CHAPTER 4

Revitalizing HIV Prevention Interventions

1. Background

1.1 HIV epidemic situation

UNAIDS and WHO[1] categorize HIV epidemics as low level, concentrated or generalized scenarios. Low-level scenarios are those with HIV prevalence levels of below 1% and where HIV has not spread to significant levels within any subpopulation group. Concentrated scenarios are those where HIV prevalence is high in one or more sub-population such as men who have sex with men, injecting drug users or sex workers and their clients, but the virus is not circulating in the general population. Generalized scenarios are those where HIV prevalence is 1% to 15% among pregnant women attending antenatal clinics. This indicates that HIV prevalence is present among the general population at sufficient levels to enable sexual networks that drive the epidemic. Finally, hyper-endemic scenarios refer to those areas where HIV prevalence exceeds 15% in the adult population driven through extensive heterosexual multiple concurrent partner relations with low and inconsistent condom use.

In past years, Thailand was classified as a generalized epidemic, with prevalence among pregnant women at more than 1%. Recently, the epidemic has evolved from a generalized to a concentrated epidemic in specific population groups. High HIV prevalence of over 15% has been observed among MSM, while prevalence among pregnant women has gone down to 0.8%. [2]

However, some experts in the HIV control program contend that the epidemic has not yet fully evolved to a concentrated scenario. They argue that at 0.8%, prevalence among pregnant women is marginal, and could move up to more than 1%. Thus there is no room for complacency and revitalizing HIV prevention is critical.

As a starting point in revitalizing HIV prevention, it is vital to acknowledge that the situation in Thailand is a mixture of both concentrated and

generalized epidemics. See Table 4.1 on HIV prevalence estimates from the annual National Sero-Sentinel Survey, every June, for rounds 13 to 24 (1995 to 2006)[3], which are similar to other countries such as South Africa, Egypt, Russia, and Papua New Guinea [4]. The survey clearly indicates program failure in bringing down prevalence among IDUs (33%) and the continuing high prevalence among direct female sex workers (4.59%) and indirect female sex workers (2.27%). The only exception was the prevalence among pregnant women which decreased steadily to 0.87% in 2006.

Table 4.1: Median HIV prevalence in specific population groups by percentage, Thailand sero-sentinels round 13 (1995) to 24 (2006)

Year	Round	Blood donor	IDU	ANC	Male STI clinics	FSW direct	FSW indirect
1995	13	0.63	37.00	2.29	8.16	NA	17.19
1996	14	0.56	43.26	1.81	8.00	27.78	10.14
1997	15	0.56	40.00	1.71	7.07	26.14	8.22
1998	16	0.39	46.88	1.53	9.30	21.13	6.74
1999	17	0.44	50.77	1.74	8.71	16.00	6.56
2000	18	0.31	47.17	1.46	5.96	18.46	5.51
2001	19	0.30	50.00	1.37	5.08	16.56	5.03
2002	20	0.24	44.91	1.39	4.76	12.34	4.07
2003	21	0.27	46.80	1.18	4.00	10.63	3.67
2004	22	0.23	42.22	1.04	5.00	7.36	4.00
2005	23	0.22	37.64	1.01	4.13	6.80	3.37
2006	24	0.29	33.33	0.87	3.39	4.59	2.27
2007	25	0.21	25.62	0.76	4.55	5.57	3.23
2008	26	0.18	48.15	0.72	3.19	4.67	2.64

Source: Bureau of Epidemiology [4]

1.2 Why HIV/AIDS matters?

Table 4.2: Share of DALY loss, curative expenditure, and productivity loss in terms of premature death and absenteeism from 12 leading burden of disease, 2004

	ICD code	Burden of diseases	DALY loss	Curative expenditure			Premature death	Absenteeism		
				OP	IP	Total		OP	IP	OP+IP
1	**A3**	**HIV/AIDS**	**19%**	28%	4%	**17%**	**35%**	6%	8%	6%
2	F5	Liver cancer	8%	1%	2%	1%	10%	1%	3%	1%
3	**H**	**DM**	9%	31%	4%	**18%**	4%	35%	9%	**32%**
4	J1	Depression	7%	1%	0.1%	0.4%	0%	1%	1%	1%
5	J4	Alcohol	7%	0.4%	1%	1%	1%	2%	5%	2%
6	L2	Cataracts	2%	3%	8%	6%	0%	5%	4%	5%
7	M3	IHD	7%	7%	11%	9%	6%	5%	6%	5%
8	M4	CVD	13%	4%	10%	7%	9%	4%	9%	5%
9	N1	COPD	6%	3%	5%	4%	3%	8%	6%	7%
10	O2	Cirrhosis	3%	1%	2%	1%	6%	2%	3%	2%
11	R2	Osteoarthritis	3%	7%	3%	5%	0%	5%	1%	4%
12	**U**	**Traffic accidents**	**15%**	14%	50%	**31%**	**26%**	28%	45%	**30%**
Total from 12 leading BOD			100%	100%	100%	100%	100%	100%	100%	100%
Million Baht, except DALY loss in years			4,780,000	32,452	29,484	61,936	208,287	9,836	1,437	11,273

Source: A report on "Investment in health sector in the 10th National Socio-Economic Development Plan 2007-2011 (2550-2554 BE)" by the International Health Policy Program [6]

Note: DM = Diabetic Mellitus, IHD = Ischemic Heart Disease, CVD = Cerebo-Vascular Disease, COPD = Chronic Obstructive Pulmonary Disease

A major study by the International Health Policy Program[5] assessed the economic loss due to the top ten priority burden of diseases in Thai men and women. Among the twelve disease groups which were selected from the top ten diseases selected in men and women, Table 4.2 clearly indicates that HIV/AIDS is responsible for the highest DALY loss or 19% of total DALY loss. HIV/AIDS registered the third highest curative expenditure or 17% of total spending. HIV/AIDS was also responsible for causing the highest economic loss (35%) due to premature deaths, and the fourth highest cause of economic loss due to absenteeism (6% of total OP and IP absenteeism loss).

Economic loss due to premature mortality in adults is a major policy concern for which the universal ART policy was introduced in 2003. The policy was found to be cost effective due to Thailandís capacity to produce low cost combination triple antiretroviral therapy, programmatic feasibility, and the role of state and non-state actors [6], though ex-post evidence found to be ART cost effective [7]. This evidence supports the notion that HIV/AIDS is one of the key national health agendas.

1.3 Why revitalizing HIV prevention matters?

Thailand launched a universal ART program in 2001 and today close to 150,000 individuals are on regular treatment. A National AIDS Spending Assessment [8] report indicates that the proportion of spending on treatment and care increased from 64.3% in 2000 to 84.6% 2004 while spending on prevention decreased from 18.4% in 2000 to 13% in 2004, as shown in Table 4.3. A 2008 UNGASS report indicated that spending on prevention had insignificantly increased to 14.1% [9] in 2007. The decreasing trend of prevention spending is worrisome.

Table 4.3: Thailand National AIDS spending Assessment, 2000-2004

Activities	2000	2001	2002	2003	2004
1. Prevention	18.4%	21.9%	24.5%	14.7%	13.0%
2. Treatment and care components	64.3%	59.5%	66.9%	74.2%	84.6%
3. Orphans and Vulnerable Children	3.2%	3.3%	2.6%	2.3%	0.8%
4. Program cost	14.0%	15.4%	5.9%	8.8%	1.6%
Total spending on HIV/AIDS, %	100%	100%	100%	100%	100%
Total spending on HIV/AIDS, million Baht	2,623.3	2,571.8	3,174.2	3,549.4	4,943.3
Total spending on HIV/AIDS, million US$	65.4	57.9	73.9	85.6	122.9

Source: A National AIDS Spending Assessment report [9]

To sustain past achievements on HIV prevention, two policy concerns can be raised. Does Thailand spend enough on prevention in light of the ever increasing fiscal demand for treatment? Does Thailand spend limited resources on prevention wisely to realize value for money?

This study attempts to answer the second question through a critical assessment of the performance of prevention interventions. Special focus is given to the effectiveness and cost effectiveness of prevention interventions, in the context of sex behaviour among young adolescents, MSM and IDUs.

1.4 Dynamic of risk behaviour in general population

A report by the Commission on AIDS in Asia does not show that casual sex among the youth is a major risk factor. This is largely because of socio-cultural restrictions on women's sexual freedom. Increases in unprotected casual sex are unlikely to lead to a larger HIV epidemic in the future, as shown in Figure 4.1. A large proportion of those at a high risk of HIV infection are young, but this does not mean that large numbers of young people are at high risk of HIV infection in every country in Asia. More than 98% of young women and 90% of young men neither sell nor buy sex, and neither inject drugs. Finally, the Commission on AIDS in Asia concludes that there is not a high risk of HIV infection [10].

However, this study shows that the changing sexual behavior of young people in Thailand is worrisome. The Bureau of Epidemiology [11] of the Ministry of Public Health conducted a review of risk behaviour based on: (1) the 1996 to 2007 National Behavioural Surveillance Surveys - BSS data, and (2) trend analysis among different sub-population groups using the National Sexual Behaviour Survey (NSBS) datasets 2006, conducted by Mahidol University, Institute of Population and Social Research. Results of this assessment are highlighted below.

1. Knowledge on HIV prevention was low among adolescents in Grades 8 (14 years old) and 11 (17 years old). Less than 20% and 30% respectively had an accurate understanding of the five UNGASS HIV prevention questions. Complacency is the enemy of successes; these findings call for effective HIV learning and awareness programs among these young people who are most vulnerable to HIV infections.

2. In the general population, the average age of first sexual intercourse was 18 years among men and 20 among women. This information is vital for intervention design well before the age of sexual debut.

3. Over the last 12 years, an increasingly high proportion of students, especially from vocational schools, had sexual intercourse experiences; men had more experiences than women. Vocational school students had more sex experiences than Grade 11 students; and again men had more sex experiences than women, as shown in Figure 4.2.

4. Condom use among students when having sex with boyfriends or girlfriends was low (less than 30% in most groups). Although a slight increase over the last 12 years was observed, overall condom use levels were worrisome, as shown in Figure 4.3.

5. Consistent condom use among male workers (15 to 49 years old) and students when having sex with sex workers and non-regular partners were low, around 60% or less, though an increase was observed in 1995-2007, Figures 4.4 and 4.5.

6. Among female sex workers, consistent condom use varied by types of their partners. Condom use was lowest when having intercourse with a regular partner or spouse. Condom use was high, around 90% to 95%, when intercourse was with general and regular clients, and 80% for non-regular partners in 2007, Figure 4.6.

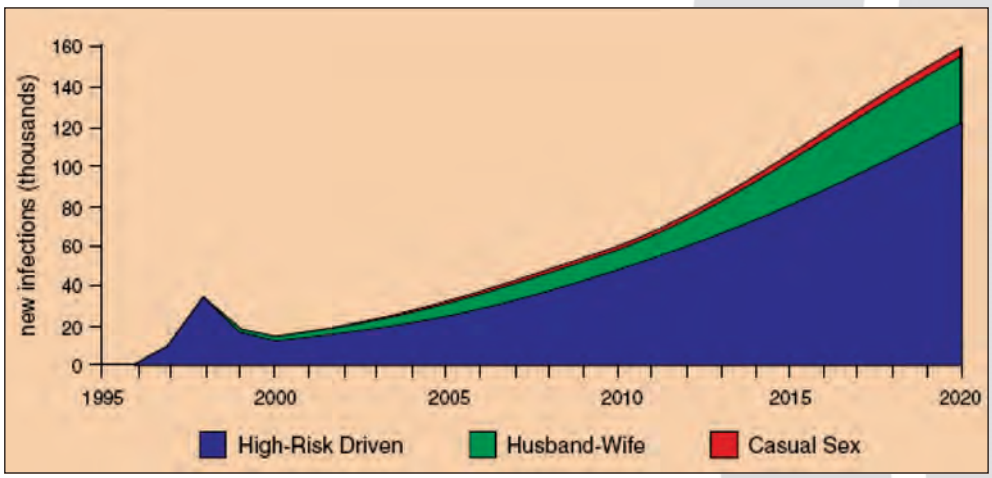


Figure 4.1: Estimated number of annual new infections and proportion of casual sex in a typical 100-million population setting in Asia

Source: Asia Commission estimate based on Asian Epidemic Model, using regional averages.

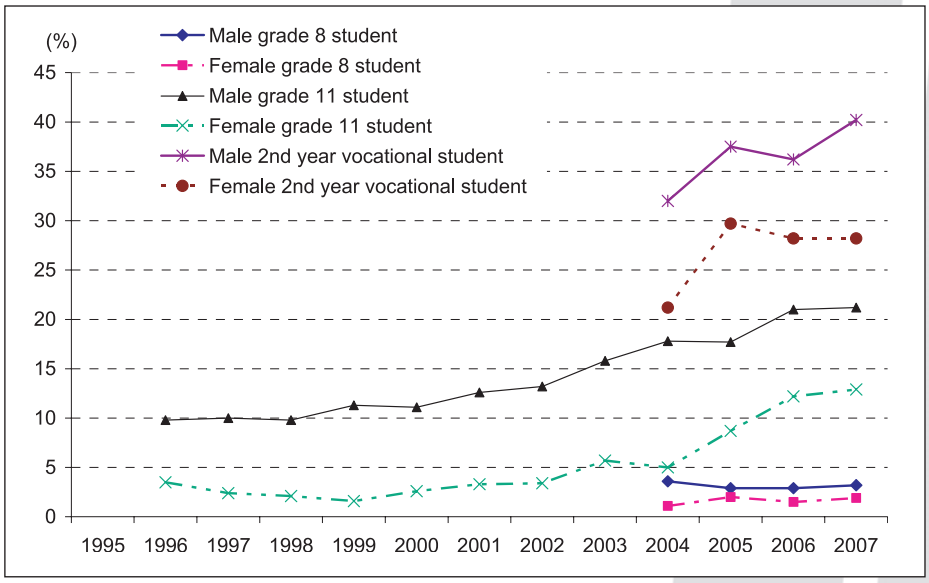


Figure 4.2: Percentage of the respondents who had sexual intercourse experiences, Thailand 1995-2007

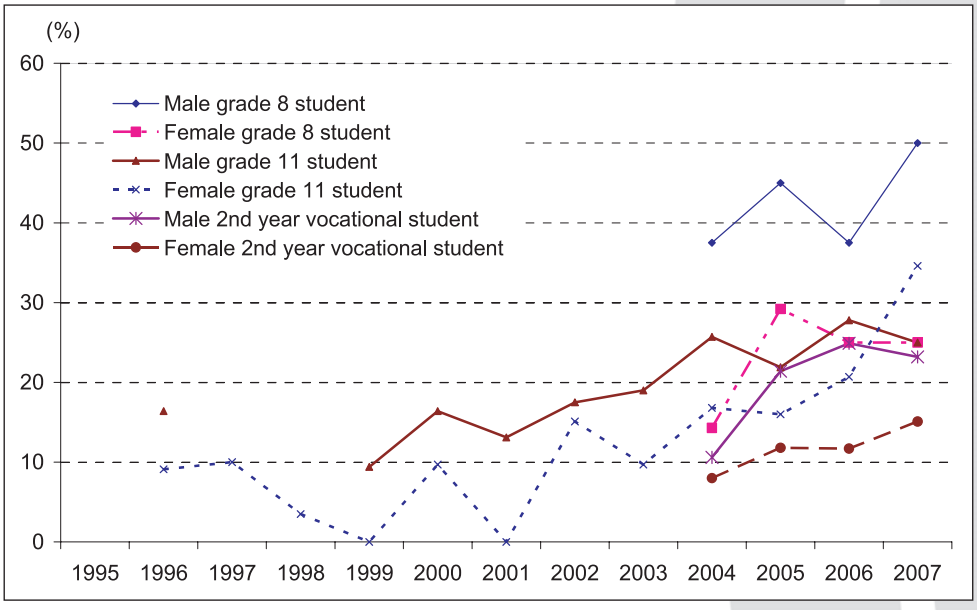


Figure 4.3: Percentage of respondents who used condoms consistently when having sex with boy/girlfriend in the past 1 year, Thailand 1995-2007

Figure 4.4: The percentage of respondents who consistently used condoms when having sex with female sex workers in the past 1 year, Thailand 1995 - 2007

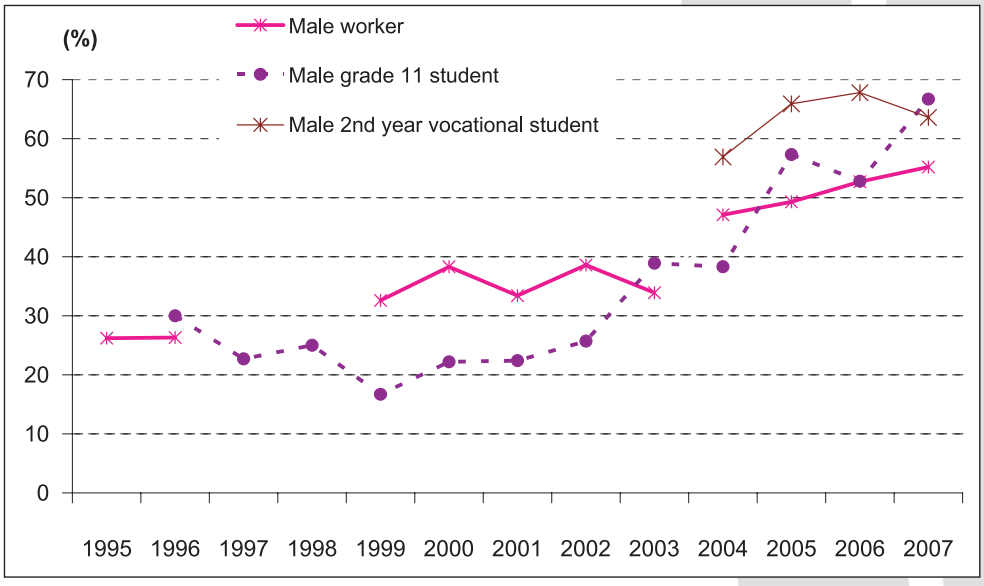


Figure 4.5: The percentage of respondents who consistently used condoms when having sex with non-regular partners in the past 1 year, Thailand 1995 - 2007

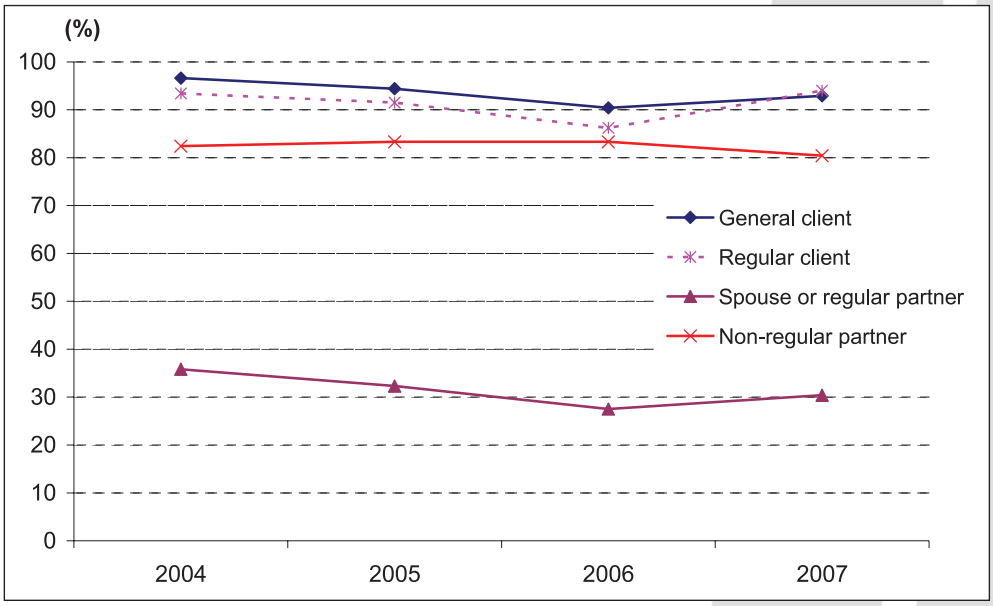


Figure 4.6: The percentage of female sex workers who consistently use condoms when having sex with general clients in the past month, with regular clients in the past week, with regular partner/spouse in the past month, and with non-regular partners in the past month in Thailand 1995 - 2007

1.5 Dynamics of risk behaviour in MSM and IDU

The annual sero-sentinel survey results alarmed policy makers over the consistent high and increasing trend of HIV prevalence among MSM and IDUs in the Bangkok Metropolitan area. HIV prevalence in MSM increased from 17% in 2003 to 30% in 2007[12], while among IDUs prevalence was at 33.3% in 2006 [13]. To better understand the risk behaviour of these two groups, a special survey was conducted by Laohasiriwong [14] from March to July of 2008. A sample of 639 adult MSM (over 15 years old) was identified from 4 provinces (Chonburi, Chiang Mai, Khon Kaen, and Surat Thani) using the snow ball approach.

A sample of 444 adult IDUs was identified from treatment clinics and through the snow ball approach in Jana Hospital of Songkla, Drug Dependence Treatment Center in Khon Kaen, Chiang Mai, Mae Hong Son, Songkla, Pattani and Thanyarak Institute in Prathumtani. Others were identified in Baan Ozone, Baan Pakjai and IDU networks. Face to face interview questionnaires, approved by the National Ethical Review Committee, were used for both groups.

1.5.1 MSM

Six months prior to the survey, 42% of MSM respondents had sex with women, and 59% used condoms while having sex with women. At the last sexual intercourse, 23.5% of these MSM did not use condoms. Many of them perceived that having more sex partners than peers means being superb (40.4%), having many male lovers, or male partners makes one accepted by friends (34.1%), the outlook of being a healthy person should not be HIV+ (26.9%) and having penetrative anal sexual intercourse will not result in getting HIV/ AIDS (21.6%).

A high proportion of MSM who were surveyed had inappropriate attitudes on condom use. Almost half (46.3%) believed that using condoms when having sex reduces pleasure, and one in three (34.6%) believed that using condoms means distrust between them and their partners. Close to a third (30.7%) of them believed that telling partners to use condoms is not appropriate since it shows distrust. Almost one in five (23.8%) said they were shy to buy condoms and more than half (55.2%) reasoned that buying condoms is a burden they should not pay for. However, the majority (84.7%) thought condoms should be free for those who need them. See Annex 1.

Finally, during the past year, slightly more than half of MSM (56.4%) always or usually used condoms when having sex with their male partners, 38% never or seldom used condoms when having sex with male sex workers, and 32% often had sex with non-regular partners.

1.5.2 IDUs

Most IDUs (70%) had never or seldom used condoms when having sex with their husband/wife, 63% never or seldom used condoms when having sex with male/female sex workers, and 61% never or seldom used condoms when having sex with their lovers and girlfriends.

Only 51.8% had injected drugs during the past year, of which 19.8% often injected drugs, and 20.1% had shared needles with others. About 30% participated in a 'party' of sharing needles for injecting drugs and had sex under the influence, and 30.3% had sex after injecting drugs.

Not many MSM and IDUs access counselling services on sex education or sexually transmitted infections. In this study, only 27.7% of MSM and 42.1% of IDUs had received counselling services on sex education or sexually transmitted infections.

In summary, this survey highlights a gloomy situation for MSM and IDUs, though their population size is not large. MSM are estimated at 0.1-0.3% of male adults between the ages of 15-49 in Thailand. Therefore there are approximately 0.53 million MSM, of which 60% (0.32 million) engaged in risky behaviour. The number of IDUs is unknown, but both groups have extremely high HIV prevalence which warrants immediate policy attention.

1.6 Thailand's expenditure on HIV/AIDS

In 2007, total health expenditure in Thailand was 3,876 Baht per capita population, or US$ 115 per capita (exchange rate 33.7 Baht per US$), see Table 4.4.

Table 4.4: Background data on healthcare financing, 2007

Population	64,197,000
Total Health Expenditure	
• per capita, Baht	3,876
• per capita, US$	115
• % GDP 2007	3.4%

Source: Estimates by the Thai working group on NASA - Thursday, January 24, 2008. Note that IHPP developed and maintained the National Health Account in a long series from 1994 to 2005. To comply with the UNGASS 2008 reporting requirements, IHPP estimated total health expenditure per capita based on the 1994 to 2005 series of National Health Account.

According to the UNGASS report [9], in 2007 total expenditure on HIV/AIDS was 6.728 billion Thai Baht. This is equivalent to 105 Baht per capita, or 11,600 Baht per capital PLHA, given the total number of 580,000 PLHA. Total expenditure on HIV/AIDS accounted for 0.081% of GDP in 2007, or was equivalent to 2.7% of Total Health Expenditure as shown in Table 4.5.

Table 4.5: Key parameters of expenditure on HIV/AIDS, 2007

Total Expenditure on HIV/AIDS, million Baht	6,728.0
Estimated Total Health Expenditure, Baht	248,852.4
Total Expenditure on HIV/AIDS,	
• per capita population, Baht	105
• per capita PLHA, Baht	11,600
• % GDP	0.081%
• % of Total Health Expenditure	2.7%

Source: Estimated by the Thai working group on NASA - Thursday, January 24, 2008

With regard to sources of financing for HIV/AIDS programs in 2007, it was indicated that domestic public financing had the highest share or 82.7% of Total Expenditure on HIV/AIDS (TEA). International resources accounted for 17.3% of TEA. This finding indicates better self-reliance for HIV/AIDS program financing, and reflects the firm commitment of the Royal Thai Government to the fight against HIV.

In light of the universal access to ART which was adopted by the Government in 2001, a huge share of total expenditure on HIV/AIDS (71.8%) went to care and treatmen . HIV prevention activities accounted for 14.1% [3], and program administration, 9.7% of total spending on HIV/AIDS (Table 4.6).

Financing HIV/AIDS programs in Thailand relies mostly on domestic resources, 82.7% of total expenditure, as shown in Table 4.6. This clearly reflects the government's financial commitment and little external donor influence in program direction. This is different from countries in the Asia Pacific Region where financing HIV/AIDS programs relies solely on external donor resources, and is vulnerable to fragmentation and lack of harmonization across programs and projects [9]

Table 4.6: Total Expenditure on HIV/AIDS by sources of finance and functions, current year price, 2007

Type of expenditure	Domestic	International	Total
1. Prevention	7.3%	6.8%	14.1%
2. Care and Treatment	67.2%	4.6%	71.8%
3. Orphans and Vulnerable Children	1.4%	0.1%	1.5%
4. Program Management Administration Strengthening	5.0%	4.7%	9.7%
5. Other related work e.g. research, social services, incentive human resources	1.80%	1.04%	2.84%
Total, row percent	100%	100%	100%
Total, million Baht	5,563.9	1,164.1	6,728
Total, column percent	82.7%	17.3%	100.0%

Source: UNGASS report [9]

1.7 Effectiveness and cost effectiveness of prevention interventions

A study by Teerawatananon et al [1] assesses the effectiveness and cost-effectiveness of prevention interventions in Thailand through a review of published and unpublished grey literature. In addition, a systematic search for evidence from international databases was conducted.

In this study, a total of 932 Thai abstracts were identified through search definitions, of which 890 were excluded as irrelevant. Some 42 full papers were reviewed, 28 were excluded after reading the full texts, and only 14 were included in the analysis. Additionally, a total of 1,395 international abstracts were identified through search definitions, of which 1,213 were found to be irrelevant and excluded. Overall, 182 full papers were reviewed, of which only 63 were included in the analyses. The 63 included 15 systematic reviews or meta-analysis, 17 economic evaluations, 18 randomized control trials, and 13 observational studies.

Findings indicated that the interventions that showed strong evidence of reducing HIV infection among the target populations were: (1) male/female condoms for female sex workers, (2) a street outreach program for IDUs, (3) a program for prevention of mother-to-child HIV transmission in pregnant women, (4) improvements in sexually transmitted infections treatment services and (5) male circumcision.

A key finding echoed a recommendation in Disease Control Priorities in Developing Countries. [15] the lack of significant evidence indicated that community-based education for various target groups e.g. FSW, MSM, IDUs, young and general population, offer good value for money in prevention of HIV infection either in low or high HIV prevalence settings. This review found potential for interventions that aim to mitigate barriers to prevention and minimize the negative social outcomes of HIV infection such as increased alcohol tax, financial and in-kind support.

The review further highlighted serious limitations of local evidence on the effectiveness of HIV interventions among high risk populations in Thailand such as IDUs, MSM, FSW and young people. Thus international experiences on effectiveness and cost effectiveness may not be applicable for the local Thai context and call for prioritizing local research to assess the effectiveness and cost effectiveness of prevention interventions.

2. Goal and objectives

The goal of this study is to provide policy recommendations on revitalizing HIV prevention interventions in the context of universal ART and increasing expenditure on treatment.

Based on reviews of the effectiveness and cost effectiveness of prevention interventions, this study aims to assess the coverage of these interventions among nine risk population groups: (a) FSW, (b) MSM, (c) IDUs, (d) sero-discordance couples, (e) pregnant women, (f) prison inmates, (g) healthcare workers, (h) young people, and (i) the general population. The study seeks to: (1) assess the adequacy of prevention programs in population coverage and program spending in order to scale up or maintain high coverage of proven effective and cost effective interventions, and (2) to assess the coverage of interventions proven to be ineffective and not cost effective that could be scaled down or terminated.

3. Methodologies

We apply the evidence on effectiveness and cost effectiveness of HIV prevention intervention by Teerawattananon et al in chapter 3 which can be categorized into four main groups: (1) interventions proven both effective and cost-effective, (2) interventions proven effective but with no evidence on cost effectiveness, (3) interventions proven effective but not cost effective, and (4) interventions proven neither effective nor cost effective.

Effectiveness and cost effectiveness of these interventions are specific to the nine different population groups. In the matrix of 25 interventions accross the nine target groups, the most recent coverage rates were selected from relevant documents, published and unpublished grey literature in the Ministry of Public Health and other small scale program/ pilot information.

In-depth interviews of key informants were conducted where coverage data does not exist for the best expert estimates. Investment in different prevention interventions referred to various estimates in the National AIDS Spending Assessment.

Where appropriate in the results section of IDUs, MSM, young adolescents and the general population, comments refer to reports by the Bureau of Epidemiology and a special survey by Laohasiriwong in chapter 2.

4. Results

4.1 Convention on colour

Table 4.7: convention on colour

Colour	Description
	Intervention proven both effective and cost-effective
	Intervention proven effective but with no evidence on cost-effectiveness
	Intervention proven effective but not cost-effective
	Intervention proven neither effective nor cost-effective
	No evidence on effectiveness and cost-effectiveness
	Intervention does not match with target group

Table 4.7 Aids the colour interpretation of effectiveness and cost effectiveness of interventions. This colour convention, a traffic-light system, used by the study of Teerawattananon et al [1], will be applied throughout the rest of this report. For example, dark green refers to interventions proven to be both effective and cost-effective; and red refer to interventions proven neither effective nor cost effective. Table 4.8 shows the results of the Teerawattananon et al study [1].

Note that the study by Teerawattananon et al [1] assesses both Thai published and grey literatures from all possible sources; whereby internationally published literatures were systematically searched from Pub Med and Cochrane library. However, that study was dominated by international publications whereby local Thai evidence on the effectiveness of interventions among high risk populations such as IDUs, MSM, female sex workers and young people are very limited.

Table 4.8: Summary of findings by intervention and target population

Interventions	FSW	MSM	IDU	SDC	Preg	PI	HCW	Young	G pop
I. Interventions that affect knowledge, attitude and beliefs and influence psychological and social correlates of risk									
Abstinence-only programs [16]									
Abstinence-plus programs [17,18]									
Community-based education [19,20,21,22,23,24,25]									
Mass media campaigns [26]									
Peer education [27,28,29,30,31,32,33,34,35]									
Routine (provider-initiated) voluntary HIV screening at healthcare settings [36]									
School-based sex education programs (combined with life skills) [37,38,39,40,41,42]									
Voluntary HIV counselling and testing (VCT) (+ STI clinic and condom distribution) [43,44,45,46,47,48]									
Workplace-based education (+condom distribution / free STI clinic) [49,50,51,52,53,54,55,56]									
II. Harm reduction interventions that lower the risk of a behaviour, but do not eliminate the behaviour									
Condom use (availability and accessibility) [57,58,59,60,61]									
Introduction of female condoms [44,56, 62]									
Needle and syringe exchange [63,64]									
Needle social marketing [65]									
Street outreach [66,67,68,69]									
III. Biological/biomedical interventions that strive to reduce HIV infection and transmission risk									
HIV vaccine [70,71]									
Improved STI treatment services [44, 72]									
Mass or community treatment of sexually transmitted infections [45, 73]									
Male circumcision [45, 74,75,76,77,78]									
Microbicides [45]									
Post-exposure prophylaxis [68,79,80]									
Prevention of mother-to-child transmission of HIV [81,82]									
Screening blood products and donated organs for HIV [44,56,83]									
Substitution treatment [84,85,86]									
Using nucleic acid test screening (NAT) of volunteer blood donations [87]									
IV. Mitigation of barriers to prevention and negative social outcomes of HIV infection									
Increased alcohol tax [45]									
Microfinance [88]									
Microfinance (combined with education) [89]									

4.2 Setting the scene on principles for policy recommendations

The finite HIV/AIDS resources are mostly allocated to treatment and care under universal coverage launched in 2001; it is unaffordable to spend unnecessarily on the ineffective and non-cost effective interventions. Table 4.9 provides a generic principle on how we craft our policy recommendations for scaling up, scaling down and termination.

Table 4.9: Principle of policy recommendations

Stage of intervention	A Proven effective and cost effective	B Proven effective but no evidence on cost-effectiveness	C Proven effective but not cost effective	D Proven neither effective nor cost effective
1. No policy intervention	**A1** Generate evidence through e.g. operational research to assess implementation feasibility, in order to introduce policy and program implementation and rapid scale up to highest possible coverage	**B1** Lower priority, it is high priority if the HIV program had introduced all proven effective and cost effective interventions, as country should invest more on prevention interventions in the light of universal ART	**C1** Least priority, discourage the attempt to initiate program	**D1** Discourage attempts to introduce policy or program
2. Interventions exist, but no coverage data	**A2** Develop effective information systems to assess coveragee	**B2** Where existing program operate with no coverage data, we recommend develop coverage data. Though not cost effective, it is effective and may support the implementation of proven effective and cost effective intervention	**C2** Least priority	**D2** Terminate
3. Interventions exist, and coverage data is available	**A3** Sustain and scale up to reach the highest possible coverage	**B3** Where existing program operates with high coverage level, maintain these coverage, as it is effective and may support the implementation of proven effective and cost effective interventions	**C3** Scale down unless convincing argument to maintain program or other ethical justifications	**D3** Terminate programs and reallocate resources for effective and or cost effective interventions

The matrix presents the interventions in four groups by level of evidence of effectiveness and cost effectiveness using colour conventions in four columns (A. dark green, B. light green, C. yellow and D. red colour). It also presents three stages of interventions in three rows: (1) no policy or program interventions; (2) interventions exist but no coverage data; and (3) interventions exist and coverage data is available. From an understanding of this matrix, we developed a generic principle for recommendations. In the matrix, there are 12 cells of possible recommendations.

Where interventions are proven to be effective and cost effective these fall in the "dark green column." If there is no policy intervention (Box A1), it is recommended to generate evidence through operational research to assess programmatic and implementation feasibility and socio-cultural acceptability, in order to introduce policy and program implementation and rapid scale up to the highest possible coverage.

From interventions in Box A2, it is advisable to rapidly install information systems in order to verify the coverage rate which facilitates program performance assessment.

Likewise, in Box A3 where interventions exist, it is recommended to sustain the current high coverage or to scale up to reach the highest possible coverage. Program barriers should be identified and overcome to reach the highest possible coverage.

Interpretation for the "red colour column" where interventions are proven neither effective nor cost effective indicates it is advisable to terminate these programs, or not to initiate. Financial resources and programmatic efforts should be given to interventions in the "dark green" and "light green" groups.

In the "light green column" where interventions are proven effective, but there is no evidence on cost effectiveness, we recommend to initiate a program if there is none, or to scale up these interventions to reach a high coverage level. This is because investment in prevention interventions is small, 14.1% of total spending on HIV/AIDS (see Table 4.6), with a decreasing trend in terms of proportion of total spending on HIV/AIDS as a result of scaling up universal ART. Another argument in favour of spending on more on prevention interventions classified as light green: HIV/AIDS is consistently the top first burden of disease in terms of Disable Adjusted Life Year-DALY loss in 1999 and 2004 [90], see also Table 4.3.

Based on these arguments, we tend to recommend in favour of interventions which fall under the "light green category" to scale up and reach high coverage instead of scaling down; while efforts should be made to uncover the cost effectiveness of these interventions.

Compared to "light green category", we tend to not favour scaling up interventions which fall under the "yellow colour category". This is because though effective, it is not cost effective or efficient to do so. Programmatic efforts should be given to "dark green" and "light green" categories.

4.3 Results of critical assessment

With reference to Teerawattananon et al [1], Table 4.9 is the main result of our assessment of population coverage for all current prevention interventions which are relevant to the nine population groups.

Table 4.10 is self-explanatory; there are 25 interventions under four clusters for nine population groups. In addition to the Green, Yellow and Red traffic light convention, the white represents interventions that do not have evidence on effectiveness and cost effectiveness while the grey refers to interventions not applicable to that specific population.

Based on the matrix in Table 4.10 we produced nine tables (Table 4.11 to 4.19), one for each population group, where specific recommendations can be made.

Table 4.10: Existing prevention activities and coverage by risk groups, according to gradient of effectiveness and cost-effectiveness of HIV prevention intervention

	A	B	C	D	E	F	G	H	I
Interventions	**Female sex workers**	**MSM**	**IDU**	**Sero-Discordant couples**	**Pregnant women**	**Prison inmate**	**Healthcare Workers**	**Young people (10-24 yrs)**	**General population**
I. Interventions that affect knowledge, attitude and beliefs and influence psychological and social correlates of risk									
1. Abstinence-only programs								No policy, but some small project [a]	
2. Abstinence-plus programs [b]								No policy, but some debates are discussed [c]	
3. Community-based education	100% coverage for direct FSW in Bangkok only. There were small scale project in some provinces [d] (estimated 75,046 direct FSW) [e] All projects get govern-ment budget support	Activities are provided by TUC+MSM consortium, its coverage about 6.25% of target group [f]	No data at national level, but some small scale projects are available and its coverage was about 50% of target group [g]					Some activities are provided by health centres [h] but data of coverage is unavailable. In addition, GF RCC round 1 has a plan for many projects	Similar to Young Pop
4. Mass media campaigns									Sporadic activities by government or GF [j] but no coverage data

	A	B	C	D	E	F	G	H	I
Interventions	**Female sex workers**	**MSM**	**IDU**	**Sero-Discordant couples**	**Pregnant women**	**Prison inmate**	**Healthcare Workers**	**Young people (10-24 yrs)**	**General population**
5. Peer education	Peer group-education for direct sex workers with community based education [d, [51],]	Activities are provided by TUC+MSM consortium, its coverage about 6.25% of target group [f]	Peer group-activity in every year, since 2004 [g]					In 2006 reported for 465 students in 16 schools [T]	
6. School-based sex education program (combined with life skills)								Coverage 40.5 % of target school [k] In addition, GF RCC round 1 2008 has a plan for many projects	
7. Routine (provider-initiated) voluntary HIV screening at healthcare settings (PICT)					No policy on PICT yet for any group			No policy on PICT yet for any group	No policy on PICT yet for any group
8. Voluntary HIV counselling and testing (VCT) Note: VCT services in 2008 was 257,457	Coverage data is incomplete:- 100% coverage for the Direct FSW in	No coverage data, stigma is a major barrier to VCT. Therefore	Activities to educate IDUs and inmate in prisons, no regular	At initial phase of policy implement-ation, a number of	99.1% of pregnancies covered by VCT (2007)	National policy of Dept of Correction to provide compre-		No data on VCT for this group Current policy on free access	No data on VCT for this group Current policy on free access

	A	B	C	D	E	F	G	H	I
Interventions	**Female sex workers**	**MSM**	**IDU**	**Sero-Discordant couples**	**Pregnant women**	**Prison inmate**	**Healthcare Workers**	**Young people (10-24 yrs)**	**General population**
cases l but did have breakdown data who got the services	Bangkok and some brothels in Chiang Mai [d] These activities got financial support from government	coverage should be low	coverage data Coverage was 0.9 % of the project in Bangkok [m]	problems encountered, no data on coverage		hensive VCT, provision of condom, education, treatment and care for prison inmate but no coverage data [n]		to VCT by any individual walk in and request for VCT	to VCT by any individual walk in and request for VCT
9. Workplace-based education (±condom distribution/ free STD clinic visits)	Doubtful systematic policy interventions, no coverage data Safe sex education in some provinces [o] but no coverage data								ASO Thailand was national implemented since 2000, with 10% coverage for employees. Condom vending machines in many places [p]
II. Harm reduction interventions that lower the risk of a behaviour, but do not eliminate the behaviour									
10. Condom use 10.1 Condom provided by government	Clear government policy on free condom distribution, now 100 % coverage for Direct FSW [d, p]	Clear government policy on free condom distribution, but has not be the first priority as FSW, MSM most accesses by self-purchase	Clear government policy on free condom distribution, but has not been the first priority as FSW. IDU, but may access by self-purchase	Clear government policy on free condom distribution, but has not been the first priority as FSW				Clear government policy on free condom distribution, but has not been the first priority as FSW and possible access by self-purchase	Clear government policy on free condom distribution but has not been the first priority as FSW and possible access by self-purchase

	A	B	C	D	E	F	G	H	I
Interventions	**Female sex workers**	**MSM**	**IDU**	**Sero-Discordant couples**	**Pregnant women**	**Prison inmate**	**Healthcare Workers**	**Young people (10-24 yrs)**	**General population**
10.2 Condom use rate	96.2 % with clients [k]	Condom use rate with men 89.9% but with women 76.5 % [k], but recently survey showed lower rate of condom use, with men 78.5%, with women 52.7% [q]	Condom use rate was 35% [k] but another report showed 48% [m]	No coverage data. When SDC is identified, advice to practice safe sex provided, condom use from self-purchase [p]				Condom use rate 60-70% when have sex with FSW, 10-50 % with boy/girl-friend [q]	Condom use rate 50.9% [f] or adult men and women having sex with partner [k], 60% for Thai men having sex with FSW [q]
11. Introduction of female condom	No policy, an introduction for optional use, promoted by UNFPA with GF support								
12. Needle and syringe exchange			No policy						
13. Needle social marketing			No policy						
14. Street outreach			Small scale pilot projects [g]						

	A	B	C	D	E	F	G	H	I
Interventions	**Female sex workers**	**MSM**	**IDU**	**Sero-Discordant couples**	**Pregnant women**	**Prison inmate**	**Healthcare Workers**	**Young people (10-24 yrs)**	**General population**
III. Biological/biomedical interventions that strive to reduce HIV infection and transmission risk									
15. HIV vaccine			In clinical trial phase 3						
16. Improved STI treatment services	No data, See comments in Annex 2	No data, See comments in Annex 2	No data, See comments in Annex 2	No data, See comments in Annex 2				No data, See comments in Annex 2	No data, See comments in Annex 2
17. Mass or community treatment of STI									No policy
18. Male circumcision									No policy
19. Microbicides	No policy								
20. Post-exposure prophylaxis			No policy				Policy to provide one month ART to health personnel exposed to HIV for occupational safety [r]		
21. PMTCT					95.90 % coverage [k]				

	A	B	C	D	E	F	G	H	I
Interventions	**Female sex workers**	**MSM**	**IDU**	**Sero-Discordant couples**	**Pregnant women**	**Prison inmate**	**Healthcare Workers**	**Young people (10-24 yrs)**	**General population**
22. Screening blood products and donated organ for HIV									Policy to screen HIV antibody and antigen and Hep B-C were well in place and funded, In 2008, coverage 99.79 % [k]
23. Substitution treatment			Application of Methadone maintenance 100% coverage in public services [g]						
24. Using nucleic acid test screening (NAT) of volunteer blood donations									No policy but available for affordable patient (1,500 units/day) [s]
IV. Mitigation of barriers to prevention and negative social outcomes of HIV infection									
25. Increased alcohol tax									Current advocated for the national policy. The trend of having sex after alcohol consumption is increasing, with 39.80 % condom used rate [m]

	A	B	C	D	E	F	G	H	I
Interventions	**Female sex workers**	**MSM**	**IDU**	**Sero-Discordant couples**	**Pregnant women**	**Prison inmate**	**Healthcare Workers**	**Young people (10-24 yrs)**	**General population**
26. Microfinance									No policy and not applicable.
27. Microfinance combined with education									No policy and not applicable.

Footnotes for Table 4.10

[a] Thailand is not a recipient of the PEPFAR grant. However, there are some small scale projects initiated by individual interest e.g. abstinence advocacy project of "Rak Neuan Sagnuan Tau" led by a former senator; Rabiabrat Pomgpanich.

[b] Abstinence and encourage condom use and other safer sex practice for sexually active participants.

[c] Nevertheless, some debates are being discussed among different groups (e.g. MOPH vs MOE) about the right to encourage condom use.

[d] Information is from the interview of Ms. Vipada Maharattanaviroj, STIs cluster, Bureau of AIDS, TB, and STIs, Department of Disease Control, Ministry of Public Health. There are small scale projects of community-based education and peer groups in some provinces, especially the upper North and East of Thailand; i.e. Chiang Mai, Phrae, Lam pang, Chon Buri.

[e] This is survey data in 2001 using geographical mapping. Source of data is the website of STIs Cluster, Department of Disease Control, Ministry of Public Health http://www3.easywebtime.com/aids_stis/statvd2.html access on 12 January 2009.

[f] TUC and MSM Consortium estimated 0.01-0.03% of male adults, around 0.53 million, were MSM, of which 60% had risk behaviour, 0.32 million. The consortium provided activities on community-base education to 20,000 individuals. Therefore, the coverage was 6.25% (20,000/320,000=0.0625).

[g] Refer to the report of the study of AIDS prevention and alleviation during 2002 - 2006 the Bureau of AIDS, TB and STIs, Department of Disease Control, Ministry of Public Health, activities for IDU groups are (1) community-based education for harm reduction and HIV/AIDS and Peer group activities since 2004 to 2005, (2) incorporate HIV/AIDS Education in Exchange needing program for 9 villages in Amphur Maechan, Chiang Rai Province and ARKA hill tribe in the North, (3) small scale project on street outreach for IDU groups organized by Thanyarak Institute and all 8 regional Addiction Treatment Centres and (4) Methadone replacement Program throughout the country under the Universal Health Care Coverage Program, 100% coverage. However, this is available only 147 public hospitals.

[h] Information is from Key Informant interview. KI is Mr.Sorakij Bhakeechip, Director of AIDS Management Fund, the National Health Security Office (NHSO). NHSO provided financial support, 37.50 baht per capita, to the local government unit in order

to support health facilities to conduct community-based education program. Nevertheless, the amount of financial support (37.50 baht per capita) is for all diseases. Assuming that some amount would be used for community based education of HIV/AIDS.

[i] Refer to the working group of AIDS project RCC Round 1 2008, the summary report of the first meeting for the Coordinating and Development of AIDS Project of Sub Recipients (SRs) in 2009, Principle Recipient office (PR), Department of Disease Control, Ministry of Public Health, there is a plan for an implementation of training project aiming to develop good practice of students and school model or so called "Learning Resource". It has been implemented in 2008 only 1 school each province, 43 provinces out of 76 provinces. In addition, youth network in school will be established. PATH and BATS are the main responsible unit for these projects and get support from GF. The same projects will be applied for general population as well.

[j] Information is from Key Informant interview. KIs are Dr.Cheewanan Lertpiriyasuwat and Dr. Petchsri Siriniran, Department of Disease Control, Ministry of Public Health. There are 4 campaigns in each year supported from different sources i.e. government budget and GF. For example mass media campaign on the World AIDS day, Valentine 's Day and the New Year. There are other sporadic projects as the National media via TV and posters in several circumstances e.g. (1)"Yeud Ok Pok Toong", encouraging condom use, supported from GF 20 Million baht per year, (2) "Kui Rak Puerd Jai, คุยรักเปิดใจ". sincere talk among lovers", for the family life education and counselling and (3) "Vending machine for condom, ตกลงมาถุงยาง.".

[k] Coverage data is from the UNGASS country progress report 2008: Thailand, reporting period: January 2006 - December 2007. There are three patterns of school based education which are (1) at least 5 hours per year inserted in the subject, (2) at least 10 hour on life skills and sex education and at least 16 hours intensive class on sex education.

[l] Total annual VCT services in 2008 was 257,457 cases (73% was NHSO service, 15 % was SSO service, and 12% was CSMBS, and 6 % was other services) There is no breakdown who are these VCT subpopulation, except pregnancy as it was already reported in the PMTCT system. This data was retrieved from the NHSO routine report (AIDS Management Fund, National AIDS Program Report 2008, NHSO) which was likely to be under-report. These figures were the public services, not included private sector.

[m] Bang-on Thepthien and Parinda Tasee. 2008 Behavioral related to HIV infection among drug user in 4 years round Bangkok Metropolitan. Journal of Public Health and Development. Vol.6 No. 1.

[n] Information is an interview of Dr.Weerakit Hanpharipan, AIDS Cluster, Medical Correctional Institution, Department of Corrections, Ministry of Justice. There is more information that about 506 prison inmate volunteered to get VCT and HIV testing; reported HIV positive (6.5 %).

[o] Some safe sex education programmes for FSW at the work places in Bangkok. For example 14 night clubs (about 2,000 workers), 13 KARAOKE places, public parks in BKK (e.g. Silom, Klonglord, Wang Saranrom).

[p] Information from the interview of Dr.Cheewanan Lertpiriyasuwat, AIDS cluster, Bureau of AIDS, TB, and STIs, Department of Disease Control, Ministry of Public Health. ASO is "AIDS-response Standard Organization".

[q] Surveyed by Dr. Wongsa Laohasiriwong, CDP-Health HIV/AIDS

[r] US.CDC is concerned that appropriate post-exposure management is an important element of workplace safety. Reference is made to Adelisa LP, Denise M C, Lisa AG, Walid H, Clara SR. Updated U.S. Public Health Service Guidelines for the Management of Occupational Exposures to HBV, HCV, and HIV and Recommendations for Postexposure Prophylaxis. MMWR Recomm Rep 2001;50 (RR-11):1-52. Refer to Policy and guidance: Technical Policies of the UNAIDS Programme by UNAIDS 2008, it recommends PEP in comprehensive prevention package which emphasizes primary prevention, even HIV-PEP was proved that is not 100% effective.

[s] Laboratory Centre of Thai Red Cross, Thailand. No government policy to provide NAT but voluntary NAT testing in blood use paid by patient is available (1,500 units/day). Therefore, in fact, only patients in private hospitals could access to NAT.

[T] Refer to the report of the study of AIDS prevention and alleviation during 2002 - 2006. Bureau of AIDS, TB and STIs, Department of Disease Control, Ministry of Public Health, activities for young group are 19 training course including peer group educational in every year since 2004, campaign, counselling services.

4.4 Status of prevention interventions and policy recommendations for nine population groups

4.4.1 Female Sex Workers

Table 4.11: Summary of current interventions, coverage and recommendations for Female Sex Workers

Coverage of intervention	Proven effective and cost effective	Proven effective but no evidence on cost-effectiveness	Effective but not cost effective	Neither effective nor cost effective
No policy intervention	Female condom use is not a policy. We recommend evaluation of programs in UNFPA sites and conduct operational research to test if female condoms are acceptable, assess program feasibility in the Thai context			No policy to introduce microbicide, but it is in the study process for policy recommend-ation Recommend-ation: Do not initiate
Interventions exist, but no coverage data	1.No systematic intervention on workplace education and peer group education, and no coverage data Recommend to introduce clear policy interventions, rapid scale up and develop coverage data 2.No coverage data on the existing STI treatment services Recommend to improve information on coverage and improve user friendly STI treatment services			
Interventions exist, and coverage data is available	1. 100% free condom distribution in direct FSW, 96.2% condom use with clients Recommend to adequately fund and sustain program coverage 2. 100% coverage of VCT for FSW in Bangkok, few sites in other provinces. Recommend to urgently scaling up to national coverage	High coverage of community based education for FSW in BKK, small scale pilots in other provinces Recommendation: rapid scaling up community based education program for FSW		

Female sex workers (FSW) are most vulnerable to infection, and require special attention and continued efforts of effective interventions. Of the interventions under the "dark green" banner; female condom use was not a policy, for which operational research to assess its applicability for Thai context is urgently required as an alternative to male condoms when clients refuse to use condoms. Workplace education, peer education and the existing STI treatment services are not systematically fostered without coverage data. This requires a major review and effective and wide coverage of workplace education programmes and friendly services. Free condom distribution and high level of use by clients must be sustained at the highest level possible. Wide coverage of quality VCT for FSW is recommended.

Interventions under "light green" banners: as a result of public sector reform a few years ago, STI treatment services were transferred from the STD Clinic under the Provincial Health Office to the Provincial Hospital Obstetric Gynaecology Department. The transfer was based simply on the grounds that the Provincial Health Office is an administrative arm and should not provide clinical services. This is a major negative impact, as STD clinics not only provide health checkups but were actively involved in the past few decades on prevention, education of sex workers, peer education, trust partnership building with brothel owners in ensuring a high level of condom use. Staffs in the Obstetric Gynaecology Department did not have such skills, partnership and management with owners, managers of brothels and other indirect sex establishments. STI treatments for FSW in provincial hospitals do not provide adequate barriers to prevent exposure of FSW to general patients. STI service is therefore not carried out in a user friendly manner. STI service requires major revisiting and program leadership to solve the protracted problems.

Microbicide, is an intervention in the study for policy recommendation. During the time of the investigation in this study, it was found to be neither effective nor cost-effective should not be initiated which distracts program focuses, until the study will prove effectiveness and/or cost-effectiveness.

4.4.2 MSM

Table 4.12: Summary of current interventions, coverage and recommendations for MSM

Coverage of inter-vention	Proven effective and cost effective	Proven effective but no evidence on cost-effectiveness	Effective but not cost effective	Neither effective nor cost effective
No policy inter-vention				Very low coverage of peer education 6.25% Recom-mendation: this is not high prior-ity for MSM program interven-tions
Interven-tions exist, but no coverage data	1. Priority group. MSM most accesses condoms by out of pocket payment. Recommend to provide more free condom distribu-tion, create awareness for sustaining high coverage 2.No coverage data on the existing STI treatment services Recommend to improve informa-tion on coverage and improve user friendly STI treat ment services	No coverage data of VCT due to stigmatization Recommend: minimize stigmatization and develop reporting systems		
Interven-tions exist, and coverage data is available			Very low coverage of community-based education 6.25% Recommendation: this is not a high priority for MSM program interventions	

MSM are not covered by sero-sentinel surveys despite their high HIV prevalence. Surveys among MSMs by Rainbow Sky Association of Thailand (RSAT or Fah Si Roong) show consistent increase in HIV prevalence from 17% in 2004 to 28.8% in 2005, and 30.2% in 2007. The 2008 survey is expected to show even higher prevalence.

In Table 4.11, interventions under the "dark green" banner such as free distribution of condoms to MSM are under a policy vacuum. Though MSM access condoms through self-purchasing, evidence from surveys [14] shows very low rate of condom use. An evidence informed policy for effective condom distribution and use advocates through MSM peer groups and NGOs should be tested, reviewed, and advocated. However, the major barriers are stigmatization and difficulty of reach, with skilful health workers in the localities where they live and work; they may have comparative advantages to overcome these barriers.

For interventions under the "light green" banner, there is no coverage data on VCT services for MSM, but it is low due to stigma as confirmed by surveys in this group [14]. It is recommended that the social stigma barriers must be minimized to accommodate better access to VCT services. Access to and use of STI treatment services is a cross cutting problem across the whole spectrum of clients who may use it, as discussed in the female sex workers above on negative outcomes of public sector reform and termination of STD clinics in the Provincial Health Offices. Similar recommendations are made.

For interventions under the "yellow" banner, the low coverage of community based education does not matter as it was proven not to be cost effective; this intervention should be given low priority.

For interventions under the "red" banner, the review reported no effectiveness and cost-effectiveness. These interventions should not be provided if there is no proof for effective and/or cost-effectiveness.

4.4.3 IDUs

Table 4.13: Summary of current interventions, coverage and recommendations for IDUs

Coverage of intervention	Proven effective and cost effective	Proven effective but no evidence on cost-effectiveness	Effective but not cost effective	Neither effective nor cost effective
No policy intervention	1. priority group. MSM most accesses condoms by OOP payment. IDU most accesses condoms by OOP Recommend to provide more free condom create awareness in order to reach high coverage 2.No policy on needle and syringe exchange Recommend to stay as is, this is least priority to do	No policy on needle social marketing Recommendation: though no evidence if it is cost effective, it is effective and should have a clear policy but requires extraordinary strong leadership in the light of "cracking down drug".		1. No HIV vaccine , but in the clinical trial phase 3 2. No policy on post-exposure prophylaxis Recommend to discourage these policy interventions
Interventions exist, but no coverage data	1.Small scale pilot project on street outreach supported by GF, no coverage data Strongly recommend to rapidly scale up 2.No coverage data on the existing STI treatment services Recommend to improve information on coverage and improve user friendly STI treatment services			
Interventions exist, and coverage data is available	VCT project supported by GF, low coverage at 0.9% Strongly recommend to rapidly scale up	Methadone substitution treatment, high coverage at public clinics Recommend to sustain the program		Small scale project of community-based education, with 50% coverage of target group Recommend to terminate this intervention

For interventions under the "dark green" banner in Table 4.13, it is unacceptable that effective and cost effective interventions such as free distribution of condoms and needle syringe exchange to IDUs with very high HIV prevalence are not endorsed by policy. However, reaching this group is a major programmatic barrier, as the current government policy against "drugs" drives all IDU movement under-ground. Distribution of condoms through peer groups and NGOs is one of the possible solutions. Street outreach has yet to be scaled up and develop information on coverage rates. VCT services are poorly performed with an extreme low coverage rate and should be rapidly scaled up.

As for interventions under the "light green" banner, it is not unexpected as there is no government policy on needle social marketing to prevent sharing of syringes and needles, as it contradicts with the policy on "drugs." We argue that it is effective, though there is no evidence if it is cost effective; it is one of a few interventions available among IDUs to prevent sharing of injecting implements. A pilot of integrated different interventions in one setting of social marketing of needles and syringes, such as condom distribution, VCT and STI treatment, delivered by IDU peer groups or NGOs would be an innovation and overcome various barriers.

Interventions that fall under the "red" banner, there is no policy on post-exposure prophylaxis and must wait for the study results if it can be proven for effectiveness or cost-effectiveness in the future. One should not initiate these ineffective and non-cost effective interventions. Community based education for IDU groups should be replaced by integrated social marketing of needles, syringes and provide VCT and STI treatment services.

4.4.4 Sero-Discordance Couple

Table 4.14: Summary of current interventions, coverage and recommendations for Sero-Discordance Couple

Coverage of intervention	Proven effective and cost effective	Proven effective but no evidence on cost-effectiveness	Effective but not cost effective	Neither effective nor cost effective
No policy intervention	Priority group. They mostly access condoms by OOP payment.			
Interventions exist, but no coverage data	No coverage data on the existing STI treatment services Recommend to improve information on coverage and improve user friendly STI treatment services	Initial phase of VCT implementation, no coverage data Recommend to scale up the program and improve information on coverage		
Interventions exist, and coverage data is available				

Under the "dark green" banner in Table 4.14, MSM who are the priority group mainly accesses condoms by out of pocket payments. We recommend that a policy should be established regarding not only stand-alone effective condom distribution, but providing a more comprehensive approach integrating condom distribution with VCT services and STI treatment where sero-discordant couples are identified. Psycho-social dimensions and issues on HIV disclosure between discordant couples should be well understood through qualitative research to inform policy and guide effective program design.

4.4.5 Pregnant Women

Table 4.15: Summary of current interventions, coverage and recommendations for Pregnant women

Coverage of intervention	Proven effective and cost effective	Proven effective but no evidence on cost-effectiveness	Effective but not cost effective	Neither effective nor cost effective
No policy intervention	No policy on PICT for pregnant women Recommend to formulate national policy and clearly spell out and rapidly scale up in order to reach high coverage			
Interventions exist, but no coverage data				
Interventions exist, and coverage data is available	1. Effective VCT with high coverage 2. Effective PMTCT with high coverage Strongly recommend to sustain high coverage and program achievement			

HIV vertical transmission prevention among pregnant women through the PMTCT program is a success story with high coverage. There are several enabling factors:

- High ANC coverage, 98% in 2000-2006, high level of skilled attendant at delivery, 97% in 2000-2006, and high level of institutional care, 97% in 2000-2006 [91].
- Strong MOPH policy commitment, including full support of free breast milk substitutions for 18 months to babies born by PMTCT and good information systems.
- Simple programmatic design: ART delivery to pregnant women and new born babies,

In Table 4.15, interventions under the "dark green" banners such as VCT with high coverage, PMTCT with very high coverage were fully implemented. As a result, in the 14 provinces with good monitoring systems of the outcomes of PMTCT, infection rates were constant at 6.4% between 2001 and 2004, and a declined sharply to 1.3% in 2006[10].

Under the "dark green" banner, Provider Initiated Counselling and Testing (PICT) was effective and cost effective for pregnancies, but there was no PICT policy for clients in ANC. In light of high coverage of VCT and PMTCT, offering PICT to pregnant women has no role, but the program has to sustain high coverage of VCT and PMTCT. Policy options to consider include diversifying PMTCT to offer VCT to husbands in ANC through advocates of couple counselling. Offering quality VCT to husbands in ANC is another key potential strategy to boost awareness of safe sex in and enrolment into universal ART program for negative counselling.

4.4.6 Prison Inmates

Table 4.16: Summary of current interventions, coverage and recommendations for Prison Inmates

Coverage of intervention	Proven effective and cost effective	Proven effective but no evidence on cost-effectiveness	Effective but not cost effective	Neither effective nor cost effective
No policy intervention				
Interventions exist, but no coverage data				
Interventions exist, and coverage data is available			VCT implementation with low coverage As there is no cost effective intervention for this captive population, it is strongly recommended to scale up due to its effectiveness and continuity of ART or VCT after being discharged from prison. For prison inmates, a package of integrated services should be considered such as distribution of condoms, VCT, treatment of TB-HIV, provision of ART.	

Intervention under the "yellow" banner in Table 4.16, include VCT services among prison inmates which, though effective, was proved not to be cost effective. VCT coverage in prisons is lower than 30%.

Prevention interventions had inadequately addressed problems among prison inmates, the most vulnerable population group. In 2007 there were 168,656 male and 24,660 female prisoners in 162 prisons throughout the country. About 52% of them had sentence terms of less than 5 years, 36% were 5-20 years, 10% were 20-50 years, 1.5% were life-imprisonment, and 0.09% had death penalty [92] sentences. Between January and

December 2008, there were 46,981 juvenile delinquents (boys 91% and girls 9%) in 5,451 mid-way homes [93]. There is a great opportunity to introduce effective and continued interventions in the prisons and beyond when they are released back to the society.

To ensure health equity, more resources and program efforts should be given to this group e.g. free condom distribution. It is unfortunate that there is no evidence on effectiveness and cost-effectiveness of condom distribution in prison inmates under the 'white banner' (Table 4.9). Evidence indicates VCT is effective but not cost-effective for this group. We recommend scaling up VCT services in general. Policy makers should consider offering an integrated package such as distribution of condoms, quality VCT services, treatment of TB-HIV, provision of ART, and ensuring continued service beyond their release from prison. Strong collaboration between the Ministries of Justice and Health is an important foundation for effective policy formulation and implementation.

4.4.7 Healthcare Workers

Table 4.17: Summary of current interventions, coverage and recommendations for Healthcare Workers

Coverage of intervention	Proven effective and cost effective	Proven effective but no evidence on cost-effectiveness	Effective but not cost effective	Neither effective nor cost effective
No policy intervention				
Interventions exist, but no coverage data				
Interventions exist, and coverage data is available				Post exposure prophylaxis: government policy to provide one month ART to health personnel exposed to or suspect to expose to HIV in their clinical services. Despite evidence on ineffective and non CE, UNAIDS and US-DDC recommend this intervention as an occupational safety. It is not easy to terminate the ongoing program.

Interventions under the "red" banner, Table 4.17; Post-Exposure Prophylaxis was found ineffective and non cost effective for healthcare workers. The government provides full support for a free one-month course of ART to health care workers who are exposed to or are suspected to have been exposed to HIV infection in their clinical services. In theory, PEP should be terminated but politically, it is not that easy to terminate on the grounds of occupational safety in addition to full investment in Universal Precautions. Otherwise they would be discouraged to provide health services to HIV/AIDS patients. However, incidence of occupational injuries is very low; therefore there is little financial implication to the government. It is further recommended to modify conventional PEP towards a comprehensive prevention package.

4.4.8 Young People

Table 4.18: Summary of current interventions, coverage and recommendations for Young People

Coverage of intervention	Proven effective and cost effective	Proven effective but no evidence on cost-effectiveness	Effective but not cost effective	Neither effective nor cost effective
No policy intervention	Young mostly accesses condoms by OOP payment. Recommend to sustain provide free condom distribution and create awareness	No policy on abstinence-plus programs Recommendation: Although this is less priority, it should be considered to advocate in conjunction with other CE interventions	No policy on PICT for young people Recommendation: This is the least priority	
Interventions exist, but no coverage data	No coverage data on the existing STI treatment services Recommend to improve information on coverage and improve user friendly STI treatment services	VCT, no coverage data Recommend to scale up the program and improve information on coverage	Community-based education with government financial support, no coverage data Recommendation: This is least priority	Despite no government policy, there were small projects of abstinence-only Recommend to terminate
Interventions exist, and coverage data is available	School-based sex education program, 40.5% coverage Recommend to strengthen and scale up to achieve 100% coverage			

For interventions under the "dark green" banner, in Table 4.18, the priority group is the young population (10-24 years old) most of whom access condoms by out of pocket payment. A recent policy on installing condom vending machines in wash rooms in high schools and universities resulted in hot debates both for and against and in the end it was not successful. However, young people access condoms in convenient shops and out of pocket payment. The most important point is to create awareness of safe sex behaviour in this group. The low coverage, at less than half of school based sex education program should be accelerated. Friendly STI services also need to be promoted.

Interventions under the "light green" banner, abstinence plus programs should be integrated with school based sex education. By nature, VCT services for young people are not easy to scale up; therefore program efforts should be given to school based education.

Interventions under the "yellow" banner, PICT and community based education for young people should receive lower priority. Abstinence only under the "red" banner should be terminated.

4.4.9 General Population

Table 4.19: Summary of current interventions, coverage and recommendations for the General Population

Coverage of inter-vention	Proven effective and cost effective	Proven effective but no evidence on cost-effectiveness	Effective but not cost effective	Neither effective nor cost effective
No policy inter-vention	1. They can access condom by OOP Recommend to maintain public awareness on safe sex and condom use purchase by their own 2. No policy on male circumcision Recommend to generate evidence on public acceptability of male circumcision in Thai context	1. No policy on microfinance combined with education Recommend to scale up the intervention	1. No policy on community-based education 2. No policy on PICT to general population Recommenda-tion: These inter-ventions are of low priority	No policy on mass or community treatment of STI Recommend not to initiate such program 2. No policy on microfinance Do not recommend because it is not applicable in Thailand

Coverage of inter-vention	Proven effective and cost effective	Proven effective but no evidence on cost-effectiveness	Effective but not cost effective	Neither effective nor cost effective
Interven-tions exist, but no coverage data	No coverage data on the existing STI treatment services Recommend to improve informa-tion on coverage and improve user friendly STI treatment services	Existing VCT for walk in individuals but no coverage data Recommendation to scale up this and improve information on coverage	1. Despite no policy, NAT was implemented for patient in private hospitals, no coverage data but should be very low coverage Recommend to bargain the price of the test to reach the CE level and advocate as a national policy to achieve 100% coverage 2. Sporadic activities of mass media campaigns by government or GF [j] but no coverage data Despite evidence on effective but non CE, the existing program should be	
Interven-tions exist, and coverage data is available	1. Existing policy to increase Alcohol Tax Recommend to maintain high level of taxation on alcohol	1. Existing intervention on workplace-based education but low coverage Recommend to maintain the intervention and increase coverage 2. Extremely high coverage of screening blood products and donated organ for HIV Recommend to maintain high coverage		

Interventions under the "dark green" banner in Table 4.19, it is reasonable that they can access condom by out of pocket payments. It is advisable to increase and maintain public awareness on safe sex and use of condoms. Male circumcision is not a customary practice for newborns; it is recommended that policy is guided by research and evidence on public acceptability in the Thai context. Policy to increase Alcohol Tax is recommended.

Interventions under the "light green"banner, microfinance and education should be addressed for policy recommendation; scaling up STI treatment faced a common problem of incompetent providers and user unfriendly services in provincial hospitals as a result of recent public sector reforms discussed in other sections. Work-place based education has high potential for extension due to the nature of the institutionalized population. However, the Ministry of Labour has yet to buy into this policy and provide an enabling environment, incentives and other mechanisms to facilitate implementation. HIV and other essential screening in blood safety programs is performing well, all donated blood was tested with HIV antibody and antigen tests, other agents such as Hepatitis A, B and C were also screened. It is recommended to sustain the high performing blood safety program. Control of alcohol consumption has an indirect positive impact on HIV prevention and others such as violence and injuries. It is recommended to maintain a high alcohol tax and other measures to control supply and advertising. These are in the legislative framework but have yet to improve the enforcement capacity. VCT for the general population should be scaled up and improve information coverage.

Interventions under the "yellow" banner; show that it is advisable that community-based education and PICT are a low priority, in view of other cost effective interventions and have not yet fully materialized in this group and other risk groups such as FSW, IDUs and MSM. It is recommended to scale up to full coverage of Nucleic Acid Testing (NAT) of all donated blood, to address the inequity problem between public and private hospitals blood services, ensure the highest possible safety blood service to prevent law suits from medical errors and iatrogenic HIV infection. The cost of laboratory test is still unaffordable, the Thai Red Cross Society, as the designated National Blood Centre, has yet to better perform in bringing down the price of this test. It is possible that NAT will become cost effective when the cost of laboratory tests decreases.

Finally regarding interventions under the "red" banner, the development of a policy on mass community treatment of STIs should be discouraged by all means. Despite the evidence, mass media campaigns are neither effective nor cost effective. The existing program should be modified to minimize stigma and create public awareness on safe sex.

5. Discussions

In the results section, it is imperative to report the results in the performance assessment of interventions used with different population groups, and to provide discussion and policy recommendations.

Discussion focuses on mismatches of interventions, priority groups, and cross cutting issues around program bottle necks.

5.1 Mismatches of intervention

We define mismatches between the stage of interventions verified against evidence on effectiveness and cost effectiveness. Mismatches are (1) the proven effective and/or cost effective interventions (combined dark green and light green banners) that were not implemented, and (2) the proven ineffective and non-cost effective interventions (red banner) that were actually implemented. Table 4.19 depicts a conceptual thinking of mismatches. Interventions falling in Box A1 and C3 are the mismatches where evidence based policy formulation, effective programme design and implementation are required for Box A1 and terminations are required in Box C3.

Likewise, in Box A2 and A3, interventions match with evidence on effectiveness or cost effectiveness and require scaling up for Box A2 while maintains high performance in Box A3.

Table 4.20: Conceptual approach of intervention mismatches and correction measures

Stage of intervention	Proven effective and cost effective, proven effective but no evidence on cost effective	Effective but not cost effective	Neither effective nor cost effective
No policy, no intervention	**A1** Mismatches, Needs evidence based policy formulation, effective program design and implementation	**B1** Borderline, Scale up or low priority is on case by case review	**C1** Match, Discourage attempts to initiate
Interventions exist, poor performed	**A2** Matches, Need for scaling up	**B2** Borderline, Scale up or low priority is on case by case review	**C2** Mismatches, Needs to terminate
Interventions exist, good performed	**A3** Matches, Need to maintain high performance	**B3** Borderline, Scale up or low priority is on case by case review	**C3** Mismatches, Needs to terminate

Table 4.21: Critical assessment of mismatches of HIV/AIDS interventions

Stage of intervention	Proven effective and cost effective, proven effective but no evidence on cost effective	Effective but not cost effective	Neither effective nor cost effective
No policy, no intervention	**A1** - Free distribution of condom to MSM, IDU, Discordance couples, young people and general population - PICT offered to pregnant women - Abstinence plus in young people - Male circumcision in male newborns - Needle and syringe exchange for IDU - Microfinance combined with education for general population - Female condom for FSW	**B1** - PICT for young people, general population - Community based education in general population - Needle social marketing for IDU	**C1** - Microbicide in FSW - HIV vaccine - PEP for IDU - Mass community treatment of STI for general population - Microfinance policies

Stage of intervention	Proven effective and cost effective, proven effective but no evidence on cost effective	Effective but not cost effective	Neither effective nor cost effective
Interventions exist, poor performed	**A2** - Work place education for FSW - Community based education and peer education for FSW - STI treatment for all population groups - VCT for FSW, MSM, IDU discordance couples, young people - Street outreach for IDU - School based sex education program for young people - Workplace-based education in general population - Community based education for and peer education MSM	**B2** - VCT for prison inmate, general population - Community based education for young people - Mass media campaign in general population - Nucleic Acid Test for donated blood	**C2** - Community based and peer education for IDU - Abstinence only in young people
Interventions exist, good performed	**A3** - Free condom distribution for FSW - High coverage of methadone substitution treatment in public clinics - VCT and PMTCT for pregnant women - Screening of HIV antigen, antibodies and other in all donated blood - Increase alcohol tax	**B3**	**C3** - PEP for healthcare workers

With the application of a conceptual framework, Table 4.21 synthesizes all HIV/AIDS prevention interventions categorized as Green, Yellow and Red banners for all nine population groups by three stages of implementation.

There are seven mismatches in Box A1 for which different policy recommendations are made. From the critical assessment and understandings from discussions with key informants, we suggest the following:

Four interventions require further evidence on applicability, acceptability and programmatic designs. These are:

- Female condoms for FSW: operational research to test if it is acceptable, assess program feasibility in the Thai context
- Male circumcision in male newborns: generate evidence on public acceptability in Thai context
- Female condom use and microbicides which are in the study process for policy recommendation

Two interventions require immediate policy actions.

- More availability of free distribution of condoms to MSM and IDUs. Condoms can be integrated in a comprehensive package by peer groups and NGOs. For example integration of VCT, condom distribution, STI treatment service and ART. Condom distribution to discordant couples can be done in VCT clinics. Condom distribution to young people and the general population are not easy in terms of programmatic design, but creating awareness of safe sex is essential.
- Needle social marketing for IDUs: there is a need for a clear policy but requires extraordinary strong leadership in the light of "cracking down on drugs."

Two interventions do not require attention.

- PICT offered to pregnant women, as the program should focus on sustaining high coverage of PMTCT. Opportunities exist to extend VCT services to husbands in ANC clinics
- Abstinence plus in young people is not a policy culture in Thailand; safe sex and condom use are main programmatic focuses.

There is one serious mismatch in Box C3, the PEP for healthcare workers. It should be terminated but politically not easy on the grounds of occupational safety. We recommended keeping it, as incidence of occupational injuries is low and financial implications to the government would be low. Conventional PEP should be modified towards a comprehensive prevention package.

We commend the good performance contained in Box A3, and recommend sustaining its high performance, such as free condom distribution to female sex workers, methadone substitution treatment in public clinics,

VCT and PMTCT for pregnant women, screening of HIV antigen, antibodies and others in all donated blood, and increased alcohol tax which has an indirect impact on vulnerability to HIV infections.

In Box A2, many activities require rapid and wide scale up. For example, community-based education, peer education and VCT for FSW in Bangkok which showed high coverage, although other provinces were lagging behind. These interventions should be scaled up throughout the country with sufficient support from the government.

5.2 Which priority group?

Based on sero-sentinel evidence of high prevalence and high risk of infections and transmission of HIV to others, three population groups require priority attention: FSW, MSM and IDUs. As clearly reflected in a survey conducted by Laohasiriwong [14] indicating that MSM and IDUs have multiple partners and clients of sex workers, unsafe sex practices and low condom use rate, sharing needle and syringe among IDUs, are the main drivers of HIV transmission. Specific recommendations for these three population groups were provided in section 4.4.1 FSW, 4.4.2 MSM, and 4.4.3 IDUs.

Accordingly, to more precisely measure incidence of HIV infection, the Medical Sciences Department and AFRIMS, with technical support from the US Centers for Disease Control conducted a pilot study of the BED IGG CAPTURED IMMUNOASSAY (BED-CEIA) among pregnant women and FSWs in Bangkok and 24 provinces, and army recruits from 2004 to 2007. The results suggest that HIV incidence increased among the general population, pregnant women and indirect FSWs. In sum, data from the national HIV surveillance and other ad hoc sero-surveys shows an epidemic pattern that is a combination of generalized and concentrated epidemics. There is evidence of declining prevalence in almost all groups, however prevalence is still high among IDUs, and there are indications of increasing prevalence among MSM. Recent studies of incidence provide a warning sign to Thailand that rapid spread of HIV could be returning [10,94]

Based on BSS, young people emerge as a new priority and vulnerable to HIV infection which requires specific monitoring for HIV infection

prevalence and interventions because of the sexual behaviour which might be risky to infection. For example, knowledge on HIV prevention was low among young adolescents, less than 20% to 30% had accurate understanding on the five UNGASS HIV preventions. Over the last 12 years, an increasingly high proportion of students, especially from vocational schools had sexual intercourse experiences. Condom use rate among students was less than 30% in most groups. However, the report of the Commission on ASIA AIDS does not show concern about this group [11]. From this study, it is recommended that young people, including young sex workers, young IDU, and young MSM are particularly vulnerable to HIV infection, and deserve greater attention in HIV prevention programs.

Prison inmates are the most vulnerable and socially disadvantaged group, often with repeated imprisonment, especially cases dealing with drugs. Most of them are IDUs with TB and HIV co-infections. As a captive population, there is a great opportunity to introduce effective and continued interventions in the prisons and beyond when they are released back to the society. It is recommended to scale up VCT services. Policy makers may want to consider offering an integrated package including distribution of condoms, VCT services, treatment of TB-HIV and provision of ART, and ensure services continue beyond prisons after their release back to the society. This will require a strong collaboration between the Department of Corrections, Ministry of Justice and Ministry of Public Health.

5.3 Cross cutting program bottlenecks

As a result of public sector reform - termination of STD clinics under Provincial Health Offices, and transfer of mandates to Provincial Hospitals- the STI treatment services were weakened with a resurgence trend of STI incidence (see Annex 2). In this context, it is imperative that HIV programs build and strengthen skills to work with communities in particular owners of, and sex workers in brothel and non-brothel based sex establishment. Priority should be given to developing user friendly STI services, accessible by all, in particular FSW, MSM, and IDUs, as well as integrating STI treatment with quality VCT services.

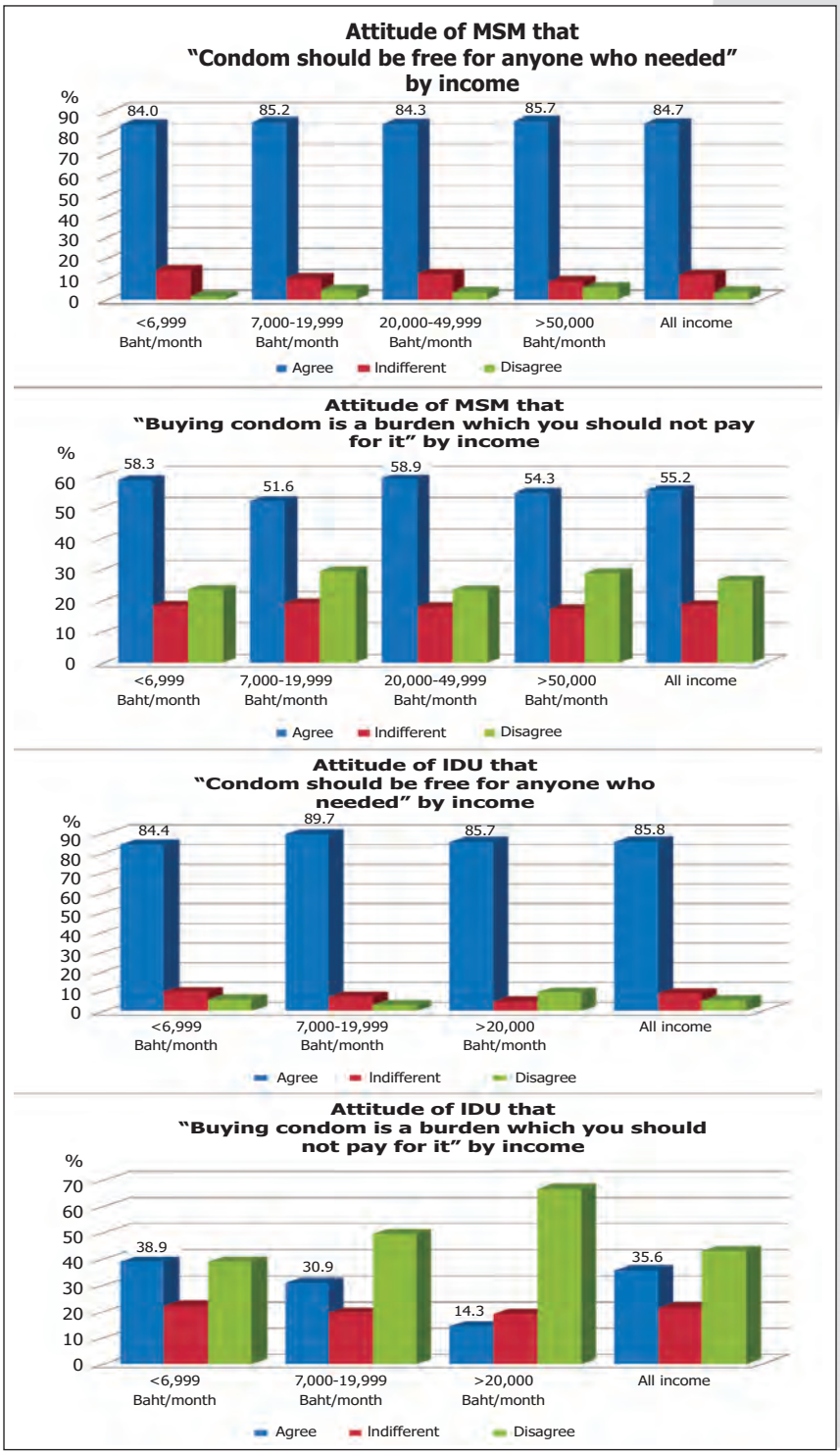
5.4 Limitations of the study

Due to data limitation, this study cannot assess the financial resources spent in each of the 25 interventions currently employed by the national HIV/AIDS program specific to the nine population groups. As evident in Annex 1, total prevention expenditure in 2007 was 950 million Baht, which provides a good enough breakdown of expenditure on some detailed prevention interventions. In addition, this study did not aim and was not designed to conduct expenditure projection of financial resources and programmatic capacity required for scaling up recommendations provided in the "dark and light green" banners which is unmatched in Box A1, and described as low performance in A2, or to sustain high coverage in A3 in Table 4.21.

6. Annex for Chapter 4

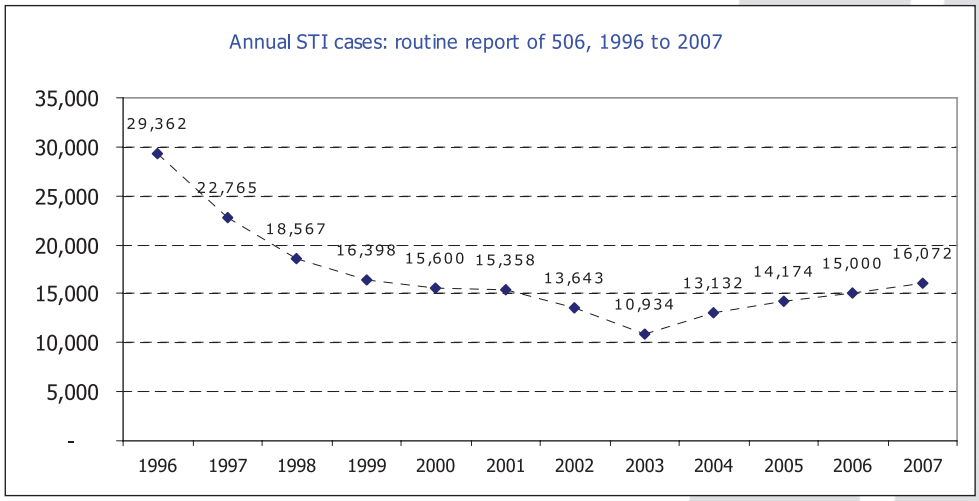
Annex 1

Attitude of MSM and IDUs about free condoms and buying condoms [14]



Annex 2

Annual STI cases reported by routine surveillance 1996 to 2007



Source: MOPH Bureau of AIDS, TB and STI, various years

In the figure above, there was a resurgence trend of STIs reported in 2004 to 2007, reversing the decreased trend from 1996 to 2003. This is not a good sign that condom use rate might reduce, and STI incidence is a proxy indicator of HIV prevalence. Note that this is a voluntary report by mostly public providers, excluding private pharmacies and clinics. In addition, the STI report covered the whole population and did not distinguish whether they were FSW, MSM, IDU or any other subpopulation group.

7. References for Chapter 4

1 UNAIDS. Practical Guidelines for Intensifying HIV Prevention: towards universal access. Geneva, Joint United Nations Programme on HIV/AIDS (UNAIDS) 2007.

2 National AIDS Prevention and Alleviation Committee (2008). UNGASS country progress report: Thailand, reporting period: January 2006 - December 2007. Thailand, Ministry of Public Health

3 Bureau of Epidemiology. Results of national sero-sentinel for HIV prevalence, various rounds. Nonthaburi, Ministry of Public Health

4 Wilson D, Halperin DT. Know your epidemic, know your response: a useful approach, if we get it right. Lancet 2008; 372:423-426

5 International Health Policy Program. Investment in health sector in the 10th National Socio-Economic Development Plan 2007-2011 (2550-2554 BE). A research report to the National Socio-Economic Development Board. 2008. Bangkok. Ministry of Public Health

6 Tantivess S, Walt G. The role of state and non-state actors in the policy process: the contribution of policy networks to the scale-up of antiretroviral therapy in Thailand. Health Policy and Planning 2008 23(5):328-338.

7 Revenga A, Over M, Masaki E, Peerapatanapokin W, Gold J, Tangcharoensathien V, Thanprasertsuk S. The Economics of effective AIDS treatment, evaluating policy options for Thailand. 2006, Washington DC, The World Bank

8 Tangcharoensathien V, Chokchaicharn H, Tisayaticom K, Teokul W, Patcharanarumol W. Asia Pacific Regional Report on National AIDS Spending Assessment 2000-2004. Nonthaburi, Ministry of Public Health, International Health Policy Program, 2006

9 National AIDS Prevention and Alleviation Committee. UNGASS Country Progress Report, Thailand, reporting period January 2006- December 2007. 2008, Nonthaburi, Ministry of Public Health, Department of Diseases Control.

10 Oxford University Press. Redefinition AIDS in ASIA Crafting and effective Response: Report of the Commission on AIDS in Asia, New Delhi.

11 Plipat T, An assessment of the trend of sex behaviour among Thai population and sub-groups. Ministry of Public Health, Bureau of Epidemiology, Disease Control Department 2008.

12 Bureau of Epidemiology. The prevention and alleviation of HIV infection for MSM. Thailand, Nonthaburi, Department of Disease Control, Ministry of Public Health, 2008.

13 Bureau of Epidemiology. The 2006 national sero-sentinel survey. Nonthaburi, Ministry of Public Health, Department of Diseases Control

[14] Laohasiriwong W, Palipat T. Trends of sex behavior in Thailand: General and specific population subgroups. Bangkok, International Heath Policy Program.

[15] Jamison DT, Breman JG, Measham AR, Alleyne G, Claeson M, Evan DB, Jha P, Mills A, Musgrove P. (eds). Disease control priorities in developing countries, 2nd edition. New York: Oxford University Press; 2006

[16] Underhill K, Operario D, Montgomery P: Abstinence-only programs for HIV infection prevention in high-income countries. Cochrane Database Syst Rev 2007:CD005421.

[17] Underhill K, Montgomery P, Operario D: Abstinence-plus programs for HIV infection prevention in high-income countries. Cochrane Database Syst Rev 2008:CD007006.

[18] Di Noia J, Schinke SP: Gender-specific HIV prevention with urban early-adolescent girls: outcomes of the Keepin' It Safe Program. AIDS Educ Prev 2007, 19:479-488.

[19] Jewkes R, Nduna M, Levin J, Jama N, Dunkle K, Khuzwayo N, Koss M, Puren A, Wood K, Duvvury N: A cluster randomized-controlled trial to determine the effectiveness of Stepping Stones in preventing HIV infections and promoting safer sexual behaviour amongst youth in the rural Eastern Cape, South Africa: trial design, methods and baseline findings. Trop Med Int Health 2006, 11:3-16.

[20] Wongjak T, Wibulnuttakul K, Wichacharn M, Tejafong k, Cheewawat W, Saokaew P, Taecharoenkun S: A study of behavior post intervention on reducin HIV risk in intravenous drug users in Northern drug dependence treatment center and community clinic Chiangmai. Chiang Mai: Research Institute for Health Sciences, Chiang Mai University; 2004.

[21] Peragallo N, Deforge B, O'Campo P, Lee SM, Kim YJ, Cianelli R, Ferrer L: A randomized clinical trial of an HIV-risk-reduction intervention among low-income Latina women. Nurs Res 2005, 54:108-118.

[22] Johnson-Masotti AP, Pinkerton SD, Sikkema KJ, Kelly JA, Wagstaff DA: Cost-Effectiveness of a Community-Level HIV Risk Reduction Intervention for Women Living in Low-Income Housing Developments. The Journal of Primary Prevention 2005, 26:345-362.

[23] Shahmanesh M, Patel V, Mabey D, Cowan F: Effectiveness of interventions for the prevention of HIV and other sexually transmitted infections in female sex workers in resource poor setting: a systematic review. Trop Med Int Health 2008, 13:659-679.

[24] Johnson WD, Hedges LV, Ramirez G, Semaan S, Norman LR, Sogolow E, Sweat MD, Diaz RM: HIV prevention research for men who have sex with men: a systematic review and meta-analysis. J Acquir Immune Defic Syndr 2002, 30 Suppl 1:S118-129.

[25] Herbst JH, Beeker C, Mathew A, McNally T, Passin WF, Kay LS, Crepaz N, Lyles CM, Briss P, Chattopadhyay S, Johnson RL: The effectiveness of Individual-, group-, and community-level HIV behavioral risk-reduction interventions for adult men who have sex with men: A systematic review. Am J Prev Med 2007, 32:S38-67.

[26] Cochen DA, Wu S-Y, Farley TA: Structural Interventions to Prevent HIV/Sexually Transmitted Disease: Are They Cost-Effective for Women in the Southern United States? Sex Transm Dis 2006, 33:S46-49.

[27] Garfein RS, Golub ET, Greenberg AE, Hagan H, Hanson DL, Hudson SM, Kapadia F, Latka MH, Ouellet LJ, Purcell DW, et al: A peer-education intervention to reduce injection risk behaviors for HIV and hepatitis C virus infection in young injection drug users. Aids 2007, 21:1923-1932.

[28] Weeks MR, Li J, Dickson-Gomez J, Convey M, Martinez M, Radda K, Clair S: Outcomes of a peer HIV prevention program with injection drug and crack users: the Risk Avoidance Partnership. Subst Use Misuse 2009, 44:253-281.

[29] Luchters S, Chersich MF, Rinyiru A, Barasa MS, King'ola N, Mandaliya K, Bosire W, Wambugu S, Mwarogo P, Temmerman M: Impact of five years of peer-mediated interventions on sexual behavior and sexually transmitted infections among female sex workers in Mombasa, Kenya. BMC Public Health 2008, 8:143.

[30] Elford J, Bolding G, Sherr L: Peer education has no significant impact on HIV risk behaviours among gay men in London. Aids 2001, 15:535-538.

[31] Williamson LM, Hart GJ, Flowers P, Frankis JS, Der GJ: The Gay Men's Task Force: the impact of peer education on the sexual health behaviour of homosexual men in Glasgow. Sex Transm Infect 2001, 77:427-432.

[32] Flowers P, Hart GJ, Williamson LM, Frankis JS, Der GJ: Does bar-based, peer-led sexual health promotion have a community-level effect amongst gay men in Scotland? Int J STD AIDS 2002, 13:102-108.

[33] Borgia P, Marinacci C, Schifano P, Perucci CA: Is peer education the best approach for HIV prevention in schools? Findings from a randomized controlled trial. J Adolesc Health 2005, 36:508-516.

[34] Mahat G, Scoloveno MA, De Leon T, Frenkel J: Preliminary evidence of an adoles cent HIV/AIDS peer education program. J Pediatr Nurs 2008, 23:358-363.

[35] Miller AN, Mutungi M, Facchini E, Barasa B, Ondieki W, Warria C: An outcome assessment of an ABC-based HIV peer education intervention among Kenyan university students. J Health Commun 2008, 13:345-356.

[36] Teerawattananon Y, Hiransuthikul N, Hanvoravongchai P, Tantivess S, Lertpiriyasuwat C, Chaikledkaew U, Thavorncharoensap M, Youngkong S, Leelukkanaveera Y, Mohara A, et al: Effectiveness of routine offer of

HIV counseling and testing at community hospitals in Thailand. Nonthaburi: Health Intervention and Technology Assessment Program; 2008.

[37] Nilabut S: Achievement of integrated teaching using the applied protection motivation theory on AIDS prevention among informal education students in Saraburi. Master of Science (Public Health). Mahidol University, Faculty of Public Health; 1999.

[38] Sunsiri M: An application of life skills to AIDS prevention among grade 9 junior high school students in Burirum province. Master of Science (Public Health). Mahidol University, Faculty of Public Health; 2002.

[39] Nobnorb S: The effectiveness of health education program on AIDS prevention among vocational male students in Krabi province. Master of Science (Public Health). Mahidol University, Faculty of Public Health; 2002.

[40] Simtaraj P: Effects of skills development for prevention of sexual risk behaviour on perceived self-efficacy and sexual risk behavior among male vocational students. Chiang Mai University, Department of Medical and Surgical Nursing; 2001.

[41] Silva M: The effectiveness of school-based sex education programs in the promotion of abstinent behavior: a meta-analysis. Health Education Research 2002, 17:471-481.

[42] Walker D, Gutierrez JP, Torres P, Bertozzi SM: HIV prevention in Mexican schools: prospective randomised evaluation of intervention. Bmj 2006, 332:1189-1194.

[43] Walker D: Cost and cost-effectiveness of HIV/AIDS prevention strategies in developing countries: is there an evidence base? Health Policy Plan 2003, 18:4-17.

[44] Cohen DA, Wu SY, Farley TA: Comparing the cost-effectiveness of HIV prevention interventions. J Acquir Immune Defic Syndr 2004, 37:1404-1414.

[45] Wang LY, Davis M, Robin L, Collins J, Coyle K, Baumler E: Economic Evaluation of Safer Choices. Arch Pediatr Adolesc Med 2000, 154:1017-1024.

[46] Corbett EL, Makamure B, Cheung YB, Dauya E, Matambo R, Bandason T, Munyati SS, Mason PR, Butterworth AE, Hayes RJ: HIV incidence during a cluster-randomized trial of two strategies providing voluntary counselling and testing at the workplace, Zimbabwe. Aids 2007, 21:483-489.

[47] Varghese B, Peterman TA: Cost-effectiveness of HIV counseling and testing in US prisons. J Urban Health 2001, 78:304-312.

[48] Allen S, Meinzen-Derr J, Kautzman M, Zulu I, Trask S, Fideli U, Musonda R, Kasolo F, Gao F, Haworth A: Sexual behavior of HIV discordant couples after HIV counseling and testing. Aids 2003, 17:733-740.

[49] Celentano DD, Bond KC, Lyles CM, Eiumtrakul S, Go VF, Beyrer C, na Chiangmai C, Nelson KE, Khamboonruang C, Vaddhanaphuti C: Preventive intervention to reduce sexually transmitted infections: a field trial in the Royal Thai Army. Arch Intern Med 2000, 160:535-540.

[50] Yotruean K: Using acitivities to promote self-prevention of HIV infection female sex workers, Chiang Mai Province. Chiang Mai University.

[51] NaThalang D: The effectiveness of a health education program on AIDS prevention through behavior modification among traditional massage working girls in Satun province. Master of Science (Public Health). Mahidol University, Faculty of Public Health; 2001.

[52] Wu Z, Rou K, Jia M, Duan S, Sullivan SG: The first community-based sexually transmitted disease/HIV intervention trial for female sex workers in China. Aids 2007, 21 Suppl 8:S89-94.

[53] Rou K, Wu Z, Sullivan SG, Li F, Guan J, Xu C, Liu W, Liu D, Yin Y: A five-city trial of a behavioural intervention to reduce sexually transmit ted disease/HIV risk among sex workers in China. Aids 2007, 21 Suppl 8:S95-101.

[54] Wilkinson D, Ramjee G, Tholandi M, Rutherford G: Nonoxynol-9 for preventing vaginal acquisition of HIV infection by women from men. Cochrane Database Syst Rev 2002:CD003936.

[55] Creese A, Floyd K, Alban A, Guinness L: Cost-effectiveness of HIV/AIDS interventions in Africa: a systematic review of the evidence. Lancet 2002, 359:1635-1642

[56] Fung IC-H, Guinness L, Vickerman P, Watts C, Vannela G, Vadhvana J, Foss AM, Malodia L, Gandhi M, Jani G: Modelling the impact and cost-effectiveness of the HIV intervention programme amongst commercial sex workers in Ahmedabad, Gujarat, India. BMC Public Health 2007, 7:195.

[57] Celentano DD, Nelson KE, Lyles CM, Beyrer C, Eiumtrakul S, Go VF, Kuntolbutra S, Khamboonruang C: Decreasing incidence of HIV and sexually transmitted diseases in young Thai men: evidence for success of the HIV/AIDS control and prevention program. Aids 1998, 12:F29-36.

[58] Weller S, Davis K: Condom effectiveness in reducing heterosexual HIV transmission. Cochrane Database Syst Rev 2002:CD003255

[59] Chesson HW, Greenberg JB, Hennessy M: The cost-effectiveness of the WINGS intervention: a program to prevent HIV and sexually transmit ted diseases among high-risk urban women. BMC Infect Dis 2002, 2:24.

[60] Bedimo AL, Pinkerton SD, Cohen DA, Gray B, Farley TA: Condom distribution: a cost-utility analysis. Int J STD AIDS 2002, 13:384-392.

[61] McGrath JW, Celentano DD, Chard SE, Fullem A, Kamya M, Gangakhedar RR, Khamboonruang C, Joglekar N, Malhotra-Kohli R, Kiwanuka A, Sirirojn B: A group-based intervention to increase condom use among HIV serodiscordant couples in India, Thailand, and Uganda. AIDS Care 2007, 19:418-424.

[62] Thomsen SC, Ombidi W, Toroitich-Ruto C, Wong EL, Tucker HO, Homan R, Kingola N, Luchters S: A prospective study assessing the effects of introducing the female condom in a sex worker population in Mombasa, Kenya. Sex Transm Infect 2006, 82:397-402.

[63] Stoltz JA, Wood E, Small W, Li K, Tyndall M, Montaner J, Kerr T: Changes in injecting practices associated with the use of a medically supervised safer injection facility. J Public Health (Oxf) 2007, 29:35-39.

[64] Laufer FN: Cost-effectiveness of syringe exchange as an HIV prevention strategy. J Acquir Immune Defic Syndr 2001, 28:273-278.

[65] Wu Z, Luo W, Sullivan SG, Rou K, Lin P, Liu W, Ming Z: Evaluation of a needle social marketing strategy to control HIV among injecting drug users in China. Aids 2007, 21 Suppl 8:S115-122.

[66] Coyle SL, Needle RH, Normand J: Outreach-based HIV prevention for injecting drug users: a review of published outcome data. Public Health Rep 1998, 113 Suppl 1:19-30.

[67] Young TN, Arens FJ, Kennedy GE, Laurie JW, Rutherford G: Antiretroviral post-exposure prophylaxis (PEP) for occupational HIV exposure. Cochrane Database Syst Rev 2007:CD002835.

[68] Des Jarlais DC, Kling R, Hammett TM, Ngu D, Liu W, Chen Y, Binh KT, Friedmann P: Reducing HIV infection among new injecting drug users in the China-Vietnam Cross Border Project. Aids 2007, 21 Suppl 8:S109-114.

[69] Vickerman P, Kumaranayake L, Balakireva O, Guinness L, Artyukh O, Semikop T, Yaremenko O, Watts C: The Cost-Effectiveness of Expanding Harm Reduction Activities for Injecting Drug Users in Odessa, Ukraine. Sex Transm Dis 2006, 33:S89-102.

[70] Pitisuttithum P, Gilbert P, Gurwith M, Heyward W, Martin M, van Griensven F, Hu D, Tappero JW, Choopanya K: Randomized, double-blind, placebo-controlled efficacy trial of a bivalent recombinant glycoprotein 120 HIV-1 vaccine among injection drug users in Bangkok, Thailand. J Infect Dis 2006, 194:1661-1671.

[71] Ono S, Kurotaki T, Nakasone T, Honda M, Boon-Long J, Sawanpanyalert P, Kimura K: Cost-Effectiveness Analysis of Antiretroviral Drug Treatment and HIV-1 Vaccination in Thailand Jpn J Infect Dis 2006, 59:168-173.

[72] Sangani P, Rutherford G, Wilkinson D: Population-based interventions for reducing sexually transmitted infections, including HIV infection. Cochrane Database Syst Rev 2004:CD001220.

[73] Wawer MJ, Sewankambo NK, Serwadda D, Quinn TC, Paxton LA, Kiwanuka N, Wabwire-Mangen F, Li C, Lutalo T, Nalugoda F, et al: Control of sexually transmitted diseases for AIDS prevention in Uganda: a randomised community trial. Rakai Project Study Group. Lancet 1999, 353:525-535.

[74] Siegfried N, Muller M, Volmink J, Deeks J, Egger M, Low N, Weiss H, Walker S, Williamson P: Male circumcision for prevention of heterosexual acquisition of HIV in men. *Cochrane Database Syst Rev* 2003:CD003362.

[75] Weiss HA, Quigley MA, Hayes RJ: Male circumcision and risk of HIV infection in sub-Saharan Africa: a systematic review and meta-analysis. *Aids* 2000, 14:2361-2370.

[76] Weiss HA: Male circumcision as a preventive measure against HIV and other sexually transmitted diseases. *Curr Opin Infect Dis* 2007, 20:66-72.

[77] Gray RH, Li X, Kigozi G, Serwadda D, Nalugoda F, Watya S, Reynolds SJ, Wawer M: The impact of male circumcision on HIV incidence and cost per infection prevented: a stochastic simulation model from Rakai, Uganda. *Aids* 2007, 21:845-850.

[78] Kahn JG, Marseille E, Auvert B: Cost-Effectiveness of Male Circumcision for HIV Prevention in a South African Setting. *Plos Medicine* 2006, 3:2349-2358.

[79] Crepaz N, Horn AK, Rama SM, Griffin T, Deluca JB, Mullins MM, Aral SO: The efficacy of behavioral interventions in reducing HIV risk sex behaviors and incident sexually transmitted disease in black and Hispanic sexually transmitted disease clinic patients in the United States: a meta-analytic review. Sex Transm Dis 2007, 34:319-332.

[80] Roland ME, Neilands TB, Krone MR, Katz MH, Franses K, Grant RM, Busch MP, Hecht FM, Shacklett BL, Kahn JO, et al: Seroconversion following nonoccupa tional postexposure prophylaxis against HIV. Clin Infect Dis 2005, 41:1507-1513.

[81] Teerawattananon Y, Vos T, Tangcharoensathien V, Mugford M: Cost-effectiveness of models for prevention of vertical HIV transmission-voluntary counseling and testing and choices of drug regimen. Cost Eff Resour Alloc 2005, 3:7.

[82] Lallemant M, Jourdain G, Le Coeur S, Mary JY, Ngo-Giang-Huong N, Koetsawang S, Kanshana S, McIntosh K, Thaineua V: Single-dose perinatal nevirapine plus standard zidovudine to prevent mother-to-child transmission of HIV-1 in Thailand. N Engl J Med 2004, 351:217-228.

[83] AuBuchon JP, Birkmeyer JD, Busch MP: Cost-effectiveness of expanded human immunodeficiency virus-testing protocols for donated blood. Transfusion 1997, 37:45-51.

[84] Gowing L, Farrell M, Bornemann R, Ali R: Substitution treatment of injecting opioid users for prevention of HIV infection. Cochrane Database Syst Rev 2004:CD004145.

[85] Wong KH, Lee SS, Lim WL, Low HK: Adherence to methadone is associated with a lower level of HIV-related risk behaviors in drug users. J Subst Abuse Treat 2003, 24:233-239.

[86] Pang L, Hao Y, Mi G, Wang C, Luo W, Rou K, Li J, Wu Z: Effectiveness of first eight methadone maintenance treatment clinics in China. Aids 2007, 21 Suppl 8:S103-107.

[87] Lertiendumrong J, Techakehakij W, Pongpirul K, Tangcharoensathien V, Srirattana S: Using nucleic acid testing in screening donated blood in Thailand :a policy analysis. 2007.

[88] Pronyk PM, Hargreaves JR, Kim JC, Morison LA, Phetla G, Watts C, Busza J, Porter JD: Effect of a structural intervention for the prevention of intimate-partner violence and HIV in rural South Africa: a cluster randomised trial. Lancet 2006, 368:1973-1983.

[89] Pronyk PM, Kim JC, Abramsky T, Phetla G, Hargreaves JR, Morison LA, Watts C, Busza J, Porter JD: A combined microfinance and training intervention can reduce HIV risk behaviour in young female participants. Aids 2008, 22:1659-1665.

[90] Thai Working Group on Burden of Diseases. The report on Burden of Disease in Thailand (1999, and 2004). Nonthaburi, Ministry of Public Health, International Health Policy Programme.

[91] UNICEF. The state of the world's children 2008, child survival. 2007, New York, United Nations Childrenís Fund.

[92] Department of Correction, Ministry of Justice. Statistic Report available from http://www.correct.go.th/eng/Stat/statistic.htm#_Number_of_Prisoners_during%2010%20years. Access on 2 February 2009.

[93] Department of Juvenile Observation and Protection, Ministry of Justice. Statistic Report 2008. available on http://www2.djop.moj.go.th/stat/upload_stat/4-1-2.pdf and http://www2.djop.moj.go.th/stat/upload_stat/5-1-11.pdf access on 2 February 2009.

[94] Bureau of epidemiology, Deaprtment of Disease Control. The studies of Ig-G capture BED-EIA. Ministry of Public Health, Nonthaburi, 2008.