivoire achieved a 1.7-fold increase (20 to 35%) within two years and this steadily increased to 78% in 1998. Our programs, like those in other countries, also showed a marked

reduction in STI. In addition, the programs in Thailand,^{10,45} Cambodia,⁴² India,¹⁸ and countries in Africa such as Tanzania,⁷ Cote d'Ivoire,⁴³ and Benin⁴⁴ demonstrated a marked decline in HIV. HIV was not used as an outcome measure in our study due to the very small numbers.

5.5.2 Comparison of program activities

It is difficult to compare the various program activities as not all studies gave a complete account or process evaluation of their activities. Our program shared similarities with other long-term programs (more than four years) in Africa^{43,44} and Thailand^{10,45} in using a variety of health education activities for sex workers, ensuring a ready supply of condoms and providing screening and treatment services for STIs. Our programs were also similar to that in Thailand in that it included sanctions against non-compliant brothels with closure or suspension. The two programs in Africa^{43,44} did not use administrative measures on brothels. Whether this could be one of the factors that accounted for their not achieving condom use of more than 90% would need further study.

Our program activities differ from Thailand^{10,45} in one component. Continuous quality improvement was an important feature in our program in which program activities were monitored regularly with behavioral surveillance surveys to identify needs and problems; feedback was provided regularly to staff; and meetings were held with staff and representatives of sex workers to discuss and act on problems encountered. It was due to this regular monitoring that problems like the marked unexpected increase in

oral sex and pharyngeal gonorrhoea and inadequate follow-up of brothels were detected early, thus enabling prompt action to be taken. It is not clear whether continuous quality improvement was incorporated into the program in Thailand, as it was not reported in the published studies. If the lack of continuous quality improvement was indeed the difference between our program and theirs, it may explain why the level of condom use was not maintained in some areas in Thailand.^{35,36} It is noted though that other non-modifiable factors like lack of resources, environmental factors like economic recession or change in socio-demographic profile of the sex workers could have also contributed to their non-maintenance of condom use.

The other important component in our program was equipping sex workers with condom negotiation skills. This activity was not reported in the program in Cambodia.⁴² Even though the 100% condom policy with client education and outreach health education to sex workers was established in Cambodia in 1998, condom use leveled off around 78-80% in 2001, leaving planners concerned about not achieving the set objective of condom use of at least 90%. Coercion by itself may not be effective in maintaining condom use to high levels for two reasons. First, sex workers would use condoms with clients because they feel it was imposed on them rather than they themselves feeling motivated to do so. In addition, the 100% condom policy may not be enforced due to inadequate policing of brothels. Hence, it is important to develop sex workers' negotiation skills as well. This would enable them to successfully get clients to use condoms when brothel support was lacking. The negotiation skills training workshops could also serve as entry points to involve sex

workers by encouraging them to share problems and suggest practical solutions on condom negotiation and other related problems. This could prepare them for further involvement in planning, decision-making and negotiation for safer sex practices at their workplace with their employers and health authorities.

In conclusion, our programs generally differ from other long term programs in two additional features: I incorporated continuous quality improvement activities in our program to ensure that the high levels of condom use were sustained by taking timely action on problems encountered during program implementation; sex workers' negotiations skills were also developed to sustain their behavior on condom use. While I could not discount other factors such as the differences in population size and socio-cultural settings, environmental factors, and resource constraints, the abovementioned two distinct features in our programs were likely to have contributed to the sustained and comparatively higher levels of condom use for both vaginal and oral sex condom promotion programs in my study as compared to the programs in other countries.

5.6 Replication of the program in Siem Reap, Cambodia

Can our condom promotion program for vaginal sex with its positive impact on condom use and gonorrhoea be replicated in other settings? In February 2001, the intervention strategies and educational materials of our program were implemented, with some cultural adaptations, among sex workers in Siem Reap, Cambodia.¹⁰⁰

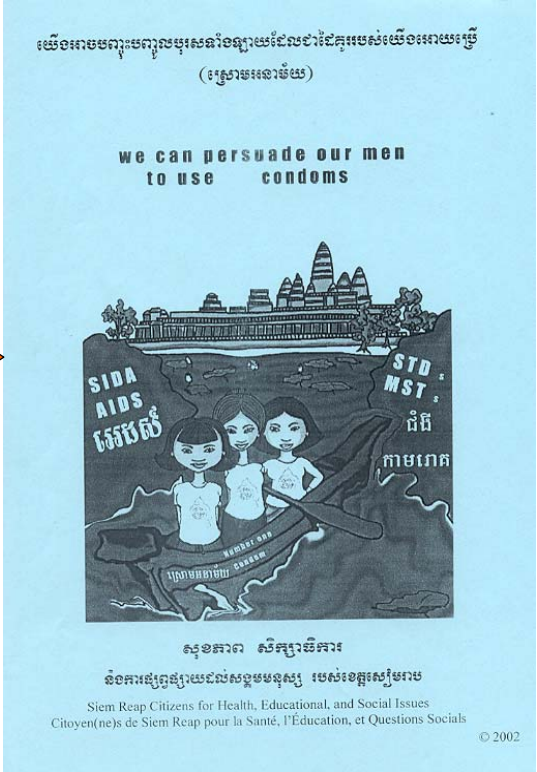
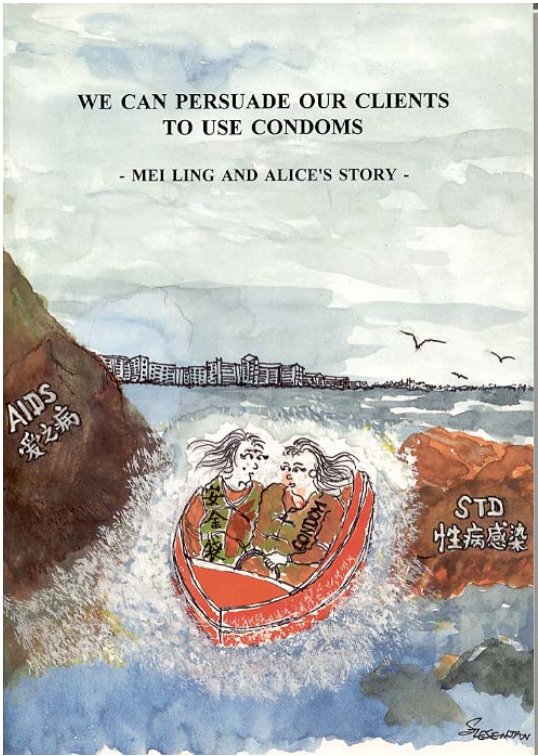
Cambodia has one the highest HIV prevalence rates in Asia, with an adult prevalence of about 4%.¹⁹ The rapid spread of HIV/AIDS/STIs has been attributed to extensive solicitation of sex workers by Cambodian men. Cambodia implemented the national 100% condom use program for entertainment establishments in 1998, and this has increased condom use among direct sex workers from 53% in 1998 to 78% in 1999, with a concomitant significant decline in HIV.⁴² Despite this success, there is a need to increase condom use to a higher level, particularly in Siem Reap with its massive expansion in tourism and the high HIV prevalence of 43% and 16% respectively among direct and indirect sex workers (beer promotion girls).¹⁰¹

Findings from my survey on sex workers in Siem Reap were very similar to those among sex workers in Singapore. Almost all (>90%) of them were aware of the effectiveness of condom use and non-curability of AIDS, but only 78% used condoms consistently with their clients. Like the sex workers in Singapore, their main reason for not using condoms was not being able to persuade their clients (66.7%). Multivariate analysis found a significant association of inconsistent condom use with low income and lack of negotiation skills.¹⁰² I concluded that developing the sex workers' condom negotiation skills and addressing their economic barriers should increase condom use among them. This strategy would complement the government's current program of client education, 100% condom policy and brothel administrative measures.

Thus, in May 2002, peer educator training workshops on condom negotiation skills and behavioral strategies were conducted for 35 sex workers and 25 outreach health

workers from the government and non-governmental organizations by the researchers (Lubek Ian and WML).¹⁰¹ These peer educators and health staff would in turn train other sex workers to use condoms. Health education materials from our intervention programs in Singapore such as the comic book (Figure 5.2) and video clips demonstrating condom negotiation strategies were adapted to the cultural setting in Siem Reap. Inputs were obtained from sex workers and health staff in Siem Reap to ensure their cultural relevance. Peer educators were trained to use these health materials to teach negotiation skills to the sex workers.

Figure 5.2. Cultural adaptation of health education materials from Singapore to Siem Reap: Comic book demonstrating condom negotiation skills



Some of the major cultural adaptations included (i) depicting the commonly used local condom brands in the comic books; (ii) converting video clips to audio cassette recordings as pilot testing found that the latter were preferred and were more readily available to the sex workers; and (iii) distributing Tee shirts with messages on condom use (Figure 5.3). While Tee shirts were not used in Singapore because the sex workers felt embarrassed to wear them, the sex workers wore them openly in Siem Reap.

Figure 5.3. Tee shirt with message on condom use



Other components in the Siem Reap program included working at the socio-political level with local and international beer companies to promote HIV education and condom use for the beer promotion girls, and with hotel industries to provide training and safer alternative employment for direct and indirect sex workers.

Process evaluation. Evaluation of the project is ongoing and in its early phase. Preliminary evaluation of the peer training activities and adapted health education materials showed high ratings with a median score of 9.2 out of 10. The four most highly rated health education methods, with half or more of the sex workers rating them as excellent, were practical demonstrations on condom use and negotiation techniques (67%); small group discussion (61%), peer training manual (50%) and audio recordings (50%). The key messages that were used by sex workers in Singapore to get clients to use condoms, such as focusing on the family and not bringing shame to the family from getting AIDS from sex workers were also found to be effective in persuading their clients. Before training, none of the 35 sex workers reported that they could persuade all their clients to use condoms, after training, 40% were confident that they could. The trained sex workers have in turn trained many more sex workers. In-depth interviews with some peer educators found that the Tee shirts have stimulated interest on HIV and condom use among the men and they have asked for more information from the peer educators. The peer educators had used this as an opportunity to educate the men about HIV and condom use.

Our experience in Siem Reap shows that it is feasible to adapt health education materials and behavioral strategies from this study to the setting in Siem Reap. While it is too early to evaluate the behavioral and disease outcomes of the program, process evaluation found high ratings on the appropriateness and contents of the health education materials.

Chapter 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The condom promotion programs for vaginal and oral sex have led to sustained high levels of consistent condom use of more than 90% with a corresponding decline in cervical and pharyngeal gonorrhoea after 8 years of the implementation of the program for vaginal sex and 6 years for the program on oral sex. There are no published data on evaluation of condom promotion programs specifically for oral sex in other countries. With regard to the condom promotion program for vaginal sex, the level of condom use achieved was higher than the range of between 66 and 81% found in long-term interventions in other countries, and is comparable to the level of 94% achieved in the comprehensive program in Thailand. Thailand is well known for its success in achieving a marked increase in condom use with a sharp decline in HIV and STIs within a short period of 4 years. However, subsequent evaluations showed that condom use was not maintained in Southern Thailand,³⁵ where it reached a plateau of 80% with no difference from the control area. In addition, more recent studies reported high HIV prevalence of between 26% and 34% among brothel-based sex workers nationwide in 1997⁴⁷ and higher HIV seroprevalence rates among sex workers who began sex work after 1994 (12.5%) compared to those who began work before 1989(8%).⁴⁸ These findings suggest that the high level condom use of 94% achieved in the early nineties in Thailand may not have been sustained.

Process evaluation of our health education materials and activities, which included comic scripts, taped recordings and video clips on condom negotiation approaches and training manuals, showed high ratings with regard to their clarity, relevance and cultural acceptability. The health education materials, which have been adapted for use among sex workers in Siem reap, Cambodia, also showed high ratings.

Our programs' successes may be attributed to (i) comprehensive planning that applies principles from the behavioral, social and management sciences to promote and sustain condom use among sex workers; (ii) the use of quantitative and qualitative methods to identify sex workers' needs; (iii) the multifaceted approach targeting individual and organizational levels to change sex workers' behavior and provide a supportive work environment for behavior change; (iv) involvement of sex workers and health staff in identifying solutions; (v) reinforcement sessions that stress on condom use as a norm; and (vi) the use of quality improvement principles to monitor and take prompt action on problems encountered.

6.2 Public health implications and recommendations

Although the behavioral intervention programs, implemented in Singapore with its specific socio-cultural and political characteristics, may be relatively small compared to other countries, certain principles can be drawn from this experience that may help program managers plan and evaluate sustainable STI prevention programs for brothel-based sex workers in countries with comparable socio-cultural environments.

1. Programs should be multifaceted, combining individual behavioral change methods targeting sex workers with socio-environmental approaches directed at brothels, health staff and clients to support sex workers in condom use. A comprehensive approach is recommended that aims to (i) motivate sex workers to use condoms by personalizing and linking health messages to what they value, (ii) enable sex workers to persuade clients to use condoms by developing their negotiation and other condom-use related skills and (iii) mobilize support from significant others that influence their behavior such as brothel owners, clients and health staff.

2. Programs must address sex workers' needs. These are best determined by a complement of quantitative, qualitative and ethnographic methods and by involving sex workers themselves in program planning and monitoring. Ethnographic methods to observe and gather data on the daily routine and interactions of the sex workers with the brothel keepers and clients would help provide program managers with a deeper understanding of the socio-cultural context in which sex workers work and this insight would also help program managers build trust and rapport with them.

3. A variety of health education methods and messages should be used to meet the differing needs of sex workers and objectives of the interventions. For example, health education messages and strategies for oral condom use have to be designed differently from those for vaginal sex as reasons for not using

condoms for oral sex may differ from those for vaginal sex. In fact, our earlier research showed that clients demanded unprotected oral sex, which was often perceived to be safer, when pressured to use condoms for vaginal sex. The group approach should be used to share experiences and enlist support. Individual counseling allows the health educator to accommodate individual differences, assess stage of behavior change and provide personalized advice.

4. Health messages must relate to the values of the target group. The majority of sex workers in Singapore, as in other Southeast Asian communities, are in sex work to support their families. Many of them share common values of putting their children or families before self and see sex work as a source of steady income to provide for their families. Thus messages that relate safe sex to being STI- or AIDS-free so that they could work to support their families and not get infected and bring suffering to them were found to be effective in motivating them to negotiate condom use. Culturally relevant messages linking safe sex to family values were also effective on clients. Messages should be specific. Our posters depicting 'Condoms MUST be used here: 100% condom use' were found to be more effective than previous posters depicting 'Use condoms' in promoting the practice to always use condoms.
5. Sex workers should be empowered to protect themselves from STI/HIV/AIDS. This can start from the personal level, focusing on personal health and safety issues, followed thereafter by group level cohesion-building

(including strategies for forming sex-workers' organizations). At the personal level, sex workers should be taught condom negotiation and other condom-use skills so as to empower them to successfully get clients to use condoms when brothel support is lacking. The 100% condom policy may not be enforced due to inadequate or lax policing of brothels over time. Hence, we should empower sex workers by involving them in decision-making and negotiation for safer sex practices at their workplace with their employers and health authorities. Negotiation skills training workshops could be used as entry points to involve sex workers by encouraging them to share problems and suggest practical solutions on condom negotiation and other related problems. Female-controlled barrier methods such as the female condom should also be considered. However, it must become more acceptable to men as earlier research in other countries showed mixed results¹⁰³⁻¹⁰⁶ with its unaesthetic appearance and hence client refusal¹⁰⁶ being the main reason for resistance to its use. In Singapore, the female condom was not well accepted by sex workers and clients because it is unaesthetic, expensive and difficult to use.

6. Program managers may encounter methodological difficulties in evaluating the long-term effects of interventions among sex workers. These include problems of attrition with time; validating self-reports and non-feasibility of withholding interventions from a comparison group for longer time periods. To overcome the limitations and draw reasonably sound conclusions, program managers can combine a quasi-experimental with time series design, select outcome

indicators specific to the interventions and complement quantitative data with qualitative evaluation to add plausibility to the interpretation of the intervention effects.

7. Given the complexity of reasons for non-condom use among sex workers, there is no place for complacency in planning condom promotion programs for sex workers. Even with a seemingly successful program, it is still important to apply continuous quality improvement principles to monitor and identify, for example, the potential unintended consequences of a successful condom promotion program for vaginal sex on other risky sexual behaviors such as anal or oral sex.

- 8 If the programs in our study are to be adapted in another country, the socio-cultural context of sex work, political and societal values and prevailing health care and community resources of that country have to be considered. For example, condom negotiation may not be feasible in situations where sex workers hold low status and often encounter aggressive clients. In such situations, female controlled methods such as the femidom, brothel policies and client education may play a more important role. Our programs have targeted mainly sex workers due to cultural sensitivities of using the mass media to disseminate messages on condom use to men in the general population. In more 'open' societies, there is a need to target clients of sex workers as they form the bridge for HIV transmission to the mainstream

population such as their wives or girlfriends. Notwithstanding these differences, there are some important principles from our program that can be adapted universally. These include application of comprehensive frameworks in planning programs, assessment of needs using a complement of quantitative and qualitative methods and regular program monitoring with regard to its activities, intended and unintended effects.

9. Although I was able to assess the independent effect of brothel interventions on condom use, I was limited by the small number of intervention sites and other constraints in a small country to use a factorial design to assess the comparative effects of each of the specific components in the multifaceted program on condom use. I recommend that researchers in other countries examine the role and effectiveness of different programmatic approaches in increasing condom use among sex workers. This would guide countries with limited resources to implement condom promotion programs for sex workers in the most effective and efficient manner.

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Appendix 1

Questionnaire on condom use

Section A: Biodata

1. Date of interview: _____
2. Name: _____
3. Registration No.: _____
4. Registration Date: _____
5. Date of Birth: _____ Age: _____ yrs
6. Duration of Prostitution: _____ mths in Singapore
7. Work Address: _____
8. Nationality:
 1. Malaysian
 2. Singaporean
 3. Thai
 4. Others specify _____
9. Ethnicity:
 1. Chinese
 2. Malay
 3. Indian
 4. Thai
 5. Others specify _____
10. Educational level:
 1. No schooling
 2. Primary (1-6 yrs)
 3. Secondary (7-12 yrs)
 4. College and university
11. Class:
 1. Low
 2. Medium
 3. High
 4. Exclusive
12. Previous work prior to present occupation _____

Section B: Particulars of work and sexual behavior

13. How many clients do you usually see in a normal working day? _____
14. How many clients did you see in your last working day? _____
15. In your last working week, how often did you use condoms?
1. Always (100%)
2. Sometimes (at least half the time)
3. Less than half the time
4. Not at all
16. Out of 10 clients who had vaginal sex with you during your last working week, how many used a condom without your asking? _____
(Write down 10 if all your clients use condoms without you asking)
80. Out of 10 clients who did not use a condom without your asking, how many did you suggest to?

18. Out of 10 clients you suggested it to, how many took your suggestion?
(Write down 10 if all your clients take your suggestion) _____
19. When your clients do not want to use condoms, have you refused vaginal sex with them?
1. Yes, I always refuse sex with them
2. Yes, I sometimes refuse sex with them
3. No, I did not refuse sex with them
20. Have you ever had oral sex in the last working week?
1. Yes
2. No (go to question 10)
21. How often do you use condoms when you have oral sex?
(Please do not answer this question if you do not have oral sex)
1. Yes, always
2. Yes, sometimes
3. No, hardly ever
22. Have you ever have sex with a non-paying partner? (husband or boyfriend) in the last six months?
1. Yes
2. No (go to Q24)

23. In your last sexual encounter with him did he use condoms?
(Please do not answer this question if you do not have a boyfriend or husband or non-paying partner)
 1. Yes, always
 2. Yes, sometimes
 3. No, hardly ever

24. Have you ever had anal sex in the last six months?
 1. Yes
 2. No (go to question 26)

25. How often do you use condoms when you have anal sex?
(Please do not answer this question if you do not have anal sex)
 1. Yes, always
 2. Yes, sometimes
 3. No, hardly ever

26. Did your condom ever slip when have sex with your client in the last six months?
 1. No, never or hardly ever
 2. Sometimes
 3. Very often

27. Did your condom ever break when have sex with your client in the last six months?
 1. No, never or hardly ever
 2. Sometimes
 3. Very often

Appendix 2

List of health education materials developed from this study

2.1 Used in Singapore

(Available in English, Malay, Mandarin and Thai)

- 1 Comic book 'We can persuade our clients to use condoms: Mei Ling and Alice story'
- 2 Posters and stickers on 100% condom use
- 4 Posters and stickers on 'Always use condoms for oral sex'
- 3 Training manual for peer educators
- 4 Training manual on behavioral approaches in HIV/AIDS/STIs for health staff
- 6 Video clip: 'How to persuade your clients to use condoms for vaginal sex'
- 7 Video clip: 'How to persuade your clients to use condoms for oral sex'
- 8 Video clip: 'How to put the condom on the penis with your mouth'

2.2 Used in Siem Reap, Cambodia

(Available in Khmer)

- 1 Audio cassette recordings: 'How to persuade your men to use condoms'
- 2 Video clip: 'How to persuade your men to use condoms for vaginal sex'
- 3 Comic book 'We can persuade our men to use condoms'
- 4 Peer training manual
- 5 Tee-Shirt on condom use

Appendix 3

Research award and publications (*first author only*) arising from this study

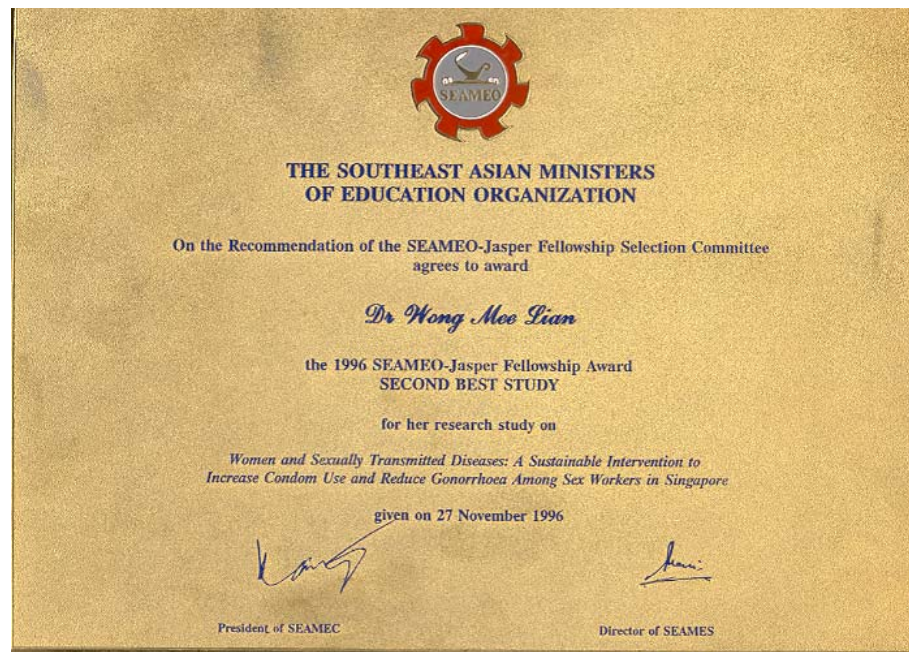
3.1. Award

Awarded **Second Best Research Study** in the SEAMO (Southeast Asian Ministers of Education Organisation) JASPER Fellowship Competition, 1996 on 'Women and Health' for my research 'Women and Sexually Transmitted Diseases: A Sustainable Intervention to Increase Condom Use and Reduce Gonorrhoea among Sex Workers in Singapore'.

(The SEAMEO-Jasper Fellowship is an annual award bestowed by the Government of Canada and SEAMEO on outstanding researches conducted by SEAMEO nationals)

Figure 5.4. SEAMEO Jasper Fellowship Award:

Second best study 'Women and Sexually Transmitted Diseases: A Sustainable Intervention to Increase Condom Use and Reduce Gonorrhoea Among Sex Workers in Singapore'



3.2 List of publications (n=7) arising from thesis: 2000-2003

1. **Wong ML**, Chan RKW, Wee S. Sex Workers' Perspectives on Condom use for oral sex: a qualitative study. *Health Educ Behav* 2000; 27:502-16.
2. **Wong ML**, Chan RKW, Koh D, Wee S. Factors associated with condom use for oral sex among female brothel-based sex workers in Singapore. *Sex Transm Dis* 2000; 27:39-45.
3. **Wong ML**, Chan RKW, Koh D, Wee S. A prospective study on condom slippage and breakage among female brothel-based sex workers in Singapore. *Sex Transm Dis* 2000; 27; 208-14.
4. **Wong ML**, Chan RKW, Koh D S Q, Wong S, Wee S, Lee E. Designing an Oral Sex Condom Promotion Program for Female Sex Workers in Singapore. *Int Q Community Health Educ* 2000; 19:321-39.
5. **Wong ML**, Chan RKW, Koh D. Promoting condoms for oral sex: impact on pharyngeal gonorrhoea among female brothel-based sex workers. *Sex Transm Dis* 2002; 29:311-8.
6. **Wong ML**, Lubek I, Chemn B D, Kros S, Pen S, Chhit M. Social and behavioural factors associated with condom use among direct sex workers in Siem Reap. *Sex Transmitted Infect* 2002; 79:163-5.
7. **Wong ML**, Chan RKW, Koh D. The long-term effects of behavioural interventions on condom use and sexually transmitted infections among female brothel-based sex workers in Singapore. *AIDS* 2004 (in press).