

Thesis for doctoral degree (Ph.D.)
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Management of Reproductive Tract Infections among health providers and in the community in Lao People's Democratic Republic



Amphoy Sihavong

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The picture on the front page is Sethathirath Hospital, a university hospital in Vientiane Capital, where one of the studies in this thesis was carried out.

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ABSTRACT

Background: Reproductive tract infections (RTI), including sexually transmitted infections (STI) constitute an important health threat, both directly and through their potential effect in facilitating HIV transmission. Creating community awareness of RTI/STI and how to prevent them is essential in minimising their spread. Health providers play a critical role in controlling RTI/STI spread. No previous study on RTI/STI management among health providers and in the community was carried out in Laos.

Objectives: (1) To describe antimicrobial use as self-medication for RTI/STI; (2) To clinically and microbiologically identify RTI/STI, and to monitor the antimicrobial susceptibility of *N. gonorrhoeae*; (3) To explore community members' perceptions, treatment-seeking behaviour and understanding of health information about RTI/STI; and (4) To assess health providers' reported knowledge and practice competence regarding RTI/STI management.

Methods: Structured interviews were conducted with 500 community members aged 18 or above, who had used antimicrobials as self-medication for RTI/STI during the past year. They were recruited among 3056 family members in Vientiane Capital (VTC) and Champasak Province (CPS) (Paper I). In total, 1125 women aged 15-49 years attending a gynaecology out-patient department underwent a pelvic examination, and specimens were taken for laboratory testing (Paper II). Fourteen focus group discussions (FGDs) and 20 individual interviews (IDIs) were held with a total of 132 participants (76 women, 56 men) in urban and rural communities in VTC and CPS (Paper III). All 272 health providers (medical doctors/assistants, midwives/nurses and drug sellers) working with RTI/STI patients in one urban and one rural district in VTC, were invited to fill in a self-completed questionnaire including four written simulated case scenarios, and 93% participated (Paper IV).

Results: Among the 500 respondents reporting antimicrobial use as self-medication for RTI/STI, 91% had bought the antimicrobials from local private pharmacies without a physician's prescription, 58% were advised to buy the drugs from drug sellers, and 79% used antimicrobials for a non-recommended duration of time. Ampicillin (not recommended as syndromic treatment for RTI/STI) was used in 83% of all cases, in 28% combined with tetracycline (Paper I). Among 1125 women, 82% clinically presented with an RTI syndrome. Only 64% had an aetiologically diagnosed RTI, including 11% with an STI. Endogenous infections were most prevalent (candidiasis 40%; bacterial vaginosis 25%), followed by STI (*Chlamydia trachomatis* 4.1%; *N. gonorrhoeae* and *Trichomonas vaginalis* both 3.7%). Of the 41 *N. gonorrhoeae* isolates, 20% showed resistance to ciprofloxacin, 98% to penicillin, and 100% to tetracycline (Paper II). Both men and women in the FGDs and IDIs exposed some misconceptions about the causes and symptoms of RTI/STI and their cure, and reluctance to seek health care. The most common treatment-seeking behaviour was self-medication through private pharmacies, following advice mostly given by friends and drug sellers. An unwillingness to use condoms was commonly expressed. The main media sources of RTI/STI information were radio and television. Access to health information was poorer in rural areas (Paper III). Of 252 responding health providers, 34% scored below 50% regarding both the case scenarios and reported knowledge, and 87% gave inadequate advice regarding health education. Only 34% gave correct advice on contact tracing, 38% on counselling, 52% regarding compliance and 59% on condom promotion. Drug sellers scored lowest in all aspects of RTI/STI management. Urban respondents were more likely to report adequate knowledge (Paper IV).

Conclusions: Strengthening RTI/STI management is recommended, including health education and promotion through interventions at community level, and to health providers, including private drug sellers. Concurrent with syndromic case management, periodic evaluations of aetiological diagnosis should be available to ensure adequacy of treatment algorithms and prescribed medications. Continuous training in syndromic approach and supervision are recommended to improve quality of RTI/STI management, particularly among health providers at private pharmacies and in rural areas. Health education messages should also be improved, particularly in rural areas.

Keywords: reproductive tract infection; prevalence; syndromic case management; antimicrobial self-medication; community; perception, treatment-seeking behaviour; competence; health provider; Lao PDR

LIST OF PUBLICATIONS

This thesis is based on the following papers, which will be referred to by their Roman Numerals I-IV.

- I. Amphoy Sihavong, Cecilia Stålsby Lundborg, Lamphone Syhakhang, Kongsap Akkhavong, Göran Tomson, and Rolf Wahlström.
Antimicrobial self-medication for reproductive tract infections in two provinces in Lao People's Democratic Republic.
Sexually Transmitted Infections 2006;82:182-6.
- II. Amphoy Sihavong, Traykhouane Phouthavane, Cecilia Stålsby Lundborg, Khanthanouvieng Sayabounthavong, Lamphone Syhakhang, and Rolf Wahlström.
Reproductive tract infections among women attending a Gynaecology Out-Patient Department in Vientiane, Lao PDR.
Sexually Transmitted Diseases 2007;34:791-5.
- III. Amphoy Sihavong, Cecilia Stålsby Lundborg, Lamphone Syhakhang, Sengchanh Kounnavong, Rolf Wahlström, and Solveig Freudenthal.
Community members' perceptions and treatment-seeking behaviour regarding the management of reproductive tract infections in two provinces in Lao PDR: a qualitative study. (Submitted for publication).
- IV. Amphoy Sihavong, Cecilia Stålsby Lundborg, Lamphone Syhakhang, Åsa Vernby, Amphayvanh Panyanouvong, Lena Marions, and Rolf Wahlström.
Health providers' competence in the management of reproductive tract infections in Vientiane, Lao PDR.
International Journal of STD & AIDS 2007;18:774-81.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
ASEAN	Association of South-East Asian Nations
CI	Confidence Interval
CPS	Champasack Province
EU	European Union
FGD	Focus Group Discussion
GDP	Gross Domestic Product
HIV	Human Immunodeficiency Virus
IDI	Individual Interview
IEC	Information, Education and Communication
IHCAR	Division of International Health, Department of Public Health Sciences, Karolinska Institutet, Stockholm, Sweden
IMR	Infant Mortality Rate
MCH	Maternal and Child Health
MMR	Maternal Mortality Rate
MOH	Ministry of Health
NCCAB	National Committee for the Control of AIDS Bureau
OPD	Out-Patient Department
OR	Odds Ratio
PDR	People's Democratic Republic
RTI	Reproductive Tract Infections
SD	Standard Deviation
SI	Swedish Institute
Sida	Swedish International Development Cooperation Agency
STI	Sexually Transmitted Infections
STD	Sexually Transmitted Diseases
TFR	Total Fertility Rate
U5MR	Under-5-year Mortality Rate
UNAIDS	United Nations Joint Programme on AIDS
UNFPA	United Nations Population Fund
VTC	Vientiane Capital
WHO	World Health Organization

PREFACE

I am a medical doctor by training at the Thaibinh Medical University of Vietnam and the Lao National University, and hold a Master of Medical Sciences from Tasmania University, Australia. I have worked since 1983 at the Obstetrics & Gynaecology section of Sethathirath Hospital, a university hospital in Vientiane, the capital of Laos, but have now a position as a research officer at the Vientiane Capital Health Department. In the beginning of my work in the hospital, I did not think that reproductive tract infections would be my main focus of research. However when I was involved in 1999 as a member of Technical Advisory Committee for the Lao National Programme for prevention and care of sexually transmitted infections (STI), my observation was very limited data available from Laos regarding reproductive tract infections (RTI) including STI, which remain a common problem worldwide, particularly in low-income countries.

In addition to this, in 2001, I had the opportunity to be involved in one of the Health System Research projects for implementation of the Lao National Drug Policy Programme, funded by the Swedish International Development Cooperation Agency (Sida), and technically supported by the Division of International Health (IHCAR), Karolinska Institutet, Stockholm, Sweden. The results from this research project showed me that self-medication with antimicrobials for RTI/STI was widespread among Lao people. The majority of people who self-medicated for RTI/STI used inappropriate drugs bought from local private drug sellers. The most common reason for self-medication for RTI/STI was out of habit or following previous self-treatment with similar symptoms. From this point, I started looking at my data that were collected during 2000-2001 among women attending a gynaecology out-patient department of Sethathirath Hospital. The results revealed to me that there were high rates of RTI/STI combined with high resistance of *N. gonorrhoeae* to some common drugs used. The findings also showed that symptomatic treatment for vaginal discharge as a potential STI involves unnecessarily treating eight women for each correct case. I recognized that irrational use of antimicrobials could worsen the continuing increase in antimicrobial resistance and could compromise effective treatment of RTI/STI. This would result in treatment failure, complications and further transmission. The critical question in my mind is how the quality of care can be improved?

The studies in this thesis have their beginning in this work. Later on, during my PhD training at IHCAR, Karolinska Institutet, I was given the opportunity to explore further about people's perceptions and their treatment-seeking behaviour related RTI/STI, and to assess health providers' competence in the management of RTI/STI. I hope that the findings of the studies in this thesis provide useful information and evidence as a basis for decision-makers to guide planning for future interventions to contribute to quality improvement of RTI/STI management.

1 BACKGROUND

1.1 Definition and aetiology of reproductive tract infections

Reproductive tract infections (RTI) encompass three main groups of infection in men and women: (1) endogenous infections occurring primarily among women as a result of a disturbance of the normal genital tract flora; (2) sexually transmitted infections (STI) in both men and women; and (3) iatrogenic infections, acquired, for example, through unsterile procedures across the cervix, such as insertion of an intrauterine device, or termination of a pregnancy (UNFPA and Population Council, 2001; WHO, 2005a).

There are over 30 identified organisms which can infect the reproductive tract (WHO, 2005a). The micro-organisms associated with sexual transmission or with infection of the reproductive tract include:

- (1) Bacteria: *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, *Treponema pallidum* (syphilis), *Gardnerella vaginalis*, and *Haemophilus ducreyi*;
- (2) Viruses: *Herpes simplex virus* (HSV), *Human papilloma virus* (HPV), *Molluscum contagiosum*, *Hepatitis viruses*, *Cytomegalo-virus*, *Human immunodeficiency virus* (HIV), and *Human T Lymphotropic viruses*;
- (3) Protozoa: *Trichomonas vaginalis*, *Entamoeba histolytica*, and *Giardia lamblia*;
- (4) Mycoplasmas: *Ureaplasma urealyticum*, *Mycoplasma hominus*, and *Mycoplasma genitalium*;
- (5) Parasites: *Sarcoptes scabiei*, and *Phthirus pubis*; and
- (6) Fungi: *Candida albicans*.

Common examples of endogenous infections are candidiasis and bacterial vaginosis. For the STI, there are gonorrhoea, chlamydia, syphilis, trichomoniasis, genital herpes, chancroid, genital warts, and HIV. For iatrogenic infections, there are pelvic inflammatory diseases (PID) following abortion or other transcervical procedure if infection control is poor (WHO, 2005a).

In brief, not all RTI are sexually transmitted and not all STI are RTI. RTI refers to the site where the infections develop, whereas STI refers to the way of transmission (WHO, 2005a). To highlight the importance of RTI, including STI, the term RTI/STI is used throughout this thesis.

1.2 The importance of RTI/STI

1.2.1 The global burden

The global disease burden of RTI/STI is a major public health concern, particularly in low-income countries (Mayaud et al., 1998). WHO estimated that over 340 million new cases of curable STI (chlamydia, gonorrhoea, syphilis and trichomoniasis) occur every year throughout the world in men and women aged 15-49 years, with the largest proportion in the region of South and South-East Asia, followed by Sub-Saharan Africa, and Latin America and the Caribbean (Table 1) (WHO, 2001a). Millions of viral STI

also occur annually, attributable mainly to HIV, HSV, HPV and hepatitis B virus (HBV) (Mayaud & Mabey, 2004). Seven million people across Asia and the Pacific Region are living with HIV/AIDS (WHO, 2005a).

Table 1. Estimated new cases of four curable STI among adults aged 15-49 years, 1999

Region	All four STI (million)	Chlamydia (million)	Gonorrhoea (million)	Syphilis (million)	TV* (million)
South and South-East Asia	151	43	27	4	76.5
Sub-Saharan Africa	69	16	17	4	32
Latin America and the Caribbean	38	9.5	7.5	3	18.5
Eastern Europe and Central Asia	22	6	3.5	0.10	13
East Asia and Pacific	18	5.3	3	0.24	10
Western Europe	17	5	1	0.14	11
North America	14	4	1.5	0.10	8
North Africa and the Middle-East	10	3	1.5	0.37	5
Australia and New Zealand	1	0.34	0.12	0.01	0.61
Total	340	92	62	12	174

Source: WHO, 2001a. *TV=Trichomoniasis

1.2.2 Serious health consequences

RTI/STI are among the most important causes of morbidity and mortality most particularly in women and children, resulting in serious economic, social and psychological consequences, particularly in low-income countries (WHO, 2005a; Aria & Hart, 1998). RTI/STI are important not only because of their acute presentation, but also because of their associated sequelae including chronic pain, ectopic pregnancy, infertility, poor pregnancy outcomes, and neonatal and infant morbidity and mortality (UNFPA and Population Council, 2001; WHO, 2005a).

The infections with greatest public health importance are *N. gonorrhoeae* and *Chlamydia trachomatis*, as these infections are less symptomatic resulting in delay for diagnosis and treatment thereby increasing the potential spread of infections and complications (e.g., ectopic pregnancy, PID, and infertility) arising from these infections (Rowe, 1998). Up to 80% of women and 10% of men infected with gonorrhoea are asymptomatic, and 70-75% of women and 50% of men infected with chlamydia are asymptomatic (WHO, 2001a; Lazaro, 2006).

Herpes simplex virus type 2 (HSV-2) infection has been shown to be the leading cause of genital ulcer disease in low-income countries; 30%-80% of women and 10%-50% of

men in Sub-Saharan Africa, and 10%-30% of the general population in the low-income Asian countries are infected with HSV-2 (WHO, 2006a). In the United States of America, the prevalence of HSV-2 among 14-49 year-olds is 19% (Weinstock et al., 2004). Throughout the world, HSV-2 seropositivity is uniformly higher in women than in men and increases with age (Weiss, 2004).

Human papilloma virus, another important sexually transmitted viral pathogen, causes about 500,000 cases of cervical cancer annually with 240,000 deaths, mainly in resource-poor countries (Ferlay, 2004; WHO, 2004a). Hepatitis B virus (HBV), which may be transmitted sexually and through needle sharing, blood transfusion and from mother to child, has caused an estimated 350 million cases of chronic hepatitis and at least one million deaths each year from liver cirrhosis and liver cancer (Montesano, 2002; Chang et al., 2000).

Most RTI/STI may affect both men and women, however, their complications are among the most important causes of morbidity and mortality for women in low-income countries (UNFPA, 2004). It is estimated that about one-third of the 500,000 maternal deaths occurring each year have been due to infectious complications of pregnancy, e.g., post-abortion and postpartum infections (UNFPA, 2004). Infection within the placenta or amniotic sac (chorioamnionitis) due to endogenous or sexually transmitted organisms has been a major cause of late spontaneous abortion, stillbirth, prelabour rupture of membranes and preterm delivery. Congenital infection caused by syphilis, gonorrhoea, chlamydia, HSV, HBV and HIV may result in blindness, disability and death of the newborn (WHO, 2005a).

Most of this preventable burden of disease is concentrated in low-income populations. After maternal causes, STI result in the greatest number of healthy years lost to women of reproductive age in low-income countries, and the consequences of RTI/STI including stigmatization, reproductive impairment, domestic abuse and abandonment, can be severe in women (UNFPA, 2004).

1.2.3 Facilitation of HIV transmission

The presence of an untreated or incorrectly treated STI (ulcerative or non-ulcerative) can increase the risk of both acquisition and transmission of HIV (Fleming & Wasserheit, 1999). Genital ulcer diseases (e.g., chancroid, syphilis, herpes or unspecified genital ulcer disease) have been reported to be most strongly associated with increased risk of HIV transmission for both men and women (Rottingen et al., 2001). Through ulceration and inflammation resulting in increased genital HIV shedding, the presence of STI has been estimated to increase the risk of HIV transmission two to sixfold (Laga et al., 1993).

It has been demonstrated that cervical infections may act as cofactors for the acquisition and transmission of HIV infection (Laga et al. 1993; Ghys et al., 1997). There is biologic evidence that the non-ulcerative STI increase recruitment into the genital tract of HIV target cells (e.g., CD4 lymphocytes) and are responsible for superficial cervical ulcers (Levine et al., 1998).

1.2.4 Increased importance of antimicrobial resistance

Self-medication with antimicrobials is commonly found in low-income countries, misuse of antimicrobials is widespread, and private pharmacies, often with untrained drug sellers, are commonly the first contact with health delivery services (Adu-Sarcodie et al., 1997; Hart & Kariuki, 1998; Chalker et al., 2000; Tomson et al., 1986; Stenson et al., 2001; Ward et al., 2003). Self-medication is defined as the selection or use of medicines by individuals to treat self-recognized illnesses or symptoms (WHO, 1998). In this thesis, self-medication with antimicrobials was defined as antimicrobial use without prescription or recommendation by a physician for the specific episode.

A high percentage of irrational antimicrobial use is likely to worsen the continuing increase in antimicrobial resistance, and may result in treatment failure, treatment costs, disease spread, drug side-effects, allergic reactions and toxic poisoning (Okeke et al., 2005; Laxminarayan, 2003). The rapidly changing antimicrobial susceptibility of *N. Gonorrhoeae* has created an important problem for STI treatment and control worldwide, particularly in low-income countries (Aria & Hart, 1998; Okeke et al., 2005). As an antibiotic should not be used when more than 5% of strains are resistant to it (WHO, 2001a), treatment regimens must be tailored to the prevalence of antimicrobial resistance in each setting. However, tailored antimicrobial treatment is only possible after obtaining the results of cultures and susceptibility testing from a diagnostic laboratory (McGowan Jr. & Metchock, 1995). In addition, the cost constraints prevent the application of newer, more expensive agents, which may make the problem of antimicrobial resistance worse, especially in low-income countries.

1.2.5 Public health perspectives: biological, political and economic

Biological: It has been shown that improved treatment services of STI can reduce the incidence of HIV infection in populations with high prevalence of curable STI and high-risk sexual behaviour, particularly in the early phases of an HIV epidemic (Mayaud et al., 1997; White et al., 2004; Korenromp et al., 2005).

Political: Since the recommendations from the 1994 United Nations International Conference on Population and Development stated that: “*All countries should strive to make accessible through the primary health care system, reproductive health to all individuals of appropriate ages ... this should include ... treatment of RTI; STI and other reproductive health conditions*”, there has been a programme-level shift away from vertical family planning services and towards the provision of comprehensive integrated reproductive health care at all health service levels (UNFPA and Population Council, 2001).

Economic: From a public health perspective, the importance of RTI/STI has increased with the recognition that the economic consequences for health care systems can be significant in order to implement effective prevention and care activities for these infections. Globally, RTI/STI constitute a huge health and economic burden, especially for low-income countries where they account for 17% of economic losses caused by ill-health (Mayaud & Mabey, 2004). The socio-economic costs of STI and their complications are substantial, ranking among the top 10 reasons for health care visits in

most low-income countries (WHO, 2006a). Care for STI sequelae accounts for a large proportion of tertiary health care costs in terms of cervical cancer screening and treatment, liver disease management, infertility investigation, care for perinatal morbidity, childhood blindness, and chronic pain in women. The STI social costs include conflict between sexual partners and domestic violence, and the costs rise further when the cofactor effect of other STI on HIV transmission is taken into consideration.

1.3 Management and control of RTI/STI in general

1.3.1 The role of health providers and community

Health providers play a critical role in controlling the spread of RTI/STI through early and accurate diagnosis, appropriate treatment, and counselling regarding prevention (Khandwalla et al., 2000; Workowski, 2002). Creating community awareness of RTI/STI and how to prevent them is essential for preventing their spread (UNFPA, 2004). Most of the serious health problems caused by RTI/STI are preventable. It has been shown that communities with good access to effective prevention and treatment services have lower RTI/STI rates and complications than communities where services are poor, or not used by people at risk (WHO, 2005a). Thus, good clinical management of individual patients is necessary to reduce RTI/STI transmission in the community.

However, the quality of STI case management is often unsatisfactory in low-income countries (Voeten et al., 2001; Khandwalla et al., 2000). In addition, there are some barriers to RTI/STI control at the community level. Firstly, poverty and labour migration separate families and may lead to risky sexual behaviour. The low status of women limits economic options leading to risky sexual behaviour (e.g., women may exchange sex for money or other forms of support), little control over decisions and less ability to negotiate with partners (WHO, 2005a). Secondly, the asymptomatic nature of many STI (e.g., chlamydia and gonorrhoea) and the lack of screening programmes or rapid, inexpensive diagnostic tests mean that a large number of people experience unrecognized chronic infections and long-term consequences (e.g., infertility and cancer of the cervix) from untreated infections, especially in women (WHO, 2006a). Thirdly, people in the community may avoid health care services because of ignorance or lack of information about RTI/STI, as well as accessibility barriers (e.g., location, cost), and acceptability of services, including stigma, lack of privacy, poorly managed health care facilities, inadequate supplies of drugs, and incompetent and disrespectful health care providers (WHO, 2005a). Addressing those barriers would make it easier to promote use of services for RTI/STI prevention and care. The services provided could be made more attractive to high-risk groups by maintaining longer working hours/opening times and decreasing waiting times (Morris & Ferguson, 2007).

To manage RTI/STI in the community, there are several common interventions which can be highlighted: (1) *Promoting effective health care seeking*: Early health care sought from trained providers are the key for ensuring effective case management, as patterns of health seeking will change if people can be assured of high quality and effective treatments from providers (UNFPA and Population Council, 2001); (2) *Case management of symptomatic individuals*: Improved case management of STI is one of the interventions scientifically

proven to reduce the incidence of HIV infection in the general population (Mayaud et al., 1997; Manhart et al., 2000) (see section 1.3.2 for more details); (3) *Partner management*: By treating sexual partners of patients, whether symptomatic or not, re-infection can be halted and ongoing transmission curtailed (Macke & Maher, 1999). Thus, partner notification is seen as a cornerstone of effective RTI/STI management, and methods should be adjusted to the practical and cultural context in each country (Faxelid & Ramstedt, 1997; Kissinger et al., 2005); (4) *Counseling for prevention*: STI counselling, including promotion of correct condom use, represents an important component of comprehensive HIV and RTI/STI prevention strategies (Holmes et al., 2004). The efficacy of risk reduction counselling in reducing STI has been proved by prevention research in the past decade (Rietmeijer, 2007); and (5) *Improving treatment adherence*: It is important to train health workers to advise people to complete their recommended drug courses, as incomplete course of treatment can lead to chronic infections as well as increasing the likelihood of antimicrobial resistance (UNFPA and Population Council, 2001).

Self-medication should also be discouraged for several reasons: (1) ineffective drugs are often sold by people with minimal or no training; (2) drugs may be sold in inefficient dosages to make treatment more affordable; (3) although symptoms may disappear for a while, the infection is not cured; and (4) the germs become more resistant to common antibiotics (Swedish Institute for Infectious Diseases Control, 2006; Chan & Tapsall, 2006). However, health care providers should try to understand why people treat themselves. It may be because local clinics are not acceptable for many reasons, such as cost, waiting time, or perceived lack of privacy. Thus, improving and promoting clinic services would reduce the amount of self-medication.

1.3.2 Syndromic case management of RTI/STI

Syndromic case management means that diagnosis and management are based on the identification of syndromes, which are combinations of symptoms (reported by the patient) and signs (observed during clinical diagnosis), and the recommended treatment for these syndromes (WHO, 2005a). In this thesis, the reported symptoms of RTI/STI included abnormal vaginal discharge and low abdominal pain in women, urethral discharge and scrotum swelling in men, and genital ulcer/wart, inguinal bulbo, genital itching and pain during passing urine or urine with pus in both women and men.

Laboratory tests require resources, may need clients to make extra visits to the clinic and almost always result in delays in treatment (Nichols et al., 2007; Schwebke et al., 1997). For these reasons, WHO has developed simple flowcharts (algorithms) to guide health care providers in using the syndromic approach to manage seven syndromes, including vaginal discharge, genital ulcer, lower abdominal pain, urethral discharge, scrotal swelling, inguinal bubo and genital growths. Consequently, syndromic case management guidelines are widely used for syndromes such as lower abdominal pain, urethral discharge and genital ulcer, even in high-income countries with advanced laboratory facilities (WHO, 2005a).

Global review of syndromic case management has shown that this approach is both effective and practical for the management of urethral discharge in men and genital ulcers

in both men and women to prevent new infections by providing curative treatment without delay and breaking the chain of infection (WHO, 2005a). For the syndromic approach to lower abdominal pain in women, it is aimed to offer effective treatment to women with symptoms that could indicate pelvic inflammatory diseases (PID), although some women managed with this algorithm might not actually have PID (false positives) (WHO, 2005a). Thus, treatment is justified, because of the severe consequences (e.g., infertility and ectopic pregnancy) that often follow PID that is left untreated or not treated early in the disease course.

The syndromic algorithms for women with symptoms/signs of vaginal discharge work well for vaginal infections, but not generally as well for cervical infections (WHO, 2005a). The lack of specificity of VD symptoms and the difficulty interpreting clinical signs may mean that women are over-diagnosed and over-treated for STI when they are in fact only suffering endogenous infections. Conversely, the asymptomatic carriage of *N. gonorrhoeae* and/or *Chlamydia trachomatis* may lead to a low sensitivity for detecting cervical infections, which may result in infected women not being treated. Because accurate detection of gonococcal and chlamydial cervicitis requires expensive laboratory tests, which are not available in most settings, particularly in low-income countries, treatment for cervical infections can be adapted to the local epidemiology and aetiology (Pettifor et al., 2000), and thus diversion from the syndromic approach can be justified in some special situations.

It has also been shown that internal gynaecological examinations can improve the performance of adapted algorithms, and that trained and experienced clinicians achieve a higher sensitivity for detecting cervical infections through clinical diagnosis in women with vaginal discharge, than other health workers (WHO, 2005a). Similarly, the introduction of behavioural risk assessment into the syndromic algorithm (to distinguish between those women with an STI as a cause of their symptoms, and those suffering from an endogenous infection) has been shown to increase its specificity and positive predictive value, but sensitivity may remain a problem (WHO, 2005a).

Due to its strengths and despite its potential limitations, the syndromic approach will continue to play a significant role in STI/HIV control in many low-income countries (Aria & Hart, 1998). At the same time, strengthening the infrastructure and appropriate diagnostic and treatment facilities at the primary health care level is needed. For specific treatment recommendations to be made, periodic studies are needed in order to determine a change in the prevalence of the aetiological agents and the pattern of antimicrobial susceptibility.

1.3.3 Prevention and control of RTI/STI

Conventionally, the three most important aims of RTI/STI control are: (1) interrupting transmission by promoting safer sexual practices, (2) rapidly curing those infected, and (3) preventing the development of complications and sequelae by screening for the diseases in high-risk groups. There is a general consensus that most countries need to develop a more comprehensive approach to STI control, which requires interventions based on countries' current needs and available resources, and a careful adaptation to local realities (Lindstrand et al., 2006).

People in the community should be aware of RTI/STI and know how to prevent and treat them. The most effective strategy to preventing RTI/STI is to avoid exposure by: (1) delayed sexual activity (for adolescents); (2) decreasing the number of sex partners; and (3) using condoms correctly and consistently, as “*Prevention is better than cure*”. In order to reduce the risk of complications for the individual, as well as to prevent new infections, RTI/STI secondary prevention should involve prompt recognition and effective treatment of RTI/STI when they do occur (WHO, 2005a). The sooner an STI is cured, the less chance it will be transmitted to other people.

Prevention and management of RTI/STI require special attention to factors that can influence risk and vulnerability, such as age, sex, culture and occupation. Community control of RTI/STI will be very difficult to achieve, if men and/or adolescents are ignored (WHO, 2005a). It is important to: (1) encourage men with an STI to bring their partners for treatment, as STI are more often symptomatic in men than in women, thus, partner management is an important way to identify asymptomatic women who need treatment; and (2) reach men with information about prevention, especially about use of condoms.

Similarly, safer behaviours that should be encouraged for young people include: (1) delaying onset of sexual activity; (2) learning how to use condoms consistently and correctly; (3) practising dual protection to prevent RTI/STI as well as unplanned pregnancy; (4) limiting numbers of partners; (5) avoiding high-risk sexual practices (eg., unprotected vaginal or anal sex) with any partner; and (6) recognizing symptoms of STI and seeking early treatment. Other groups, such as sex workers and their clients, migrant and mobile workers, prisoners, and street children, may be at high risk of STI. Outreach to these groups strengthens STI control. Peer education is the key to supporting sex workers in demanding safer conditions, such as promoting consistent use of condoms (WHO, 2005a).

Public health approaches to RTI/STI control

Control of endogenous infections: As a wide variety of factors may put women at risk of endogenous infections, such as certain types of contraceptive use (e.g., higher dose of oral contraceptives), vaginal douching, pregnancy, and use of antimicrobials, control strategies for these infections would include promoting the rational use of antimicrobials and use of lower dose oral contraceptives (UNFPA and Population Council, 2001).

Control of iatrogenic infections: It should include care sought from skilled and qualified health workers, screening for infections before undertaking a transcervical instrumentation, and advising the client to return immediately if any abnormal symptoms occur after such a procedure (UNFPA and Population Council, 2001). Appropriate antibiotic prophylaxis would also prevent some iatrogenic infections.

Control of STI: Effective prevention and care of STI can be achieved using a combination of responses (WHO, 2006a). Services for STI prevention and care should be expanded and embrace a public health package, including a horizontal implementation of RTI/STI prevention and care across all primary health care programmes (e.g., sexual and reproductive health and HIV programmes).

Behaviour change communications for RTI/STI: It has been well substantiated by behavioural scientists that real, long-lasting behaviour change is not the result of simply telling people what to do (UNFPA and Population Council, 2001). Behaviour change communications involve understanding the individual's needs, concerns, and perceptions. Mass media would be effective in providing a general understanding of a problem, whereas interpersonal channels would be effective in changing specific and individual attitudes and behaviour.

Mass treatment: This is an alternative and more radical approach to reducing the high numbers of people infected with STI. Whole communities, or selected populations within communities (e.g., sex workers), are given regular repeated doses of drugs against bacterial infections. Its main advantage is that of addressing infection in asymptomatic individuals. However, it can be an expensive strategy and repetition of repeated doses of drugs may lead to a potential danger of antimicrobial resistance. Although mass treatment may, in the short run, have an impact comparable to sustained syndromic treatment (Korenromp et al., 2000), there have been serious doubts about sustainability and long-term effectiveness of mass treatment for STI (UNFPA and Population Council, 2001).

Vaccination programmes: There is no vaccination currently available against STI or endogenous infections. However, since 1982, there has been an effective preventive vaccine against HBV. So far, preventive vaccines against oncogenic types of HPV show great promise (WHO, 2006a) and are now available (CDC Media Relations, 2006).

Screening programmes: Case finding among family planning clients is an important opportunity to detect and counsel about these infections when women and men are present for contraceptive services (UNFPA and Population Council, 2001). The most common screening programmes worldwide are those for detecting syphilis in pregnant women. Although the cost of syphilis screening is low and the diagnostic technology is simple to use, this screening programme has not yet been applied in many low-income countries, including Laos.

1.4 Lao People's Democratic Republic

1.4.1 General information

The Lao People's Democratic Republic (Lao PDR or Laos), a low-income country in South-East Asia, has an area of 236,800 square kilometres. It shares borders with Thailand, Vietnam, Cambodia, China and Myanmar (Figure 1). Since its admission as one of the ASEAN member countries in 1997, the landlocked country has become a land-linked country. The population of Laos doubled from 2.2 million in 1960 to 4.6 million in 1995, and in 2005 it had a total population of 5.6 million, of which 2.8 million were females (National Statistics Centre, 2006). Its people are relatively young with about 39% being under the age of 15 years, 57% aged 15-64 and 4% being 65 and older. The population density is 23.7 persons/sq.km, which means Laos is the least densely populated country in South-East Asia. Forests and mountains cover about 65% of the total area.



Figure 1. Map of the Lao PDR (Source: United Nations, 2003)

Thirty years of war in Indochina have substantially retarded the industrial and human development of Laos and decimated its rural areas and natural resources. A weak infrastructure and an economic system mainly based on agricultural subsistence population further contributed to retarded economical growth. Agriculture accounts for over 50 % of the Gross Domestic Product (GDP) and about 40 % of the country's total foreign exchange earnings (Asian Development Bank, 2001).

The population contains 49 different ethnic groups, which are classified within three general groups of Lao Sung (upland Lao), Lao Theung (midland Lao), and Lao Loum (lowland Lao), that have different local dialects. The official language is Lao. Sixty-seven percent of the population is Buddhist (National Statistics Centre, 2006), and 33% are others (e.g., Animist, Christian, and Muslim). Administratively, Laos has 16 provinces, and one capital city, 141 districts, 10,553 villages, and 958,955 households. The average

household size is 5.8 persons; the household size is generally lower in urban areas as compared to rural areas. Twenty-seven percent of the population is living in urban areas and 73% in rural areas (National Statistics Centre, 2006). Communication conditions are poor, particularly in the rainy seasons.

Since the Lao PDR in 1986 adopted the New Economic Mechanism, an economic reform from a centrally planned system to a more market based system, the country's economy has gradually improved. For instance, there has been an increase in exports, a lower inflation rate, and an expansion of foreign direct investment. The annual GDP growth rate was 5.8% in 2000 and 7% in 2005 (World Bank, 2007). The GDP per capita has increased from 322 US\$ /person/year in 2000 to 491 US\$ /person/year in 2005 (National Statistics Centre, 2006), but 39% of the population still live on an income below the poverty line, and many people lack basic food and have less access to health care. The mortality and morbidity rates are high, especially in the remote and mountainous areas where poverty is more common (MOH, 2002).

Table 2. Selected health and social development indicators of Laos from 1995 to 2005

Selected health and social development indicators	1995	2000	2005
Population size, thousand	4,58	5,20	5,62
Sex ratio, males per 100 females	97.7	98.0	99.3
Population density, persons /sq km	19.3	22.0	23.7
IMR (per 1000 live births)	104	82	70
U5MR (per 1000 live births)	170	107	90
MMR (per 100,000 live births)	656	530	405
Life expectancy at birth (years)			
Total (Male/Female)	51 (50/52)	59 (57/61)	61 (59/63)
Population growth rate (%)	2.8	2.6	2.1
Total fertility rate (per woman)	5.6	4.9	4.5
Adult literacy rate (%)			
Total (Male/Female)	60 (70/51)	70 (82/59)	73 (83/63)

Source: Ministry of Health (MOH), 2001a; National Statistics Centre, 2001, and 2006.

IMR=Infant mortality rate; U5MR=Under-5-year mortality rate; MMR=Maternal Mortality Rate

Over the past ten years, several health indicators have been substantially improved, such as a gradual decrease in maternal mortality rate (MMR), infant mortality rate (IMR), and under-5-year mortality rate (U5MR), and a gradual increase in the life expectancy at birth (Table 2). However, those indicators remain poor compared to many other countries in South-East Asia, Japan, and Sweden (Table 3). Health indicators tend to be worse

among the ethnic minorities who commonly are poor and tend to live in remote areas where provision of health services is difficult.

Table 3. Health status indicators in South-East Asian countries, Japan and Sweden

Countries	Total population (000) 2003	TFR 2003	Life expectancy at birth (years)			IMR	U5MR	MMR
			2003			per 1000 LB	per 1000 LB	per 100,000 LB
			Total	M	F	2002	2003	2002
Lao PDR	5,657	4.7	59	58	60	82	91	530
Cambodia	14,144	4.7	54	50	57	95	153	437
Myanmar	49,485	2.8	59	56	63	60	106	255
Indonesia	219,883	2.3	67	65	68	35	41	307
Vietnam	81,377	2.3	71	68	74	26	23	165
Philippines	79,999	3.1	68	65	71	29	36	96
Thailand	62,833	1.9	70	67	73	22	23	13
Malaysia	24,425	2.9	72	70	75	6.2	7	30
Brunei	358	2.5	77	75	79	83	6	27
Singapore	4,253	1.3	80	78	82	2.2	3	3
Japan	127,654	1.3	82	78	85	3	4	7
Sweden	8,876	1.6	81	78	83	3 (2005)	4	2 (2000)

Source: WHO, 2005c. The World Health Report 2005; WHO, 2005d. Core indicators 2005. TFR=Total fertility rate; IMR=Infant mortality rate; U5MR=Under-5-year mortality rate; MMR=Maternal Mortality Rate; LB=Live births; M=Male; F=Female

1.4.2 Health care

The economic reform has affected the development of the health care system throughout the country, contributing to the improvement of the health condition of a majority of Lao people as shown in Table 2. However, the health indicators are still poor. At the same time, the number of private pharmacies has increased rapidly leading to low utilization of health facilities and patients turning directly to pharmacies where all kinds of treatment are available without prescription (Syhakhang, 2002). Eighty percent of the Lao population turn to private pharmacies for treatment; a health seeking behaviour which merits more attention (MOH, 2003).

Health care system

The health care system in Laos encompasses both the activities of health care providers and people who seek health care, as well as people's own activities to promote, restore or

maintain their health without relying on health care provision (National Statistics Centre, 2006).

There are two categories of health care providers, formal health care providers, and informal health care providers (Boupha, 2005). The system of formal health care provision has three types of services covering both curative and preventive services, including services provided by hospitals (hospital system), services provided by the primary health care system, and services provided by vertical programmes. The system of informal health care provision includes traditional healers, traditional birth attendants, drug sellers, village health providers, and village health volunteers.

Throughout the country there are four administrative levels responsible for public health, including central, provincial, district and village levels (Figure 2). The central level comprises the Ministry of Health (MOH) headquarters and specialized institutions (institutes, centres, hospitals, university and colleges). Within the MOH there are seven departments (Cabinet Office, Department of Hygiene and Disease Prevention, Curative Department, Department of Planning and Finance, Department of Food and Drugs, Department of Personnel and Organisation, and Department of Inspection), whose responsibility is to formulate health policies and develop plans and strategies to implement them effectively.

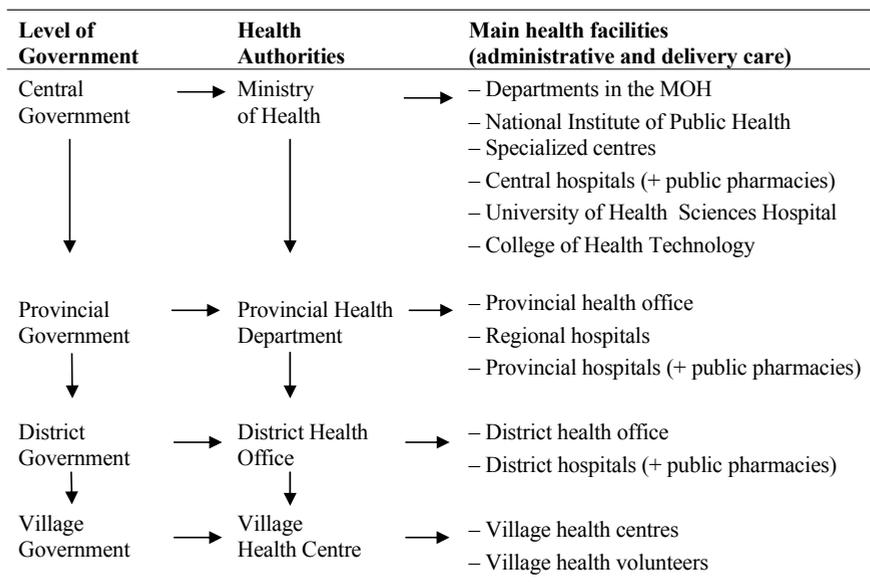


Figure 2. Public health care structure in Lao PDR (Modified from Syhakhang, 2002)

The health care services are provided throughout the country through four central hospitals - Mahosot, Mittaphab, Sethathirath (namely University of Health Sciences Hospital), and Mother & Child Health (MCH); nine specialized centres (ophthalmology, tuberculosis, dermatology, orthopaedic and rehabilitation, MCH, malaria-parasitology and entomology, traditional medicine research, laboratory and epidemiology, and HIV/AIDS

centres); three regional hospitals - one located in Oudomxay for northern parts, one in Savannakheth for central and one in Champasack for southern parts; 13 provincial hospitals; 126 district hospitals (National Statistics Centre, 2006); and 734 health centres, each covering 10-20 villages.

The central hospitals are responsible for tertiary curative care, the third level in the referral system. Some hospitals function as teaching hospitals, providing specialist medical care, scientific research and technical assistance for every hospital in the country. The regional hospitals are responsible for the second level in the referral system, curative services at provincial level, providing health care for the entire region, centre for health development and primary health care (PHC), monitoring and conducting training for health staff in the region. The provincial hospitals, with about 60-100 inpatient beds each, are responsible for the second level in the referral system, treatment and rehabilitation services, and training all categories of professional health staff. The district hospitals, with about 10-15 inpatient beds each, are responsible for the first level in the referral system, health care services, disease prevention, health promotion, diagnosis, treatment of the most common diseases, mother and child care, and planning and implementation of PHC in district. The health centres are responsible for treatment of basic diseases, MCH services, prevention, health promotion and supervision of village health volunteers in the villages covered by the health centre. Village health volunteers are trained for different kinds of activities to promote PHC activities, such as implementing health education and promotion about clean water, sanitation, and malaria control, assisting with immunization, antenatal care and family planning programmes, and introducing drug kits to people in remote villages.

The total number of hospital beds in 2001 was 6495, in which 1033 beds in central hospitals, 932 in regional hospitals, 940 in provincial hospitals, 2350 in district hospitals. There were 308 private clinics, 2132 registered private pharmacies, six pharmaceutical factories, and no private hospital (National Statistics Centre, 2006). Private clinics were mainly run by general practitioners or specialists and were only active in curative outpatient care. There were also a number of traditional medicine clinics including herbal medicine and acupuncture clinics. Private pharmacies are categorized as Class I run by a qualified pharmacist with a university degree, Class II run by a pharmacist assistant and Class III run by any medical professional, often nurses. The majority of the pharmacies were Class III, but the policy is now to reduce Class III pharmacies in urban areas. In addition to those registered pharmacies, there was also an illegal drug market of unknown size (Stenson et al., 2001). The total number of pharmacists in early 2007 was 310 and assistant pharmacists 322 (Department of Organization and Personnel, personal communication).

In total, there were about 1.04 hospital beds per 1000 inhabitants (MOH, 2001d) and 3.6 doctors and 6.9 nurses per 10,000 inhabitants, compared to Thailand with 1.8 hospital beds per 1000 inhabitants and 2.8 doctors and 9.3 nurses per 10,000 inhabitants, Vietnam with 2.2 hospital beds per 1000 inhabitants and 4.8 doctors and 5.5 nurses per 10,000 inhabitants (Health systems development advanced international training program, 1999), and Sweden (a high-income country) with 3.4 hospital beds per 1000 inhabitants and 31

doctors and 34 nurses per 10,000 inhabitants (The Swedish Association of the Pharmaceutical Industry, 2001).

The health care spending is about 11.5 US\$ per person per year, with about 60% from household expenditure, 30% from donor sources, and 10% from government tax revenue (WHO, 2005b). Although per capita health spending has increased from 8.5 US\$ in 1997-1998 to 11.5 US\$ in 2000-2001, this figure is still low compared to neighbouring countries such as Vietnam (19 US\$), Cambodia (16 US\$), Myanmar (86 US\$), and Thailand (71 US\$). Out of pocket spending accounts for 58% of health care financing, most of it being spent on drugs, and two thirds of that in private pharmacies, of which less than 10% are run by a qualified pharmacist or an assistant pharmacist (MOH, 2003).

Surveys on drug use showed great problems in self-medication, dispensing and prescribing practices, which made decision-makers aware of the need for a comprehensive National Drug Policy (NDP) to improve the pharmaceutical sector (Paphassarang et al., 1995). With financial support from the Swedish International Development Agency (Sida) and technical assistance from IHCAR, Karolinska Institutet, the government of the Lao PDR formulated a comprehensive NDP in 1993, covering the following 13 elements: drug legislation and regulation, drug selection, drug nomenclature, drug registration and licensing for sale, drug procurement, financial resources, drug distribution and storage, quality assurance of drug substances and pharmaceutical specialities, rational drug use, drug advertising and promotion, international technical cooperation, traditional medicine, and drug monitoring and evaluation. The main objective was to ensure the availability, safety, low price and good quality of the essential drugs affordable to those who needed them, and to ensure the rational use of drugs (Paphassarang et al., 1995). The Food and Drug Department implemented the policy through the Lao NDP Programme in 1993-2002, with continued support from Sida and IHCAR, Karolinska Institutet. The Lao Essential Drug List, originally created in 1978, was revised in 1994 following the approval of the NDP, and was again revised in 1997 and 261 items were listed. It has been revised again in 2004 and then recently in 2007. The number of items was 287 and 294 respectively. The NDP was revised in 2001, adding operational research as one important element to support the implementation of the policy on evidence-based grounds.

Health-seeking behaviour

Health-seeking behaviour refers to action taken for a health event. A health event does not always mean sickness. Pregnancy is a health event, too. The National Health Survey 2000 showed that about 50% of those falling ill sought care - of those, 71% practised self-medication, including visiting a pharmacy, 20% consulted at government facilities, 5% visited a private clinic or got a home visit, 3% visited village health volunteers or traditional birth attendants (TBAs), and 1% visited a spiritualist (MOH, 2001a). Another household survey conducted by the Asian Development Bank (ADB, 1999) also showed that self-medication, including visiting a pharmacy, was the most common health-seeking behaviour (63%). The type of action first taken when people suffer from acute illness was not dependent on their sex (MOH, 2001a).

Why do some people self-medicate and others seek care from skilled personnel?

It has been reported that, among those who used health facilities, the expressed reasons for their choice included: facility being close and easy to access (57%); satisfaction with staff (13%); severity of illness (11%); and others (fees of consultation or medication) (MOH, 2001a). A study on the strategic assessment of reproductive health in Laos in 2000 found that most people prefer to buy drugs at private pharmacies because drugs are easy to access and can be bought at any time (WHO, 2000a).

Regarding pregnancy-related health-seeking behaviours, it has been reported that only 29% of pregnant women received antenatal care from a midwife, nurse or doctor, whereas 65% of pregnant women did not receive any antenatal care at all (MOH, 2001a). During deliveries, relatives or friends assisted in 39% of cases, skilled health workers in 21%, TBAs in 16%, and no assistance in 14% of deliveries (MOH, 2001a). The survey conducted in 11 provinces also revealed that the top three actions taken by pregnant women during labour were seeking the assistance of friends/relatives (62%), seeking assistance of TBAs (11%) and not seeking any assistance at all (10%), and that the number of deliveries assisted by skilled health workers was only 17% (Asian Development Bank, 1999). The rate of pregnant women not having antenatal care was found much higher in rural communities (73%) than in urban centres (17%) (Asian Development Bank, 1999).

Common illnesses among the Lao people

Laos is undergoing a demographic transition and is in the position of being vulnerable to a dual burden of disease. Communicable diseases, such as malaria, diarrhoea, dengue hemorrhagic fever, intestinal parasitism, tuberculosis, acute respiratory infection, measles, and STI remain common or are serious threats (MOH, 2001a). At the same time, non-communicable diseases, such as traffic accidents, drug addiction, cancer, diabetes, hypertension, cardiovascular diseases, neurological diseases, and mental illness are emerging and being recognized as significant and expanding problems (MOH, 2001a).

Regarding children, malaria, acute respiratory infections and diarrhoea diseases are the three major mortality causes, accounting for more than 70% of deaths in children under five years of age in Laos (MOH, 2000). Reduction of the death number due to these illnesses could lead to an improvement in health indicators such as IMR, U5MR, and life expectancy. High childhood mortality seems to be associated with underdeveloped socio-economic conditions that result in poor sanitation, inadequate hygiene, and lack of safe water supply (MOH, 2000). Adverse health impacts like malnutrition, anaemia, vitamin A deficiency, and intestinal helminth infection are also related to this poor socio-economic status (MOH, 2000).

Poverty has a negative impact on health. Conversely, if health is poor, it will result in increasing the poverty of the people because the ability to work or to be economically productive has decreased. For people living in the remote and hard to reach areas where poverty is more common, the birth and mortality rates are high if compared to the people in urban areas (MOH, 2001a).

1.4.3 RTI/STI/HIV/AIDS situation

Laos is a low prevalence country for HIV/AIDS with an estimated adult seroprevalence of HIV of 0.05% in 2000 (UNAIDS/WHO, 2000), and 0.1% in 2005 (WHO, 2005e), while higher HIV prevalence has been reported in neighbouring countries, such as Cambodia (Kim et al., 2005), Thailand (Limpakarnjanarat et al., 1999) and Myanmar (Beyrer et al., 2003).

The first HIV-infected individual was detected in Vientiane, the capital, in 1990, and the first case of AIDS was identified in 1992. A survey of 502 pregnant women in Vientiane Capital in 1996 showed that two women (0.4%), both aged 20 years, were HIV-seropositive (Loue et al., 1998). Case reports in 2003 from 14 provinces and blood samples from 91,003 persons showed that the cumulative number of HIV-positive persons was 1,102, including 599 individuals living with AIDS, and 461 deaths had occurred from AIDS (Phimphachanh & Sayabounthavong, 2004). Almost 80% of all HIV infection cases occurred in people aged 20-40 years. Four out of five of the HIV infections were attributed to heterosexual intercourse, less than 3% to homosexual encounters, 16% to unknown risk factors, and almost 1% (some 10 cases) was infected from the use of contaminated needles during acupuncture. Twenty-four children were HIV-infected, 2.2% of the total (Phimphachanh & Sayabounthavong, 2004).

Although the data available from Laos showed low HIV prevalence, the risk of an epidemic is present and increasing (Phimphachanh & Sayabounthavong, 2004); the epidemic may merely be growing at a slower pace (Toole et al., 2006). Owing to massive economic expansion and social changes in the last decade, after opening its borders to foreign investments and visitors, Laos is facing the challenges of an increase in domestic and cross-border migration, number of sex workers, unsafe sexual behaviour, and illicit drug use, especially among the youth (WHO, 2002).

Sentinel surveillance in 2001 showed that the HIV prevalence rate was 0.9% among high risk groups such as service women (any woman who worked in a small drink shop, nightclub, or guesthouse and had direct contact with customers), and that infection rates of certain STI among service women were high, 32% for chlamydia and 14% for gonorrhoea (National Committee for the Control of AIDS Bureau, 2002). The high prevalence of chlamydia and gonorrhoea probably reflects poor access to treatment or poor condom use for disease prevention among service women. A study among ante-natal care clinic patients in Vientiane in 2001-2002 showed a rather high prevalence of lower genital tract infections, e.g., 27% for *Candida species*, 22% for bacterial vaginosis, 10% for *Chlamydia trachomatis*, 2% for *Trichomonas vaginalis*, and 1% for *N. gonorrhoeae*, but no syphilis serological markers (Thammalangsy et al., 2006).

Community-based surveys showed that 38% of those reporting more than three sexual partners, had never used condoms (WHO, 2001b). In a study among young men in Laos, most young men reported initiating sex at an early age and having multiple sexual partners, a sexual behaviour that could lead to accelerated HIV transmission (Toole et al., 2006). Awareness among Lao people of HIV/AIDS and protection against it remains low. The National Health Survey in 2000 showed that about one third of women in

reproductive age had never heard about HIV/AIDS and did not know how to protect oneself from HIV infection (MOH, 2001a).

In brief, risks factors for an increase in HIV transmission in Laos include: (1) proximity to countries with higher HIV/AIDS prevalence; (2) increasing travel and migration, both internal and external; (3) poverty and low living standards, which have been shown to be associated with an increase in risky behaviours; (4) increased use of illicit drugs and regular use of alcohol; (5) increased risky sexual behaviours including having more than one sexual partner (Population Services International, 1999); (6) poor access to effective STI treatment; (7) relatively low awareness about the causes and prevention of HIV/AIDS in some segments of the Lao population (MOH, 2001a); (8) poor implementation of universal precautions against HIV/AIDS transmission in health facilities; and (9) poor implementation of universal screening for HIV of blood transfusions or blood products before use. However, the low HIV prevalence in Laos provides a real opportunity for the development and implementation of effective HIV/STI prevention programmes to prevent HIV transmission in order to avoid an epidemic across the whole community.

1.4.4 Strategies for RTI/STI control

In order to fight HIV/AIDS, the National Committee for the Control of AIDS Bureau (NCCAB) was established in 1998 as a core organization responsible for planning, coordination, resource allocation, management and administration of the National HIV/AIDS Programme (MOH, 2001b).

Laos constructs its HIV/AIDS/STI policy and control activities on the following universal principles: (1) non-discrimination; (2) a multi-sectoral, integrated approach; (3) voluntary approaches with informed consent; (4) confidentiality and privacy in counselling, testing and care; (5) empowerment of individuals to take personal responsibility; (6) gender equity; (7) accessibility to affordable and acceptable services; (8) reduction of risk for vulnerable individuals and community groups; and (9) involvement in decision making of those affected by HIV/AIDS (MOH, 2001c).

Since STI are a known co-factor in facilitating HIV transmission, care and prevention of STI are an integral priority component of HIV/AIDS control. The provision of effective case management based on WHO's syndromic approach (WHO, 1995) as well as counselling, contact tracing and condom use promotion, form the cornerstones of the national HIV/STI prevention and control programme (MOH, 1998). In Laos, it has been difficult to openly talk about sex including condom use, but evidence-based information about the results of the behaviour and HIV/STI surveys gained more political support, as decision-makers better understood the HIV situation in the country. Thus, a strong, scientifically sound, and sustainable surveillance system is a high priority to provide information about trends in HIV/STI prevalence, and behaviours related to vulnerability to HIV/STI infection.

As the main method of acquiring HIV is through unsafe sexual behaviour, the core strategy for HIV/AIDS/STI control is promotion of safer sexual behaviour. This includes: (1) encouragement of sexual abstinence; (2) encouragement of fidelity within marriage; (3) encouragement of the use of condoms (in cases where abstinence or faithfulness are

not certain) including making condoms widely available (MOH, 2001c). Effective HIV/AIDS/STI prevention requires clear and frank messages about sexuality that take into account the cultural and social values of Laos without compromising clarity. Skills in negotiating the use of condoms, especially for women in sexual relationships should be an important part of information and education programs. Prevention of new transmission in Laos is attempted through low-cost interventions including access to cheap condoms, HIV surveillance and counselling, and sex education at school (MOH, 2001c).

Focusing HIV prevention efforts on vulnerable groups has been shown to be effective in reducing transmission of HIV to the general population. Community groups in Laos that are believed to be at increased risk of infection include: (1) service workers in entertainment sites; (2) internal and external migrants; (3) long distance truck drivers and other transport workers; (4) businessmen, traders, and government employees who travel frequently within Laos and internationally; (5) youth who tend to experiment; and (6) anyone with more than one sexual partner who does not use a condom (MOH, 2001b).

Laos supports a multi-sectoral response to the threat of HIV/AIDS/STI, which requires a response from multiple governmental agencies and ministries, mass organizations, civil society, the private sector, and international organizations. Due to an awareness of the risk of an HIV epidemic, the country has been supported by the Global Fund for HIV/AIDS control, aiming to improve STI services in public facilities and to implement “Presumptive treatment for STI” among service women in five provinces. The presumptive treatment project has been piloted in one province, with financial and technical support from the Family Health International, and in collaboration with Global Fund and Asian Development Bank projects (MOH, 2001b). The lessons learned from that pilot project indicated that presumptive treatment must be supported by the 100% condom use program in order to reduce STI and to maintain a low prevalence of HIV.

Pilot programmes for the treatment and care of people living with HIV/AIDS have been launched on a hospital basis in the Savannakhet Province and the Sethathirath Hospital in Vientiane Capital. Symptomatic treatment for conditions associated with AIDS should be made available with an essential drug list. Patients with HIV or AIDS should receive quality of care without any stigma. Capacity building regarding acceptance of knowledge and behaviour at the community level is an essential process for HIV prevention measures to work.

In brief, all RTI/STI/HIV/AIDS control strategies mentioned above should serve the general goal of the health development to the year 2020 as follows:

“To free the health care services in Lao PDR from the state of underdevelopment and to ensure full health care service coverage, justice and equity in order to increase the quality of life of all Lao ethnic groups” (MOH, 2000).

1.5 Rationale and conceptual framework

1.5.1 Rationale

Reproductive tract infections including STI, represent a silent worldwide pandemic, which adversely impacts the reproductive health of women and men (UNFPA and Population Council, 2001). There is a need of information regarding the management of

RTI/STI in Laos for many reasons such as recent recognition of RTI/STI as a major public health problem, the country's vulnerability to HIV/AIDS epidemic, stigma and discrimination associated with STI, limited availability of diagnostic facilities, and delayed or incorrect treatment of RTI/STI in combination with insufficient health education to the public. In addition, it is important to know the prevalence of RTI/STI in order to best apply the WHO's syndromic approach case management, which is advocated as a cost-effective public strategy to control RTI/STI, especially in resource poor settings (WHO, 1999a).

So far, data on the prevalence of RTI/STI in Laos remains limited, and its impact on public health has largely been undetermined. Also, no previous study on self-medication with antimicrobials for RTI/STI was carried out in Laos. Such a study was therefore highly relevant to the nation, as it was a response to an awareness of the continuing increase in antimicrobial resistance due to irrational drug use, and to the higher levels of HIV prevalence in countries neighbouring Laos (Kim et al, 2005; Limpakarnjanarat et al, 1999; Beyrer et al, 2003). Further, exploring lay people's perceptions, treatment-seeking behaviour and understanding of health information about RTI/STI has a major implication on community interventions to prevent and control RTI/STI. Moreover, assessing health providers' reported knowledge and practice competence regarding RTI/STI management has implications for future interventions to improve their awareness of appropriate management of RTI/STI including health education and partner notification.

Several questions needed to be answered:

- 1) To what extent and how do people use antimicrobials as self-medication for RTI in the community in Laos, and which factors influence their behaviour?
- 2) What are the rates of clinically and microbiologically identified RTI/STI among women attending a gynaecology clinic in Vientiane, and what is the antimicrobial resistance pattern of *N. gonorrhoeae*?
- 3) How do people in the community perceive RTI/STI, what do they do when they have symptoms related to RTI/STI, and to what extent do they have access to and understand RTI/STI health information?
- 4) To what extent do health providers have appropriate knowledge about RTI/STI case management, how are their self-reported practices, and which factors are associated with their competence in the management of RTI/STI?

1.5.2 Conceptual framework

The conceptual framework for the studies in this thesis encompassed two target groups, namely the community and its members focusing on adult men and women, and health providers and their health facilities. In this thesis, health providers included: (1) medical staff (medical doctors, medical assistants, midwives and nurses) working with RTI/STI patients in the public sector (district hospitals and health centres) and at private clinics; and (2) drug sellers (pharmacists, assistant pharmacists, medical doctors, medical assistants, midwives, nurses, and others) at private pharmacies. Regarding health facilities, the procedures and structures in a university hospital were investigated for

RTI/STI among women aged 15-49 years. Community included the social relationships, such as friends, parents, and relatives, and the community structures, such as access to health facilities, and availability of information. The relation between the study components is illustrated in Figure 3. For each component, a number of aspects were conceptualized and explored in relation to RTI/STI management.

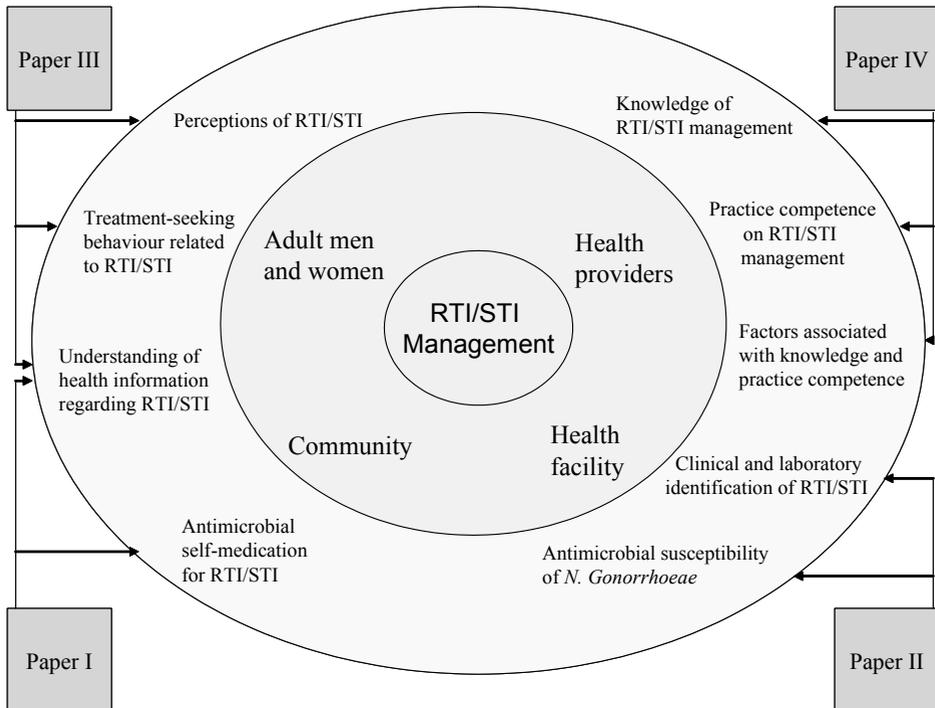


Figure 3. Conceptual framework for the studies

The findings of the studies contribute to an assessment of the present situation in Laos and provide essential information and evidence for decision-makers. They can serve as a basis to guide planning and resource allocation for future interventions to improve the quality of the management of RTI/STI, and in the fight to control STI spread as a means of reducing HIV/AIDS in this vulnerable country.

2 OBJECTIVES

2.1 General objective

The main aim of the study was to explore, describe and assess the management of RTI including STI among health providers and in the community in different settings in Laos. The long-term aim was to contribute to quality improvement of RTI/STI management. This includes health education and promotion through interventions at community level and to health providers, contributing to control RTI/STI spread as a means of reducing HIV transmission in Laos.

2.2 Specific objectives

- To describe antimicrobial self-medication for RTI/STI and to explore the understanding of health information, among the adult population in two provinces of Laos (Paper I)
- To clinically and microbiologically identify RTI/STI, and to monitor the antimicrobial susceptibility of *Neisseria gonorrhoeae* among women attending a gynaecology out-patient department in Vientiane, Laos (Paper II)
- To explore perceptions, treatment-seeking behaviour, and understanding of health information about RTI/STI among community members in two provinces in Laos and to explore their views regarding community interventions for correct treatment and prevention of RTI/STI (Paper III)
- To assess health providers' reported knowledge and practice competence regarding the management of RTI/STI in Vientiane, Laos (Paper IV)

3 METHODS

3.1 Study design

Quantitative research methods were used in Papers I, II and IV, and qualitative research methods in Paper III. The quantitative methods encompassed a community based study among the adult population including both women and men with the use of structured interviews to describe the use of antimicrobials as self-medication for RTI/STI (I); a hospital based study among women with the use of interview, clinical examination and laboratory tests to clinically and microbiologically identify RTI/STI, and to monitor the antimicrobial susceptibility of *Neisseria gonorrhoeae* (II); and a self-completed questionnaire to assess reported knowledge and practice competence regarding RTI/STI management among health providers (health professionals working with RTI/STI patients in both the public and private sectors and drug sellers at private pharmacies) (IV). The qualitative methods encompassed focus group discussions (FGDs) and individual interviews (IDIs) to explore community members' perceptions, treatment-seeking behaviour and understanding of information about RTI/STI (III). The summary of study design and methods is presented in Table 4.

Table 4. Summary of study design and methods

Study	Setting	Design/data collection methods	Subjects and sample size	Data collection period
I	Urban and rural areas in VTC and CPS	Cross-sectional community based study - Structured-interviews	500 men and women ≥18 years old	March 2002
II	Gynaecology OPD, Sethathirath Hospital, VTC	Clinical and laboratory based study - Interview - Clinical examination - Laboratory tests	1125 women aged 15-49 attending a gynaecology OPD during the study period	July 2000 to December 2001
III	Urban and rural areas in VTC and CPS	Community-based exploratory study - 14 FGDs - 20 Individual interviews	132 participants (76 women, 56 men) ≥18 years old	March 2002 and October 2005
IV	Urban and rural areas in VTC	Cross-sectional study - Self-completed questionnaire including written simulated cases with four scenarios	252 health providers - Medical doctors, medical assistants, midwives and nurses in the public and private sectors. - Drug sellers at private pharmacies	November 2005

VTC=Vientiane Capital; CPS=Champasack Province; OPD=Out-patient department; FGDs=Focus group discussions

3.2. Study settings

Studies I and III were conducted in both urban and rural areas in Vientiane Capital (VTC) and Champasak Province (CPS). The two provinces were chosen because VTC is a metropolitan area with a large number of contacts from outside and CPS is a transit province, particularly for trade and tourism. Vientiane Capital had a total population of 531,800 in 2002, and consisted of 9 districts, 591 villages and 102,043 households. Champasak Province had a population of 503,300 and consisted of 10 districts, 914 villages and 95,685 households. The average size of the study villages was 1300 people per village in VTC and 1050 people per village in CPS. In both provinces, the average size of urban and rural villages was similar. The socio-economic situation was somewhat better in VTC regarding, e.g., household economy and education (National Statistics Centre, 2003). A village was classified as urban if it had fulfilled at least 3 out of 5 of the following conditions: (1) village situated in district or provincial municipality; (2) more than 70% of total households in the village used electricity; (3) more than 70% of total households in the village used pipe water; (4) village accessed to the road; and (5) village had a permanent market that was operating throughout the whole day (National Statistics Centre, 2006).

Study II was conducted at Sethathirath Hospital (SH), a university and referral hospital in VTC. At the time of the study, the hospital had about 300 daily out-patient visits, including approximately 70 daily obstetrics/gynaecology visits, of which on average five were first-time visits for gynaecology. The hospital was one of the first settings in Laos that was approved by the Ministry of Health and the MOH/EU/STD Project for conducting research on RTI/STI in 2000.

Study IV was conducted in VTC. Vientiane Capital is located in the center of the country, and consists of four urban and five rural districts. One urban and one rural district, containing approximately one fifth of the inhabitants in VTC, were arbitrarily chosen (Figure 4). In these areas, there were two district hospitals, 11 health centres, 22 private clinics, and 102 licensed private pharmacies, including 10 pharmacies Class I, 34 Class II and 58 Class III.

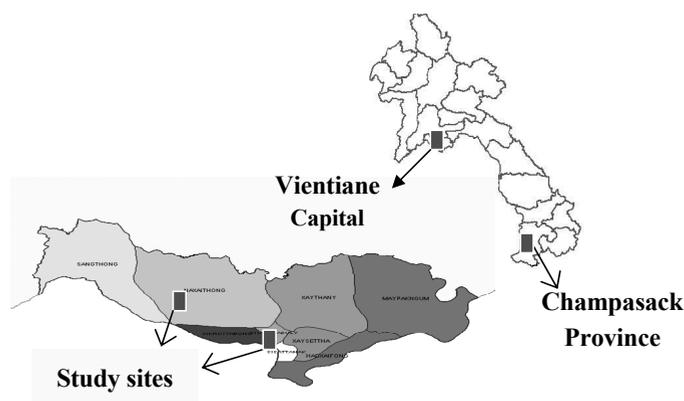


Figure 4. Location of the study settings and a map of Vientiane Capital

3.3 Study subjects and sample selection

Study I: Inclusion criteria were women and men aged 18 or above who reported use of an antimicrobial as self-medication for RTI/STI during the past 12 months in VTC and CPS, and who were willing to participate.

Sampling procedure: Using ordinary sample size calculations (estimated prevalence 50%, precision 5%, confidence interval 95%), the total number of participants was estimated to be 500. Within two districts (one urban, one rural) purposively selected in each of the two provinces, ten villages were randomly selected for the household survey. From each village, 25 persons should be included, and thus the total number of households was divided by 25. The first household selected was the household number on the list corresponding to the quotient. Thereafter the households were selected in relation to the same interval as the quotient. All household members aged 18 or above were screened by interviewers using a check list to determine if the individual met the criteria for inclusion or not. If the number of participants was less than 25 after the first round, new households were visited, starting with the one next in line related to the already selected households, until 25 study participants were recruited from each village.

The 500 study participants (250 in VTC and 250 in CPS), including 466 women and 34 men, were recruited from 3056 family members aged 18 years or above (1690 women and 1366 men) in 827 households in the two study sites, including 1331 family members in 363 households in VTC (714 women and 617 men), and 1725 family members in 464 households in CPS province (976 women and 749 men). Of all family members screened, 16% (500/3056) reported use of an antimicrobial as self-medication for RTI/STI during the preceding twelve months. More women than men were recruited, because more women were present during the survey, and full information could therefore not be obtained for all men in the household.

Study II: All women aged 15-49 years, attending for a first visit to the gynaecology OPD of Sethathirath Hospital during the study period, and agreeing to participate, were included in the study. Exclusion criteria included menstruation, heavy vaginal bleeding, pregnancy, hysterectomy, and antimicrobial use in the preceding two weeks, all based on self-report. A nurse-receptionist screened all attendees, using a checklist of inclusion and exclusion criteria. After the purpose of the study had been explained, all eligible women were asked if they would be willing to participate in the study, and no one refused. In total, 1125 women participated in the study.

Study III: Community members in both urban and rural areas in VTC and CPS were recruited from women and men aged 18 or above. They were selected purposively to have diversity of socio-demographic background such as gender, age groups, marital status, women's child bearing status, occupation variety and location. Overall 14 focus group discussions and 20 individual interviews were held with a total of 132 participants (76 women, 56 men) in Lao urban and rural communities in VTC and CPS.

Study IV: All 272 health providers (medical doctors, medical assistants, midwives, nurses and drug sellers) working with RTI/STI patients in one urban and one rural district in VTC, were invited to fill in a self-completed questionnaire including written simulated cases with four scenarios, and 252 (93%) participated.

3.4 Data collection

The data collection methods in this thesis included structured interviews (I, II), focus group discussions (III), individual interviews (III), a self-completed questionnaire including written simulated cases with four scenarios (IV), and clinical examination and laboratory tests (II).

Study I: The data were collected in March 2002. A structured interview form contained questions on demographic information, self-reported symptoms of RTI/STI, details of antimicrobial self-medication, and the understanding and use of health information. The form was developed and pre-tested outside the study areas. The structured interview contained both closed and open-ended questions (see Appendix 1). Prior to the data collection, all ten enumerators (five in each province) were trained in order to standardize the procedures of data collection.

Study II: The data were collected from July 2000 to December 2001. Standardization of gynaecological examination, specimen collection, transport and storage and relevant laboratory procedures was ensured by appropriate training of all involved staff before starting the study. Data collection procedures are illustrated in Figure 5.

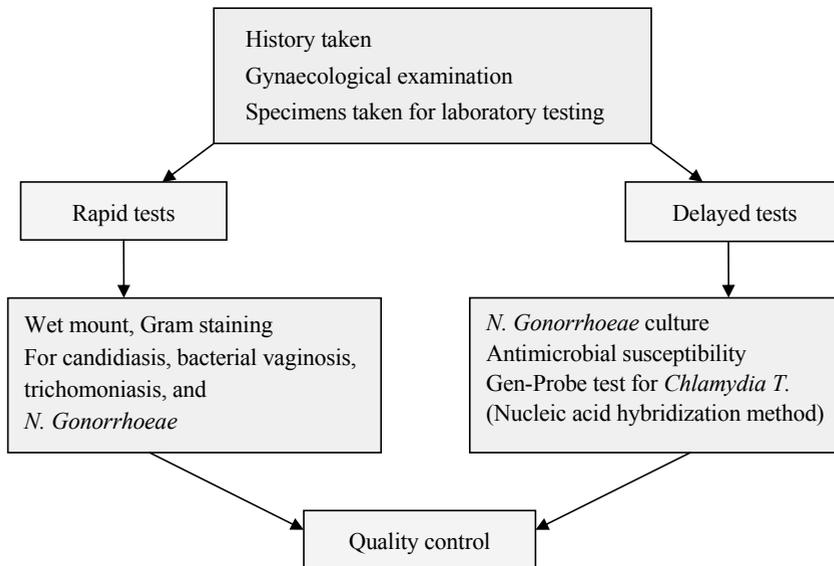


Figure 5. Data collection procedures

Interview and clinical examination: A clinician obtained a standardized history, including socio-demographic data and details of current symptoms related to RTI/STI, followed by gynaecological examination, including speculum examination, and specimens taken from the posterior vaginal fornix and endocervical canal for laboratory testing. Finally, a bimanual pelvic examination was made. All tests in this study were free of charge. Routine laboratory tests for syphilis and HIV were not included due to practical reasons.

Laboratory tests: The specimens were immediately transported to the adjacent hospital laboratory for aetiological diagnosis, including rapid tests and delayed tests. The rapid tests consisted of vaginal wet mount (vaginal secretions diluted with normal saline solution) with Gram stain for the microscopical detection of *Candida species*, *Trichomonas vaginalis* (TV) and bacterial vaginosis (BV), and endocervical Gram stain for *N. gonorrhoeae* (NG). The delayed tests consisted of culture for NG and Gen-Probe test for *Chlamydia trachomatis* (CT) on endocervical material, using two Dacron-tipped swabs. Antimicrobial susceptibility for gonorrhoea was determined at the hospital laboratory, and confirmed at the Centre of Laboratory and Epidemiology (CLE) on NG subcultures. The CLE performed quality control reviewing 10% of randomly selected negative slides and all positive gonorrhoea identified by Gram stain and/or subcultures. The results of the clinical examinations were not known to the laboratory staff.

Laboratory diagnosis: Candidiasis was diagnosed by the visualization of budding yeasts or pseudohyphae on microscopy of vaginal wet mount and/or Gram stain; TV by the visualization of motile trichomonads on microscopy of vaginal wet mount; BV by Nugent's Gram stain score (Nugent et al., 1991) of 7-10; NG by a positive intracellular gram-negative diplococci on microscopy of endocervical Gram stain, and confirmed by a positive culture by inoculation on modified Thayer-Martin medium, followed by inoculation at 37°C in 10% carbon dioxide. Antimicrobial susceptibility for ceftriaxone, ciprofloxacin, spectinomycin, penicillin and tetracycline was determined by E test (Biodisk, Stockholm, Sweden) on NG sub-cultures. CT was diagnosed by a positive result of nucleic acid hybridization test (Gen-Probe Pace® -2 System, *Chlamydia trachomatis*, Gen-Probe Inc., San Diego, CA, USA) on endocervical smears.

Management of RTI/STI: Clinicians based the initial treatment on WHO (1995) and national (MOH, 1998) guidelines on syndromic RTI/STI case management. The recommended drugs for the treatment of vaginal discharge and lower abdominal pain syndromes include metronidazole orally in single dose or daily for 7 days for bacterial vaginosis or trichomoniasis, clotrimazole cream or vaginal suppository for candidiasis, ceftriaxone or cefixime or spectinomycin in single dose for gonorrhoea, and doxycycline or tetracycline or erythromycin for 7 days orally for chlamydia. A follow-up appointment was arranged one week later for any further treatment of RTI/STI subsequently detected by laboratory tests. All treatment options should be given together with the "4 Cs" - counselling/education, correct condom use, contact tracing and compliance with the treatment regimen prescribed (MOH, 1998).

Study III: The data were collected during March 2002 and October 2005. Overall 14 FGDs and 20 IDIs were held with a total of 132 participants (76 women, 56 men). Eight FGDs were conducted in 2002 in VTC and CPS with in total 75 participants (37 women, 38 men) to get insight into people's understanding of RTI/STI information, and their views on correct treatment and prevention of RTI/STI. Because RTI/STI is a gender sensitive topic, the FGDs were homogenous with four groups of women and four groups of men (half in each province).

Based on the outcome of the FGDs in 2002, six more FGDs (four groups of women and two groups of men) with a total of 57 participants (39 women, 18 men), were conducted in 2005 in VTC to further explore people's perceptions and understanding about

RTI/STI symptoms, causes, transmission routes, risk factors, consequences and prevention, and their treatment-seeking behaviour. After each FGD in 2005, two to three participants were invited to participate in IDIs to get more insight into the issues brought up during the FGDs. The IDI participants were selected based on the observation that he/she would be shy to talk in the group because of the sensitive topic of RTI/STI, and also based on various occupation of the participants and their willingness to participate. In total 20 participants (14 women, 6 men) were invited and agreed to participate in IDIs.

The FGDs and IDIs were held at locations where people felt comfortable to talk (such as temples) and lasted approximately one and half hours for each FGD and about half an hour to one hour for each IDI. An interview guide was used as a prompt (see Appendix 2). The FGD and IDI guides were pre-tested in areas with similar characteristics as the study sites to ensure that the questions were understood. Before data collection, the research team contacted the head of the concerned village about the study purpose and procedures. Through this cooperation, the selected subjects were asked to participate one to two days before the meeting took place. Participation was voluntary. Each FGD consisted of 8-10 participants.

Women focus groups were conducted by a female moderator and men focus groups by a male moderator. Both were research team members and had previous experience of conducting FGDs. The interviews were made by three members of the research team, always with interviewer and interviewee of the same sex. The discussions and the interviews were audiotaped with the participants' consent. A note-taker listed topics discussed during the FGDs, took note of interactions between the participants, and assisted with the transcription of the taped discussions. The Lao transcripts were translated into English and entered into the computer. Sessions were continued until little or no new information was being obtained (data saturation) (Krueger, 1998). The transcribed materials of both FGDs and IDIs were checked by research team members by comparing the recorded tapes to the transcriptions.

Study IV: The data were collected in November 2005. A self-completed questionnaire containing both closed and open-ended questions was developed and pre-tested outside the study areas. The questionnaire included: (1) information about demographic characteristics; (2) four written case scenarios to assess health providers' ability to relate knowledge to practice in the management of patients with RTI/STI syndromes: abnormal vaginal discharge, genital ulcer and lower abdominal pain in women, and urethral discharge in men; (3) RTI/STI knowledge: differences between RTI and STI, causes, route of transmission and risk factors for RTI/STI, and consequences of untreated or incorrectly treated RTI/STI; and (4) knowledge and reported practices regarding RTI/STI syndromic case management and antibiotics (see Appendix 3).

The six data collectors were trained in order to standardize the data collection procedures. Each eligible health provider was contacted by telephone to book an appropriate time for the questionnaire completion after being informed about the study purpose and procedures. Health providers without a phone were directly contacted at their facility by one of the study staff. For health providers who worked at both public sector and private clinics, their facility type was identified as private clinic. About 15 to 25 health providers

were gathered in one meeting room so that the questionnaire could be administered at one sitting at the district health offices or hospitals. However, providers working at private clinics were gathered on different occasions in smaller groups of three to five persons. Each participant was required to complete the questionnaire within 30-45 minutes under supervision and without consulting any aid.

3.5 Data analysis

3.5.1 Statistical analysis

Data analysis was performed with Epi Info version 6.04 and SPSS version 10 (Centre for Disease Control and Prevention, Atlanta, GA, USA) in all quantitative studies (I, II, IV). The frequencies, means, standard deviations, and proportions were calculated. The 95% confidence intervals and the chi-square (χ^2) test were used to compare differences between age groups (I, II), between urban and rural areas, and between provinces (I). The sensitivity, specificity, and positive predictive value (PPV) of clinical diagnosis of RTI/STI were determined using laboratory test results as the reference (II).

In Paper IV, the responses to open-ended questions and the case scenarios were translated into English and coded. Answers were categorized into either correct - if matching the correct answer based on WHO (1995) and national (MOH, 1998) guidelines - or incorrect. Competence regarding the case scenarios and reported knowledge about RTI/STI were determined by a score. For each scenario, the score 1.5 was given to correct answers to questions asked (0.3 score for each of history taking, asking related symptoms, patient's risk behaviour, patient's partner and previous treatment), and the score 1.0 was given for each of the correct answers as regards diagnosis, treatment, and advice (0.25 score for each of the correct advice on the "4 Cs" - counselling for changing behaviour, condom use promotion, contact tracing and compliance with treatment). For questions related to RTI/STI knowledge, the score 1.0 was given for each of the correct answers. The total score of each aspect was divided in three categories, including optimal (above 75% of total score), medium (50-75%), and suboptimal (below 50%).

The χ^2 -test was used to compare differences between urban and rural areas, between provider types, between facility types and between previous participation or not in an STI training course. Due to the number of tests performed and the possibility of an inflated p-value, a Bonferroni corrected significance level was used. Participation in an STI training course was defined as having attended at least one STI management course organized by the national HIV/STI prevention and control program since 1999.

Logistic regression was performed in order to examine the simultaneous effect of health providers' sex (male/female), age (up to 40 years/over 40 years), practice location (urban/rural), provider type (medical doctor and medical assistant/midwife and nurse/drug seller), practice type (public/private sector or pharmacy class I/class II/class III), and previous participation in an STI training course (yes/no) on practice competence (regarding RTI/STI management and health education related to RTI/STI) and reported knowledge of RTI/STI. The outcomes for these models were coded so that respondents who achieved a medium to optimal score were considered to possess adequate practice competence or adequate knowledge, and those who achieved a suboptimal score were

considered to possess inadequate practice competence or inadequate knowledge. A corresponding model was developed for the health providers' competence regarding health education on the "4 Cs", taking into account the health providers' sex, age, practice location, provider type, practice type, and previous participation in an STI training course.

3.5.2 Qualitative data analysis

The FGDs and IDIs were analysed separately using qualitative content analysis (Graneheim & Lundman, 2004). Content analysis is a process of identifying, coding and categorizing the content of the data into patterns or themes (Polit & Beck, 2004). The first author (AS, principal investigator) did the main analysis with additional contributions by co-authors. The transcripts of the discussions and the interviews were read through several times to obtain a sense of the whole. Meaning units were identified, condensed and coded. The various codes were compared based on differences and similarities of perceptions, then sorted into sub-categories and categories. Finally, the authors reflected and compared the findings between the different FGDs and IDIs, and formulated three main themes. Qualitative comparisons were made between men and women, between age groups, between women with children and without children, and between urban and rural areas.

3.6 Ethical issues

The research project was approved by the National Ethical Committee for Health Research, Ministry of Health of Laos (No 037/NECHR) for Studies III and IV, by the National Committee for the Control of AIDS Bureau, Ministry of Health of Laos (No 078/NCCAB) for Study II, and by the Research Ethics Committee North at the Karolinska Institutet, Sweden (Dnr: 03-689) for Studies I and III. Official and open information was presented to local authorities before implementing the study.

Informed consent was obtained from all the subjects, emphasizing that refusing to participate or leaving the study at any time, would not adversely affect any care provided or would not influence future care. Participation was voluntary. All study personnel were trained in the importance of strict confidentiality of information and data. All collected information was handled anonymously.

4 RESULTS

4.1 Antimicrobial self-medication for RTI/STI (Paper I)

The mean age of the 500 study participants was 34.8 (SD \pm 9.5). The most frequently reported symptoms among the 466 female respondents was a combination of vaginal discharge and lower abdominal pain (78%), while 29 out of 34 male respondents reported symptoms of urethral discharge. The symptoms reported by men are likely to be signs of STI, while the symptoms reported by women may be caused by other RTI.

Almost all respondents (91%) had obtained the antimicrobials for the reported treatment episode from local private pharmacies without a physician's prescription. Fifty-eight percent obtained the advice to buy the drugs from drug sellers. Ampicillin (not recommended as syndromic treatment for RTI/STI) was used in 83% of all cases, in 28% combined with tetracycline (Table 5). Seventy-nine percent of respondents used antimicrobials for a non-recommended duration of time.

Of all respondents, 43% replied that they treated themselves for RTI/STI out of habit (following previous self-treatment with similar symptoms), either as the only reason (21%) or one of several reasons (22%). Other expressed reasons of self-medicating with antimicrobials for RTI/STI included: no time to see physician (33%); following advice of other people (24%); no serious disease (23%); too far from physician (17%); following drug advertisement (14%); not enough money (13%); long waiting time (4%); and shy of disclosing own disease (4%).

Table 5. Kinds of drugs used as self-medication for RTI/STI, classified by areas.
More than one alternative may be given

Kinds of drugs	Vientiane	Champasak	Total	
	Capital N=250	Province N=250	N=500	%
Ampicillin	100	65	165	33.0
Tetracycline	15	10	25	5.0
Penicillin	1	6	7	1.4
Metronidazol	1	0	1	0.2
Clotrimazole	3	0	3	0.6
Ceftriaxone	1	0	1	0.2
Mixed antibiotics :	99	150	249	49.8
– Ampicillin + tetracycline	56	85	141	28.2
– Ampicillin + penicillin	15	46	61	12.2
– Ampicillin + kanamycin	7	6	13	2.6
– Other mixed antibiotics	21	13	34	6.8
Other mixed drugs:	30	16	39	7.8
– Ampicillin + Clotrimazole	19	5	24	4.8
– Ampicillin+traditional medicine	2	7	9	1.8
– Traditional medicine + penicillin/tetracycline	3	4	7	1.4
Don't know the name of drugs	6	3	9	1.8

RTI=reproductive tract infections; STI=sexually transmitted infections

Of the 496 respondents who had ever gone to hospital, 59% replied that the services of medical staff were polite/good, while 37% said that the services were fair, and 4% said that some medical staff were impolite/rude/bad or provided service too slowly or disregarded the queue or paid attention only to rich patients. Of 122 women respondents who mentioned that they had problems with the genital examination, 94% replied that they were shy, and 6% were specifically afraid of pain in connection with the genital examination.

Almost all respondents, 91% had received some information on RTI/STI. Of those who had received RTI/STI information, 58% got the information from the radio and the television, 34% from drug sellers, 16% from friends, and 3% from medical staff or village health volunteers. The percentages add up to more than 100% because some respondents reported receiving information from more than one source. Although most respondents had access to health messages regarding RTI/STI, only 17% of all respondents reported that they had ever used a condom (25% in VTC vs 9% in CPS, $p < 0.01$). The higher rate of reported use of condoms in VTC than in CPS may relate to educational level as the number of respondents who had completed secondary school in VTC was higher than those in CPS (49% vs 34%, $p < 0.01$).

In brief, the study showed that more than three quarters of respondents who self-medicated with antimicrobials for RTI/STI used inappropriate drugs bought from private pharmacies. There is a need to improve RTI/STI management, including health promotion, through interventions at community level, and to health providers, including private drug sellers.

4.2 Clinical and microbiological identification of RTI/STI and antimicrobial resistance pattern of *N. gonorrhoeae* (Paper II)

The mean age of the 1125 study participants was 31.2 years (SD \pm 7.4 years). The most common symptoms reported by the women during the interview were vaginal discharge (67%), followed by lower abdominal pain (30%) (Table 6).

In total, 922 (82%) presented clinically with an RTI syndrome, including possible STI (Table 6). However, laboratory testing verified an infection in 719 women (64%), including 121 women (10.8%) with an STI (NG, CT, or TV). Fifty-two percent of all women had a single infection and 12% had two or more infections.

The total prevalence among all participants of any kind of RTI was 76%, including 12% for STI (NG, CT, and TV) (Table 7). The most common endogenous infection was candidiasis (40%), followed by BV (25%). Of the STI, CT was found in 4.1%, NG and TV both in 3.7% (Table 7). Five women (0.5%) had coinfection with NG and CT, and 1 (0.1%) with NG and TV, whereas 1 (0.1%) had simultaneous infections with NG, CT, and TV. The prevalence of NG and CT was higher among women under 30 years of age compared to those aged 30 years or above ($p < 0.05$).

For the 749 women who reported vaginal discharge (Table 6), the prevalence was 3.5% (26 cases) for NG, 3.6% (27 cases) for CT, 3.7% (28 cases) for TV, 26.8% (201 cases) for BV, and 43.5% (326 cases) for candidiasis. Of those women, 67% had a single infection, and 0.4% had two infections.

Table 6. Reported symptoms and clinical diagnosis of reproductive tract infections among 1125 women seeking care at a gynaecology OPD in university hospital, Vientiane

	Number	Percent
Reported symptoms*		
Vaginal discharge	749	66.6
Lower abdominal pain	343	30.5
Genital itching/wart	48	4.2
Dysuria/vesicular ulceration/dyspareunia	42	3.7
No symptoms (such as seeking care for infertility, or gynaecological check-up)	40	3.6
Clinical diagnosis**		
Vaginitis	433	38.5
Cervicitis	170	15.1
Vaginitis plus cervicitis	182	16.2
Pelvic inflammatory disease	99	8.8
Genital wart	24	2.1
Genital ulcer	14	1.2
Total	922	82.0

* Some had more than one symptom

**Vaginitis: Inflammatory appearance of the vagina or abnormal vaginal discharge, or both; Cervicitis: Inflammatory appearance of the cervix or cervical erosion or cervical bleeding at touching or abnormal discharge from cervical os, or combinations; Vaginitis plus cervicitis: Combination of signs of cervicitis and vaginitis; Pelvic inflammatory disease (PID): Purulent or muco-purulent discharge from the cervical os combined with lower abdominal or adnexal tenderness, or cervical motion tenderness.

Table 7. Aetiological diagnosis of reproductive tract infections in relation to age group among 1125 women seeking care at a gynaecology OPD in university hospital, Vientiane

Infection	No. Positive samples (%)		
	<30 years old (n=492)	≥30 years old (n=633)	Overall (n=1125)
<i>N. gonorrhoeae</i>	23 (4.7)	18 (2.8)	41 (3.7)
<i>Chlamydia trachomatis</i>	25 (5.1)	21 (3.3)	46 (4.1)
<i>Trichomonas vaginalis</i>	21 (4.3)	21 (3.3)	42 (3.7)
Bacterial vaginosis	112 (22.8)	164 (25.9)	276 (24.5)
<i>Candida species</i>	210 (42.6)	234 (37.1)	444 (39.5)
Total	391 (79.5)	458 (72.4)	849 (75.5)

All 41 isolates of *N. gonorrhoeae* were fully sensitive to ceftriaxone and spectinomycin, but eight isolates (20%) were resistant to ciprofloxacin, 40 (98%) resistant to penicillin, and all 41 (100%) resistant to tetracycline. Forty isolates (98%) were resistant to more than one drug.

The sensitivity, specificity and PPV for the treatment of vaginitis for candidiasis was 69%, 82%, and 71%, respectively, while for the treatment of vaginitis for TV and/or BV it was 70%, 74%, and 52%, respectively. For the syndromic approach that recommends drugs against both gonorrhea and chlamydia for the treatment of vaginitis plus cervicitis and/or PID syndrome, the sensitivity was high (98%), but the specificity was lower (81%), and the PPV only 30%. For every woman receiving correct treatment for either gonorrhea or chlamydia, two others were treated unnecessarily. If the treatment is based only on symptoms, the PPV for treating vaginal discharge as a potential STI (NG, CT or TV), would be only 10.4%, thus involving unnecessarily treating eight women for each correct case.

In brief, high rates of RTI/STI, combined with high *N. gonorrhoeae* resistance, emphasize that, concurrent with syndromic case management, periodic evaluations of etiological diagnosis should be available to ensure adequacy of treatment algorithms and prescribed medications.

4.3 Community perceptions, treatment-seeking behaviour, and understanding of health information regarding RTI/STI (Paper III)

Perceptions of RTI/STI

Although both men and women participants had quite good basic knowledge about the transmission routes, risk factors and prevention methods of STI/AIDS, some misconceptions about the causes and symptoms of RTI/STI and their cure still existed. Most women participants expressed the opinion that vaginal discharge can be due to unclean sex (no cleaning or washing of genital areas before and after sex), poor hygiene practice, sharing a dirty toilet, and digestion of some kinds of food. AIDS, gonorrhea, and genital warts were most commonly named by men participants as diseases due to sexual intercourse with service women, sharing a dirty toilet, and lack of hygiene. They also emphasized that alcohol consumption contributes to sexual desire and thereby the risk of getting infections.

Both men and women were afraid of not getting rid of the diseases. Some FGD participants stated that they were aware that STI can be cured and that AIDS is more harmful and cannot be treated. The women groups mostly stated that “*chaepmotlook*” (uterine pain), cervical and uterine infection and cancer, and AIDS may lead to body weakness and death. In contrast, men groups were afraid of becoming dysfunctional in their genital organs, getting RTI from women, and spreading diseases. Keeping one’s body clean and practising hygiene were mentioned in all groups as ways to prevent diseases. Restriction on eating papaya salad, abstinence during menses and taking traditional medicine every day were mentioned in the women groups as ways of RTI/STI prevention. Some men stated that not drinking alcohol can prevent diseases because drinking made people lose control.

Participants in the group of women with children stated that the main purpose of condom use was for contraception, while the majority of young men and women without children

stated that they had heard about condoms but never used them. Men participants expressed a view that condoms would make them lose some of the feeling, and that condom use is not natural. Further, they expressed trust in their partners and only used condoms in selected cases. Women also expressed concerns about the men's problem of less feeling. They also mentioned that condoms might cause itching, burning, and vaginal discharge.

"I don't like to use condoms because it's not natural, lack of feeling, and I trust my partners. I started having sex when I was 16 years old. Since then until now I have had three partners. I didn't use a condom because I trust my partners who were all my classmates. For service women, I should ask them whether or not they had any infections. If I don't trust them I would wear a condom" (A 20 year-old unmarried man from IDI).

Treatment-seeking behaviour for RTI/STI

The most common treatment-seeking behaviour mentioned by both men and women was self-medication through a private pharmacy or by using traditional medicine, and only finally visiting a health facility when a variety of other options had been tried and had failed. The duration from the onset of symptoms until seeking care was mentioned from within one week to many months or until the symptoms became serious.

"I spent time looking at my symptoms, if there is no improvement I go to hospital. My friend got these symptoms, she got vaginal discharge with pus, genital itching and pain. She used traditional medicine "Tom bay syda" for two weeks, but didn't get cured, she couldn't walk and then went to hospital" (Woman with children from IDI).

There were no obvious differences regarding treatment-seeking behaviour related to RTI/STI between men and women, nor between urban and rural areas. However, the first persons that men participants sought advice from when experiencing symptoms were friends followed by drug sellers, while the women participants sought advice from parents or relatives followed by friends and drug sellers.

The main reasons for RTI/STI self-medication included fear of social discrimination, fear of being criticized, the shame of letting people know about the disease, shyness of genital examination, not having time or enough money to go to hospitals.

".... I assume that 80% were shy to see a physician. Married men also don't want to see physicians because they are afraid of disclosing their diseases. Also they don't want other people to know that they play around even when they are married" (FGD unmarried man).

The commonest place for getting treatment for RTI/STI, that was mentioned by both men and women participants, was a private pharmacy because this is a comfortable option: there is no need to have genital examination, and it is easy to buy antibiotics without a physician's prescription. Other reasons for not using health facilities were that health services in the hospitals were slow, that the provision of treatment and care were sometimes not as good as expected. Some complaints were made about the negative attitudes of some medical staff regarding "dirty disease" (such as malodorous vaginal discharge).

Most men and women participants said that they preferred to consult with physicians of the same sex, also with trusted and experienced physicians. With respect to the genital examination for women, preference of a female provider was generally based on perceptions that female providers would be more understanding simply because they were women, and that they were shy to be examined by a male provider.

Understanding of RTI/STI health information

Most FGD participants in both urban and rural areas said that the most common sources of RTI/STI information were radio and television. Other sources of health information, including posters, booklets and pamphlets, and health education in school were also mentioned by some urban participants. Most participants stated that they could understand the messages provided, but in some instances the terms used were too technical and should be explained more clearly.

The common suggestions for improving RTI/STI health information were that mass media including radio, television, and posters should reach both urban and rural areas. Peer education, organizing of a quiz, and group discussions were also mentioned. Some participants in the group of women without children suggested more information about STI than about AIDS.

“Radio should reach remote areas. Urban people can receive more health information than the rural people Also put posters in crowded places not only in urban areas but also in rural areas to inform and educate people how to prevent diseases” (FGD woman without children).

In summary, the study showed that both men and women exposed some misconceptions about RTI/STI, a reluctance to seek health care that could cause delay to appropriate diagnosis and treatment, and an unwillingness to use condoms for disease prevention. Strengthening health education and promotion through interventions at community level, also in rural areas, is recommended to improve quality of RTI/STI management.

4.4 Health providers’ competence in the management of RTI/STI (Paper IV)

The mean age of the 252 respondents was 42.2 years (SD ± 9.7). Most of respondents reported seeing 1-4 RTI/STI clients in the previous week.

Practice competence regarding RTI/STI management

The total score for all four scenarios showed that one third (34%) of all respondents performed suboptimally, and that drug sellers’ scores were significantly lower than those of the medical staff (suboptimal score 42% vs 19%, $p < 0.003$) (Table 8). For all respondents, the percentage of suboptimal scores were similar for all scenarios with 32% for the case with abnormal vaginal discharge, 25% for urethral discharge, 41% for genital ulcer and 35% for lower abdominal pain. Regarding scenario aspect, the rate of suboptimal scores ranged from 12% for probable diagnosis to 87% for adequate advice (Table 8).

Table 8. Respondents' reported knowledge and practice competence regarding RTI/STI management, classified by practice types (n=252)

Score†	Medical staff			Drug seller n=164 (%)	All health providers n=252 (%)
	Public sector n=52 (%)	Private clinic n=36 (%)	Total n=88 (%)		
Total four scenarios					
Optimal	8	5	7	2	4
Medium	71	78	74	56	62
Suboptimal	21	17	19*	42*	34
Scenario aspect					
<i>Questions asked</i>					
Optimal	0	0	0	0	0
Medium	21	56	35	32	33
Suboptimal	79*	44*	65	68	67
<i>Probable diagnosis</i>					
Optimal	81	72	77	54	62
Medium	17	22	19	29	26
Suboptimal	2	6	4*	17*	12
<i>Treatment</i>					
Optimal	52	58	55	43	47
Medium	35	31	33	33	33
Suboptimal	13	11	12	24	20
<i>Advice</i>					
Optimal	8	5	7	1	3
Medium	21	17	19	5	10
Suboptimal	71	78	74*	94*	87
Total reported knowledge					
Optimal	12	36	22	8	13
Medium	46	53	49	55	53
Suboptimal	42*	11*	29	37	34

RTI=reproductive tract infections; STI=sexually transmitted infections

† Optimal = >75% score; Medium = 50-75%; Suboptimal = <50%

* p<0.003 (Significant difference between practice types; Bonferroni corrected p-value for the χ^2 -test = 0.003)

Medical doctors and medical assistants were 5-7 times more likely than drug sellers to possess adequate practice competence (medium to optimal) regarding the total four scenarios (OR:5.7; 95%CI:1.7-18.8; p<0.05), and similarly for the scenario aspects of asking appropriate questions (OR:4.8; 95%CI:1.8-13.3; p<0.05), and suggesting the right treatment (OR:6.7; 95%CI:1.3-34.3; p<0.05). Public sector providers and pharmacy Class I drug sellers had both 70% less probability of possessing adequate practice competence regarding the scenario aspect of questions asked (OR:0.3; 95%CI:0.1-0.9; p<0.05). Having participated in an STI training course was associated with a 2-4 times higher probability of possessing adequate practice competence regarding the total four scenarios (OR:1.8; 95%CI: 1.02-3.2; p<0.05) and the scenario aspects of questions asked (OR:3.5; 95%CI:1.8-6.5; p<0.001) and of advice given (OR:3.9; 95%CI:1.3-11.5; p<0.05).

Knowledge regarding RTI/STI

The total reported knowledge score was suboptimal for one third (34%) of all respondents (Table 8). However, the rates for suboptimal score were much lower for knowledge about routes of transmission (12%), risk factors (11%) and consequences of untreated RTI/STI (3%). For the total reported knowledge score, medical doctors and medical assistants were about 5 times (OR:5.5; 95%CI:1.5-20.1; $p<0.05$) more likely than drug sellers to possess adequate knowledge. Urban district respondents were almost 5 times (OR:4.8; 95%CI:2.9-9.4; $p<0.001$) more likely than those in the rural district to report adequate knowledge.

Practice competence regarding health education related to RTI/STI

About one third of all respondents (34% and 38%) reported correct advice regarding contact tracing and counselling. Medical staff achieved significantly higher scores than drug sellers (55% and 56% vs 23% and 29%, $p<0.01$) (Table 9). About half of all respondents (52%) gave correct advice on compliance, while the corresponding number for condom promotion was 59%. For the latter, medical staff were more active than drug sellers (80% vs 48%, $p<0.01$).

Table 9. Respondents' competence regarding RTI/STI health education (the 4 Cs), classified by practice types (n=252)

Correct advice	Medical staff			Drug seller n=164 (%)	All health providers n=252 (%)
	Public sector n=52 (%)	Private clinic n=36 (%)	Total n=88 (%)		
Counselling	62	48	56*	29*	38
Condom promotion	87	69	80*	48*	59
Contact tracing	52	58	55*	23*	34
Compliance	63	56	60	47	52

RTI=reproductive tract infections; STI=sexually transmitted infections

* $p<0.01$ (Significant difference between practice types; Bonferroni corrected p-value for the χ^2 -test=0.01)

Medical doctors and medical assistants were 3-7 times more likely than drug sellers to give correct advice on condom promotion (OR:3.1; 95% CI:1.1-8.5; $p<0.05$) and contact tracing (OR:7.5; 95% CI:2.6-21.3; $p<0.001$). Public sector respondents were 3-4 times more likely than those in the private sector to give correct advice on counselling (OR:3.0; 95% CI:1.1-8.5; $p<0.05$) and condom promotion (OR:4.6; 95% CI:1.2-17.3; $p<0.05$). Previous participation in an STI training course doubled the probability of giving correct advice on counselling (OR:2.0; 95% CI:1.1-3.6.; $p<0.05$), condom promotion (OR:2.5; 95% CI:1.4-4.5; $p<0.05$), contact tracing (OR:2.7; 95% CI:1.4-5.2; $p<0.05$) and compliance (OR:1.7; 95% CI:1.01-3.01; $p<0.05$).

Knowledge and reported practices regarding RTI/STI syndromic case management and antibiotics

Of the 252 respondents, 68% reported use of a syndromic approach in their own practice, and 59% replied that they knew about syndromic STI case management; however, only 40% described it appropriately. There was no significant difference between the two

study sites, nor between medical staff and drug sellers regarding the appropriate description of syndromic STI case management.

When deciding on prescribing antibiotics in cases with suspected RTI/STI or giving advice about antibiotic use, 55% of all respondents stated that they followed recommendations in existing guidelines, 42% based on symptoms, and 12% based on patients' demand (more than one answer possible). Of all respondents, 63% stated that they had heard about antibiotic resistance, but only 47% could give an adequate description. When prescribing or advising antibiotics, 80% of all respondents reported that they took resistance aspects into consideration, but only 61% could give adequate reasons.

In summary, the study demonstrated that one third of respondents performed suboptimally regarding RTI/STI management, and that nine out of ten gave inadequate advice on health education. This may reflect that a substantial number of patients with RTI/STI received suboptimal care. Therefore, continuous training in syndromic approach and supervision are recommended to improve the quality of RTI/STI management, particularly among health providers at private pharmacies and in rural areas.

5 DISCUSSION

The main findings in these four studies were that: more than 80% of respondents reporting antimicrobial use as self-medication for RTI/STI, had bought the antimicrobials from local private pharmacies without a physician's prescription, used non-recommended drugs, and mostly did not take antimicrobials for the recommended duration of time (Paper I); two of three women attending for a first visit to a gynaecology OPD had an etiologically diagnosed RTI, and one of eight had an STI with chlamydia, gonorrhoea, or trichomoniasis. Two of five women had candidiasis, and one of four had BV. Resistance of *N. gonorrhoeae* was nearly total to some of the drugs commonly used (Paper II); both men and women in the community exposed some misconceptions about RTI/STI, were reluctant to seek health facilities, and were unwilling to use condoms for disease prevention. The main media sources of RTI/STI information were radio and television. Access to health information was poorer in rural areas (Paper III); and reported knowledge and practice competence regarding RTI/STI management were suboptimal in one third of responding health providers, while competence to give advice regarding health education was inadequate for nine out of ten respondents (Paper IV).

5.1 High rates of RTI/STI combined with high antimicrobial resistance – health concerns and options for improvement

Needs for prompt and effective treatment of STI in combination with health education

We found that the prevalence of gonorrhoea and trichomoniasis (3.7% for each) were higher than those reported among women attending the ante-natal care clinic at the same hospital (1.8% and 0.8%, respectively) (Thammalangsy et al., 2006), but the rate of chlamydia was much lower (4.1% vs 10.2%). Such high proportions are not unexpected among gynaecology out-patients, as those women mostly got symptoms of vaginal discharge or lower abdominal pain before seeking care. However, it is not clear why the rate of chlamydia was lower than among pregnant women. It might be due to the known fact that women of younger age have a higher rate of chlamydia, as pregnant women had a lower mean age (25.7 years vs 31.2 years) (Thammalangsy et al., 2006).

Complications and severe sequelae attributed to gonorrhoea or chlamydia infection in women and new-borns have been well documented (Aria & Hart, 1998; Lazaro, 2006; Rowe, 1998; UNFPA, 2004; WHO, 2005a). It has also been demonstrated that cervical infections may act as cofactors for the acquisition and transmission of HIV infection (Laga et al., 1993; Ghys et al., 1997). Moreover, there is evidence that the presence of TV in the female genital tract increases the susceptibility of women to HIV infection (Sorvillo et al., 2001), and that untreated or incorrectly treated trichomoniasis can cause complications, such as PID in women or conditions that contribute to infertility in men (Soper, 2004). The significant number of disease cases of public health importance found in Paper II, especially in younger women, raises concerns that it is important to promptly and effectively treat these infections along with implementing contact tracing to increase the cure rate and prevent further transmission or re-infection and complications. In

addition, promotion of condom use should be one priority in the health education activities for protection against HIV and RTI/STI (NIAID/NIH, 2001).

Options for improving the management of endogenous infections

Another concern about RTI is that endogenous infections (candidiasis 40% and BV 25%) were found to be the most prevalent in this study. This is in line with findings from other studies (Thammalangsy et al., 2006; Phan et al., 2002; Patel et al., 2006). It has been documented that vaginal candidiasis frequently is associated with pregnancy, high-oestrogen oral contraceptives, uncontrolled diabetes mellitus, tight-fitting clothes, antibiotic therapy, intestinal colonization, and STI (Fichtenbaum & Aberg, 2006). Although the relationship of candidiasis to HIV infection remains unclear, vulvo-vaginal candidiasis is an important concern for women with HIV infection (White, 1996; Schuman et al., 1997). Although candidiasis does not cause serious consequences on women's health, it could lead to an inappropriate use of antibiotics and subsequent unnecessary morbidity. Thus, it is important to educate people about appropriate use of antibiotics under physician's prescription, because irrational antimicrobial use may lead to antimicrobial resistance, which increasingly precipitates treatment failure, treatment costs, disease spread and even death (Okeke et al., 2005; Chan & Tapsall, 2006; Laxminarayan, 2003).

Although the pathogenesis of BV is still enigmatic, it is an important genital syndrome because it affects a large number of women, and there is a clear association between BV and adverse medical sequelae including preterm delivery, complications of neonatal and gynaecological infections (such as post-abortion PID, post-hysterectomy cuff cellulites and post-cesarean endometritis associated with asymptomatic BV), as well as vulnerability to HIV infection (Morris et al., 2001; Koumans et al., 2001; Sewankambo et al., 1997). Since preterm birth is one of the common causes of high perinatal mortality (WHO, 1999b), and a universal prenatal screening for BV is not realistic in this resource-poor setting, it may be feasible, especially in urban areas, to screen for BV among pregnant women at high risk, as well as women who are undergoing gynaecological or obstetrical operations in order to prevent adverse outcomes caused by untreated BV.

Repeatedly monitor antimicrobial resistance pattern

Bacterial genital tract infections can be treated successfully if the causative organism is susceptible to the antibiotic used. However, the capacity of *N. gonorrhoeae* to develop resistance is one barrier to the use of effective treatment. Treatment regimens must be tailored to the prevalence of antimicrobial resistance in each setting (WHO, 2001a). Antibacterial susceptibility studies for gonorrhea in the WHO-Western Pacific Region and in Sweden have shown high resistance to quinolones - 63% in the Philippines (Tapsall, 2001), and 61% in Sweden (Swedish Institute for Infectious Diseases Control, 2006). In our study, 20% of the isolates were resistant to ciprofloxacin, indicating the necessity to consider another first-line treatment (WHO, 2001a). All isolates remained fully sensitive to ceftriaxone and spectinomycin. This may be because these drugs were rarely used in Laos at the time of the study, mainly due to their high cost. On the other hand, we found high resistance to penicillin and total resistance to tetracycline. These two drugs were

among the most common drugs used for RTI/STI (Paper I). This is consistent with other reports in low-income countries (Ray et al., 2005). However, the number of isolates in our study was only 41 and further work is required before definitive guidance can be given. It is also important to repeatedly monitor resistance patterns to guide treatment in cases where treatment is mainly based on clinical symptoms and signs, due to an unwillingness or inability of patients to pay for or incapacity of the health system to provide expensive laboratory investigations.

Periodic evaluations of aetiological diagnosis

RTI/STI can be diagnosed according to a number of criteria: laboratory (aetiological diagnosis), clinical, or syndromic. Choice of which criteria to use depends predominantly on the resources available at different levels of the health care system (UNFPA and Population Council, 2001). In relation to the syndromic approach, Pettifor et al. (2000) reviewed 36 studies of the accuracy of the syndromic management, which showed widely varying results, and that the algorithms for vaginal discharge are not highly effective in detecting gonorrhoea and chlamydia in women. Although the syndrome of vaginal discharge has a low sensitivity and specificity for predicting gonococcal and chlamydial cervical infections (WHO, 2006a), the approach to treat BV or trichomoniasis vaginitis is of benefit and becomes cost-effective in all settings (Dallabetta et al., 1998; Vuylsteke, 2004).

In our study, it is noteworthy that all 41 cases of gonorrhoea and 44 of the 46 cases of chlamydia would have been included as cases using a syndromic approach, based on clinical examination for vaginitis plus cervicitis and PID syndrome. However, for each woman treated correctly for either gonorrhoea or chlamydia, two more women would be treated unnecessarily. Without clinical examination, eight more women would receive unnecessary treatment of vaginal discharge as a potential STI. The additional cost of over-treatment includes treatment costs, possible adverse effects of antibiotics, and the emerging problem of antibiotic resistance. STI cannot be diagnosed accurately on clinical grounds alone (especially to distinguish STI from other RTI which produce similar symptoms), and their complications and late results are serious, particularly for women. Therefore, concurrent with syndromic case management, periodic evaluations of aetiological diagnosis should be available in referral settings to ensure adequacy of the treatment algorithms and prescribed medications.

Rapid point-of-care STI diagnostic tests – needs for local research on its cost-effectiveness

Since one of the most important roles of the microbiology laboratory in RTI/STI control programmes is as a facility for monitoring and evaluating activities, a critical question is then what an “ideal laboratory test” is? To judge whether a diagnostic test should be introduced at a particular level of health care, the following aspects must be taken into account: (1) sensitivity of the test (proportion of true positives identified); (2) specificity of the test (proportion of true negatives identified); (3) cost (to both the patient and the health system); (4) feasibility (for both the laboratory and the health system); (5) acceptability of the test; (6) reliability (repeated tests on the same sample produce the

same result); (7) availability (UNFPA and Population Council, 2001); and (8) the prevalence of RTI/STI in each setting.

It is not clear whether having an aetiological diagnosis available for women in the clinic improves the public health outcome, since laboratory diagnoses would not be available at the time of the women's visit and may require them to make extra visits to the clinic. This delay may lead to patients not returning for treatment, and the consequence might thus be further disease transmission (Nichols et al., 2007). It has been reported that up to 20% of STI clinic patients with positive chlamydia or gonorrhoea tests fail to return for treatment within 30 days, and 30% fail to return within two weeks after test results (Schwebke et al., 1997). This can lead to spread of the disease and ultimately may result in increased number of cases of PID in women (Nichols et al., 2007). Another major challenge for laboratory diagnoses of gonorrhoea and chlamydia in Laos is that in practice their high costs and technical requirements make their routine use difficult, and would not be feasible on a large scale for the whole country. The results do provide another argument for the need of simple, affordable and rapid point-of-care STI diagnosis. It has been reported that rapid point-of-care diagnostic tests can be important tools for STI control in women (Vickerman et al., 2003). However, it is not known whether health care services in Laos will be able to afford even inexpensive and rapid diagnostic tests and appropriate treatment. There is need for local research to assess the cost-effectiveness of such tests in STI diagnosis and treatment in this resource-poor setting.

5.2 Community perceptions, treatment-seeking behaviour and antimicrobial self-medication for RTI/STI – suggested interventions at community level

Community perceptions of RTI/STI and health-seeking behaviour model

In the health-seeking behaviour model (Chrisman 1977; Kleinman, 1980), the process of care-seeking begins with recognition of a symptom or how people define the symptom itself, and the cause and severity of the symptom. We found in our studies that people in the FGDs and IDIs defined AIDS, gonorrhoea and genital warts as diseases caused by lack of hygiene, sharing a dirty toilet, and sexual intercourse with service women, which are stigmatized by the society. People also defined AIDS as a harmful disease, which cannot be treated. Following the health-seeking behaviour model, the next step was consulting with lay persons and making a decision about treatment. However, due to the stigma of STI, some people delay in seeking care, resulting in continuous transmission of infection to others. Decisions about what to do when sick tend to be based upon knowledge and beliefs about bodily physiology, the nature of the environment, the aetiology of disease, and available treatment (Chrisman 1977). In Paper III, the most common treatment-seeking behaviour mentioned by both men and women was self-medication through a private pharmacy or by using traditional medicine, and only finally visiting a doctor when a variety of other options had been tried and had failed. This may lead to a delay in diagnosis and treatment, which may result in spreading the disease to others and ultimately increase cases of complications.

Impacts of stigma, shame and gender

Stigma is an important issue, which affects health-seeking behaviour and its outcome and thus should be taken into consideration when planning for health policies and health care provisions. Stigma may shape the course and outcome of the stigmatized disease through the delay, or termination of treatment for curable health problems (Link & Phelan, 2001). The stigma and shame associated with RTI/STI might be important barriers to appropriate diagnosis and treatment services (Cunningham et al., 2002), as many women respondents reporting RTI/STI symptoms said that they were shy to take part in the genital examination and opted for self-medication. Discussing genital symptoms and sexual activity can be embarrassing to both men and women, leading to an avoidance of consulting a provider (Akinawo & Oguntimehin, 1997; Arkell et al., 2006). There can also be a cultural inhibition or a stigma associated with genital symptoms (Bhatti & Fikree, 2002), and an experience of negative attitudes from some health staff towards RTI/STI patients. Health service providers' emphasis upon the role of dirt and germs in gynaecological health may lead them to blame women for their lack of hygiene, resulting in reluctance to admit their symptoms to service providers (Whittaker, 2002). Most men and women participants reported that they preferred to consult with physicians of the same sex because of shyness to consult a health provider of the opposite sex. This supports that clinical sensitivity and recognition of gender has a role in the interaction. Therefore, health care settings with an atmosphere of privacy and trust, and health providers with client/patient respect and non-judgmental attitudes are essential in modifying health-seeking behaviour. Clinician-patient relationship remains a source of significant influence and opportunity to promote improved health (Mechanic, 1999).

Inappropriate use of antimicrobials as self-medication – a major concern and needs for intervention at community level and to health providers

A major concern is that we found that more than 80% of respondents reporting antimicrobial use as self-medication for RTI/STI, had bought the antimicrobials from local private pharmacies without a physician's prescription, used non-recommended drugs, and mostly did not take antimicrobials for the recommended duration of time. Previous studies on private pharmacies in Vietnam and Brazil also found that none provided correct treatment for STI (Chalker et al., 2000; Ramos et al., 2004). In Laos, ampicillin was the most common drug taken, probably due to low costs, easy access at every drugstore without a prescription, and that people were familiar with "ampi". However, following WHO's recommendations and according to the national guidelines, ampicillin should not be used for syndromic STI case management, as a high level of resistance has been detected in some Asian countries, including Laos (Tapsall, 2001; MOH, 1998). As antimicrobial resistance compromises effective treatment of RTI/STI, it is important to educate people about the benefits of appropriate treatment with effective drugs in order to prevent treatment failure, which may cause complications, relapse and further transmission of infection.

Since private pharmacies in Laos are a common place for people to get advice for RTI/STI treatment, the critical question is how the quality of care can be improved. A study on private pharmacies in Ghana suggested a critical role of pharmacists in effective

management of STI, particularly in the management of urethral discharge (Mayhew et al., 2001). A study in Zimbabwean private pharmacies revealed low sales of antibiotics without prescription among men with urethral discharge, showing good adherence to the letter of the law (Nyazema et al., 2007). It has been shown that STI services provided by pharmacy staff, especially pharmacists can be significantly improved through a short-term training; however, the improvements have been shown to be time-limited, indicating the need for continued training and supervision (Chuc et al., 2002; Garcia et al., 2003; Tuladhar et al., 1998). Recognizing the importance of prompt and correct treatment with effective drugs for RTI/STI in combination with health education to the public, continuous training of drug sellers on syndromic RTI/STI case management should be initiated in Laos in order to improve their awareness and competence. In addition, strict control should be put on the prescription and sale of these antimicrobials. However, this can be done only if there is enough access to trained doctors or other personnel, as well as diagnostic equipment being available throughout the country.

Promoting changes in health-seeking behaviour

The most common reasons for self-medication with antimicrobials for RTI/STI were habit or following previous self-treatment of similar symptoms. Such behaviour in association with inappropriate antimicrobial use may contribute to the development of antimicrobial resistance (WHO, 2000b). In order to encourage appropriate and prompt care-seeking behaviour for RTI/STI, there is a need to improve health education messages, focusing on a change in knowledge about RTI/STI regarding causation, transmission, prevention and treatment, which may lead to behaviour change communication for RTI/STI. However, it has been well substantiated that real, long-lasting behaviour change is not the result of simply telling people what to do (UNFPA and Population Council, 2001). To address a sensitive issue like RTI/STI, and to promote changes in health-seeking behaviour requires an understanding of people's needs, concerns, and perceptions.

Spreading health education messages through existing communication networks

Our findings show that friends, drug sellers, and the media have a large influence on people's decisions regarding RTI/STI self-medication. Existing communication networks, including peer education at school, training of drug sellers, and mass media, should be used to inform people about the dangers of self-medication in order to promote appropriate RTI/STI management in the community. In addition, publications for lay people providing relevant health information and research findings should be promoted, not only in urban but also in rural areas. Health education messages must be easily accessible in particular in rural areas, and culture specific health education messages and strategies need to be designed to meet the local information needs (Whittaker et al., 2002). In particular, the local language should be used among minority ethnic groups in order to make health education messages more effective. Using popular community leaders to spread education messages, may be effective in changing people's perceptions of RTI/STI (Kelly et al., 1991).

Changing community perceptions of condom use

Although condom use was mentioned by both men and women participants as a possible way of preventing RTI/STI, the commonly expressed reasons for the unwillingness to use condoms were diminished sexual pleasure, trust of their partners, fear of side effects or suspicion about condom efficacy. The negative attitude towards condom use has also been reported from other countries, adding that it might lead to moral decadence and increased sexual activity among the youth (Rizvi et al., 2004; Nuwaha et al., 1999). In contrast, it has been shown that the promotion of condom distribution has increased condom use and reduced teenage pregnancies, births and STI without a significant change in sexual encounters (Dubois-Arber et al., 1997). The efficacy of risk reduction counselling (including the promotion of correct condom use) in reducing STI has been proved by prevention research in the past decade (Rietmeijer, 2007). The expressed unwillingness to use condoms and the low rate of self-reported use of condoms in our studies (Papers I, III) strongly support that promotion of condom use should be one priority in the health education activities for protection against HIV and RTI/STI (NIAID/NIH, 2001; Holmes et al., 2004). Some men could benefit from the provision of instructions on correct condom use to prevent condom breakage (Crosby et al., 2007). Women need to acquire skills to negotiate safer sexual contact. Particularly among service women and their clients, there is a need to encourage consistent condom use through intervention programmes, such as the 100% condom use programme implemented in Thailand, which increased condom use and reduced STI rates among sex workers and their clients (WHO, 2004b). This strategy is gradually being implemented in Laos, but is still seeking broad political support.

Partner referral and treatment

One preventive measure is to treat a patient's partner(s). By treating sexual partners of patients, whether symptomatic or not, re-infections can be halted and ongoing transmission curtailed (Macke & Maher, 1999). Nuwaha (2000) reported that about 14% of patients sought care with the partner and that about 34% of the partners were referred for care by the index patient. Since a person often has problems to disclose his or her own STI and delays a visit to a health facility until the symptoms become serious, it is difficult for the person to understand the importance of referring his/her asymptomatic partner for STI treatment. It is not just an individual's number of partners that determine their risk of STI acquisition, but their partner's partners and beyond (Ward, 2007). Thus, a stronger effort to increase community awareness about partner referral and treatment is clearly needed. Methods should be adjusted to the practical and cultural context in each country (Faxelid & Ramstedt, 1997; Kissinger et al., 2005).

In brief, stressing the importance of referring one's partner(s) for treatment, changing community perceptions of condom use, and discouraging multiple partnerships for both men and women could be a feasible strategy for STI/HIV prevention (Manhart et al., 2000). This should be backed by strong political and financial commitment (Mayaud & Mabey, 2004).

5.3 Health providers' competence in the management of RTI/STI – call for action

Improving knowledge of RTI/STI management among health providers in both urban and rural areas

The finding revealed that one third of responding health providers performed suboptimally regarding reported knowledge of RTI/STI management. Urban district respondents were almost five times more likely than those in the rural district to report adequate knowledge. This is probably due to a combined effect of higher education and more training in STI among urban providers. It might also be that more urban providers have encountered RTI/STI, as STI prevalence tends to be higher in urban residents (WHO, 2002), and thus, they would have more knowledge about RTI/STI-related issues (Wiesenfeld et al., 2005). However, it has been reported that STI prevalence was also significant in rural populations (Smith et al., 2003), and that the rate of chlamydia infections in some rural communities exceeds that of urban centres (Michelson et al., 1999). Thus, all providers working with RTI/STI patients in both urban and rural areas should possess adequate RTI/STI knowledge to appropriately manage potential at-risk populations.

Improving health providers' competence regarding health education related to RTI/STI

Despite growing interest in raising awareness of the dangers of RTI/STI in order to prevent their spread, nearly half to two-thirds of all respondents performed suboptimally regarding health education on RTI/STI prevention. Drug sellers' scores were significantly lower than those of the medical doctors and medical assistants in all aspects of RTI/STI management, and public sector respondents scored better than the private clinics regarding counselling and condom promotion. The reason for the suboptimal performance might be the providers' ignorance, reluctance due to the stigma associated with RTI/STI or the high workload some providers are facing, as both health education and counselling requires more time and interpersonal skills on the part of the provider. These skills include having empathy, adopting a non-judgmental approach, gaining an understanding of the patient's situation, and possessing cultural sensitivity (UNFPA, 2004). The study findings indicate that improving health education competence among reproductive health medical staff and drug sellers should be an area of high priority, since health education requires few resources, and improving its quality can be a cost-effective way to prevent RTI/STI/HIV infections (WHO, 2005f). Condom promotion in particular should be one priority in the health education activities, as condoms are the single, most efficient and available means of preventing RTI/STI/HIV transmission (WHO, 2006b). It is equally important to counsel patients about the need to adhere to therapy, and to reduce the risk of re-acquiring and spreading STI, since education and counselling are crucial parts of the syndromic RTI/STI management.

Continuous training of syndromic RTI/STI case management and supervision

The finding showed that having participated in an STI training course was associated with higher probability of possessing adequate practice competence in RTI/STI management. However, one cannot know whether the STI training course improved respondents' knowledge and practice or if those that already had more knowledge and skills took the course since there was only one measurement. Reviews of intervention studies in low-resource settings suggest that the simple dissemination of written guidelines is often ineffective, that supervision and audit with feedback is generally effective, and that multifaceted interventions might be more effective than single interventions (Rowe et al., 2005; Chalker et al., 2000; Garcia et al., 2003; Tuladhar et al., 1998). Wahlström et al. (2003) and Vang et al. (2006) have also shown the effectiveness of audit-feedback systems in the Lao context. Since it is important to promptly and correctly treat RTI/STI patients, and to give health education and counselling regarding prevention, continuous training in syndromic RTI/STI case management should be implemented among health professionals working with RTI/STI patients in both the public and private sectors and drug sellers at private pharmacies in Laos. Supervision should also be improved, as inadequate supervision has been shown to be one of the factors contributing to low quality of RTI/STI care (Voeten et al, 2001). In addition, the collaboration between the public and private health sectors should be strengthened to improve the quality and widen the coverage of RTI/STI services (Connolly et al., 1999).

Packaged syndromic kits for RTI/STI management – needs for local research on the cost-effectiveness of this approach

The finding that one third of the health providers reported suboptimal practice competence in RTI/STI management may reflect that a substantial number of patients with RTI/STI received suboptimal care. This is in line with findings from other low-income countries that have shown a low quality of RTI/STI case management (Voeten et al., 2001; Khandwalla et al., 2000). This provides an argument for a need to introduce packaged syndromic kits for RTI/STI case management in Laos. Such kits contain recommended drugs for RTI/STI syndrome, condoms, partner notification cards and information leaflets. It has been reported that this simple health service intervention achieved substantial improvement in RTI/STI case management by making treatment easier and saving time, but had little positive impact on health-seeking behaviour, highlighting the need for additional interventions at community level (Wilkinson et al., 1999; Harrison et al., 2000). Packaged syndromic kits improved RTI/STI syndromic management at a reasonable cost by increasing condom supply and partner notification cards, as well as RTI/STI education thoroughness, especially for females (Colvin et al., 2006). However, it is not known whether health care services in Laos will be able to afford even inexpensive syndromic kits and appropriate treatment, and there is therefore a need for local research to assess the cost-effectiveness of such an approach in RTI/STI case management. The introduction of packaged syndromic kits and the training in syndromic management would be important interventions for private pharmacies as they are the commonest place visited by people seeking care for RTI/STI, and they do not perform examinations or laboratory tests.

5.4 Methodological considerations

5.4.1 Qualitative research methods

Focus group discussions and individual interviews

Two qualitative methods, focus group discussions and individual interviews, were used in Paper III. The advantage of the FGD method is that group interaction can be utilized to explore people's own experiences and knowledge and how their views are constructed or expressed in a certain context (Dahlgren et al., 2004). Since RTI/STI are thought to be culturally sensitive and could influence the information flow of some FGD participants who were shy to talk, we additionally used individual interviews to get more insight into the issues brought up during the FGDs.

By relating data from different sources to each other it is possible to establish credibility of the findings (Maxwell, 1996). In trying to understand community members' perceptions of RTI/STI, we compared data from FGDs and from IDIs and the results mainly complemented each other and provided additional richness to the analysis. For example, some men participants described their own symptoms and their sexual behaviour in more detail in the individual interviews than in the FGDs. In addition, the use of moderators and interviewers of the same sex with participants and interviewees appeared to be an advantage, as we observed that the participants and interviewees discussed openly and freely and provided a lot of unexpected information.

Furthermore, in order to improve the trustworthiness of the study we used two types of triangulation: data triangulation and investigator triangulation (Lincoln, 1985). Data has been collected from persons with a diversity of socio-demographic background such as gender, age groups, marital status, occupation variety and location (including urban and rural areas). The investigators represent different academic perspectives (gynaecology, general practice, pharmacy, public health and medical anthropology), which served to broaden the data interpretations. The final results represent a negotiated outcome of these perspectives. Also, we employed moderators and interviewers who were all research team members and who had previous experience of conducting FGDs and interviews.

The combined findings from the FGDs and IDIs did provide insights into people's perceptions and treatment-seeking behaviour related to RTI/STI, and clearly defined areas for IEC (information, education and communication) interventions. This could be transferred to larger contexts including other social groups in Laos, and perhaps to other similar social settings in low-income countries.

5.4.2 Quantitative research methods

Internal validity

Internal validity implies the validity of the inference for the study population. Three main types of biases may threaten validity in a study: selection bias, information bias, and confounding (Gordis, 2000). We believe that the selection bias should not be a serious problem in our studies, because we have a large sample size recruited from different settings including urban and rural areas, and high response rates (93-100%) were

achieved in all studies. Identified and measurable confounding factors were controlled by using logistic regression analyses (Paper IV).

However, two sources of information bias should be considered: interviewer bias and reporting bias. We used interviewer administered questionnaires in Studies I and II. As issues related to RTI/STI are gender sensitive, it may be questionable whether the respondents are truly confident in the ability of the interviewers, particularly those of the opposite sex, to keep all interview materials strictly confidential. To handle this problem, the interviewers were carefully recruited and trained, and we tried to use interviewers of the same sex with respondents whenever possible. We chose persons who commanded confidence and respect to be interviewers, and all of them had to be approved by the research team and the head of the department. In addition, questionnaires were tested and revised before collecting data to make sure that all questions were clear to the respondents. Furthermore, to ensure data quality, we closely supervised the interviewers. After the end of every interview day, all questionnaires were checked by the research team in the field to make sure that they were fully completed and correctly filled in. In this way, we believe that interviewer bias was minimized in the studies.

The possibility of reporting bias can not be excluded in Papers I, II and IV due to the sensitive character of RTI/STI. In Paper I, an interval of up to 12 months between antimicrobial self-treatment of RTI symptoms and interview may affect accurate recall, resulting in under- as well as over-reporting. Another limitation is the reliance on self-reported information on symptoms of RTI/STI, and the fact that it was not possible to validate symptoms by laboratory tests for practical reasons. In Paper II, due to the fact that this was the first clinical and laboratory-based study on RTI/STI conducted in Laos, data on sexual behaviour of women and their partners were not included in the questionnaire because of concern about acceptance of the study.

In Paper IV, all provided responses were self-reported and might not correlate with actual practice, since it was not possible to ascertain whether what the health providers reported was an accurate description of their real practice. However, the use of a self-completed questionnaire containing open-ended questions including written simulated case scenarios that were filled in by the respondents under supervision and without any aid could have an advantage over the use of a self-administered questionnaire without supervision, where respondents are free to consult reference materials. In addition, those possessing poor knowledge may be less likely to return the questionnaire due to the fear of poor performance (Wiesenfeld, 2005). Therefore, we believe that the reporting bias in this study was reduced. Furthermore, in another study, where I was the principal investigator (Amphoy Sihavong, unpublished data), simulated clients were used to assess knowledge and practice regarding RTI/STI management by drug sellers at private pharmacies in Vientiane, and the preliminary results were comparable to those reported in Paper IV.

Quality of laboratory tests

The strength of Study II is the large sample size (1125 subjects) and the affordability of identifying RTI/STI by clinical examination and confirmation by laboratory tests that can validate patients' symptoms and signs. Even though quality control of laboratory testing was assured, there were some limitations to the laboratory tests conducted. In this clinic,

we based confirmation of gonorrhoea on culture. Although culture is invaluable in its ability to provide an isolate for antimicrobial susceptibility determination and was historically considered the “gold standard” for testing gonorrhoea, the sensitivity has been lower when compared with nucleic acid amplification tests (NAAT), e.g., polymerase chain reaction (PCR) (Koumans et al., 1998; Cook et al., 2005). One reason for the reduced sensitivity of culture is decreased viability of organisms when transporting specimens to or from off-site facilities; the culture requires a special transport medium and quick inoculation because bacterial counts are reduced by 80% after 6 hours and by 99% after 24 hours (Drake et al., 2005). In our study, inoculated plates were immediately transported to the laboratory site in the same building as the clinic following the standard operating procedures. Thus, there should be no major problems in the viability of organisms.

Regarding the Gen-Probe test for the detection of chlamydia in endocervical specimens, the sensitivity was also lower when compared with NAAT as a gold standard (Cook et al., 2005; Koumans et al., 1998). The lower sensitivity of the Gen-Probe test may be due to improper specimen collection, as grossly bloody specimens (>80µl whole blood in 1ml transport medium) may interfere with the performance of the probe test (Iwen et al., 1995). However, in our study, the exclusion of women with menstruation or heavy vaginal bleeding and appropriate training of all involved staff about specimen collection seem to minimize this limitation.

Generalizability

In a community-based study, all individuals of the community would have an equal chance to be included as study subjects, thus the results can reflect the situation of the whole community (Gordis, 2000). In Paper I (household survey), 16% (500/3056) of the persons interviewed reported use of an antimicrobial as self-medication for RTI during the preceding twelve months. However, we can not show exact prevalence figures due to the lack of full information on all family members.

In Paper II, the recruitment of all women of reproductive age, attending for a first visit to the gynaecology OPD during an 18-month study period with a 100% response rate may make the effect estimation more representative to other new patients with RTI/STI in the population. However, the prevalence estimation of RTI/STI among women seeking care in hospitals is probably not valid for those who have not sought care in a hospital. In addition, the study was limited to one geographical location in a hospital setting in the capital of Laos, and thus, it cannot automatically be considered nationally representative. Similarly, in Paper IV, the findings may not necessarily be indicative of practice and knowledge patterns among health providers in other regions.

Nevertheless, we believe that these studies provide useful information to support use and improvements of the national guidelines, as well as to guide planning and resource allocation for decision-makers regarding future interventions, that may contribute to improved quality of RTI/STI management.

5.5 Implications for future research and practice

Based on the conceptual framework for the studies and the research findings presented in this thesis, the following topics are recommended for future research:

- (1) Periodic evaluation of aetiological diagnosis of RTI/STI to ensure adequacy of treatment guidelines and prescribed medications.
- (2) Exploring views and barriers to access to RTI/STI care among high risk groups, and minority ethnic groups using both quantitative and qualitative methods.
- (3) Examining the cost-effectiveness of rapid point-of-care tests for the diagnosis of chlamydia and gonorrhoea in local settings.
- (4) Assessing the cost-effectiveness of packaged syndromic kits for STI case management in local settings.
- (5) Observing actual practice regarding RTI/STI management among health providers, particularly drug sellers.
- (6) Intervention studies at community level and to health providers to identify the most useful ways of improving RTI/STI management including health promotion.
- (7) Developing and evaluating measures to improve condom use among various groups.
- (8) Qualitative and quantitative studies on psychosocial determinants for sexual partner referral.
- (9) Intervention study on health education approaches in the general population, particularly in rural areas.
- (10) Nationwide population-based RTI/STI prevalence surveys to assess the burden of RTI/STI in order to guide planning and control strategies.

6 CONCLUSIONS AND RECOMMENDATIONS

This thesis has provided useful information regarding the management of RTI including STI among health providers and in the community in two provinces in Laos. We believe that our findings can be useful in larger contexts including other social groups in Laos, as well as in other similar social settings in low-income countries. The findings revealed several areas of concerns that call for interventions.

- Both men and women in the community exposed some misconceptions about the causes and symptoms of RTI/STI and their cure, and a reluctance to seek health care that could cause delay to appropriate diagnosis and treatment. The most common treatment-seeking behaviour mentioned was self-medication following advice mostly given by friends and drug sellers. The majority of people reporting antimicrobial use as self-medication for RTI/STI, had bought the antimicrobials from local private pharmacies without a physician's prescription, used non-recommended drugs, and mostly did not take antimicrobials for the recommended duration of time. The findings indicate that there is a need to improve RTI/STI management, including health promotion, through interventions at community level, and to health providers, including private drug sellers.
- Although condom use was mentioned by most men and women as a way to prevent RTI/STI and pregnancy, unwillingness to use condoms for disease prevention was commonly expressed, and the self-reported use of condoms was low. The main media sources of RTI/STI information were radio and television. Access to health information was poorer in rural areas. Therefore, strengthening health education and promotion through interventions at community level is recommended. Health education messages should be more accessible in rural areas, and condom promotion should be one priority in the health education activities.
- It is feasible to provide syndromic and aetiological case management for RTI/STI, in a gynaecology OPD. The number of women treated unnecessarily can be reduced further by strengthening the clinical diagnostic capacity and following correct RTI/STI diagnosis and treatment where laboratory testing is not available or used. The high level of RTI/STI, combined with high *N. Gonorrhoeae* resistance to some common drugs used, emphasizes that, concurrent with syndromic case management, periodic evaluations of aetiological diagnosis should be available to ensure adequacy of the treatment algorithms and prescribed medications.
- One third of health providers performed suboptimally regarding RTI/STI management, and nine out of ten gave inadequate advice on health education. Urban health providers were more likely to report adequate knowledge. Drug sellers scored lowest in all aspects of RTI/STI management. The findings suggest that continuous training in syndromic approach and supervision should be recommended to improve quality of RTI/STI management, particularly among health providers at private pharmacies and in rural areas. Improving health education competence focusing on counselling for changing behaviour, correct condom use promotion, contact tracing, and compliance with treatment, should also be an area of high priority.

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APPENDICES

Appendix 1. Questionnaire for household survey in Study I

Province	<input type="checkbox"/>	Vientiane Capital	1
District	<input type="checkbox"/>	Urban District	11
Village	<input type="checkbox"/>	Rural District	12
Interviewee ID	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Champasack Province	2
Date of interview (dd/mm/yyyy)/...../2002		Urban District	21
Interviewer ID	<input type="checkbox"/> <input type="checkbox"/>	Rural District	22
Name of supervisor (monitor) in the field :			

Questionnaire used to interview adults (≥ 18 years old), including men and women, who had used antimicrobial self-medication for RTI/STI in the past one year.

I. General information

- Age [in years].....
- Sex: 1=Male, 2=Female
- Marital status: 1=Married; 2=Divorced; 3=Widowed; 4=Separated; 5=Single
- Education level: 1=None; 2=Primary school; 3=Lower secondary school; 4=Upper secondary school; 5=College; 6=University; 7=Postgraduate
- Occupation: 1=Farmer; 2=Housewife; 3=Worker; 4=Officer; 5=Trader; 6=Student; 7=Soldier/Police; 8=Other (please specify).....
- Monthly income in the whole family; 1= <100,000 kips; 2=100,000– 500,000kips; 3= > 500,000kips; 4=Don't know/not sure

II. Knowledge regarding the use of antimicrobials

- Have you had any of the following symptoms in the past one year?
(There can be one or several answers)
For women: 1=Abnormal vaginal discharge; 2=Low abdominal pain; 3=Genital ulcer/wart; 4=Other symptoms of RTI/STI (please specify)
For men: 1=Urethral discharge (or pain during urination); 2=Scrotum swelling; 3=Genital ulcer/wart; 4=Inguino bulbo; 5=Other symptoms of RTI/STI (please specify)
- Do you know what an antimicrobial is? (Please explain)
.....
- Have you ever used antimicrobials (the type of drug that cure certain infection, e.g., abnormal vaginal discharge or urethral discharge) during the past one year?
1=Yes; 2=No
- Have you had any antimicrobials at home during the past one year?
1=Yes; 2=No; 3=Don't know

11. Where do you get antimicrobials? (There can be one or several answers)
1=Friend; 2=Parents; 3=Relative; 4=Pharmacy; 5=Other (please specify).....
12. Did anyone advise you to take antimicrobials during your illness related to RTI/STI?
(There can be one or several answers)
1=No, I already know how to treat myself; 2=No, but I followed previous advice from medical doctor/assistant; 3=Yes, a nurse; 4=Yes, a drug seller; 5=Yes, a friend; 6=Yes, my parent (s); 7=Yes, a relative; 8=Other (please specify)
13. When did you last take an antimicrobial for self-treatment of RTI/STI?
(One correct answer)
1=Last week; 2=The last 1-2 weeks; 3=The last 2-4 weeks; 4=The last two months; 5=The last 2-3 months; 6=More than three months to one year; 7=Don't remember
14. What kind of antimicrobials did you use without consultation when you had symptoms of RTI/STI?
1=Ampicillin (Ampiclox, Penbritin); 2=Tetracycline (Kano, Achromycin); 3=Benzylpenicillin (Penicilline G, Crystapen); 4=Chloramphenicol; 5=Kanamycin (Kannasyn); 6=Co-trimoxazole (Bactrim, Septrin); 7=Doxycycline (Vibramycin); 8=Metronidazole (Flagyl); 9=Clotrimazol (Sup) (Klamacin, Canesten); 10=Ceftriaxone (Rocephine); 11=Other (please specify).....
15. What type of antimicrobials did you use?
1=Injection; 2=Oral; 3=Vaginal suppository; 4=Injection + oral; 5=Oral + suppository; 6=Injection + oral + suppository
16. Do you know the dosage of the antimicrobials used?
1=Yes; 2=No; 3=Know the number of tablets taken per day
17. How long did you take it? (Please tick one correct answer)
1=1-2 days; 2=3-5 days; 3=6-10 days; 4=>10 days; 5=Don't remember
18. Have you got any of the following symptoms of side-effects from antimicrobials?
1=Yes; 2=No
If yes, please tick (one or several answers)
1=Nausea/Vomiting; 2=Skin rash/Allergy; 3=Diarrhoea; 4=Headache; 5=Dyspnea (difficult to breath); 6=Asthma; 7=Shock; 8=Other (please specify)
19. What are your reasons for the use of antimicrobials to treat RTI/STI without a consultation?
(There can be one or several answers)
1=Following drug advertisement; 2=Following advice of other (e.g., parent, friend, and relative); 3=Habit (following previous self-treatment with similar symptoms); 4=Low cost (by avoiding consultation fee); 5=No time to see physician; 6=Too far from physician; 7=Other (please specify)
20. Have you ever gone to the hospital for other diseases?
(In the case that you or your family were ill)
1=Yes; 2=No. If no, go to No. 22.
21. What do you think about health staff's behaviour based on your experience from your previous treatment? (Please tick one correct answer)
1=Polite/good; 2=Impolite/rude/bad; 3=Fair; 4=Other (specify)
22. Do you think that you had any specific problem in your consultation for internal (genital) examination?
1=Yes; 2=No. If yes, please specify

III. Health information

- 23. Have you ever heard about health information regarding antimicrobial use for RTI/STI?
1=Yes; 2=No; 3=Don't know
If no or don't know, go to No. 27
- 24. Where did you get health information from? (There can be one or several answers)
1=Medical staff; 2=Drug seller; 3=Friend; 4=Parent; 5=Relative; 6=Traditional healer; 7=Radio; 8=TV; 9=News paper; 10=Other (please specify)
- 25. Is there any health information which is difficult to understand?
1=Yes; 2=No. If yes, please specify.
- 26. Have you taken any action (made any change) after receiving the information?
1=Yes; 2=No. If yes, please specify.
- 27. Have you heard about condom promotion?
1=Yes; 2=No
- 28. Have you ever used a condom?
1=Yes; 2=No
- 29. What is the purpose of using a condom? (There can be one or several answers)
1=Contraception; 2=Prevention of RTI/STI/AIDS; 3=Other (please specify).....

Thank you very much

Appendix 2. Focus group discussion and individual interview guides

Focus group discussion guide

1. Greeting, introduction of the group
2. Briefing the objectives of the discussion
3. Please tell us what you know about reproductive tract infections, and sexually transmitted infections? Give some examples.
4. Could you describe what you know about suspected symptoms related to RTI/STI, what could be the causes of these symptoms? How they could be transmitted? Who could be at risk of getting these infections?
5. What could be the consequences of no treatment or incorrect treatment of those infections?
6. Suppose you have had symptoms related to genital infections, what do you do? Where do you go for the treatment? For what reasons do you get that kind of treatment?
7. Do you have any problem if the doctor asks you for genital examination? (If you are a woman and the male physician will examine you or vice versa).
8. What could be the way of prevention of sexually transmitted infections?
10. What do you think about condom use? Have you heard anything about problem with condom use?
11. From what sources do you get RTI/STI information? Which kind of information is the most useful message for you?
12. In what way to improve the information regarding community interventions for the correct treatment and prevention of RTI/STI?

Individual interview guide

1. Could you describe what you know about symptoms related to RTI/STI?
2. Please tell us what you see as the causes of RTI/STI? How can they be transmitted?
3. Please describe what are the risk factors of RTI/STI?
4. What could be the consequences from untreated RTI/STI?
5. What could be ways of prevention of RTI/STI?
6. Suppose you have had symptoms related to genital infections, what do you do?
7. How long from the onset of the problem before seeking care?
8. Who has been the first contact person whom you discuss your problem?
9. Have you chosen any particular health provider(s)? Why?

Appendix 3. Questionnaire for health providers in Study IV

Self-completed questionnaire under supervision and without any aid

ID Respondent	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Health provider code
Type of health provider	<input type="checkbox"/>	1=Medical doctor/assistant
District code	<input type="checkbox"/>	2=Midwife/nurse
Date (dd/mm/yyyy)...../...../2005		3=Drug seller
ID Data collector	<input type="checkbox"/> <input type="checkbox"/>	District code
Name of supervisor (monitor) in the field:.....		1=Urban
		2=Rural

RESPONDENT: Medical doctors/assistants, and midwives/nurses working with RTI including STI patients in public and private sectors, and drug sellers at private pharmacies in one urban and one rural district, Vientiane Capital.

I. General information

1. Age [in years].....
2. Sex: 1=Male. 2=Female
3. Education level (Please circle one correct answer)

1= Primary school	4= College
2= Lower secondary school (Junior high school)	5=University
3= Upper secondary school (Senior high school)	6=Postgraduate
4. Occupation (Please circle one correct answer)

A. For Medical doctors/assistants

- 1=Medical specialist (specify field and year of graduation)
- 2=Post-graduate (specify field and year of graduation)
- 3=Medical doctor (year of graduation)
- 4=Medical assistant (year of graduation)

B. For Midwives/Nurses

- 1=Midwife (Please specify the duration of learningyears)
- 2=Nurse (Please specify the duration of learningyears)
- 3=Auxiliary nurse (Please specify the duration of learningyears)

C. For Drug sellers

- 1=Pharmacist
- 2=Assistant pharmacist
- 3=Medical doctor
- 4=Medical assistant (Assistant doctor)
- 5=Midwife (duration of training.....)
- 6=Nurse (duration of training.....)
- 7=Village health volunteer (duration of training.....)
- 8=Other (Please specify)

5. Workplace (Please circle one correct answer)

For medical doctors/assistants, and midwives/nurses

(More than one option possible)

1=Provincial/central hospital (Please specify)

2=District hospital

3=Private clinic

4=Health centre

5=Private pharmacy

6=Other (Please specify.....)

For drug sellers

A. Type of pharmacy: 1=Class I 2=Class II 3=Class III

B. Position of drug seller: 1=Pharmacy owner 2=Assistant

6. Have you attended any training of RTI including STI?

1=Yes 2=No

If yes, please specify: number of training..... ;

number of days in each training; and place of training

7. Have you been involved in any control programme of RTI including STI?

1=Yes 2=No

If yes, specify

II. Written simulated cases regarding RTI/STI management

(2-3 lines for each answer for all case scenarios)

8. A 29-year-old married woman asks for medication because of complaints of abnormal vaginal discharge and itching.

A (8.1) What questions would you ask this woman?

.....

B (8.2) What would be the probable diagnosis?

.....

C (8.3) What treatment would you give her for that probable diagnosis?

.....

D (8.4) What advice would you give her?

.....

9. A 28-year-old man asks for medication because of complaints of urethral discharge and pain during passing urine.

A (9.1) What questions would you ask this man?

.....

B (9.2) What would be the probable diagnosis?

.....

C (9.3) What treatment would you give him for that probable diagnosis?

.....

D (9.4) What advice would you give him?

.....

10. A 30-year-old woman asks for medication because of complaints of painful genital ulcer?

A (10.1) What questions would you ask this woman?

.....

B (10.2) What would be the probable diagnosis?
.....

C (10.3) What treatment would you give her for that probable diagnosis?
.....

D (10.4) What advice would you give her?
.....

11. A 25-year-old married woman asks for medication because of complaints of lower abdominal pain and vaginal discharge.

A (11.1) What questions would you ask this woman?
.....

B (11.2) What would be the probable diagnosis?
.....

C (11.3) What treatment would you give her for that probable diagnosis?
.....

D (11.4) What advice would you give her?
.....

III. Reported knowledge and practice regarding RTI/STI

12. Please give as many examples as possible of reproductive tract infections (RTI) that are considered as sexually transmitted infections (STI)?
.....

13. Please give as many examples as possible of RTI that are considered as non-sexually transmitted infections?
.....

14. What could be the causes of RTI including STI?
(Please answer each item, if yes please give examples)

1=Bacteria: 1=Yes; 2=No; 3=Don't know

If yes, please give example(s).....

2=Virus: 1=Yes; 2=No; 3=Don't know

If yes, please give example(s).....

3=Protozoa: 1=Yes; 2=No; 3=Don't know

If yes, please give example(s).....

4=Fungi: 1=Yes; 2=No; 3=Don't know

If yes, please give example(s).....

5=Parasite: 1=Yes; 2=No; 3=Don't know

If yes, please give example(s).....

6=Other (please specify)

15. What could be the routes of transmission of transmittable RTI including STI?
(Please answer each item, if yes please give examples)

1=Sexual intercourse: 1=Yes; 2=No; 3=Don't know

If yes, please give example(s).....

2=Blood transfusion: 1=Yes; 2=No; 3=Don't know

If yes, please give example(s).....

3=Sharing needle: 1=Yes; 2=No; 3=Don't know

If yes, please give example(s).....

4=Mother to child: 1=Yes; 2=No; 3=Don't know

If yes, please give example(s).....

- 5=Sharing clothes: 1=Yes; 2=No; 3=Don't know
If yes, please give example(s).....
- 6=Sharing toilet: 1=Yes; 2=No; 3=Don't know
If yes, please give example(s).....
- 7=Sharing food: 1=Yes; 2=No; 3=Don't know
If yes, please give example(s).....
- 8=Other (specify).....

16. Please list as many risk factors as possible for RTI including STI?
.....
17. What are the consequences of untreated or incorrectly treated RTI/STI?
.....
18. Can RTI/STI be prevented?
1=Yes; 2=No; 3=Don't know
If yes, how to prevent RTI/STI in your work and in society?
.....
19. Do you know about "Syndromic STI case management"
1=Yes; 2=No
If yes, please describe.....
20. Do you use syndromic approach in your own practice (for medical doctor/assistant and midwife/nurse), in your practice as drug sellers?
1=Yes; 2=No; 3=Don't know
21. In the previous week, approximately how many RTI/STI customers have consulted/seen you? (Please circle one correct answer)
1=None; 2=1-2 clients; 3=3-4 clients; 4= >4 clients
22. About antibiotics:
 - A. In the last week, approximately how many times have you advised/sold antibiotics to RTI/STI customers? (Please circle one correct answer)
1=None; 2=1-2 times; 3=3-4 times; 4=>4 times
 - B. How did you most of the time decide which antibiotics to use?
(More than one answer possible)
1=Based on symptoms; 2=Based on guideline; 3=Based on patient demand; 4=Habit; 5=Based on the cost of the drug; 6= Other (please specify)
 - C. Have you ever heard about antibiotic resistance?
1=Yes; 2=No
If yes, please explain in a few words how you understand "antibiotic resistance".....
 - D. Do you consider antibiotic resistance when selling/advising antibiotics?
1=Yes; 2=No
If yes, please give the reasons

Thank you very much for your answers!

