

CHAPTER 3

Identifying information regarding effectiveness and cost-effectiveness of policy and strategies reorientation to mitigate the impact of HIV/AIDS in Thailand

1. Background

In Thailand in recent years, as in other developing countries, there has been an increasing impetus to justify resource allocation decisions in the health sector, especially after the introduction of the universal health insurance coverage policy in 2001.[1] The term “evidence-based decision making” was, therefore, introduced to ensure that decisions about health and health care are based on the best available knowledge. To use such an approach it is necessary to appraise what constitutes evidence in relation to health-enhancing interventions. While it is still a common practice to use data on effectiveness to justify health care resource allocation, decision makers, academics and health care professionals are becoming more interested in health economic evaluation, which is designed to guide explicit health resource allocation decisions. This is done by comparing the marginal costs and consequences of alternative health care interventions.[2]

The second edition of “Disease Control Priorities in Developing Countries” hereafter “DCP2”, aims to support a World Bank initiative in the late 1980s which sought informative evidence to guide policy makers in identifying cost-effective interventions for combating major health problems.[3] This is important because evidence suggests that proven effective and cost-effective interventions could save millions of lives in developing countries.

However, the prioritisation of strategies for dealing with sexually transmitted infections and HIV/AIDS, which are among the highest disease burdens in Thailand and many other developing countries, appeared in chapters 17 and 18 of the DCP2 respectively, and was done with several limitations.[3] Firstly, a lack of reliable evidence regarding the effectiveness and cost-effectiveness of many potential strategies was

addressed throughout the chapters. This underlines the fact that many HIV/AIDS programs have been carried out without close monitoring, and rarely incorporated well-defined control groups necessary to show the effectiveness of the intervention. In addition, the authors did not comprehensively and systematically search for evidence, which resulted in the exclusion of a number of published and unpublished literature.

Secondly, the book provides policy recommendations across health care settings which raise concerns about the transferability of the findings from one setting to another. For example, the infrastructure, social and cultural issues that are specific to the Thai health care system may not be well recognised. Lastly, there were no clearly defined strategic plans for the implementation of the recommendations. Some of the recommendations such as school-based education or peer-based programs are too broad, and would need fine tuning before implementation.

This project therefore aims to elaborate on the achievement of DCP2 by offering precise information about the effectiveness and cost-effectiveness of HIV/AIDS interventions that are specific to the Thai setting. This information will be crucial for guiding public investment to lessen both the short and long-term impact of HIV/AIDS in Thailand.

In addition, in the context of universal access to ART, evidence from the National AIDS Spending Assessment indicates a decreasing proportion of expenditure on prevention interventions, hence the need to revitalize HIV prevention. By assessing the effectiveness and cost-effectiveness of prevention interventions, this paper provides useful data that will hopefully guide policy makers in their resource allocation decisions.

2. Objectives

1. To produce a comprehensive list of prevention interventions that are likely to be cost-effective under the Thai setting (the list will include both interventions that are currently available and not available in Thailand);
2. To identify information gaps at the national and international levels concerning the effectiveness and/or cost-effectiveness of HIV/AIDS prevention interventions in general and/or in relation to specific population groups.

3. Methodology

A. Criteria for considering studies for this review

The primary criteria for selection of studies was that they report the effectiveness or cost effectiveness of HIV prevention intervention(s). Nevertheless, the effectiveness of such interventions can be measured in a number of ways. Figure 3.1 shows the concept of outcome hierarchies that emphasize the difference between 'proximal', 'intermediate' and 'distal' outcomes of HIV interventions. It can be seen that the scale of immediate measures of effectiveness of HIV intervention are characterised by the change in knowledge, attitude, perception and skills of the individuals. In many HIV programs, the changes were reported in terms of trust, caution and received assurances. Further along the continuum, these immediate changes can subsequently affect the determinants of health or health behavior, for example, condom use, abstinence or fewer partners in the case of HIV/AIDS interventions. Finally, changes in incidence or morbidity or mortality should be evaluated as the final or ultimate goal of the program.

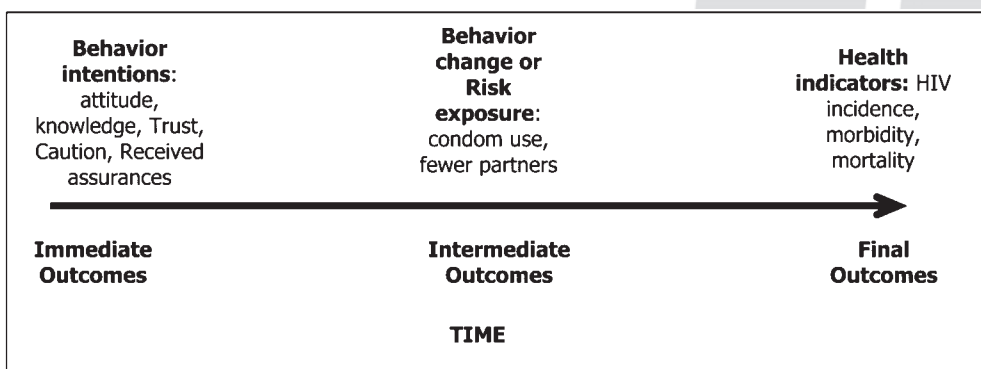


Figure 3.1: Outcome measures for HIV prevention interventions [4]

As it is not always the case that changes in immediate outcomes lead to changes in intermediate and final outcomes, this study considered only the effectiveness of interventions in terms of the changes in HIV risk behaviour (intermediate outcomes) and HIV incidence (final outcomes). Furthermore, the review included only economic evaluation studies that presented the results in terms of cost per HIV infection averted, or cost per Quality-Adjusted Life Year (QALY) gained, or cost per Disability- Adjusted Life Year (DALY) gained.

B. Sources of information

The review gave a higher priority to studies conducted within the Thai setting. These studies better recognise the limitations of resources and

infrastructure that are specific to the health care system in Thailand, and the effectiveness of the many interventions which are determined by different context specific factors. The review of the Thai literature, therefore, included both published and unpublished (grey) literature such as research reports, Master’s dissertations or Ph.D. theses, which are considered to be important in the Thai context. If the local data on the effectiveness or cost-effectiveness of interventions were available, then no further search for international evidence was made. For interventions with no supporting local evidence, a systematic search for evidence from international databases was done. Box 3.1 provides detailed information of data sources used for the review.

Box 3.1: A list of databases that were used for reviewing information on the effectiveness and cost-effectiveness of HIV/AIDS prevention.

Domestic databases:

- Thai HTA database (<http://www.db.hitap.net/>);
- Health Systems Research Institute database (<http://www.hsri.or.th>)
- Journal of Health Science (<http://pubnet.moph.go.th>)
- Thai thesis database (<http://thesis.tiac.or.th>)
- Thai Index Medicus (<http://161.200.96.194>)
- The Thailand Research Fund (<http://www.trf.or.th>)
- International Health Policy Program (<http://ihpp.thaigov.net>)
- Research Library of National Research Council of Thailand (<http://www.riclib.nrct.go.th>)
- Raks Thai Foundation
- PHAMIT
- International Organization for Migration (IOM)

International databases:

- Pubmed;
- Cochrane library:

Because the Thai databases were quite small and the intent was to include as many studies as possible in the review, only ‘AIDS’ OR ‘HIV’ were used as keywords for searching from Thai databases.

For international databases, various keywords and search strategies were used to identify the relevant papers. Table 3.1 reveals keywords and search strategies used for the Pub Med database. For Cochrane, we used ‘searched by topic’ by selecting ‘HIV/AIDS’.

Table 3.1: Keywords and search strategies used for Pub Med

Search 1 : International evidence for cost-effectiveness analysis		abstracts
#7	#4 AND #6 Limits: Publication Date from 1997/01/01 to 2008/04/30, English	236
#6	#4 AND Review	444
#5	#4 Limits: Publication Date from 2005/01/01 to 2008/04/30, English	513
#4	#3 AND economics	3660
#3	#1 AND #2 NOT Vertical Transmission	41452
#2	Prevention and Control OR Primary Prevention OR Intervention Studies OR Early Intervention	722080
#1	Acquired Immunodeficiency Syndrome OR HIV	220908
Search 2 : International evidence of effectiveness		
#8	#7 Limits: Publication Date from 1997/01/01 to 2008/04/30, English	102
#7	#5 AND Review	126
#6	#5 Limits: Publication Date from 2005/01/01 to 2008/04/30, English	373
#5	#4 NOT Vertical transmission	1288
#4	#1 AND #2 AND #3	1482
#3	Randomized Controlled Trial	302239
#2	Prevention and Control OR Primary Prevention OR Intervention Studies OR Early Intervention	785868
#1	Acquired Immunodeficiency Syndrome OR HIV	221573
Search 3 : International evidence by risk group		
#23	#22 Limits: Publication Date from 2005/01/01 to 2008/07/31, English	4
#22	#1 AND #2 AND #5 AND #21	5
#21	migrant worker	6549
#20	#19 Limits: Publication Date from 2005/01/01 to 2008/07/31, English	50
#19	#1 AND #2 AND #5 AND #18	163
#18	iv drug user	10036
#17	#16 Limits: Publication Date from 2005/01/01 to 2008/07/31, English	49
#16	#1 AND #2 AND #5 AND #15	130
#15	Search Male Homosexuality OR gay	19013
#14	#13 Limits: Publication Date from 2005/01/01 to 2008/07/31, English	35
#13	#1 AND #2 AND #5 AND #12	107
#12	prostitution OR "sex workers"	5017

Search 3 : International evidence by risk group		abstracts
#11	#10Limits: Publication Date from 2005/01/01 to 2008/07/31, English	8
#10	#1 AND #2 AND #5 AND #9	18
#9	discordant*	12552
#8	#7 Limits: Publication Date from 2005/01/01 to 2008/07/31, English	22
#7	#1 AND #2 AND #5 AND #6	77
#6	breast feeding	23834
#5	#3 OR # 4	688368
#4	observation	161732
#3	Randomized Controlled Trial	305945
#2	Prevention and Control OR Primary Prevention OR Intervention Studies OR Early Intervention	903379
#1	Acquired Immunodeficiency Syndrome OR HIV	225001

C. Types of studies

For the purpose of this review, studies were identified as being one of the following design types:

1. Systematic review and meta-analysis of randomised controlled trials (RCTs)
2. Systematic reviews of case controls or cohort studies
3. Case control studies
4. Cohort studies

Descriptive or qualitative reports were deliberately excluded from the review. Because the above information is vulnerable to different degrees of bias, systematic review and meta-analysis of high quality RCTs are the most favourable data sources [2].

The advantages of using systematic reviews of clinical effects are two fold: First, a more precise estimate can be attained from combining the outcome data from a number of studies. Second, by using the results from studies carried out in a range of settings, assuming that these studies are sufficiently homogenous to be comparable, the estimate can then be applied to a more general patient population with different baseline risks, rather than specifically for a population group selected for an individual trial. In cases where a meta-analysis of RCT(s) was not available for particular reasons, then evidence available in a higher hierarchy, based on Table 3.2, which presents a broad agreement on the level of clinical evidence, was considered.

Table 3.2: Levels of clinical evidence

1++	Systematic reviews & meta-analyses of RCTs or RCT(s) conducted in Thailand with a very low risk of bias.
1+	Systematic reviews & meta-analyses of RCTs or RCT(s) conducted internationally with a very low risk of bias.
1-	Systematic reviews & meta-analyses of RCTs or RCT(s) conducted in Thailand with a high risk of bias.
1--	Systematic reviews & meta-analyses of RCTs or RCT(s) conducted internationally with a high risk of bias.
2++	Systematic reviews of case control or cohort studies conducted in Thailand with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal.
2+	Systematic reviews of case control or cohort studies conducted internationally with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal.
2-	Case control or cohort studies conducted in Thailand with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal.
2--	Case control or cohort studies conducted internationally with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal

Adapted from [2]

Economic evaluation can be carried out using a number of different perspectives. These range from the broadest societal perspective, which includes all health and non-health care expenses paid by health providers, health insurers, patients' employers and households, to a narrow individual patient perspective, which only includes expenses paid by patients. As there is general consensus among health economists that the societal perspective is the most useful for priority setting in health care, this review compared the value for money of different HIV/AIDS preventive interventions using a societal viewpoint. However, if the economic evidence of the societal viewpoint was not provided, only the health care provider perspective was used.

In addition, different monetary currencies and unit costs associated with particular resources between locations and overtime are among the most commonly cited obstacles to applying economic evaluation findings across settings. This study adjusted all cost-effectiveness ratios in a common currency, the international dollar, and at present value-2008, using the local Consumer Price Index (CPI) from the study country and Purchasing

Power Parity (PPP) information from the World Bank (12.609 National currency per current international dollar).

D. Scope and types of interventions

Interventions under this investigation were those that showed evidence of reducing HIV incidence or risk behaviour likely to affect horizontal and vertical HIV transmission. The set of interventions was not restricted to those in practice in Thailand or funded by the Thai government. It also covered interventions provided at all levels, i.e. individuals, groups, and communities, which are likely to be beneficial in the reduction of the HIV/AIDS epidemic worldwide.

Given that a wide range of interventions were included in this study, it is vital that they have clear definitions and detailed information. This would help to ensure better understanding of each specific intervention, its delivery mode, and target population group. A lack of clarity and descriptive detail of specific interventions makes it difficult to assess and/or compare their effectiveness and cost-effectiveness in different settings. It is also impossible to make sensible recommendations for policy decision making if there are no concise definitions for commonly implemented intervention approaches.

It is necessary that this study establish or adopt a standard structure on how to define and classify interventions for the prevention of HIV/AIDS. Fortunately, a recent framework for classifying HIV prevention interventions proposed by UNAIDS serves this purpose well. The UNAIDS framework recommends that an intervention should be defined based on: i) foundation of brief description including descriptions of activities or services and commodities provided in the intervention and, when relevant, key message content included with the intervention, and ii) detail codified in quality standards namely message content, the method of delivery, target population, setting and the desirable outcomes, and its theoretical ground (see Figure 3.2).

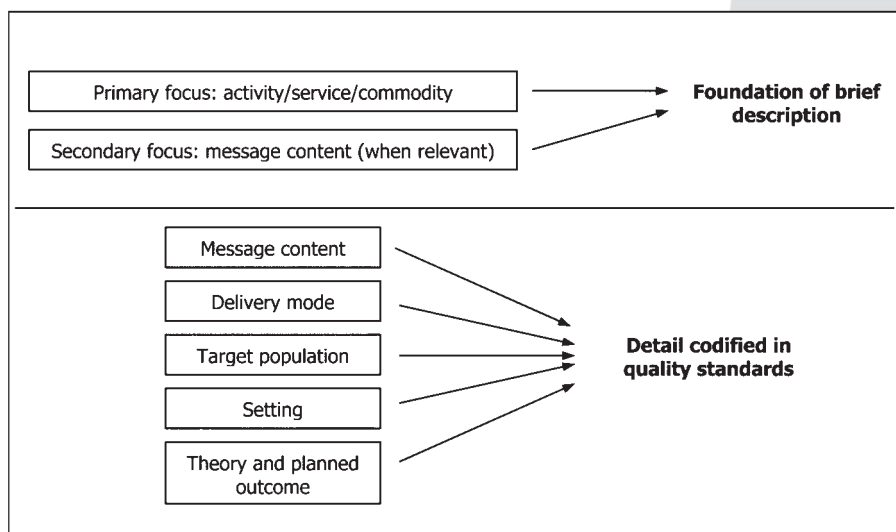


Figure 3.2: Proposed framework for establishing intervention definitions [5]

The same UNAIDS report also provides guidance for classifying HIV prevention interventions. Based on its recommendations, interventions are grouped into five broad categories as follows:

1. interventions that affect knowledge, attitude and beliefs and influence psychological and social correlates of risk;
2. harm reduction interventions that lower the risk of a behaviour, but do not eliminate the behaviour;
3. biological/biomedical interventions that strive to reduce HIV infection and transmission risk;
4. mitigation of barriers to prevention and negative social outcomes of HIV infection; and
5. mitigation of biological outcomes of HIV infection. However, as the fifth category was not related to HIV prevention interventions, it was not included in the review.

From the above recommendations, we provide a definition and classification of each HIV prevention intervention in Table 3.3.

Table 3.3: Classification and definition of HIV prevention interventions under the review

Name of intervention	Activities, services, commodity	Message content (if relevant)	Delivery mode	Target population/ setting	Outcomes/ theory
I. Interventions affecting knowledge, attitudes and beliefs and influencing psychological and social risk correlates					
Abstinence	Abstinence-only programs often target family involvement and community norms, as well as individual behaviour by addressing multiple influences on knowledge, attitudes, and values. Abstinence-plus program promote sexual abstinence as the best means of preventing HIV, but also encourage condom use and other safer-sex practices for sexually active participants.	the social, health-related, and psychological benefits of abstaining from sexual activity-most of them note the potential harm of sexual activity outside marriage	Varies	young people (10-24 years) who may not yet have initiated sexual activity	to encourage both primary abstinence (remaining a virgin) and secondary abstinence (returning to abstinence after sexual activity) to refrain from sexual activity/theoretical underpinnings include social learning theory, the health-belief model, cognitive-behavioural theory, the theory of social inoculation, the culture of poverty perspective, and utility maximization perspectives
Community-based education (including opinion leader programs)	This program affects community-wide behaviour change. In this approach, popular opinion leaders are trained to disseminate risk reduction messages to their peers, and thereby influence other group members to re-evaluate their own HIV risk, modify their attitudes toward safer sexual practices, and change their behaviour.	Varies	Varies	Broad population base	Social change theory

Name of intervention	Activities, services, commodity	Message content (if relevant)	Delivery mode	Target population/ setting	Outcomes/ theory
Peer education intervention	The peer education intervention is a model of training that supports participants to develop and then deliver information to their peers.	Varies: e.g. mitigation of stigma and discrimination towards people living with HIV	Peer educators, trained outreach workers	Typically targeted to smaller, unique populations	Varies: includes diffusion-based interventions that strive to affect behaviour through the dynamics of social networks
Life Skills-Based Education (LSBE)	LSBE refers to an interactive process of teaching and learning which enables learners to acquire knowledge and to develop attitudes and skills which support the adoption of healthy behaviour.	It is being adopted as a means to empower young people in challenging situations.	Varies	Young people (10-24 years)	Enhanced self-efficacy
Mass media campaigns	Mass communication potentially to influence social norms, expectation and behaviour related to HIV/AIDS	Varies e.g. people in the community are at risk of HIV infection through sexual behaviour	Television, radio, public events	Typically large segments of the population, but content can be targeted to subpopulations	Varies: reduced HIV-related risk behaviour, changes in social norms
Provider-initiated HIV counselling and testing (PICT)	All patients are offered HIV testing and consent to be tested is implied as with any other clinically indicated laboratory test; patients may opt out if they do not want to be tested.	e.g. Uptake of client-initiated HIV testing and counselling has been hampered by many of the same factors that limit uptake of other HIV-related services,	Healthcare providers	People visiting health care facilities for any purpose	To increase uptake of VCT and early recruit to ART if positive, or maintain low risk behavior in the population when detected negative

Name of intervention	Activities, services, commodity	Message content (if relevant)	Delivery mode	Target population/ setting	Outcomes/ theory
		including stigma and discrimination, limited access to treatment, care and health services in general, as well as gender issues.			
School-based education	School-based education programs, an aspect of information, education, and communication, provide information to young people and reinforce healthy norms in a school setting.	Varies	Teacher, healthcare provider	School children	Varies
Voluntary counselling (with/ without HIV testing)	Individual or group of people are taught about HIV/AIDS. When HIV testing is performed, counsellors notify their clients of their HIV status and provide counselling support to help them cope with the outcome. This intervention must be performed on a voluntary basis.	Causes and risk factors of AIDS, the steps necessary to prevent HIV infection, and how to prevent the spread of the disease for those who have already been infected with HIV	Trained counsellor	Varies	Varies
Workplace-based education (including prison-based education)	This program communicates HIV prevention messages to employees in either formal or informal settings, acts as a role model for behaviour change, and distributes and demonstrates the correct use of condoms.	Varies	healthcare provider, peer-educator, trainer	Varies	Varies

Name of intervention	Activities, services, commodity	Message content (if relevant)	Delivery mode	Target population/ setting	Outcomes/ theory
Workplace-based education (including prison-based education)	This program communicates HIV prevention messages to employees in either formal or informal settings, acts as a role model for behaviour change, and distributes and demonstrates the correct use of condoms.	Varies	healthcare provider, peer-educator, trainer	Employee	It induced changes in knowledge, attitudes, and risk behaviour.
II. Harm reduction interventions that lower the risk of a behaviour, but do not eliminate the behaviour					
Male and female condom use and/or distribution	This program provides free condoms in readily visible and accessible sites through health care facilities and private businesses (through social marketing) serving populations at high risk of STIs and HIV.	-	Varies, but typically free distribution in public settings	Sexually active at-risk in individuals	Decrease risk from unprotected sexual intercourse
Needle and syringe exchange	This program provides a way for those IDUs who continue to inject to safely dispose of used needles and syringes and to obtain drug injection equipment at no cost. It provides a range of related prevention and care services that are vital to helping IDUs reduce their risks of acquiring and transmitting blood-borne viruses as well as maintain and improve their overall health.	-	Most typically community-based	Injecting drug users	Decrease use of contaminated injection equipment
Needle social marketing	The intervention aimed to reach all IDUs at both detoxification centres and local health institutions e.g. drug stores, community hospitals and private clinics. In detoxification centres, the intervention mainly consisted of health education provided by health workers. In the community, health workers or peer educators visited drug users'	-	Most typically community-based	Injecting drug users	Decreased use of contaminated injection equipment

Name of intervention	Activities, services, commodity	Message content (if relevant)	Delivery mode	Target population/ setting	Outcomes/ theory
	homes or places where they gathered. The Intervention included face-to-face health education, dispensing and recalling needles. Drug users could also collect materials/needles from the local hospitals or Centres for Disease Control (CDC) and from peer educators.				
III. Biological/biomedical interventions that strive to reduce HIV infection and transmission risk					
Anti-retroviral prophylaxis for vertical HIV transmission	It is a combination between HIV counselling and testing, anti-retroviral prophylaxis and breastfeeding substitution. The Thai PMTCT program provides free services for voluntary HIV counselling and testing (VCT) for all pregnant women (approximately 0.8 million per annum), at first antenatal visit and at 28 weeks. HIV infected pregnant women receive free antiretroviral drugs, breast milk substitutes for 12 months and counselling with their partner to test their newborn babies at 12 and 18 months, and recruit them into universal ART programs when CD4 counts indicate the necessity.	-	Primarily clinic-based, which is linked to antenatal services	Infants born to HIV-positive mothers	Reduction in mother-to-child transmission and prevalence/incidence of HIV positive infants
Breastfeeding substitution for HIV positive mothers	Require access to clean water for feeding preparation	-	Via distribution of feeding substitutes	HIV-positive mothers and their infants	Reduction in mother-to-child transmission and prevalence/incidence of HIV positive infants

Name of intervention	Activities, services, commodity	Message content (if relevant)	Delivery mode	Target population/ setting	Outcomes/ theory
Diagnosis and treatment of sexually transmitted infections	The process should be confidential, voluntary and non-coercive and include all sexual partners involved with each STI patient.	-	healthcare provider, typically clinic-based	Varies	Reduced prevalence of sexually transmitted infections-thought to also reduce HIV incidence
Drug treatment including drug substitution treatment	Methadone administered orally as syrup is the pharmacological agent that is most commonly used for substitution treatment of opioid dependence worldwide. There are two types of interventions. 1) Methadone maintenance treatment (60 mg/day or more) 2) Detoxification, the schedule is completed in 90 days. Data about HIV risk behaviour was reported for weeks one and two of treatment while participants were stabilised on methadone (40 mg/day) and weeks five and six at the commencement of the dose taper	-	healthcare provider	Injecting drug users/specialist drug and alcohol treatment program	Decreased dependence on injecting drugs and therefore minimize use of contaminated injecting equipments
HIV vaccine	The first efficacy trial (Phase III) in Thailand of an HIV candidate vaccine (containing gp120 B and E subtypes) was initiated in 1999. It was conducted among injection drug users attending 17 Bangkok Metropolitan Administration (BMA) drug-treatment clinics. Eligibility criteria were: aged 20-60 years, drug injection during the previous year, being negative for HIV-1 by	-	healthcare provider	varies	Reduced incidence of HIV infection

Name of intervention	Activities, services, commodity	Message content (if relevant)	Delivery mode	Target population/ setting	Outcomes/ theory
	<p>ELISA at screening and baseline. Vaccine or placebo was injected intramuscularly at months 0, 1, 6, 12, 18, 24, and 36 (36 months of follow-up). The primary end point for vaccine efficacy was HIV-1 infection.</p>				
Male circumcision	<p>Male circumcision is the surgical removal of all or part of the foreskin of the penis.</p>	-	healthcare provider	Males/typically clinic-based	Reduced biological risk of HIV acquisition
Mass or community treatment of sexually transmitted infections	<p>The treatment consisted of azithromycin (1,000 mg single dose oral), ciprofloxacin (250 mg single dose oral) and metronidazole (2.0 g oral). Ciprofloxacin (FDA category C) was not given to pregnant women, who instead received cefixime 400 mg oral. Metronidazole (2.0 g oral) is the recommended single-dose regimen for trichomoniasis and provides short-term remission in 70-85% of cases of bacterial vaginosis; it is safe in pregnancy (FDA category B). Benzathine benzylpenicillin (2.4 million IU intramuscular injection) was given in the home to TRUST (Toluidine Red Unheated Serum Test--the syphilis screening)-positive intervention-group participants</p>	-	healthcare provider	All consenting adults aged 15-59 years were given directly observed treatment of STI at home every ten months, irrespective of laboratory testing results or the presence of symptoms.	Reduced prevalence of sexually transmitted infections-thought to also reduce HIV incidence

Name of intervention	Activities, services, commodity	Message content (if relevant)	Delivery mode	Target population/ setting	Outcomes/ theory
	<p>within 24 hr of serum collection; treatment was based on serological findings, since the administration of injections to uninfected individuals would be unacceptable. The drug regimen was given over 2 days (azithromycin and ciprofloxacin in day 1; metronidazole and intramuscular benzathine benzylpenicillin on day 2).</p>				
Microbicides	<p>Microbicides are compounds formulated as gels, films, foams, suppositories, or creams and which, when inserted into the vagina, will prevent male-to-female transmission of HIV and other STIs. Nonoxonyl-9, one potential vaginal microbicide, is widely used spermicide. The dosage ranged from 70 to 1,000 mg depending on the dosage form.</p>	-	<p>Varies, but typically free distribution in public settings</p>	<p>All women were advised to use vaginal microbicides prior to each episode of intercourse.</p>	<p>One of the important concepts in vaginal microbicide development is that it is a female-controlled method that does not necessarily require negotiation with a male sexual partner for use especially in the context of lower power relationship.</p>
Post-exposure prophylaxis	<p>Two or more antiretroviral drugs are recommended for duration of 4 weeks to reduce the likelihood of HIV infection after potential exposure, either occupationally or through sexual intercourse.</p>	-	<p>healthcare provider</p>	<p>Healthcare workers, rape victims and others exposed to bio hazardous material</p>	<p>Reduced incidence of HIV infection</p>

Name of intervention	Activities, services, commodity	Message content (if relevant)	Delivery mode	Target population/ setting	Outcomes/ theory
Screening blood products and donated organ for HIV	Blood screening should be anonymous, the test result cannot be linked with the person whose blood has been tested, other than by the person themselves or a counselor. Normally the blood sample is given a number or code, so that the person can be contacted if their results are positive.	-	healthcare provider	Recipients of blood products/and donated organs	Reduction in iatrogenic transmission of HIV through transfusion of blood/and blood products
IV. Mitigation of barriers to prevention and negative social outcomes of HIV infection					
Microfinance	The intervention employs such assets as savings accounts, family microenterprises, and scholarships to fight poverty and promote health and social functioning. For example; loans were administered for the development of income generating activities with a group lending model.	-	Varies, individuals, microfinance and microcredit, social protection, insurance	Individuals and families economically affected by AIDS	Economic empowerment. May also reduce secondary transmission of HIV
Increases in alcohol taxes	-	-	Legal system	Legislators, politicians decision-makers	A more restrictive alcohol policy through supply and demand side interventions reduces alcohol consumption, which in turn decreases risky sexual activity.

E. Description of studies

A search of Thai databases was carried out and a total of 932 abstracts were initially identified (see Figure 3.3). Of these, 890 abstracts were excluded based on our exclusion criteria namely: i) publications of the same study, ii) descriptive studies, iii) assessment of satisfaction, knowledge and attitude towards HIV/AIDS, risk behaviour and program activities (not outcomes), iv) reports of case studies, v) unit cost analysis.

Of the 42 papers reviewed, only 14 were found to be relevant and included in the analysis. Of the 28 papers excluded, 25 reported only immediate outcomes of the HIV prevention programs. For example, two papers which reported the effectiveness of the distribution of condom vending machines in the communities, only used numbers of condoms sold per machine and/or customer’s satisfaction as their outcome measures. [6, 7] Three other papers that evaluated drug regimens for the prevention of vertical HIV transmission were excluded because the regimen under investigation, i.e. AZT only regimens, is now not in clinical practice in Thailand. [8-10]

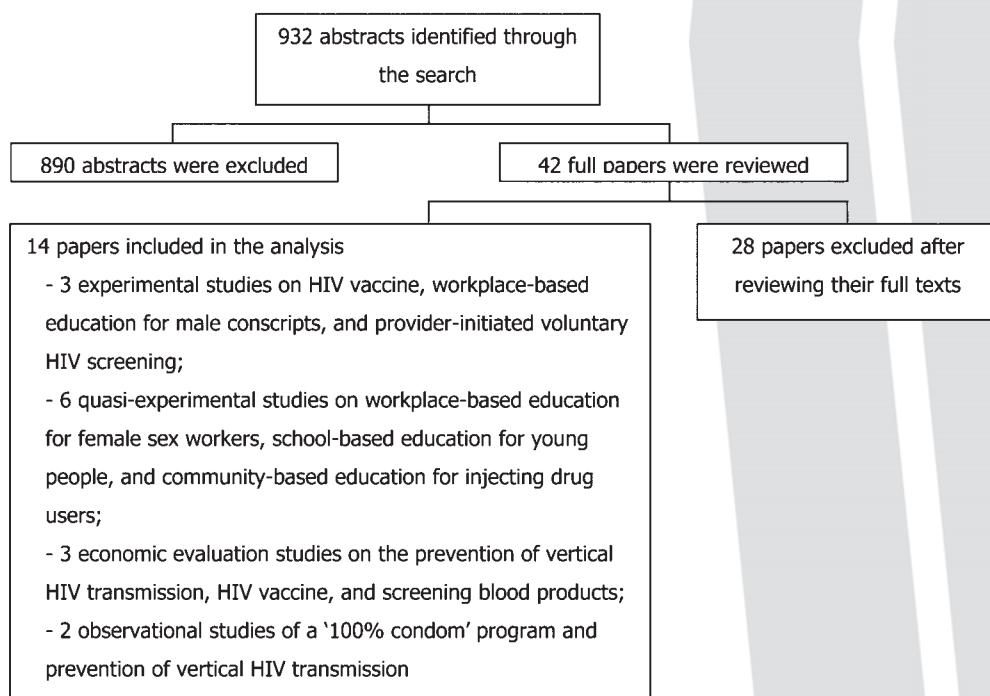


Figure 3.3: Literature review profile of the Thai literature

A total of 1392 abstracts were identified through international searches (see Figure 3.4). Of these, 1203 studies were eliminated because they were editorials, descriptive, or qualitative reports. Also excluded were a number of studies that assessed the effectiveness and cost-effectiveness of programs for the prevention of mother-to-child HIV transmission because Thai studies had already been identified. The full text of the remaining 189 studies was reviewed and 71 studies were found to be relevant and included in the analysis in the final stage.

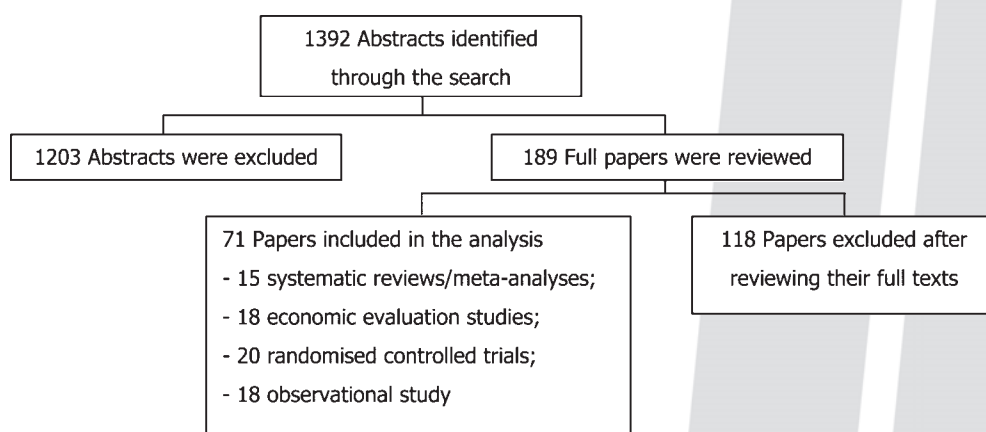


Figure 3.4: Literature review profile of the international literature

4. Results

Table 3.4 Summarizes the effectiveness and cost-effectiveness of each HIV prevention intervention based on the review of domestic and international studies. It was not surprising that a much larger proportion of effectiveness and cost-effectiveness studies were conducted in international settings, mainly the US followed by Sub-Saharan Africa. There were more effectiveness studies than cost-effectiveness studies conducted for HIV prevention within the Thai setting (11 effectiveness studies vs. 3 cost-effectiveness studies). More effectiveness studies were identified than cost-effectiveness studies from international settings (45 effectiveness studies vs. 26 cost-effectiveness studies).

Furthermore, most of the assessments focused on interventions affecting knowledge, attitudes and beliefs (48/95 or 51%), followed by biological/biomedical interventions (28/95 or 29%), harm reduction interventions (16/95 or 17%) and, lastly, mitigation of barriers to prevention and negative social outcomes of HIV infection (3/95 or 3%).

Table 3.4: Summary of the effectiveness and cost-effectiveness evidence of HIV prevention interventions

Interventions	Population	Effectiveness			Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio (s)
I. Interventions affecting knowledge, attitudes and beliefs and influencing psychological and social risk correlates								
Abstinence-only programs	Young people	1+	High-income countries	No evidence that the programs can reduce HIV risk. [11]	NA	NA	NA	NA
Abstinence-plus programs	Young people	1+	High-income countries	It found a significantly protective effect on sexual risky behaviours i.e. incidence and frequency of unprotected/protected sex; number of sexual partners; increased condom use. However, no significant effect on biological outcomes i.e. incidence of STI and pregnancy. [12, 13]	NA	NA	NA	NA
Community-based education	Young girls	1--	US	During 3-12 months of follow-up at a health care setting, the intervention reduced sexual risk behavior (e.g., vaginal sex without use of condom, giving oral sex, and alcohol and drug use before sex). [14, 15]	NA	NA	NA	NA
Community-based education	Young people in rural areas	1--	South Africa	There was no significant improvement for HIV sero-status and sexual risk behavior after 2 years of follow-up. [16]	NA	NA	NA	NA
Community-based education	Injecting drug users	2-	Thailand	Drug use and sharing injection equipment with others was not significantly decreased after 1 month follow-up. [17]	NA	NA	NA	NA

Interventions	Population	Effectiveness			Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio(s)
Community-based education	Women living in low income housing developments	1--	US	The intervention improved HIV knowledge, partner communication, risk-reduction behavioral intentions, and condom use, and decreased perceived barriers to condom use after 6-12 months follow-up. [18, 19]	Societal	US	'do nothing'	ICER is PPP\$ 2,551,240 per HIV infection averted. [19]
Community-based intervention (Sonagachi)	Female sex worker	2+	India	HIV prevalence among sex workers (< 10%) had been lower than the national average (~30%). [20]	NA	NA	NA	NA
Community-based education (including opinion leader program)	Men who have sex with men	1+	Various	The interventions were effective in reducing unprotected sex by 35% at follow-up intervals ranging from 4 months to 1 year. They were also effective in increasing reported condom use during anal intercourse by 59 %. [21, 22]	Societal	US	'do nothing'	ICER is PPP\$ 165,346 per HIV infection averted [23]
Mass media campaigns	general population aged 17-45 years	2--	US	The media campaign would increase condom use from 48 to 57%. [24]	Health care provider's	US	'do nothing'	ICER is PPP\$ 87,124 per HIV infection averted. [24]
Peer education intervention	Injecting drug users	1--	US	After 6 months of follow-up, the intervention produced a 29% greater decrease in overall injection risks relative to the control (OR 0.71; 95%CI 0.52- 0.97), and a 76% decrease compared with baseline. Sexual risk behaviour and safe injection were also decreased from baseline, but they did not differ between trial arms. [25, 26]	NA	NA	NA	NA

Interventions	Population	Effectiveness				Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio(s)	
Peer education intervention	Female sex worker	2+	Kenya	Peer-mediated interventions were associated with an increase in protected sex after 5 years follow-up. Female sex workers (FSW) who received peer interventions had more consistent condom use with clients compared with unexposed FSW (86.2% vs 64.0%; adjusted odds ratio = 3.6, 95% CI = 2.1-6.1). These differences were larger among female sex workers with greater peer-intervention exposure. HIV prevalence was 25% (17/69) in FSW attending ≥ 4 peer-education sessions, compared with 34% (25/73) in those attending 1-3 sessions (P= 0.21). [27]	NA	NA	NA	NA	
Peer education intervention	Men who have sex with men	2+	UK Scotland	Peer education was less effective in sexual behaviour change among MSM. No significant difference between control and intervention group in the proportion reporting unprotected anal intercourse (OR = 1.12, 95%CI 0.81- 1.55) and negotiated safety (OR = 1.11, 95% CI 0.79-1.57). [28-30]	NA	NA	NA	NA	
Peer education intervention	Young people	2+	Italy, US, Kenya	The intervention improved neither condom use nor number of sexual partners after 2 years follow-up. The percentage of	NA	NA	NA	NA	

Interventions	Population	Effectiveness			Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio (s)
Routine (provider-initiated) voluntary HIV screening at healthcare settings	Adults aged 15-65 years	1++	Thailand	<p>students reporting condom use during the most recent sexual intercourse slightly decreased from 55.1% to 49.7% in intervention arm, though the decrease was not significant. The percentage of students with more than one partner was increased. [31-33]</p> <p>Routine provider initiated HIV screening significantly increased the acceptance rate of HIV testing and the number of HIV infection detected, compared to the standard practice of patient-initiated HIV testing (5.59% VS 0.32%) and (23 VS 10 HIV detection within 2 months in 8/8 case and control community hospitals), respectively. [34]</p>	Healthcare provider's	Thailand	'no screening'	ICER is PPP\$ 22,899.16 per HIV infection averted [34]
School-based sex education program (combined with life skills)	Young people	2-	Thailand	<p>Three studies show improvements in AIDS preventive behavior i.e. decreased number of visits to night clubs, decreased incidence of watching arousal media, increased sporting activities, decreased consumption of alcohol , decreased number of sex partners, and increased condom use in the experimental group. However, these changes were not significant after 4-6 weeks of follow-up. [35-37]</p> <p>One study found that the sexual risk behavior was significantly improved after 4 month follow-up. [38]</p>	NA	NA	NA	NA

Interventions	Population	Effectiveness			Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio(s)
School-based sex education program	Young people	1--	US, Italy, Mexico	The results of meta-analysis of 12 controlled studies in the US indicated that the overall mean effect size for abstinent behaviour was very small (effect size=0.05, 95%CI 0.01-0.09). [39] In addition, the intervention targeted to improve sexual risk behavior did not induce change in condom use or number of sexual partners after 1-year follow-up. The only apparent benefit was a greater improvement in knowledge of HIV. [40]	Societal	India / US / Cameroon	'standard practice'	ICERs ranged from PPP\$ 4,853 [41] to 137,950,790 [42, 43] per HIV infection averted.
Voluntary HIV counselling and testing (VCT) at workplace	HIV-negative employee	1--	Zimbabwe	Highly acceptable VCT did not reduce HIV incidence at 2-year follow-up. HIV incidence was higher in the intensive VCT arm (mean per-site HIV incidence 1.37 per 100 person-years follow-up (PYFU) than in the standard VCT arm (mean per-site HIV incidence 0.95 per 100 PYFU), but the difference was not significant (adjusted rate ratio 1.49; 95%CI, 0.79-2.80). [44]	NA	NA	NA	NA
Voluntary HIV counselling and testing (VCT) in Prisons	Prison inmates at or near their time of release	NA	NA	NA	Societal	US prisons	'no HIV counselling and testing provided at Prisons'	ICER of offering VCT at prisons was PPP\$ 508,651 per HIV case averted. [45]

Interventions	Population	Effectiveness				Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio (s)	
Voluntary HIV counselling and testing (VCT) and STD services at both clinic setting and community setting	Men who have sex with men	1+	Various	Interventions delivered at the individual level were effective in reducing unprotected anal intercourse (UAI) by 43% OR=0.57, 95% CI=0.37-0.87). These effects were significant in both the short- (median 6 months) and long-term (median 12 months). It also improves sexual risk behavior: condom use with anal intercourse (OR=1.55, 95%CI 0.73-3.29), number of sex partners (OR=0.97, 95%CI 0.45-2.06), unprotected oral sex (OR=0.58, 95%CI 0.28 -1.24), incident HIV (OR=0.62, 95%CI 0.36-1.06). [22]	NA	NA	NA	NA	
Voluntary HIV counselling and testing (VCT) plus STI services and free condom	HIV sero-discordant couples	2--	Zambia	Proportion of reported condom use increased from <3% to >80% and remained stable through > 12 months of follow-up. Since underreporting was common, HIV transmission was still detected when couples had reported always using condoms. DNA sequencing confirmed that 87% of new HIV infections were acquired from spouses. [46]	NA	NA	NA	NA	
Workplace-based education	Male conscripts in military camps	2++	Thailand	Intensive workplace-based education programs for male conscripts (over 15 months) successfully decreased incidence of HIV infection by 50% during the period of two years but not statistically significant (RR 0.49, 95%CI 0.11-2.26). [47]	NA	NA	NA	NA	

Interventions	Population	Effectiveness			Cost-effectiveness				
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio (s)	
		Workplace-based education ± condom distribution	Female sex workers	2-	Thailand	Risky sexual behavior significantly decreased in the intervention group compared to the control group after 1-week follow up. [48, 49]	NA	NA	NA
Workplace-based education/ condom distribution/ free STD clinic visits	Female sex workers	2+	Indonesia, China	Interventions were effective in increasing condom use (from 55-60% to 67-85%, $p < 0.01$) and reducing STIs among sex workers at 12 months evaluation. Prevalence of gonorrhoea fell from 26% to 4%, and Chlamydia fell from about 41 to 26%. [50, 51] The prevalence of HIV remained low throughout the study. [52]	Health care provider's	India/ Cameroon	'do nothing'	ICER of the mixed interventions targeted sex workers ranged from PPP\$ 279 to 566 per HIV infection averted. [53, 54]	
II. Harm reduction interventions that lower the risk of a behaviour, but do not eliminate the behaviour									
'100% condom program'	Male conscripts	2-	Thailand	The data suggests that increased condom use along with some decrease in the frequency of commercial sex among military conscripts led to a marked decline in STI and also to a subsequent reduction in HIV incidence. [55]	NA	NA	NA	NA	NA
Condom use (availability and accessibility)	Sexually active heterosexual couples	2+	Various (reviewed evidence)	HIV incidence in the 'always' condom user group was 1.14 (95% CI 0.56-2.04) per 100 person-years. The HIV incidence in 'never' condom user group was 5.75 (95%CI 3.16-9.66) per 100 person-years. Proportionate reduction in HIV seroconversion with condom use was approximately 80%. [56]	Healthcare provider's	US	'do nothing'	Increase availability / accessibility of condoms in low HIV prevalence population (1.6% in men and 0.6% in women) appears to be cost-effective with ICER ranged from PPP\$ 7669 to 247,775 per case of HIV averted [42, 57] or about PPP\$ 22,065 per QALY saved. [58]	

Interventions	Population	Effectiveness			Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio (s)
Condom use and sex education	HIV sero-discordant couples	2-	Thailand, India, Uganda	Condom use with regular partner reached 100% at one-month follow-up visit. At three-month follow up, more than 90% of the participants reported having been able to communicate and felt more comfortable discussing AIDS with their partner, and very confident that they could refuse sex if their partner refused to use a condom (an increase from 70% at baseline, p=0.0001). [59]	NA	NA	NA	NA
Introduction of Female condom	Female sex workers	2--	Kenya	The introduction of female condoms led to a small, but significant, increase in consistent condom use with all partners. Adjusted odd ratio for consistent condom use after female condom introduction was 1.7 (95% CI: 1.4 to 2.2). [60]	No specify/ Health care provider's	South Africa/ Kenya	'do nothing'	ICER ranged from PPP\$ 934 to 7,863 per HIV infection averted [41, 53]
Needle social marketing	Injecting drug users	1--	China	Needle social marketing can reduce risky injecting behavior and HIV transmission among injecting drug users after 12-month follow-up. Needle sharing reduced significantly from 68.4% to 35.3%. However, the number of needle-sharing partners and sharing of water was unchanged. The HIV infection rate decreased but was not statistically significant. [61]	NA	NA	NA	NA

Interventions	Population	Effectiveness			Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio (s)
Needle and syringe exchange (under supervision of medical staff)	Injecting drug users	1--	Canada	At the 6 months follow-up, it was found that more consistent use of a supervised safer injecting facility (SIF) was associated with positive changes in injecting practices, including less reuse of syringes, increased use of sterile water, cleaning of injection sites and filtering of drugs (OR 2 - 3, 95%CI 1.38 - 4.37). [62]	Societal	US	'do nothing'	ICER is PPP\$ 53,285 per HIV infection averted [63]
Street outreach	Injecting drug users	2+	Various	Injecting drug users changed their baseline drug-related and sex-related risk behaviour. Significant reductions in drug injection, multi-person reuse of syringes and needles and other injection equipment was found. The studies also showed a significant growth in promoting entry into drug treatment and increasing needle disinfection. However, although there was a reduction among drug users concerning sex-related risks and an increase in condom use, the majority still practiced unsafe sex. Regarding dosage effects, the longer the exposure to outreach-based interventions, the greater the reductions in drug injection frequency. [64, 65] At cross border	Health care provider's	Ukraine	'do nothing'	ICER is PPP\$ 309 per HIV infection averted [67]

Interventions	Population	Effectiveness			Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio (s)
				areas between China and Vietnam, new injectors declined 3-14% after 36-month follow-up. HIV prevalence and estimated incidence fell by approximately half at the 24-month survey and by approximately three quarters at the 36-month survey in both areas ($P < 0.01$). [66]				
III. Biological/biomedical interventions that strive to reduce HIV infection and transmission risk								
HIV vaccine	Injecting drug users	1++	Thailand	The phase III HIV vaccine trial in Thailand demonstrated that the vaccines are safe and well tolerated. However, after 36-month follow up, there was no difference in new HIV infection between the vaccine and placebo arms (vaccine efficacy was estimated at 0.1%, 95% CI -30.8% to 23.8%). [68]	Not clearly specify	Thailand	'do nothing'	At the assumption of 30% vaccine efficacy, the ICER of vaccination, HAART, and their combination were about PPP\$ 265, PPP\$ 2,158, and PPP\$ 944 per DALY averted compared with the do-nothing strategy. [69]
Improved STI treatment services	Persons with suspected STI	1+	various	Improved STI treatment services significantly reduced HIV incidence. The two large systematic reviews indicated odd ratios ranging from 0.58 (95%CI 0.42-0.70) to 0.77 (95%CI 0.68-0.87). [70]	Healthcare provider's	Tanzania /US	'standard practice'	ICERs is PPP\$ 916 per HIV infection averted. [41]
Male circumcision	Heterosexual male	1--	Various (mainly Africa)	Results from the review of existing observational studies demonstrated a strong association between male circumcision and prevention of HIV, especially among high-risk groups [71-73].	Health care provider's	South Africa/ US	'do nothing'	Male circumcision appears to be very cost-effective in areas with high HIV prevalence (PPP\$ 1,668 per HIV infection averted in areas with HIV

Interventions	Population	Effectiveness			Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio(s)
Mass or community treatment of sexually transmitted infections (STI)	Adults aged 15-59 years	1+	Rural areas in Uganda with high rates of HIV and STI	Moreover, a randomized trial in Uganda showed that male circumcision reduced HIV incidence in men without behavioral disinheriting after 24-month follow-up. HIV incidence was 0.66 cases per 100 person-years in the intervention group and 1.33 cases per 100 person-years in the control group (estimated efficacy of intervention 51%, 95% CI 16-72; p=0.006). [74]	Healthcare provider's	Tanzania /US	'standard practice'	prevalence of 8.4% and PPP\$ 548 per HIV infection averted in areas with HIV prevalence of 25.6%. [75] However, this intervention is unlikely to be cost-effective in the US where baseline HIV prevalence is relatively lower (2%) and homosexual and infection from needle sharing were major causes of HIV infection. [42, 71]
Microbicides	Female sex workers	1+	Various	After three rounds of mass treatment (30 months) there was no evidence indicating that universal treatment of STIs reduced new HIV infections (rate ratio of 0.97% with 95%CI = 0.81 to 1.16). [76]	NA	NA	NA	ICERs is PPP\$ 694,605 per HIV infection averted. [42]
				There is no evidence that nonoxynol-9 protects against vaginal acquisition of HIV infection (RR 1.12, 95%CI 0.88-1.42). Nevertheless, the risk of genital lesions was significantly greater among women receiving nonoxynol-9 (RR 1.18, 95%CI 1.02-1.36). [52]				NA

Interventions	Population	Effectiveness			Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio(s)
Post-exposure prophylaxis	Healthcare workers	2+	Various (reviewed evidence)	No evidence suggests that offering post-exposure prophylaxis with Zidovudine lowers the rate of HIV infection compared to 'no intervention'. Please note that no studies were found that evaluated the effect of two or more antiretroviral drugs. [65, 77]	NA	NA	NA	NA
Post-exposure prophylaxis (using two antiretroviral drugs for 28 days and if subject reported having recently had a detectable plasma HIV RNA level, then a protease inhibitor was also offered	Men and women with a potential sexual or injection drug use exposure to HIV in the previous 72 hrs	2--	US	There was not a significant difference in the proportions of sero-converters (85.7%) and non sero-converters (94.1%) who were initially prescribed antiretroviral therapy (P=.4). [78]	NA	NA	NA	NA
Prevention of mother-to-child transmission of HIV	Pregnant women	1++	Thailand	A randomized clinical trial demonstrated that a combination of Zidovudine (AZT) and a single dose of Nevirapine (NVP), administered both to the mother during labour and to the newborn, is highly effective in prevention of HIV vertical transmission, resulting in only 2.2 (±0.6) % of children being born with HIV compared to 6.9 (±1.4)% in the AZT-only arm. [79, 80] *	Healthcare providers	Thailand	'do nothing'	Combining the administration of AZT and NVP is the most cost-effective drug option. Cost-effectiveness ratio per averted infection of single VCT (1D) is PPP\$ 1,938. Cost-effectiveness ratio per averted infection of double VCT (2D) is PPP\$ 4,412. [79]

Interventions	Population	Effectiveness			Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio (s)
Screening blood products and donated organs for HIV	Blood donations	NA	NA	NA	Healthcare provider's	US/ Sub-Saharan Africa	'no test'	HIV antibody testing for donated blood is a cost-saving intervention in the US [81] and very cost-effective in Sub-Saharan Africa (ICER PPP\$ 64-870 per HIV infection averted). [41, 53]
Substitution treatment	Injecting drug users	1+	Various	Follow-up interviews from one month to 18 to 24 months found that the intervention was associated with statistically significant reductions in illicit opioid use, injecting use and sharing of injection equipment. It was also associated with reductions in multiple sex partners or exchange of sex for drugs or money, but had little effect on condom use. The reporting period for assessment of HIV risk behavior ranged from 2 weeks to 6 months. Reductions in risk behavior relating to drug use translated into reductions in cases of HIV infection.[82-84]	NA	NA	NA	NA
Using nucleic acid test screening (NAT) of volunteer blood donations	Blood donations	2-	Thailand	It was estimated that there were approximately 38 to 155 additional units of donated blood detected with hepatitis B and C and HIV compared to the current practice (serology screening without NAT). [85]	Healthcare provider's	Thailand	'serology test without NAT'	ICER of providing NAT for blood donations was PPP\$ 100,923 - 404,498 per hepatitis B or C or HIV detection PPP\$ 36,897 - 129,181 per QALY. [85]

Interventions	Population	Effectiveness			Cost-effectiveness			
		Level of evidence	Settings	Findings	Perspective	Setting	Comparators	Incremental cost-effectiveness ratio (s)
IV. Mitigation of barriers to prevention and negative social outcomes of HIV infection								
Increased alcohol tax	General population	NA	NA	NA	Health care provider's	US	'current practice'	ICER is PPP\$ 5,484 [42]
Microfinance	Community	1--	Africa	The intervention did not affect HIV incidence (adjusted RR 1.06, 95% CI 0.66-1.69) or rate of unprotected sexual intercourse with a non-spousal partner (adjusted RR 0.89, 95% CI 0.66-1.19). Experience of intimate-partner violence was reduced by 55% (adjusted RR 0.45, 95% CI 0.23-0.91; adjusted risk difference -7.3%, -16.2 to 1.5). [86]	NA	NA	NA	NA
Microfinance (combined with training intervention)	female aged 14-35 year	2-	Africa	Young participants were less likely to have unprotected sex at last intercourse with a non-spousal partner (adjusted risk ratio 0.76, 95% CI 0.60-0.96) after 2 years of follow-up when compared with controls. In addition, they had higher levels of HIV-related communication (adjusted risk ratio 1.46, 95%CI 1.01-2.12) and were more likely to have accessed voluntary counseling and testing (aRR 1.64, 95% CI 1.06-2.56). [87]	NA	NA	NA	NA

RR = relative risk

RCT = randomised controlled trials

*We did not report results from another observational study because it would not change the overall conclusion but provide weaker evidence. [88]

There were thirteen interventions where effectiveness and cost-effectiveness information were both available for the same population groups. These included:

- Community-based education among MSM and women living in low income housing developments;
- Improved sexually transmitted infection treatment services;
- Male and female condom use;
- Mass media campaign;
- Mass treatment of sexually transmitted infections;
- Male circumcision;
- Needle and syringe exchange;
- Nucleic acid test for voluntary blood donations;
- Program for PMTCT - prevention of mother-to-child HIV transmission;
- Provider-initiated HIV screening at health care settings;
- School-based education;
- Street outreach program for IDUs;
- Workplace-based education for FSWs.

Five of the above thirteen interventions, namely (1) male condom use, (2) street outreach program for UDUs, (3) male circumcision, (4) needle and syringe exchange, and (5) PMTCT through a combination of antiretroviral drugs and breastfeeding substitutes, showed significant benefits in reducing HIV incidence among target populations. In addition, although there was no reduction in HIV incidence, community-based education among MSM and workplace-based education for FSWs showed a reduction in HIV risk behaviour than the school-based education program. Only mass treatment of STIs showed no evidence of reducing either risk behaviour or HIV incidence in clinical studies. Economic modelling, however, indicated a range of 916 to 695,000 PPP\$ per HIV infection averted.

Twelve interventions had information on effectiveness but lacked cost-effectiveness evidence. These are:

- Abstinence only program;
- Abstinence-plus program;
- Community-based education among young people, IDUs and FSWs.;
- Drug substitution treatment;
- HIV vaccine for IDUs.
- Microbicides;

- Microfinance;
- Needle social marketing;
- Peer education intervention;
- Post-exposure prophylaxis;
- Voluntary counselling and HIV testing for HIV-negative employees, MSM and HIV serodiscordant couples;
- Workplace-based education among male conscripts.

Overall, treatment of STIs was the only intervention that showed a significant reduction in HIV incidence. There were some indications that abstinence-plus programs, community-based education, drug substitution treatment, needle social marketing, peer education, and VCT reduced HIV risk behaviour among the target populations. However, their respective studies were not designed to assess reduction in HIV incidence. In comparison to ‘standard’ or ‘current’ practice, there was no evidence of better effectiveness (i.e. reduction of HIV incidence and HIV risk behaviour) for the following interventions: i) abstinence only program, ii) single ante-retroviral drug for post-exposure prophylaxis, iii) HIV vaccine for IDUs, iv) microfinance, and v) workplace-based education among male conscripts.

There were four interventions where only cost-effectiveness information was available through the use of mathematical estimations. These were:

- HIV vaccine for ten-year-old uninfected children;
- Increased alcohol tax;
- Screening blood products and donated organs;
- Voluntary counselling and HIV testing for prison inmates;

Notably, the cost-effectiveness of the HIV vaccine was based on the assumption that the vaccine would be available at 30% efficacy.

Figure 3.5 compares the cost per HIV infection averted of each HIV prevention intervention. Cost-effectiveness ratios vary largely, ranging from 70 PPP\$ per HIV infection averted for screening blood products, to 2,000,000 PPP\$ per HIV infection averted for community-based education for women living in low income housing. It is likely that biological/biomedical interventions (highlighted in blue) are more cost-effective than those interventions affecting knowledge, attitudes and beliefs (highlighted in pink).

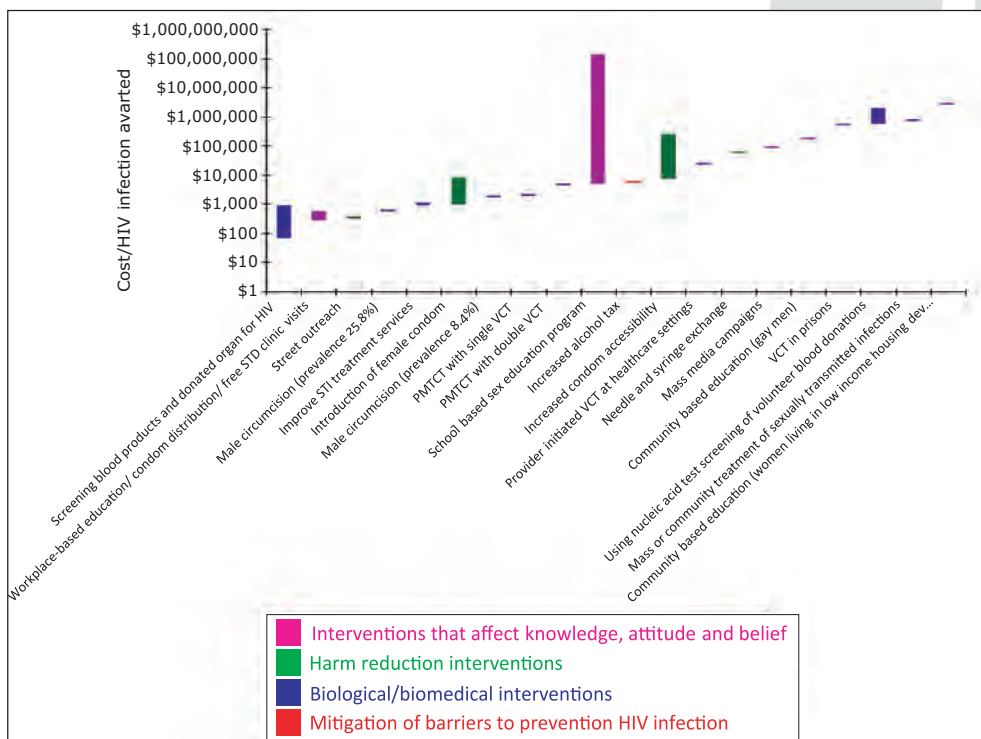


Figure 3.5: Summary of cost-effectiveness data for HIV prevention interventions (PPP\$ 2008 per HIV infection averted)

Table 3.5 Summarises the findings from the reviews. It prioritises HIV prevention interventions based on effectiveness and cost-effectiveness evidence. The table presents results by target population including FSWs, IDUs, MSM, and sero-discordant couples, who are currently the major sources of HIV infection in Thailand.

Interventions proven to be both effective and cost-effective for FSWs were: VCT, workplace-based education, and male and female condom use. Community-based education and improvement of STI services proved to be effective, but no evidence regarding the value for money among FSWs was found. The study found that microbicides were not effective in preventing HIV transmission amongst FSWs.

Condom use was proven to be the only effective and cost-effective intervention for MSM, while VCT and improved STI treatment services demonstrated effectiveness but lacked cost-effectiveness information. Community-based education was clinically effective but not cost effective.

For IDUs condom use, VCT and street outreach were shown to be both effective and cost-effective. Needle social marketing, improved STI treatment services and substitution treatment demonstrated clinical effectiveness but were not supported by economic evidence. Needle and syringe exchange under the supervision of medical staff was proven to be effective but not cost effective. Community based education; HIV vaccines and post-exposure prophylaxis were shown to be ineffective in the prevention of HIV transmission amongst IDUs.

Condom use was the only intervention proven to be both effective and cost-effective for sero-discordant couples. Voluntary HIV counselling and testing, and improvement of STI treatment services were amongst the interventions proven clinically effective but no cost-effectiveness information was available.

Overall, VCT and condom use were the only interventions where extensive evaluations of the effectiveness and cost-effectiveness across population groups were done. Meanwhile, improved STI treatment service was proven to be clinically effective across most target populations. However, no economic evaluation study was conducted for the intervention. It can be observed that in the information gap for 1) many interventions, including routine (provider-initiated) voluntary HIV screening at healthcare settings, introduction of female condoms, HIV vaccine, male circumcision, microbicides, and post-exposure prophylaxis, and 2) some targeted populations, namely sero-discordant couples, prison inmates, health care workers both effectiveness and cost-effectiveness studies need to be conducted to provide proper evidence to guide resource allocation decisions regarding HIV prevention and control.

Table 3.5: 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								Red	
Abstinence-plus programs								Green	
Community-based education	Green	Orange	Red					Green	Orange
Mass media campaigns									Orange
Peer education	Green	Red	Green					Red	
Routine (provider-initiated) voluntary HIV screening at healthcare settings					Green			Orange	Orange
School-based sex education programs (combined with life skills)								Green	
Voluntary HIV counselling and testing (VCT) (± STI clinic and condom distribution)	Green	Green	Green	Green	Green	Orange		Green	Green
Workplace-based education (±condom distribution / free STI clinic)	Green								Green
II. Harm reduction interventions that lower the risk of a behaviour, but do not eliminate the behaviour									
Condom use (availability and accessibility)	Green	Green	Green	Green				Green	Green
Introduction of female condoms	Green								
Needle and syringe exchange			Green						
Needle social marketing			Green						
Street outreach			Green						
III. Biological/biomedical interventions that strive to reduce HIV infection and transmission risk									
HIV vaccine			Red						
Improved STI treatment services	Green	Green	Green	Green				Green	Green
Mass or community treatment of sexually transmitted infections									Red
Male circumcision									Green
Microbicides	Red								
Post-exposure prophylaxis			Red				Red		
Prevention of mother-to-child transmission of HIV					Green				
Screening blood products and donated organs for HIV									Green
Substitution treatment			Green						
Using nucleic acid test screening (NAT) of volunteer blood donations									Orange
IV. Mitigation of barriers to prevention and negative social outcomes of HIV infection									
Increased alcohol tax									Green
Microfinance									Red
Microfinance (combined with education)									Green

Abbreviations

- FSW - Female sex worker
- MSM - Men who have sex with men
- IDU - Injecting drug user
- SDC - Serodiscordant couples
- Preg - Pregnant women
- PI - Prison inmate
- HCW - Healthcare worker
- Young - People aged 10-24 years old
- G pop - General people

The colour of effectiveness and cost-effectiveness

Colours	Effectiveness	Cost-effectiveness	Description
	Yes	Yes	The intervention is proven to be effective and cost-effective
	Yes	Data not available	The intervention is proven to be effective but no evidence regarding cost-effectiveness
	Yes	No	The intervention is proven to be effective but not cost-effective
	No	No, data not available	The intervention is proven to be neither effective nor cost-effective
	Data not available	Data not available	No evidence concerning effectiveness or cost-effectiveness of the intervention
			The intervention is not relevant or used for a particular target population

In general, decision makers prefer to use local evidence over international information when making policy decisions. However, the study found a glaring lack of local information on the effectiveness and cost-effectiveness of HIV prevention among the groups most at risk of HIV infection in Thailand namely, young people, MSM, IDUs, FSWs, and sero-discordant couples. See Table 3.6.

Table 3.6: Summary of interventions conducted for each target population

Target populations	Interventions	
	Domestic studies	International studies
Young people	- School-based education	- Abstinence programs - School-based education - Community-based education - Peer education intervention
Men who have sex with men	NA	- Community-based education - Voluntary HIV counselling and testing - Peer education intervention
Injecting drug users	- Community-based education - HIV vaccine	- Street outreach - Drug substitution treatment - Community-based education - Needle social marketing - Needle and syringe exchange - Post-exposure prophylaxis - Peer education intervention
Female sex workers	- Workplace-based education	- Workplace-based education / condom distribution/free STI clinic visits - Community based intervention (Sonagachi) - Microbicide - Introduction of female condom - Peer education intervention
HIV sero-discordant couples	NA	- Increase condom use - Voluntary HIV counselling and testing/STI services/free condoms
Male	- Workplace-based education - 100% condom program	- Condom distribution - Circumcision
Prison inmates	NA	- HIV screening
Pregnant women	- Program for prevention of mother-to-child transmission	NA (stop the search)
Health care workers	NA	- Post-exposure prophylaxis
General population	- Provider-initiated HIV screening - HIV screening for blood donations	- Mass media campaign - Mass treatment of STI - Community-based education - Microfinance - Voluntary HIV counselling and testing
Infrastructure	NA	- Increased alcohol tax - Improvement of STI treatment services

5. Discussion and conclusion

The review highlighted several limitations in using effectiveness and cost-effectiveness evidence for HIV/AIDS policy decision making or program reorientation. First, the lack of proper assessment of effectiveness and/or cost-effectiveness outcomes of many interventions poses a significant challenge in making evidence-informed health policy decisions. During the review, we found that most domestic studies evaluated the effectiveness or cost-effectiveness of interventions using measures such as knowledge, attitudes, perception, and skills. The use of such measures will severely limit the usefulness of the evaluations because they do not allow for the comparison of value for money across different types of interventions due to variation in outcome measurement. In addition, the outcomes of such measures may not be of primary interest to decision makers or health care planners in considering health resource allocation.

Second, although evidence for assessing the effectiveness of interventions was found to be of high quality, a major concern was the strength of evidence used to generate information on cost-effectiveness. For example, many cost-effectiveness studies did not obtain intervention effectiveness from data sources that minimized the potential for bias such as systematic reviews or experimental studies. Rather, they obtained data from expert opinions with unconvincing assumptions.[69] Economic evaluations can be useful for guiding policy decisions only when performed correctly and reported accurately; these findings clearly depict barriers that would diminish the use of cost-effectiveness evidence to inform policy decisions.

Third, given that a lot was invested in determining local information for HIV prevention, the majority of studies reporting the effectiveness and cost-effectiveness of HIV interventions were identified from international publications rather than domestic journals or grey literature (see Table 3.7). This reflects the fact that good quality studies are likely to be published in international journals. Thus, it is sensible to recommend that international databases are still major sources of information, and can be used to inform decision making about the effectiveness and cost-effectiveness of HIV prevention interventions.

Table 3.7: Review profile of domestic literature

Type of literature	Initial search	Review of full text	Final inclusion
Articles published in domestic journals	528	16	1
Articles published in international journals	111	11	5
Theses/dissertations	99	11	5
Research reports	24	3	2
Conference proceedings	170	1	1
Total	932	42	14

This study found that male/female condoms, street outreach programs, programs for the prevention of mother-to-child HIV transmission, improvement of STI treatment services and circumcision, were the only interventions that showed strong evidence of reducing HIV infection among target populations. The DCP2 also included these four interventions, excluding circumcision, in its recommendations for concentrated epidemic areas in the East Asia and the Pacific region. [3] [note that Thailand is now classified as a concentrated epidemic] [89] The differences between recommendations from the DCP2 and our findings are as follows:

- Although it was recommended in the DCP2, lack of strong evidence proved that community-based education offers good value for money in the prevention of HIV infections in either low or high HIV prevalence settings.
- There were consistent results showing that screening blood products and donated organs for HIV is very cost-effective, while there was little reference made to this intervention in the DCP2.
- This study found that there was potential for interventions that aim to mitigate barriers to prevention and negative social outcomes of HIV infection such as higher alcohol tax and micro financing. These interventions should be carefully considered in the future.

It is interesting to note that very limited local information was found about HIV interventions for the populations most at risk of HIV infection in Thailand. These include: IDUs, MSM, FSWs, and young people. Of the nine interventions identified from our review, only one study on an HIV vaccine

for IDUs was conducted in Thailand with an usual assumption of vaccine efficacy. Moreover, HIV preventive vaccines are not available on the global market. These findings underline the urgent need to prioritize health research in resource allocation in order to assess the effectiveness and cost-effectiveness of HIV interventions that could curb infections among high risk groups.

Caution should be made when applying the effectiveness and cost-effectiveness data from this study to inform policy decision making. Firstly, because many studies were conducted in various settings with target populations of different sizes, different HIV prevalence, different attitudes towards HIV/AIDS and socio-economic and cultural determinants of risk behaviours responses to interventions, these factors would greatly affect not only the effectiveness of the intervention but also its value for money. Furthermore, we would argue that this matter is rather more important because almost all preventive interventions need to be delivered on a population basis.

Secondly, although we have made explicit criteria to judge whether the effectiveness studies/data are good enough to be used in decision making, there was no standard to measure the quality of cost-effectiveness studies. While we found most effectiveness studies to be of good quality (mainly in the 1st or 2nd hierarchy), we were unsure of the quality of data used in many of the cost-effectiveness studies.

Lastly, it is important to recognise that several factors and not only effectiveness or cost-effectiveness information guide a country’s health care decisions. Other factors including political and ethical issues, and societal values such as equity, also play a significant role in the decision making processes. However, these issues were not taken into consideration in this study.

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