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IS SWITZERLAND DOING ENOUGH REGARDING THE PREVENTION OF SYPHILIS, GONORRHEA AND CHLAMYDIA INFECTIONS?

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ABBREVIATIONS

NAAT:	Nucleic acid amplification test
STI:	Sexually transmitted infections
SFOPH:	Swiss federal office of public health
PID:	Pelvic inflammatory disease
MSM:	Men having sex with men
GRASP:	Gonococcal resistance to antimicrobials surveillance program
NCSP:	National Chlamydia Screening program
GUM clinics:	Genitourinary medicine clinics

1. INTRODUCTION

Sexually transmitted infections are a major problem for medicine and for public health services worldwide. More than 30 sexually transmittable pathogenic micro-organisms are known, including bacteria, viruses, fungi, protozoa and ectoparasites [1]. According to estimates from the World Health Organisation more than 333 million of bacterial sexually transmitted infections occur worldwide per year [2]. Sexually transmitted infections, by their nature, affect individuals, within partnerships and larger sexual networks, and in turn populations.

This report focuses on three bacterial sexually transmitted infections in Switzerland that are Chlamydia trachomatis, Neisseria gonorrhea and Treponema pallidum (syphilis) in Switzerland. The prevalence of these infections has been increasing alarmingly for a decade. All three infections can be asymptomatic and their diagnosis and treatment can therefore occur too late or worse not at all, even though treatments are available. This is an important problem as untreated sexually transmitted infections may cause complications such as ascending infections, infertility, ectopic pregnancies and serious long-term neurological sequels. The consequences of these infections should not be underestimated. They constitute a significant public health burden as well as serious financial burden.

The increases in chlamydia, syphilis and gonorrhea infections have also been observed in many European countries. Countries, where rising numbers of sexually transmitted infections have been observed, have reacted in different ways. Some have developed clinical guidelines or implemented screening programs, while others are still in their observational phase.

The aim of this mémoire is to assess whether Switzerland is doing enough regarding the prevention of chlamydial, syphilis and gonorrheal infections. After first describing the infections, surveillance systems of sexually transmitted infections are assessed, then the epidemiological trends of these three infections are described, and finally the prevention measures implemented in Switzerland to respond to the increasing number of infections are described. The reaction of the United Kingdom to the same problem is reported for comparison.

2. DESCRIPTION OF SYPHILIS, GONORRHEA AND CHLAMYDIA INFECTIONS

2.1 TREPONEMA PALLIDUM (SYPHILIS)

2.1.1 Transmission

Syphilis is a contagious disease essentially transmitted by sexual contacts. It is a bacterial infection. The causal agent is *Treponema pallidum*. It is a benign disease if treated early but can be serious if it is unknown or neglected. It is contagious during the first two to four years [3]. It is an obligate human parasite, and there are no reservoirs for this organism in animals or in the environment [4]. Most cases of syphilis are acquired through direct sexual contact. A person can get syphilis during vaginal, oral and anal sex. Transmission by sexual contact requires exposure to moist mucosal or cutaneous lesions, and therefore a person is able to transmit syphilis only during the first few years of infection. Syphilis is also transmitted vertically from an infected mother to the fetus by transplacental passage of treponemes, causing congenital syphilis. Infection in pregnant women may also cause stillbirth, and prematurity. Rates of acquisition of syphilis from an infected sexual partner have been estimated at about 30% [5]. Transmission to the fetus in utero has been documented as early as the ninth week of pregnancy. Women remain potentially infectious for the fetus for many years, although the risk of infecting the fetus declines gradually during the course of untreated illness; after about 8 years there is little risk even in the untreated mother [5].

2.1.2 Clinical manifestation

Syphilis has an evolution that can be described in 4 stages [3].

- Primary syphilis

  The chancre (genital sore) is the first manifestation of syphilis infection and develops at the site of inoculation. The chancre develops from 10 to 90 days (average 3 weeks) from exposure. The lesion is usually single but may be multiple. It is usually painless and if untreated it heals in a few weeks [5].

- Secondary syphilis

  Secondary syphilis occurs up to 6 months after the healing of the primary lesion. It is a systemic disease characterized by low-grade fever, malaise, sore throat, headache, adenopathy, and cutaneous or mucosal rash. This second stage of illness may be accompanied by alopecia, and up to 10% of patients have mild hepatitis. The secondary stage rash will spontaneously disappear in 4 to 12 weeks and it may reoccur in approximately 25% of untreated patients [6]. The systemic nature of secondary syphilis and its multiple organ involvement is frequently overlooked leading to misdiagnosis [5].

- Latency

  By definition, persons with historical or serological evidence for syphilis but with no clinical manifestations have latent syphilis. Latency has been somewhat arbitrarily divided into early latency and late latency, on the basis of the time when untreated individuals are likely to have spontaneous infectious relapses. Latency can last for many years; approximately two-third of untreated patient with latent syphilis will remain in this stage for the remainder of their lives. Spontaneous cures are thought to be unusual [4].

- Tertiary syphilis

  Tertiary syphilis affects about 35% of untreated patients and usually occurs 20-40 years after the onset of infection. The disease may occur in the following forms either singly or in combination: mucocutaneous, osseous, neural and visceral, particularly the heart and great vessels. The principal morbidity and mortality of syphilis in adults is due to these later manifestations. Late complications are relatively less of a problem than in the preantibiotic era, but alertness to the possibility of late syphilis and awareness of the multiple clinical manifestations of late syphilis are crucial if these forms of disease are to be diagnosed and treated properly [5] [6].

2.1.3 Diagnosis and treatment of *T. pallidum*

The diagnosis of syphilis in most patients is made by serological testing. The two types of tests used are biologically nonspecific tests and specific treponemal tests [7]. In Switzerland, the test used for screening is a nonspecific test called "the venereal diseases research laboratory". This test gives information on the disease's activity. If positive, the diagnosis is confirmed by a specific treponemal test, usually the *T. pallidum* particle agglutination or the fluorescence treponema antibodies. Most patients who have treponemal tests will have reactive tests for the remainder of their lives, regardless of the treatment or disease activity [4]. Both tests are very sensitive, around 80% for the first stage of the infection, and 100% for the second and third stage.

Intramuscularly administered penicillin is the preferred treatment for syphilis, although other antibiotics, including tetracyclines, macrolides and cephalosporins, have also been used. These alternatives have been useful in treating penicillin-allergic patients. During the past decades, and especially since 2004, reports of treatment failures and antibiotic resistance associated with macrolides have been reported. This indicates a need for further antibiotic drug development and surveillance for resistance in *T. pallidum* [8].

2.2 NEISSERIA GONORRHEA

Gonorrhea is a bacterial infection that primarily affects male and female genital mucosa but can involve other areas of the body. Gonorrhea is a disease found only in humans; it has no other known reservoir [7].

2.2.1 Transmission

Transmission of *N. gonorrhea* is primarily by sexual contact. The efficiency of gonorrhea transmission depends on anatomic sites infected and exposed as well as the number of exposures. The risk of acquiring urethral infection for a man following a single episode of vaginal intercourse with an

infected woman is estimated to be 20%, rising to an estimated 60 to 80% following four exposures. The risk of infection for women after a single exposure to an infected man is 50%. It is likely that the single-exposure transmission rate from male to female is higher that from female to male, in part because of retention of the infected ejaculate within the vagina. The risk of transmission by other types of sexual contact is less well defined. Gonorrhea transmission through rectal intercourse is relatively efficient and pharyngeal gonorrhea is readily acquired by fellatio [5],[6],[7].

2.2.2 Clinical manifestation

Uncomplicated gonococcal infections:

Gonorrhea is manifested by a broad spectrum of clinical presentation, including asymptomatic and symptomatic local infections, local complicated infections and systemic disseminations [5].

- Urethral infection in men

  Acute anterior urethritis is the most common manifestation of gonococcal infection in men. The majority of men develop symptoms within 2 to 5 days. The predominant symptoms are urethral discharge or dysuria. The severity of symptoms is partly determined by the infecting strain of *N. gonorrhea*. Without treatment, the usual course of gonococcal urethritis is spontaneous resolution over a period of several weeks [5].

- Urogenital infection in women

  The incubation period for urogenital gonorrhea in women is less certain and probably more variable than in men, but most women who develop local symptoms apparently do so within 10 days of infection. The most common symptoms are vaginal discharge, dysuria and intermenstrual uterine bleeding. The clinical assessment of women for gonorrhea is often cofounded by the nonspecificity of these signs and symptoms and by the high prevalence of coexisting cervical or vaginal infections, like for example Chlamydia trachomatis [5].

- Rectal infection

  The rectal mucosa is infected in 35 to 50% of women with gonococcal cervicitis and is a frequent site of infection in homosexual men. Most rectal infections in women occur without acknowledged rectal sexual contact and are assumed to result from perineal contamination with infected cervical secretions [5].

- Pharyngeal infection

  Transmission of pharyngeal gonorrhea to sex partners is possible, thus pharyngeal gonococcal infection may be greater than previously appreciated and may now be an important source of urethral gonorrhea in MSM [5].

Complicated gonococcal infections

- Local complications in men

  In men, the most common local complication of gonococcal urethritis is epididymitis. At present, the most common causes of acute epididymitis in patients under 25 years old are C. trachomatis and N. gonorrhea or both. Another complication is decreased fertility [5].

- Local complication in women

  Pelvic inflammatory disease (PID) is the most common complication of gonorrhea in women, occurring in an estimated 10 to 20% of those with acute gonococcal infections. PID is the result

of post-infectious inflammation of female upper genital tract that includes salpingitis, endometritis and inflammation of fallopian tubes. In addition to being the most common complication, it is as well the most important in terms of public health impact, because of both its acute manifestations and its long-term sequelae. PID if untreated may lead to infertility, ectopic pregnancy and chronic pelvic pain [9]. Reported complications of genital gonorrhea in pregnancy include spontaneous abortion, premature rupture of fetal membrane, premature delivery and other syndromes in the new born [5].

Systemic complications: disseminated gonococcal infection

Disseminated gonococcal infection with septicemia and infection of skin and joints occurs in 1% to 3% of infections [7]. Recognition of patients with disseminated gonococcal infection is sometimes delayed because of the wide variety of clinical findings associated with this syndrome [5].

2.2.3 Diagnosis and treatment of *N. gonorrhea*

Nucleic acid amplification tests (NAAT) are the most sensitive tests available for the diagnosis of *N. gonorrhea*. A major advantage of NAATs is the ability to use them with noninvasively collected specimens. It can be used to test first catch urine and vaginal swab specimen. The ability to use first catch urine and vaginal swab means that specimens can be collected in places other than traditional clinical settings. Noninvasive collection of specimens has made it far easier to test asymptomatic individuals [10].

Over the past 60 years, *N. gonorrhea* has developed resistance to multiple classes of antimicrobials. Sulfanilamides were used for gonococcal treatment in 1936, but were short lived because of the rapid emergence of resistance by 1945. Penicillin became the recommended antimicrobial regimen for the next 40 years. In 1985, because of emerging penicillin resistance, cephalosporine and fluroquinolone became a recommended regimen for the treatment of uncomplicated gonococcal infections. But today, because of the emergence of quinolone resistant *N. gonorrhea*, the current recommended gonorrhea treatment is cephalosporin. Given the possible emergence of cephalosporin resistance, other effective therapeutic regimens and new agents for gonorrhea are urgently needed [11].

2.3 CHLAMYDIA TRACHOMATIS

Chlamydia trachomatis is a bacterial infection. Chlamydia has a very limited host range, with infections restricted to humans and one strain responsible for mouse pneumonitis. The species has been subdivided into 3 biovars: trachoma, lymphogranuloma venereum (LGV) and a third biovar that is specific to the mouse [7]. New variants of *C. trachomatis* are isolated from time to time [12].

2.3.1 Transmission

Transmissibility of chlamydia infections from women to men and inversely has not been extensively studied. Transmissibility from female to male has been estimated at 28% and from male to female, it is around 45% [5]. Chlamydia can be transmitted during vaginal, anal sex and oral sex [5].

2.3.2 Clinical manifestation

- Infections in men

  C. trachomatis is responsible for a wide range of clinical manifestations. Chlamydial infections among men were thought to be symptomatic. However, it has recently become apparent that as many as 50% of chlamydial infections in men may be asymptomatic [9]. Non specific symptoms, such as dysuria or perimeatal tingling can develop. *C. trachomatis* can cause urethritis, epididymitis and proctotis.

  Approximately 35% to 50% of cases of nongonococcal urethritis are caused by *C. trachomatis*. Chlamydial urethral infections are more often asymptomatic than gonococcal urethral infections, and when symptoms occur they are milder [9].

- Infections in women

  One of the challenges of diagnosing chlamydial infection is that at least 70% of infected women are asymptomatic. Non specific symptoms, such as abnormal vaginal discharge, intermenstrual bleeding and dysuria can develop [9].

  Chlamydial infections can cause urethritis, cervicitis and salpingitis. Untreated chlamydial infection may lead to PID in 20-40% of infected women. PID will eventually have for consequences infertility, ectopic pregnancy and chronic pelvic pain if untreated. There are no data on how long it takes for untreated chlamydial infection to develop PID [8]. The clinical symptoms of PID are non specific and can be easily missed in women with mild symptoms. Unfortunately, there might not be a relationship between the severity of the symptoms and the severity of the disease progression. The most common symptoms of PID are lower abdominal pain, abnormal vaginal discharge or bleeding [9].

- Other clinical manifestations

  Repeated conjunctival infection with *C. trachomatis* may lead to chronic inflammation of the conjunctiva. The subsequent scarring of conjunctiva causes the eye lid to turn in and to scar the cornea; it can result in blindness if untreated [7].

2.3.3 Diagnosis and treatment of *C. trachomatis*

Nucleic acid amplification test (NAAT) is considered the test of choice for diagnosing *C. trachomatis* infections. NAAT can use different testing platforms. Each platform employs a single nucleic acid target. The use of multiple testing platforms should ensure the detection of new variant *C. trachomatis* strains [13]. NAAT can be used on first void urine specimens and even with self obtained vaginal or vulvar swabs. It has a high sensitivity (more than 90%) and high specificity (99%) [14].

Macrolide is the best choice for the treatment of chlamydial infections. A single dose of 1g of azithromycin is sufficient to treat uncomplicated urethral, cervical or rectal chlamydial infections [9]. To date, no antibiotics resistance has been observed [15].

3. SURVEILLANCE SYSTEMS FOR SEXUALLY TRANSMITTED INFECTIONS IN SWITZERLAND

3.1 DESCRIPTION OF SURVEILLANCE SYSTEMS

Public Health surveillance is the ongoing systematic collection, analysis, interpretation, and dissemination of health events data used in public health activities. These activities aim to reduce morbidity and mortality and to improve health in general. Surveillance of sexually transmitted infections (STI) should provide information for action to control their spread. Surveillance systems can collect information about cases or diseases diagnosed in all settings (comprehensive surveillance), or the information can be collected through a sample of healthcare providers (Sentinel Surveillance). Ideally a surveillance system should provide consistent information according to time, place and person so that interventions can be targeted appropriately [16].

The Swiss surveillance system was assessed in 2005, and this evaluation led to the adaptation of the surveillance system in 2006. That year, as a consequence, there was a modification to the Ordinance on medical doctors' and laboratories' notifications [17]. Before 2006, the Swiss Federal Office of Public Health (SFOPH) had three sources of information concerning the epidemiology of chlamydia, syphilis and gonorrhea infections. The Swiss Surveillance system was constituted of the Swiss Network of Dermatology Polyclinics, the Swiss Sentinel Surveillance Network, and laboratory reports. Following the modification of the Ordinance in 2006, the Swiss Surveillance system is today constituted only of laboratory reports and complementary reports (table 1). The components of the official system, namely laboratory reports and complementary reports, will be described as well as the components of the previous system, namely the Swiss Network of Dermatology Polyclinics and the Swiss Sentinel Surveillance Network because they have helped collecting data on gonorrheal, syphilis and chlamydial infections in the past years.

Table 1: Years of contribution of the different networks

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Laboratory reports																						
Complementary report																						
The Swiss Network of Dermatology Polyclinics																						
The Swiss Sentinel Surveillance Network																						

3.1.1 Laboratory reports

Laboratory reporting of gonorrhea, syphilis and chlamydia to the SFOPH began in 1987 when the federal ordinance on reported infectious diseases was changed. Because of declining cases of syphilis and the lack of specificity regarding the information collected, syphilis infection was removed from the list in 1999. In 2006, the Ordinance responsible for the change in the surveillance systems reintroduced the mandatory notification of syphilis infections [17]. Laboratory reports are made by recognized laboratories and are nominative for syphilis and gonorrhea only. They contain information on the tests performed and demographic data (Table 2). There are approximately 400 hospitals and private laboratories in Switzerland and approximately 200 of these report cases each

year. The total number of tests performed is not reported [18]. Laboratories have a week to notify infections.

3.1.2 Complementary report by medical doctors

Since 2006, doctors have been legally obliged to report every case of syphilis and gonorrhea. This obligation does not concern chlamydial infections. As with laboratory reports, complementary reports contain the name of the patient and also information on sexual orientation, the nature of the relations (casual or stable), the number of partners in the last 6 months, past history of STI, risk factors, country of acquisition, clinical symptoms, route of transmission and indication on partner notification [19] [20] (table 2). Doctors have a week to report these infections (Appendix 1 and 2).

3.1.3 Swiss Network of Dermatology Polyclinics

The Swiss Network of Dermatology Polyclinics started contributing to national surveillance in 1989 as part of a European project to monitor the prevalence of HIV among patients with STI. The network comprises six clinics in public university or city hospitals situated in Basel, Bern, Geneva, Lausanne and Zürich (two clinics). These clinics see 100 to 200 patients per day, with Geneva reporting the largest number. Patients are usually self-referred, but general practitioners and other specialists can also make referrals. Screening of asymptomatic patients is not routine and testing is done according to clinical judgment [18]. Behavioral risk data is recorded, as well as demographic data, such as gender, age, marital status, nationality and canton of residence (table 2). Multiple infections diagnosed in one individual at the same clinic visit can be identified, but individuals presenting for multiple consultations cannot be identified. The total number of people tested for STI is not recorded [18]. This network stopped contributing to the surveillance systems in 2006. It still contributes to the surveillance of STI for complementary studies.

3.1.4 Swiss Sentinel Surveillance Network by gynecologists

Since 1995, the Swiss Sentinel Surveillance Network provided information about STI diagnosed in women by gynecologists (table 2). Case reports included information about laboratory diagnosis and year of birth. The number of tests performed was not recorded. Multiple infections diagnosed in the same person at different consultations cannot be identified [16]. This network stopped contributing to the surveillance systems in 2006. It still contributes to the surveillance of STI for complementary studies.

Table 2: Past and present surveillance systems and the data they generate(d) on STI

Surveillance system	Demographic data	Behavioral data
Laboratory reports [from 1987 to date]	Name (except for chlamydial infections) Age Gender Canton Year of Birth	None
Complementary report **(only for syphilis and gonorrhea)** [from 2006 to date]	Name Country of acquisition	Sexual orientation Number of partners in the last 6 months Past STI record Drug consumption Prostitution Presence of clinical symptoms Nature of relation Route of transmission Partner's notification
The Swiss Network of Dermatology Polyclinics [from 1989 to 2006]	Age Gender Civil Status Canton Nationality Country of acquisition	Drug consumption Sexual orientation Number of partners in the last 6 months Condom use frequency
The Swiss Sentinel Surveillance Network [from 1995 to 2006]	Gender Year of birth	None

3.2 EFFICACY OF THE SWISS SURVEILLANCE SYSTEM

In 2006, the modification of the Ordinance on medical doctors' and laboratories' notifications in 2006 led to a surveillance system constituted of two components: the laboratory reports and complementary reports. There are no national clinical guidelines in Switzerland for STI except for HIV. Therefore, in the absence of any recommendations, we can presume that it is mainly people with symptoms that undergo a screening test [19]. First the efficacy of the networks that were previously contributing to the surveillance system will be described, and then the efficacy of the present surveillance system will be assessed.

3.2.1 Swiss Network of Dermatology Polyclinics and the Swiss Sentinel Surveillance Network

The Swiss Network of Dermatology Polyclinics and the Swiss Sentinel Surveillance Network stopped contributing to the National surveillance system in 2006. Although some additional information was lost, this has not led to any major negative consequences. The Swiss Network of Dermatology Polyclinics system was an incomplete source of data on STI. STI constituted a small part of their case load, and they more often had syphilis cases, particularly those with skin manifestation. Men with urethral discharge would be expected to present to an urologist or general practitioners, although this can not be confirmed as little is known about sexual health-seeking behaviour in Switzerland [16]. Reports from this network were also characterized by low levels of representativeness. They gave information predominately on men, because women represented only 8.1% of the established diagnoses. Additionally, the polyclinics treated many non-Swiss patients (46% of all patients) and a mainly urban population (the polyclinics are located in large urban centers) [18].

The Sentinella system likewise provided only limited information. The system included only few gynecologists and each practitioner reported an average of less than one case of chlamydia per year. Therefore the number of cases detected by this network was also incomplete and not representative of the women in the general population. The number of chlamydial infections diagnosed by the Swiss Network of Dermatology Polyclinics and the Sentinella system represented only 2% of the notifications made by the laboratories [16]. Before the change in the surveillance system in 2006, trends in STI at a national level reported by the three different components of the surveillance system were not consistent [16].

3.2.2 Laboratory reports

Laboratory reports were already part of the Swiss surveillance system before the modification of the Ordinance in 2006 and are still part of it. They are considered as the most representative source of data on STI. However, the progression of STI cannot be estimated because the number of negative tests is not reported. Increased detection of STI might for example be the result of a combination of increased testing, a change in the population being tested, increased test sensitivity, changes in reporting or true changes in morbidity [16]. Furthermore, the absence of consistent guidelines for testing sexually transmitted infections might implicate that only patients with symptoms are tested for STI [19]. In addition, it is important to keep in mind that in case of suspicion of a STI, the patient might be treated without laboratory testing (syndromic management), so some STI might not be registered. Syndromic management is the core intervention in the WHO strategy for delivering care to people with STI in resource poor setting where laboratory testing is not available [21]. This is not the case in Switzerland. It is difficult to assess the number of infections that is not notified because of syndromic management. Furthermore, STI can also fail to be notified because of antibiotics given for another disease. The antibiotics might cure the disease but also the STI.

Laboratory reports are useful to follow trends of syphilis infections, but to follow trends of gonorrhea and especially chlamydia they seem to be less useful. In a study published in 2002, the authors concluded that the sensitivity of national laboratory reports of *C. trachomatis* in 1998 was less than 5% for women aged 20 to 34 years. It suggests that laboratory reports of *C. trachomatis* seriously underestimate the frequency of infections among women [23]. This study demonstrates the limitations of laboratory reports in evaluating the rates of infections that are mainly asymptomatic infections, such as chlamydial infections. Consequently, frequencies of gonorrhea infections, which may also be asymptomatic, might also be underestimated by laboratory reporting. Ideally, prevalence studies to measure the frequency of predominantly asymptomatic infections could complete the surveillance systems [23].

3.2.3 Complementary reports

Complementary reports by medical doctors are obligatory for syphilis and gonorrhea (appendix 1 and 2). The information contained in those reports help understanding the evolution of STI in our society. They are needed to assess risk factors associated with STI. This helps evaluating groups in the general population that are more likely to be infected. Furthermore, when high risk populations have been targeted, specific prevention measures can be developed.

However despite the obligation to report, there have been few complementary reports and most of the reports submitted have been incomplete. Consequently, demographic data and behavioral data are not representative, neither of the population nor of the sub groups. Furthermore the deadlines of reporting are rarely respected [19]. Complementary reports are not completely accepted by doctors because they are worried about data protections. Recording the patient's name is one of their main concerns [19]. The patient's name is an important information because it facilitates the notification

and follow up of the partner. Partner notification is the process of informing the sex partners of people with sexually transmitted infections of their potential exposure to infection, ensuring their evaluation and/or treatment, and providing advice about preventing future infection (also known as contact tracing) [24]. The aim is to prevent re-infection of the index case (the first patient diagnosed with a STI) and onward transmission [24]. It is an essential step in controlling STI. Partner notification is recommended by international health organizations and many health authorities [19]. In 2006, in Switzerland, even though partner notification is an essential step in controlling the epidemics of STI, sexual partners were contacted in only 45% of cases of notified gonorrhea and 36% of notified syphilis cases [19]. In addition to the problem of data protection, partner notification might be unsuccessful because physicians have too little time to initiate or follow-up partner notification or they estimate they do not have the skills to take a sexual history and discuss partner notification. Another reason might be that the index cases are unable or unwilling to contact their sexual partner(s) [24].

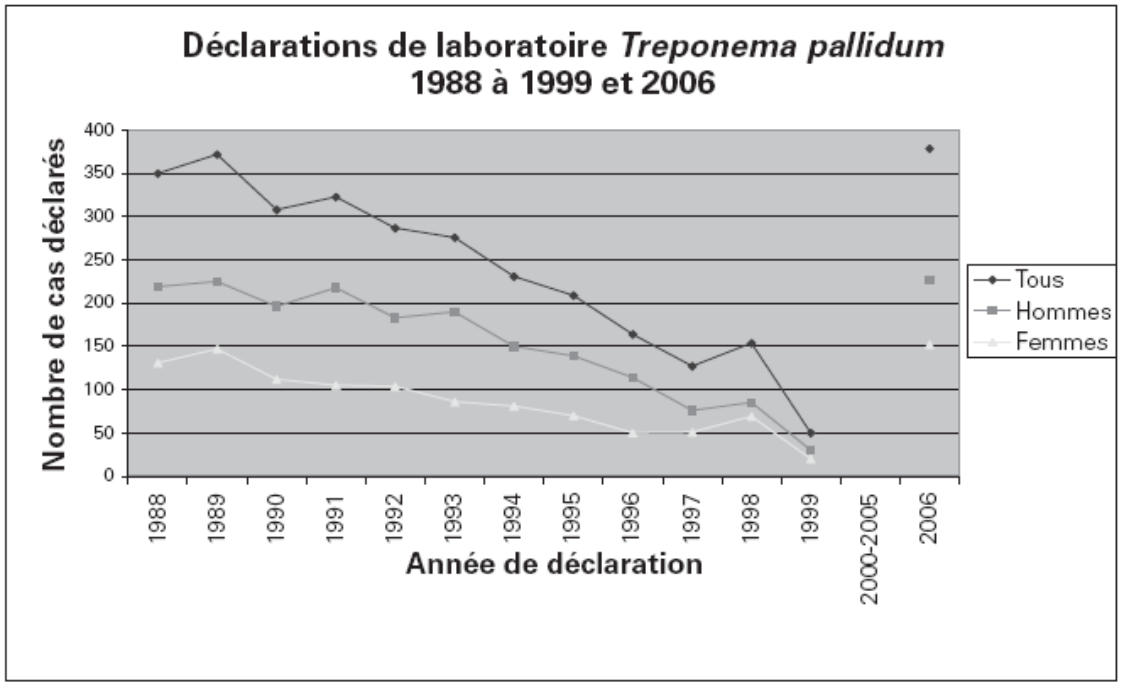
In 2008, there was a modification concerning complementary reports: the notification of the name of the patient is replaced by the notification of the patient's initials. With this modification, the health authorities should still be able to contact doctors in case of suspicion of multiple infection cases, as well as when the partner notification isn't clearly indicated [19]. As mentioned above, data protection was a major concern for doctors; consequently this modification should hopefully make them less reticent about filling complementary reports. However, this modification might not be sufficient to improve compliance, because complementary reports are still a relatively new addition to the surveillance system. One way forward would be to better inform physicians of the importance of the reports. An improvement of the compliance could be made through additional formation to physicians on STI to make them more aware of the epidemiological situation.

4. SYPHILIS, GONORRHEA AND CHLAMYDIA INFECTIONS IN SWITZERLAND

4.1 SYPHILIS INFECTIONS

4.1.1 Description of syphilis epidemiological tendencies between 1988 and 2006

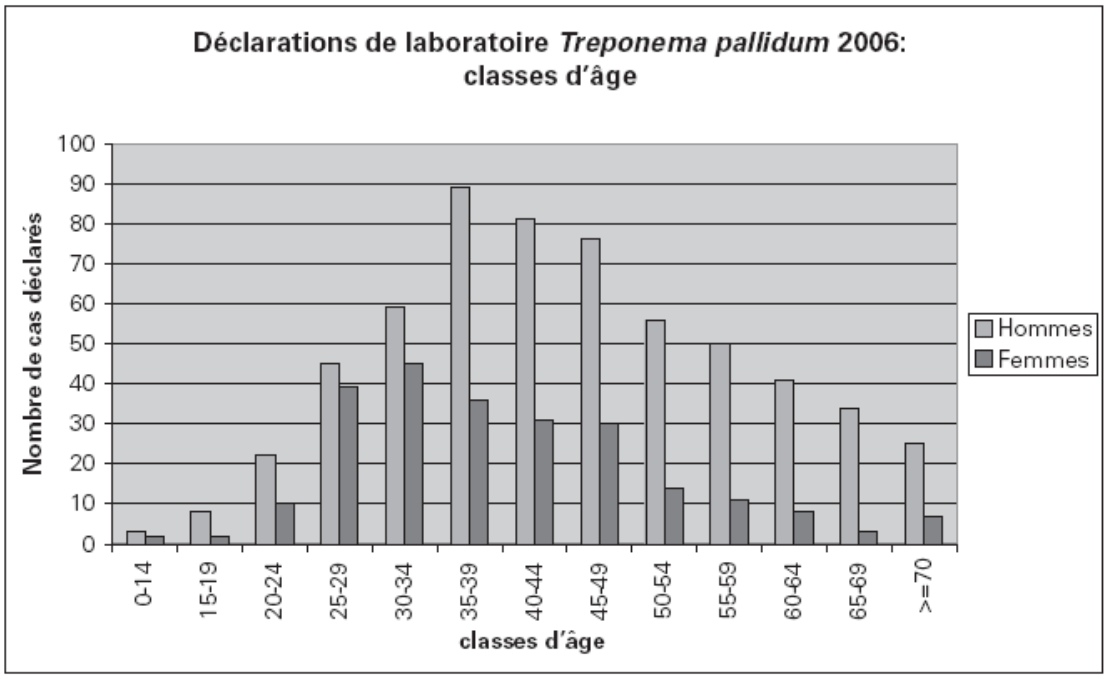
Figure 1: Laboratory reports of *Treponema pallidum* in women and men by year, 1988 to 2006 [19]



Between 1988 and 1999, there was a significant decline in the number of cases reported via laboratory reports (figure 1). During that period, the reported cases of syphilis fell from approximately 350 to 50, a decline of 86%. This decline led to the cancellation of systematic reporting of syphilis infections to the SFOPH in 1999. During the period where syphilis infections were not notified to the SFOPH, the number of cases reported by the Swiss Network of Dermatology Polyclinics was increasing quickly and in 2003 it had already tripled [22]. This led the Health Authorities to reintroduce the obligation of reporting syphilis in 2006. That year, the laboratories declared more than 400 new cases of syphilis infections, an 8 fold increase from the statistic of 1999 [19].

In 2006, it was mainly primary (21%) and secondary (23) syphilis that was diagnosed. Latency was described in 23% of the cases and tertiary syphilis was declared in 1% of the cases. In 32% of the notifications, the stage of syphilis was unknown or not mentioned (appendix 1).

Figure 2: Laboratory reports of *Treponema pallidum* , cases reported for 2006: Age Groups [19]



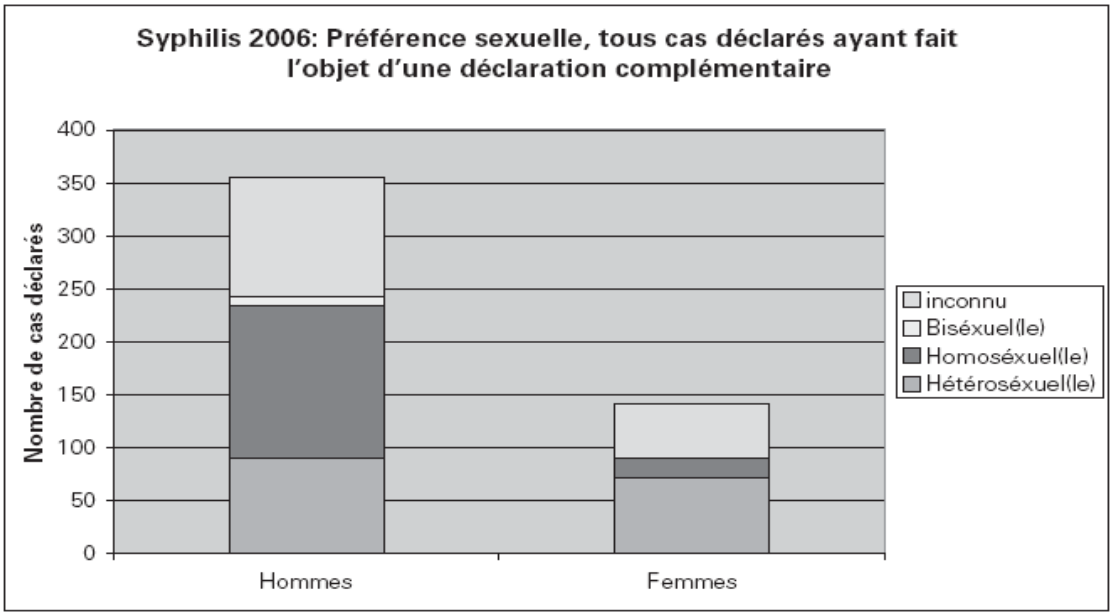
4.1.2 Patients' characteristics

In the 2006 reports, syphilis cases concerned mainly men (74%) between the ages of 35-49 (figure 2). Women notified as having syphilis belonged to younger age groups. Women between 25 and 29 years of age, between 30 and 34 years of age and between 35 and 39 years of age represented the age groups the most notified. People under 25 years represented around 8% in each group (figure 2).

In 2006, 50% of the notifications concerned men having sex with men (MSM), and 45% of the infections concerned patients with casual relations (appendix 1) [19].These two behaviors describe patients with high risk of STI acquisition and transmission. MSM are an important subpopulation in syphilis infections (figure 3). This subpopulation has increased rates of new partner acquisition and shorter intervals between new sex partners and both factors enhance sexual spread of infections [4].

The serological status of HIV when syphilis is diagnosed is not reported in Switzerland, but from data collected in a French study, nearly half of the patients (46%) diagnosed with syphilis were co infected and MSM represented 52% of those infected [25]. This statistic highlights the fact that HIV and syphilis, as well as other STI, are interrelated.

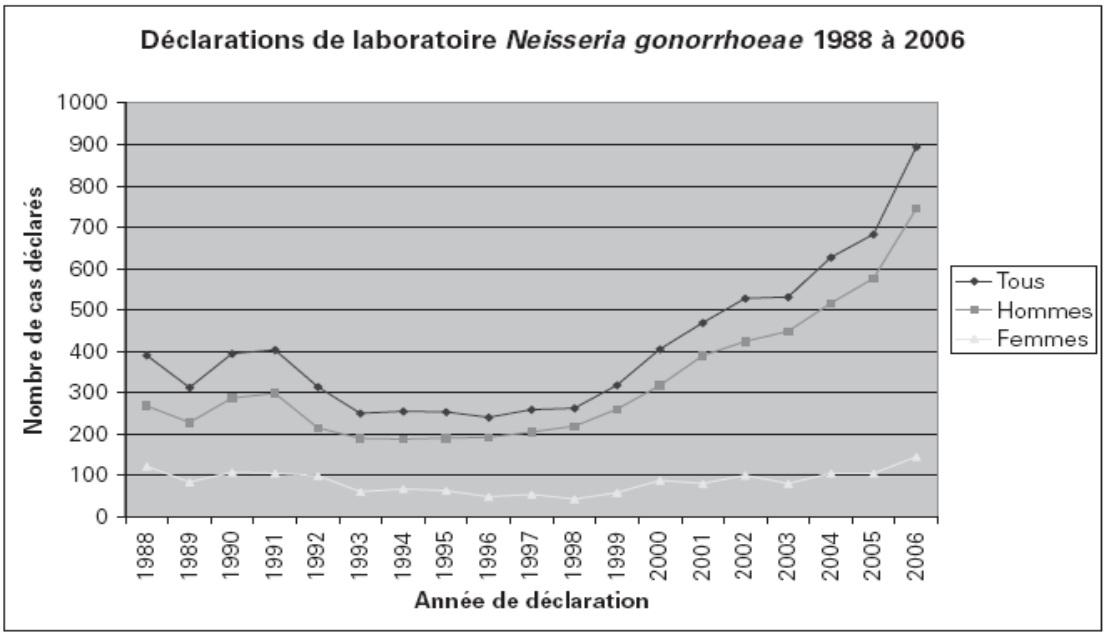
Figure 3: Syphilis 2006: Sexual orientation of cases notified in a complementary report [19]



4.2 GONORRHEAL INFECTIONS

4.2.1 Description of gonorrheal epidemiological tendencies between 1988 and 2006

Figure 4: Laboratory reports of *Neisseria gonorrhea* in women and men by year, 1988 to 2006 [19]



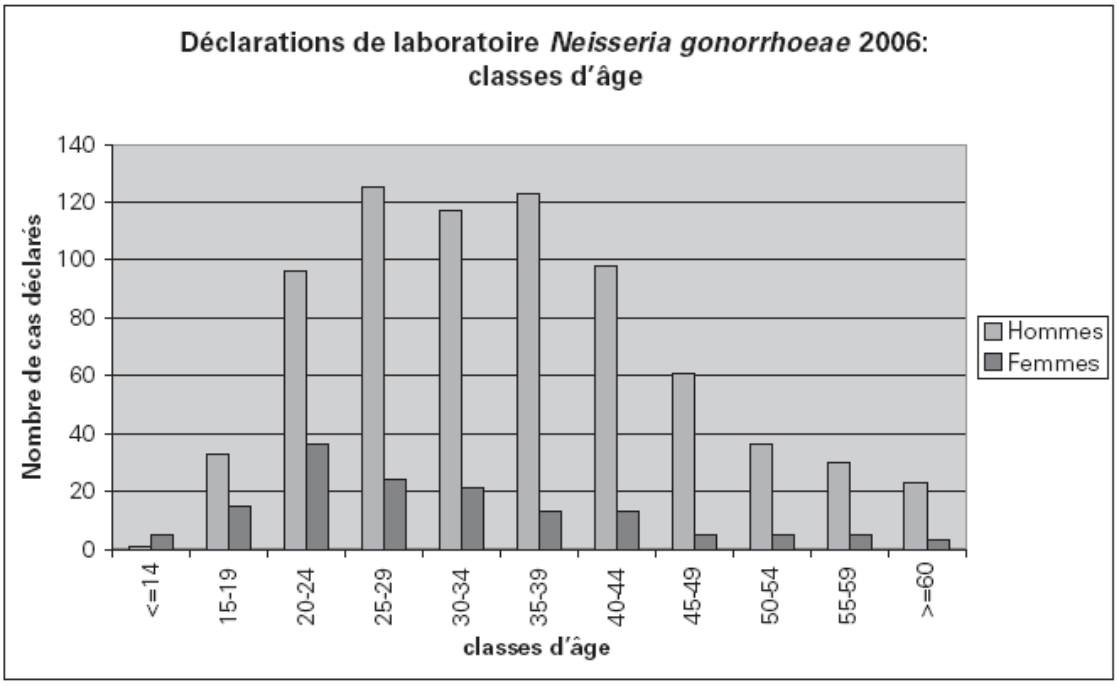
From 1991 to 1993, there was a declining trend in the annual number of reported cases of *Neisseria gonorrhea* and from 1993 to 1998, the annual number of reported cases was stable, at about 200-250 cases per year. Between 1999 and 2006, however, the number of cases declared almost tripled for both gender (figure 4).

4.2.2 Patients' characteristics

As for syphilis, gonorrheal infections in men were more often notified than in women (figure 4). In 2006, 889 cases of gonorrhea were declared: 84% were men and 16% were women. Among men, the most represented infected age groups were 25 to 29 years old (20%) and 30 to 34 years old (20%). Among women, the most represented infected age groups are 20 to 24 years old (25%) and 25 to 29 years old (20%) (figure 5).

In 2006, regarding their sexual orientation, 49% of men declared heterosexual relations, 33% homosexual relations and 2% bisexual relations. Among women, 83% declared heterosexual relations and 1% homosexual relations [19]. Considering the total MSM population compared to the heterosexual population, MSM proportionally have a higher frequency of infections. However it was still heterosexual relations that represent half of the infections (appendix 2).

Figure 5: Laboratory reports of Neisseria gonorrhea, cases for 2006: Age Groups [19]



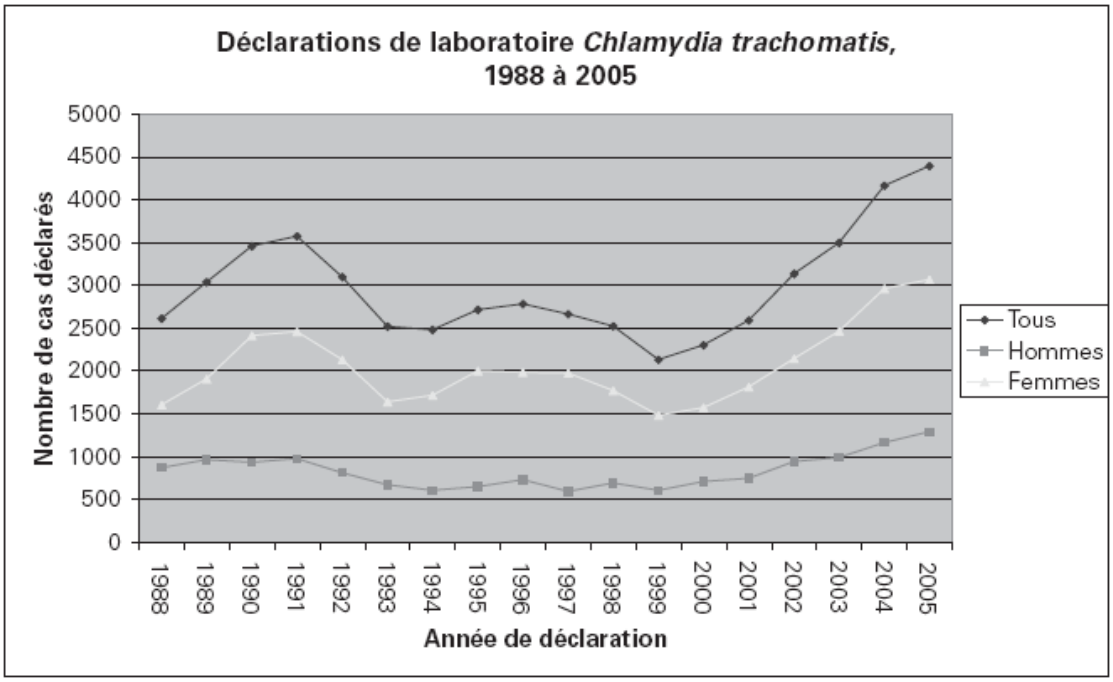
4.3 CHLAMYDIAL INFECTIONS

4.3.1 Description of chlamydial epidemiological tendencies between 1988 and 2005

After an overall decrease in the number of chlamydial cases reported between 1990 and 1999, infections more than doubled until 2006 (figure 6). That year more than 4000 cases were notified and

the number of chlamydia infections still appears to be increasing. Many chlamydial infections escape detection by the surveillance system. As mentioned above, a study, carried out in 1998 among women attending gynecologists, observed a prevalence of 1.3% among pregnant women and 2.9% among women consulting for a check up. The authors assumed that the prevalence of *C. trachomatis* among the check up women was a rough estimate of the prevalence of *C. trachomatis* among low-risk, sexually active women in Switzerland. This prevalence was then applied to the Swiss population statistics to provide an estimate of the total number of chlamydia infections in Switzerland. When extrapolating those results, the authors concluded that laboratory reports seriously underestimated the frequency of *C. trachomatis* among women in Switzerland. The authors also concluded that the estimates of the prevalence of *C. trachomatis* infections among women consulting gynecologists for a check up was also underestimated, because women who consulted public or private hospitals were excluded and there was also underrepresentation of foreign women [23]. They estimated that the sensitivity of laboratory reports of *C. trachomatis* among women aged 20 to 34 years old is probably less than 5%. This implies that laboratory reports only represent the tip of the iceberg and that there are far more cases of chlamydial infections than the 4000 cases reported in Switzerland.

Figure 6: Laboratory reports of *Chlamydia trachomatis* in women and men by year, 1988 to 2005 [19]

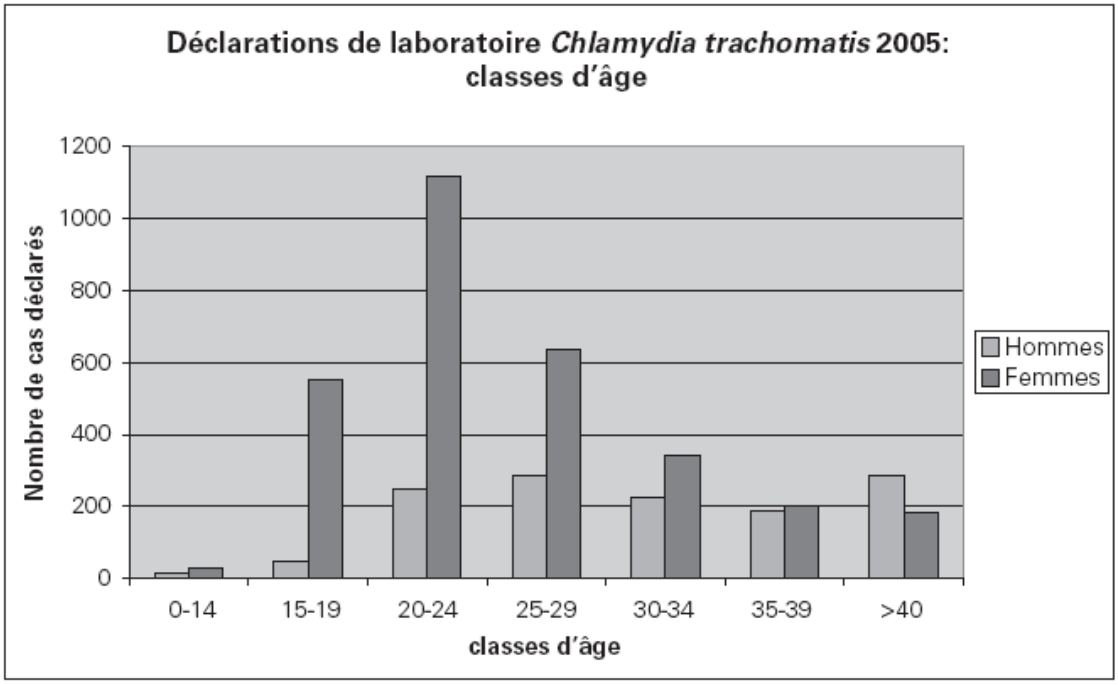


4.3.2 Patients' characteristics

In 2005, unlike for gonorrhea and syphilis infections, chlamydia infections were more present among women than men. 70% of the cases notified concerned women. Furthermore, the younger female age groups are more affected by chlamydial infection than by gonorrhea or syphilis. In 2005, 18% women were aged between 15 and 19, 37% between 20 and 24 and 21% were between 25 and 29 [19].

In 2005 among men, the 20-24 year old represented 19% of the notifications, the 25-29 year old represented 22% and the 30-34 year old represented 17% (Figure 7).

Figure 7: Laboratory reports of *Chlamydia trachomatis* in 2005: Age groups [19].



4.4 ANALYSIS OF THE TRENDS OBSERVED FOR CHLAMYDIA, SYPHILIS AND GONORRHEA INFECTIONS

Trends for syphilis, gonorrhea and chlamydia infections are quite similar and they can be divided into two periods: before and after 1999.

Between 1990 and 1999, there was an overall decline in all three infections. It was difficult to identify the precise factors causing this decrease, but evidence for at least one factor was identified. This factor was the AIDS prevention strategies which began in 1987 with the launch of the STOP-AIDS campaign (an information brochure was distributed to all households in 1986). Evaluation studies found that this campaign was associated with dramatic increases in condom use [26]. This change of behaviour had a beneficial impact on chlamydial, gonorrheal and syphilis infections. In relation to gonorrheal infections, there was a second factor which helped also its decline and stabilization during that period. It was a new form of treatment introduced in the early 1980s (called spectinomycin). This treatment was popular among physicians. In addition to being an effective treatment, it was also easy to administer as it involved a single injection [18].

Since 1999, the number of syphilis, gonorrheal and chlamydial infections notified has continuously increased. When interpreting the increases observed in STI rates, it is important to consider the influence of different factors. First of all, reports are very sensitive to case detection rates, so the more screening, the more cases are detected. In 1996, in Switzerland, the health care

insurance became obligatory with the introduction of the LAMal. As a result, every citizen had a health care insurance and this might have modified the health care seeking behaviour. However, as laboratory reports do not give information either on the number of negative tests or on the total number of laboratory tests performed each year, this potential source of bias cannot be evaluated. Secondly, trends are also responsive to any changes in the diagnostic test; if the test is more sensitive, more cases will be detected. Thirdly, the risk related to the composition of the population being tested (case mix) will also influence the trends in reported STI [27]. In fact, the case mix reflects the distribution of risks in the population being tested. If more testing is done in high risk groups, more infections will be notified [27]. Therefore, the trends observed could reflect a combination of increased testing, a change in the population being tested, increased test sensitivity, and true change in morbidity [16]. The increases observed in bacterial STI have to some extent been attributed to different factors, even though the reasons for these increases remain unclear.

A rise in high risk sexual behaviours is thought to be a major reason for increased bacterial STI [28]. Trends in STI are thought to be reasonable indicators of changes in sexual behaviour [29]. High risk sexual behaviours also place individuals at risk of infection with HIV. In fact, if the incidence/prevalence of HIV is high, there is the possibility of high rates of sexual transmission of STI and the reverse is also true [30]. This was confirmed in 2002 when Swiss HIV diagnostic laboratories reported 25% more positive HIV test results than in 2001. This was a worrying change in the trend, since numbers of positive HIV tests in Switzerland had previously fallen each year since 1991[31]. Two groups have been particularly affected by this increase: Swiss MSM and heterosexually infected immigrants from countries with a widespread HIV epidemic and high HIV prevalence. Heterosexual relation is still the main transmission mode for HIV, but homosexual relations proportionally represent more cases [31]. A proportion of MSM has been identified as returning to higher risk sexual behaviours such as unprotected anal penetration with casual partners [26]. At the moment, a decrease in condom use in the general population has not been identified, but it is important to be cautious because of the increasing number of STI and HIV cases notified and the fact that STI are also increasing in other countries. Sexual behaviour is one of the key factors for STI transmission. There seem to be a declining readiness for "safer sex" that may be caused by at least three factors: 1) Young adults who have not experienced the first HIV prevention strategies. HIV prevention today is far less visible than when the first prevention strategies were introduced. It is important that prevention messages are reiterated. 2) The weariness of already sexual active individuals who return to higher risk taking behavior [32] [1] and 3) the presence of highly active antiretroviral treatment which may reduce the fear of HIV [33].

A second factor for consideration is that HIV and STI share some risk factors but not all risk factors. Unprotected oral sex, while presenting a relatively safer alternative to penetrative sex with regard to HIV transmission, is a very effective way of transmitting syphilis, gonorrhea and chlamydia infections [34]. So even if the safer sex rules (no penetration without a condom and no sperm or menstrual blood in the mouth) established mainly for the HIV epidemic are respected, the risk of transmission of chlamydia, gonorrhea and syphilis is high. The general population needs to be aware of this difference in the probability of transmission. To some extent, unprotected oral sex is responsible for the return of bacterial STI. The transmission of these infections by unprotected oral sex probably indicates a lack of knowledge about transmission risks, arising from an incorrect belief in "safer sex" rules [1]. Furthermore, among MSM, a new sexual behaviour appeared in reaction to the HIV epidemic, named serosorting. This is the practice of deliberately selecting partners of the same HIV status for unprotected casual anal sex. Serosorting amongst gay men has been defined as "discussing HIV status with potential partners and only engaging in HIV risk behaviour with those they believe are of a similar HIV status" [35]. Serosorting is used as a deliberate strategy to replace consistent condom use with casual partners. It is highly problematic because even if both partners are indeed HIV-negative or positive, there is still a risk of other STI transmission and acquisition. Additionally, HIV status is sometimes assumed rather than actually known [35]. Specific information about transmission risks of bacterial STI should be provided to the population and to the sub groups,

so people can protect themselves correctly.

In relation to gonorrhea specifically, there is another reason which might also explain the observed increase. N. gonorrhea is becoming more and more resistant to antibiotic treatment. In the mid-1990s, high levels of penicillin resistant N. gonorrhea were reported in many large metropolitan areas across Europe. By late 1990s, resistance to fluoroquinolone was also observed and more recently resistance to ciprofloxacine was documented [36]. Treatment failure facilitates disease transmission and may also contribute to increased diagnoses [37].

By looking at bacterial STI trends across Europe, it might be possible to further explain the etiology of increase in STI in Switzerland. Many European countries are experiencing similar trends in STI. It is difficult to compare disease's rates across Europe because the overall picture has to be assembled from sources that vary in their coverage, their completeness and representativeness. Direct comparisons of absolute numbers and rates may be misleading since the proportion of diagnosed cases reported differs substantially [38]. Additionally, variations in STI screening, partner notification and treatment practices also influence the degree to which asymptomatic patients and sexual contacts are diagnosed, treated and recorded in surveillance statistics [36]. However, despite these differences, the figures 8, 9 and 10 show that, like Switzerland, chlamydia, gonorrhea and syphilis are increasing in other countries. A number of broad similarities in STI trends can be observed across Europe:

- Rates of reported chlamydia infection have increased in all European countries, except Estonia and Lativia over the past ten years (figure 8) [38].
- Rates of reported gonorrhea in the past ten years has increased in Western Europe, with the exception of Italy, Portugal and Spain (figure 9) [38].
- Rates of reported syphilis have increased in nine out of 16 Western European countries (figure 10)[38].

The consistency of trends across Europe suggests that major societal and behavioural determinants of STI transmission are operating in tandem in addition to the change in sexual behaviours. The changing demographic, social and economic structure of Europe (decrease marriage, delayed childbirth, population movement) will have implication for sexual health. These determinants will future described in section 5.1.1. Nevertheless, sexual behaviour is the key determinant of STI transmission and it undoubtedly contributed largely to the changing disease epidemiology observed in Europe [36].

Figure 8: Rate of reported Chlamydia cases per 100 000 population in selected European countries: 1997-2006 [39]

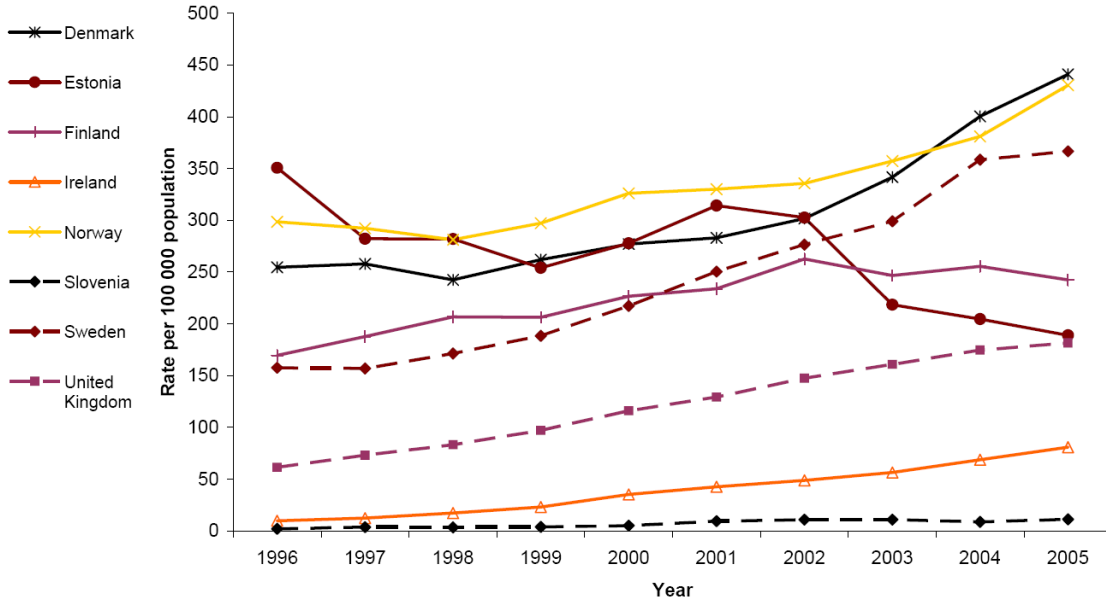


Figure 9: Rate of reported gonorrhea cases per 100 000 population in Western Europe: 1997—2006 [38]

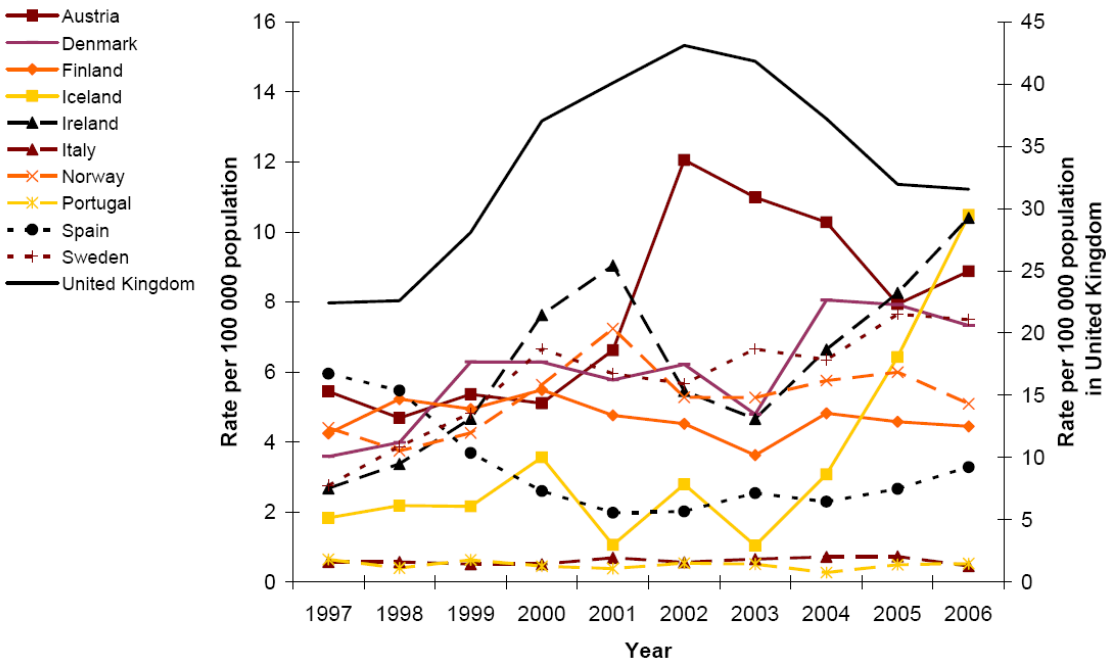
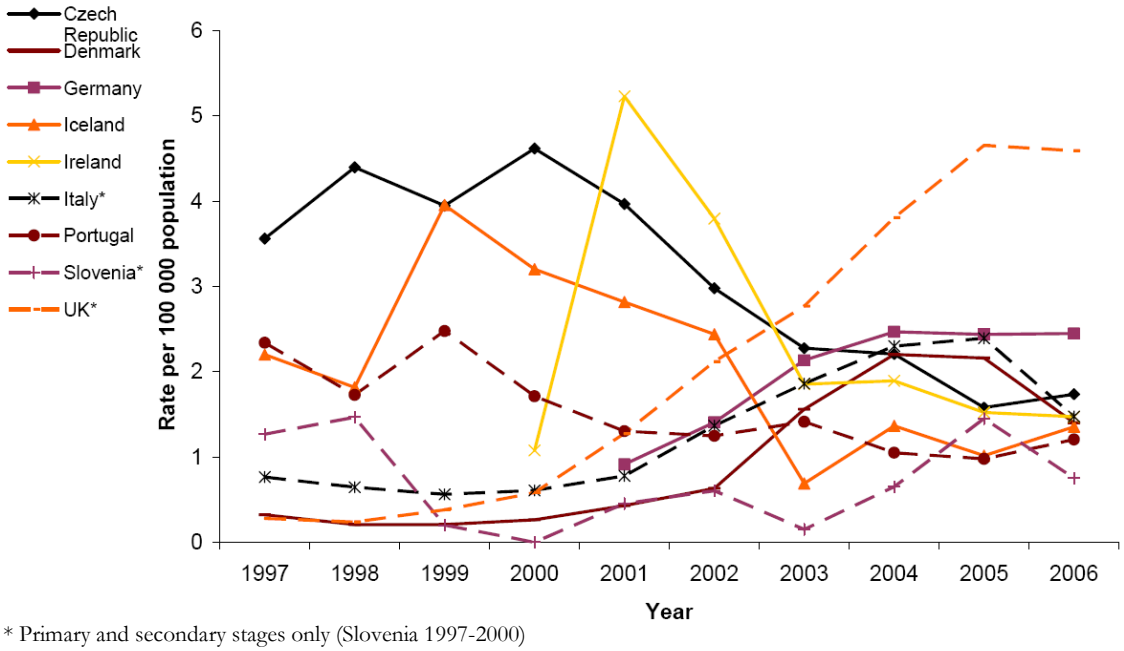


Figure 10: Rate of reported primary, secondary and early latent syphilis cases in Europe: 1997-2006 [38]



* Primary and secondary stages only (Slovenia 1997-2000)

In conclusion, the similar changes in bacterial STI epidemiology occurring across European countries, and the increasing fluidity of national borders point towards common causative factors but also towards common priorities and a need for shared solution [40]. The collaboration of Europe (including Switzerland) on STI surveillance, prevention and control would enable comparison of disease rates and trends between countries and increase our understanding of the underlying factors driving STI transmission. It would also aid in the design and implementation of effective interventions [40].

5. PREVENTION OF CHLAMYDIAL, SYPHILIS AND GONORRHEAL INFECTIONS

5.1 THE ROLE OF PREVENTION

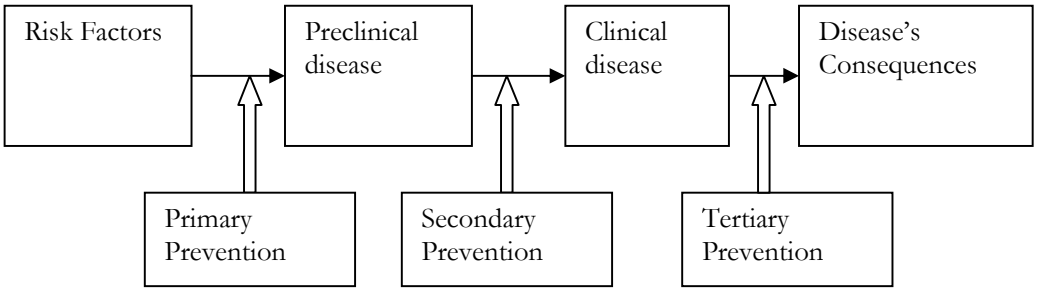
Public Health authorities have four main activities:

- Disease prevention and health promotion including:
  - controlling transmitted diseases
  - environmental hygiene
  - individual health education
- Organization of the health care system
- Health population monitoring, including
  - actual and future distribution of diseases and their risk factors.
- Assessment of the efficacy and efficiency of the health interventions.

The control of STI is a public health priority and one that has become even higher with the HIV epidemic. Prevention can be primary, secondary and tertiary (figure 11) and there are different strategies of prevention: the population strategy and the high risk strategy. The population strategy changes risk factor distribution in the entire population. On the contrary, the high risk strategy focuses on groups, such as MSM or individuals whose risk of developing infections is above average, thereby allowing the adaptation of the preventive message. The main advantage of the population strategy is that it modifies the behaviour of the population. The inconvenience is that the individual benefit is only slightly perceptible because there is little motivation of individuals. The success of population strategy largely depends on the extent to which individuals take personal responsibility for their own health by avoiding high risk sexual behaviours. For the high risk strategy, the advantage is that it is aimed at high risk individuals that are more motivated because of their own high risk. The disadvantage is a low impact, because high risk individuals do not generate the largest number of cases.

The objectives of STI prevention are to reduce the prevalence of STI by interrupting their transmission, reducing the duration of infections and preventing the development of complications [2]. STI have effects on individuals, their partnership(s) and their sexual network, and the wider population; therefore prevention should act at all these levels. For the individual, effective case management should cure the infection, prevent re-infection and acquisition of new infection and prevent sequelae, but might not have any impact on transmission at the population level. For the sexual partnership, partner notification is the appropriate intervention to treat the partner(s), prevent re-infection of the index case and, possibly, onward transmission. In order to control transmission within wider sexual networks and populations, an effective organized strategy for early detection and treatment would be required [24].

Figure 11: The evolution and prevention of disease



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5.1.1 Primary Prevention

Primary prevention involves preventing both exposure to and acquisition of STI by means of lifestyle counseling, health education and population strategies. Clinician play an important role in the primary prevention by asking questions about risk-taking sexual behavior, by encouraging screening tests for those at risk, by ensuring that sex partners are evaluated and treated, and by giving advises about safer sex practices [14]. Promotions of condom use and information campaigns on STI are part of primary prevention. Primary prevention is an important step in controlling STI, because in order to avoid a future epidemic there is a need to protect people who are not already infected. The prerequisites for primary prevention are the existence of risk factors that can be modified and controlled.

Risk factors associated with STI

Transmission models of infectious diseases have identified a wide range of factors which are likely to exert an important influence on the frequency of sexually transmitted infections. All these factors may have participated with varying importance to the increase of STI observed in the last decade. These can be divided into different groups:

- Sexual behavioral factors: sexual contact rate, type of contact, sexual mixing patterns, condom use…
- Biological factors: period of infectiousness, incubation period, infectivity, fatality…
- Behavioral factors: health seeking behavior
- Migration
- Structural, Economic and Social Factors

➢ Sexual behavioral factors

The most frequent risk factors which are associated with STI are related to sexual behaviours. Increased risk of infection has been associated with early age of first intercourse, multiple partners and inconsistent condom use.

Figure 12: 2002, proportion of people who had casual partners in the last six months and condom use by age group [26]

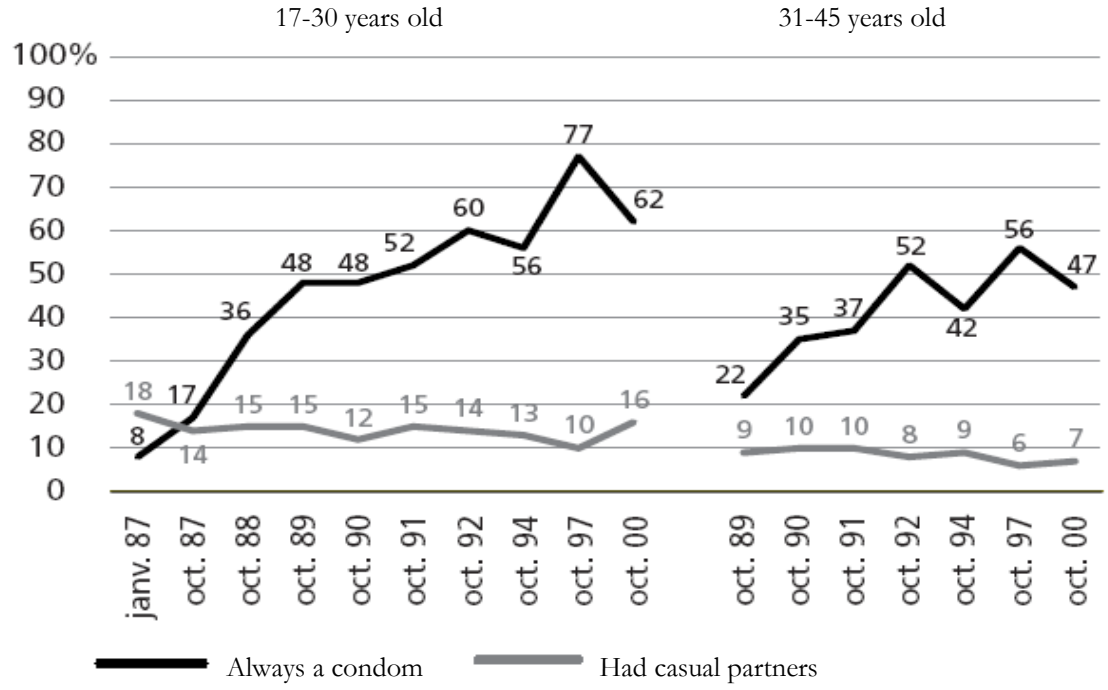
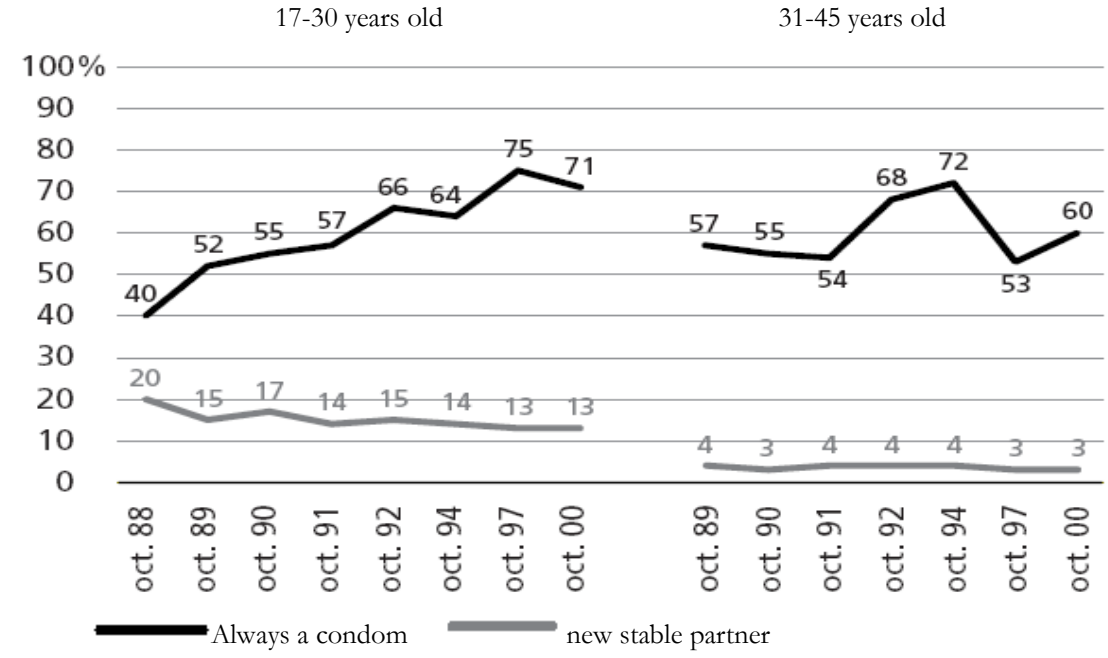


Figure 13: 2002, proportion of people who had a new stable partner in the last year and use of condom by age group [26].



In the general population, HIV prevention had an important impact on the use of condom. The systematical use of condom has increased between 1986 (first STOP- AIDS prevention) and 2000. This increase concerns relations with casual partners as well as stable partners (figure 12 and 13). There is a difference of age in condom use as the use declines with the age (figure 14). Men seem to protect themselves more than women (figure 14). However, it is important to be cautious when interpreting figure 14, because use of condom should be quite similar among men and women. The difference in the interpretation of events might explain the lower repartition of condom use in women [41]. For example, 16.7% of men include relations without penetration in their definition of sexual intercourse but only 1.4% women include this in their definition of sexual intercourse (figure 15).

Figure 14: Sexually active people in Switzerland having used a condom in there last sexual intercourse [41]

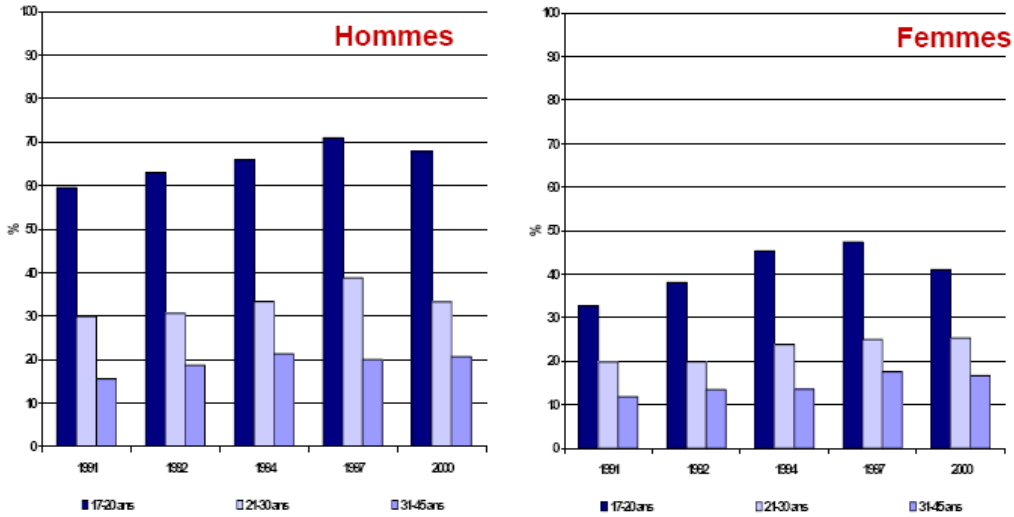
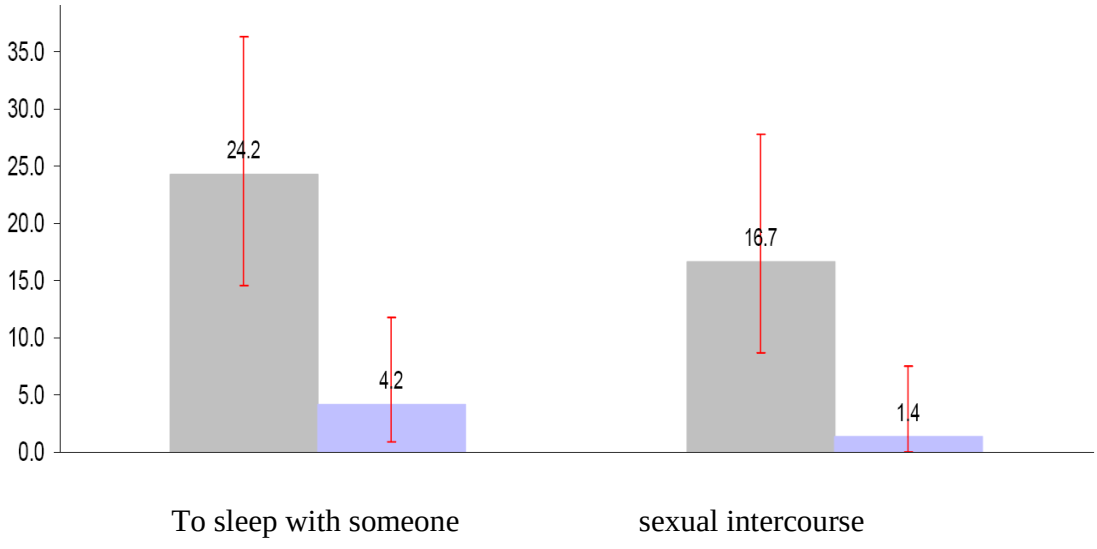
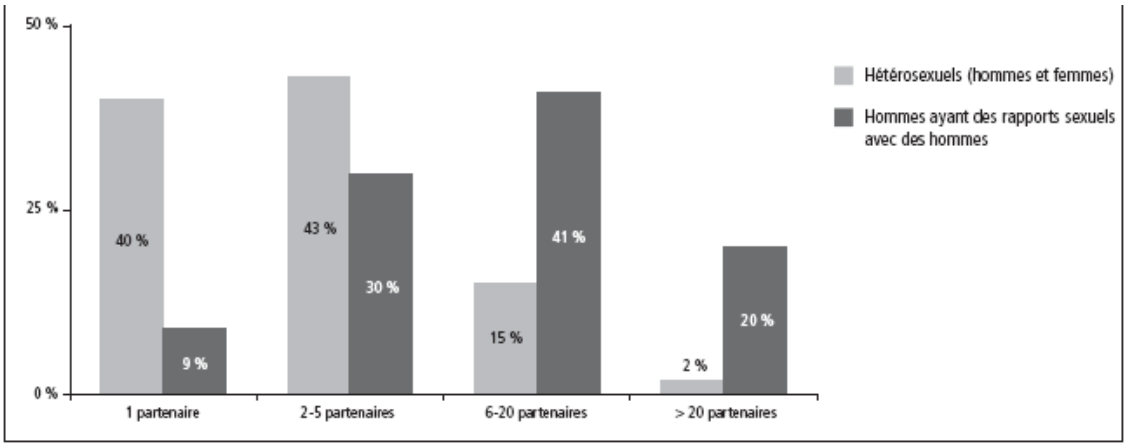


Figure 15: Proportion of men and women including relations without penetration in their definition of sexual intercourse [41]



In the general population, HIV prevention has an impact on condom use. However, it has only minor effects on other sexual behaviours, such as number of partners. For example, the median number of sexual partners has been stable from 1986 to 2000 in the different age groups and among men and women [26]. This stability has been observed for casual relations (figure 12, lower line) as well as for stable relations (figure 13, lower line). Therefore, in the general population, the main impact of HIV prevention on sexual behaviours is the increased use of condom in stable and casual relations. The increased use of condom between 1986 and 2002 has been confirmed by the sales of condoms during that period, which have increased considerably (7.1 million condoms in 1986 to 18.1 million in 2002) [36]. On the other hand, among MSM, the level of protection has decreased for anal sex as well as for oral sex. The proportion of MSM having unprotected anal penetration with a casual partner has increased from 10 % in 1994 to 19% in 2000. Preventive behaviours are declining more in older MSM population [26]. Furthermore, seropositives have more unprotected relation with casual partners than seronegatives or untested individuals. Some characteristics have not changed since the beginning of the nineties. MSM still have a high number of sexual partners (figure 16) and a higher frequency of sexual intercourse [36]. Overlapping and multiple sex partners are also high risk sexual behaviors for STI. The probability of exposure for an infected person is function of both the number of new sex partners and whether any given partner is infected, which is determined by the prevalence of the infection within a community [42]. MSM have more partners than heterosexuals, 61% are reported to have more than 5 partners in a year, while 83% of heterosexuals have between 1 and 5 partners in a year (figure 16) [25]. One in five homosexuals has more than 20 partners per year.

Figure 16 Number of partners in the last year reported by syphilis cases, classified by sexual orientation, France 2000-2005 [25]



- Biological Factors

The probability that an infection will occur after exposure is primarily a function of biological variables, including factors related to the pathogen, the infectiousness of the source and the susceptibility of the host. At the population level, the spread of a STI can be described in terms of case reproduction ratio (Ro) which, for a STI, depends upon efficiency of transmission (b), the mean rate of sexual partner change (c) and the average duration of infectiousness (D), as expressed in the term:

$$Ro = b*c*D$$

The higher the value of Ro, the greater the potential for the spread of the infection [2].

Syphilis, gonorrhea and chlamydial infections are characterized by asymptomatic periods. Asymptomatically infected males and female contribute disproportionately to syphilis, gonorrheal and chlamydial transmission, because symptomatic individuals are more likely to cease sexual activity and seek medical care [5]. This asymptomatic state tends to increase the average duration of infectiousness, because the infection goes undetected and it can be transmitted. Screening programs, in theory, should reduce Ro through reduction in the duration of the infection, by detecting asymptomatic and symptomatic infections [27].

Measures related to the biological predisposition to STI infectivity would be desirable. In the adult years, sexual and health behaviours are believed to outweigh biological factors as determinants of the incidence of STI infections, but the contribution of physiological factors cannot be overlooked. Among women, developmental changes in a number of physiological factors, such as the resident flora and acidity of the vagina and the characteristics of the cervical mucus, affects susceptibility to STI and their sequelae. For example the menstrual cycle appears to influence the risk of upper reproductive tract infection in women, and sexual intercourse during menstruation is associated with a higher STI risk. Pregnancy is associated with physiological changes that put women at higher risk of STI and its consequences because host defenses are normally suppressed during pregnancy. Among men, however, little is known about analogous physiological changes that might affect an individual's risk of infection with STI [42]

- Behavioural factors

STI is also function of health care behaviour of individuals and groups. This behavior can either sustain STI in the population or help to control it. The probability that an infection will lead to a disease is influenced chiefly by health care-seeking behaviour, which in turn is determined by such factors as the individual's willingness and ability to obtain health care services, as well as the availability, accessibility and cost of health care in the community. In Switzerland, health care costs are reimbursed only if the patient has reached his deductible. Therefore, deductible might be holding back individuals to seek care, because testing and treatment might not be reimbursed. Once health care services have been obtained, compliance with the therapy largely determines whether the infection will progress to a disease [42]. In general, women are more likely than men to seek health care. However, care for STI seems to be an important exception to this observation for several reasons. Firstly, STI among women are far more likely to be asymptomatic than infections in men. Secondly, when symptoms do occur, they are generally less obviously attributable to STI in women than in men. Thirdly, seeking health care from a STI clinic may be more stigma laden for women than for men [42].

Men and women of higher socioeconomic status have better health care seeking behaviours. Furthermore, they tend to have lower risk sex partners because those belong to the same socioeconomic group which is associated with relatively low STI rates [42]. The probability of an individual developing an outcome depends in part of the prevalence of the outcome in the group to which he or she belongs. The prevalence of the behaviour may in turn be influenced by social norms regarding its acceptability and desirability. The influence of social norms also applies to sexual behaviours [43].

- Migration

Population movement by international migration from countries with high STI prevalence and travelling overseas are other important factors influencing sexual health [44]. STI have been associated with travel and indeed blamed on travelers (particularly on foreigners) since they were first described. As we know, tourism is one of the world's biggest industries. For example, in 1993, UK residents made 36 millions visits to foreign countries and 19 million foreigners visited the UK. In addition to such tourism, the UN High Commission for Refugees estimates that there are at least 20

millions refugees in the world who have fled from their countries of origin, and that there are some 30 million migrant workers. All these migrations drastically increase the rate of STI propagation [44]. European countries are still a major recipient of asylum applications. International migration may pose a particular challenge for sexual health as individual may arrive from, or have contact with, high STI/HIV prevalence countries of origin, thereby increasing their own STI acquisition risk [36].

In Switzerland, in 2006, gonorrhea was more often acquired in Switzerland (60%) than in foreign countries (13%) (appendix 2), whereas for syphilis (appendix 1), 24% of the patients acquired the infection in foreign countries as compared to 13% in Switzerland [19].

- Structural, Economic and Social Factors

It is clear that access to appropriate detection method and treatment is a factor that can influence rates of STI. In Switzerland, the access to hospital or any medical doctor and appropriate detection method and treatment has been evaluated as good, even in rural areas.

On a different note, the recent decades have seen the evolution of human societies. There is increasing urbanization and globalization [45]. Chlamydial, syphilis and gonorrheal infections tend to be higher in urban residents. In 2006, in Switzerland, more than 80% of cases of syphilis were declared by 7 cantons: Geneva 28%, Zürich 19%, Vaud 19%, Bern 8%, St Gall 4%, Tessin 4%, and Basel 2% [19]. Additionally, in industrialized countries, the institution of marriage and family has been evolving, with greater proportion of individuals being single as a result of decreasing marriage rates and increasing divorce rates. People are settling down later thereby widening the time period available for sex partner acquisition, a key determinant of STI transmission [36].

In conclusion it can be said that the control and prevention of STI depend on a more comprehensive understanding of the social and behavioral patterns involved. While sexual and health care behaviors can be neither legislated nor controlled in any society, it might be possible to influence them if we knew enough about their determinants and how to put in place appropriate behavior modifications [42]. Even when well informed, some individuals continue to have high risk sexual behaviours. Taking into account their social and affective environment, counseling could help them assessing their own risk and finding their own prevention strategies. Health insurance deductibles might also create an obstacle to health care seeking behaviours; offering counseling or a free check up to young adults could help get around the deductible problem. Additionally, separate education programs for target groups must each contain clinically relevant information about STI and sexual health. Each program should teach the appropriate and relevant behavioural skills needed for both a healthy sexual lifestyle and STI prevention. For example, STI risk is different for a gay adolescent than for a 35-year-old person in a long term monogamous, heterosexual relationship [36]. Additionally, it is important to have a surveillance system that can collect demographic and sexual behaviour data. Without an efficient collection of data, the risk factors of each STI might not be assessed correctly. At the present time in 2008, Switzerland does not have an effective collection of information on patient characteristics. The complementary reports which are supposed to contain all those information are not filled out regularly by doctors reporting STI. The SFOPH has made some modifications to facilitate their participation, but they need to encourage, and inform medical professional more strongly in order to get them more involved in STI prevention.

5.1.2 Secondary prevention

Secondary prevention is likely to play a critical role in the prevention of STI. The aim is to reduce the prevalence by shortening the duration of the infection by:

- Promotion of early health care seeking behaviour

- Accessible, effective and acceptable care
- Education and counseling
- Early detection and treatment of asymptomatic infection through screening
- Partner notification [2].

The general prerequisites for disease prevention by screening are a high prevalence, significant morbidity, an available diagnostic test and last but not least, the disease must be treatable. Chlamydial infections seem to be the ideal candidate for screening, because it fulfills all the prerequisites [14]. Prevalence is an important parameter for screening procedure because if it is low, the screening might not be cost effective. In that case, it is important to define target groups to whom the prevention procedure will be recommended.

5.1.3 Tertiary prevention

Tertiary prevention generally consists of the prevention of disease progression. In the case of chlamydial and gonorrheal infections, it consists of preventing the complications of the infections such as PID or infertility. In the case of syphilis, it consists of diagnosing the infection early enough to prevent tertiary syphilis and its serious complications, such as neurosyphilis or visceral complications. Unlike primary and secondary prevention, tertiary prevention is made primarily by health care practitioners.

5.2 What is Switzerland actually doing for the prevention of chlamydia, syphilis and gonorrhea infections?

Switzerland is recognized internationally for its prevention campaign LOVE LIFE- STOP SIDA [46]. This campaign was awarded several prizes and the British Medical Journal even published an article on the campaign [47]. Unfortunately the prevention of STI already stops there, because it mainly focuses on HIV. The prevention strategies for HIV encourage the use of condoms and safer sexual practice but always in relation to HIV. It is clear that chlamydial infections and especially syphilis and gonorrhea infections share some risk factors with HIV infections. Therefore, change in high risk sexual behaviours will also influence rates of STI, but as explained before, STI also have their own risk factors, such as higher transmission with oral sex. Specific information on STI is not given to the general population or to the sub-groups. This means that the population at risk might not know the consequences of these infections, the symptoms they produce or the risk factors associated.

Chlamydial infections lead to a separate problem, because a high proportion of the target population does not belong to the main target groups of the HIV prevention. The latter are similar to gonorrhea and syphilis target groups, such as MSM, drug users, sex workers and clients, migrants and travelers [19]. On the other hand, the target group for chlamydial infections is sexually active young women and men. A study carried out in the UK population revealed that only 26% of people aged 16-24 years had heard of chlamydial infections and 68% of these did not know what symptoms or conditions arise from infection with chlamydia [60]. It can be expected that the level of knowledge about chlamydia in the sexually active Swiss population will also be low. Therefore, the population vulnerable for chalmydial infection might not know that they are at risk of sequelae such as ectopic pregnancy or infertility.

In Switzerland, sexual education is taught to young people, but there is a big heterogeneity in its

organization. In some cantons, the teacher is responsible for sexual education and in other cantons, it is an external professional. There is a good coverage for young students, but from 15 years of age the coverage is very heterogenic. The coverage is better in Suisse romande than it is in Suisse alémanique. Sexual education is an important prevention strategy for HIV/AIDS. The themes taught during sexual education differ from canton to canton [26]. Therefore STI, other than HIV, might not be discussed during sexual education classes. In addition, it is not possible to influence how much these young people are going to remember.

Switzerland has no national guidelines on STI except for HIV and no screening programs organized for chlamydia, gonorrhea and syphilis infections. The only screening that is performed in Switzerland is for syphilis in pregnant women [19]. This lack of national guidelines means that it is up to the willingness of the doctor to inform and estimate the risk of his patient for any of these diseases. During the personal history taken of a young adult by a medical doctor, sexuality is investigated in 49% of the cases [48]. By comparison with other public health topics, sexuality occupies a secondary place in the preventive practices of Swiss primary care physicians report. Alcohol or tobacco consumption, as well as physical activity are themes that physicians report almost systematically during a first non urgent consultation with a new patient. Overall 9 patients in 10 would like their doctor to ask them about their sexual life in order to receive counseling, while 85% would not be embarrassed if asked such a question and 57% consider themselves not well informed about STI. Despite these wishes, only 41% has ever experienced a "general discussion" on their sexual life with their doctor [41]. These statistics seem exceptionally low knowing that doctors play an important role in primary prevention by asking questions about risk taking behaviour and if needed, encouraging screening tests. There is clearly a need to issue clinical practice guidelines for the management of STI. This should be carried out by a recognized national professional body. STI's guideline should include recommendations about diagnosis, antibiotic treatment, partner notification, clinical follow up and reporting of cases. It should also contain recommendation for repeat or follow up testing of people with a diagnosed STI [24].

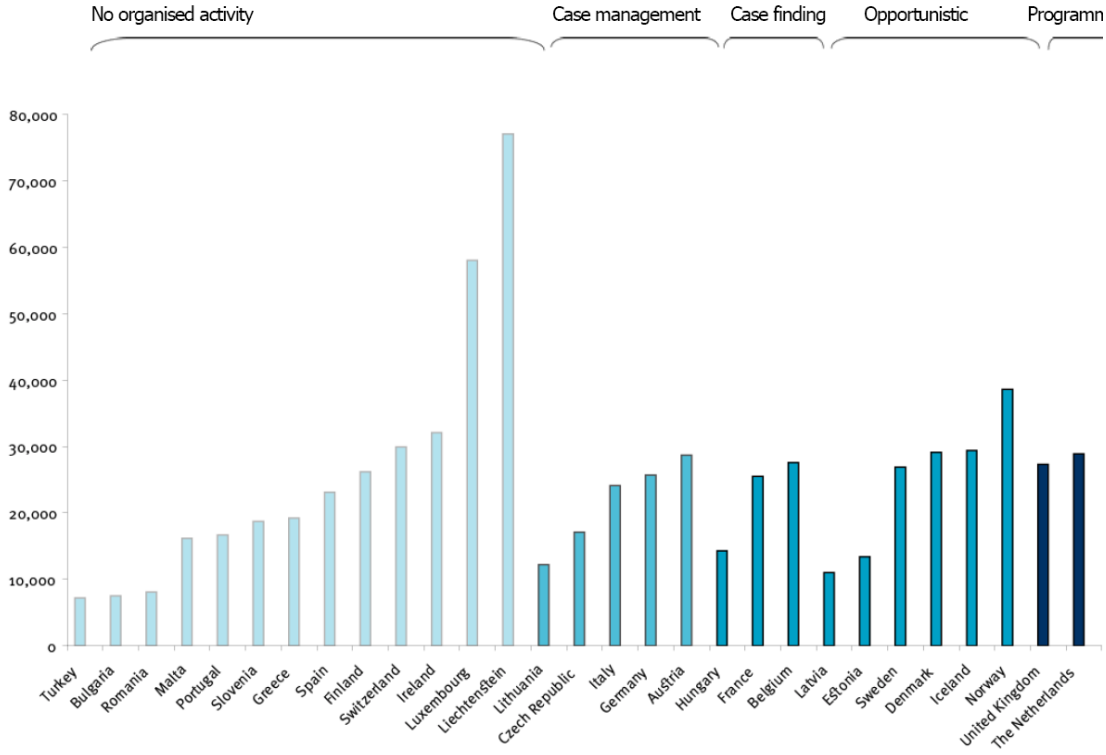
Regarding the prevention made for chlamydial infections, a project named SCREen developed a typology of chlamydia control activities in order to categories European countries and their actions to control the spread of chlamydial infections [24]. The aim of this typology is to monitor the intensity of chlamydia control activities in each country, but it is also a tool to assist decisions on control activities that should be strengthened or introduced. Information about guidelines, chlamydia testing and partner notification provided in countries taking part in the project were classified in five categories of chlamydia control activities:

- No organized activity: Countries have no guidelines for effective diagnosis and management of diagnosed chlamydial cases.
- Case management: Countries have guidelines for at least one group of healthcare professionals, recommended by an appropriate professional organization
- Case finding: Guidelines cover partner notification
- Opportunistic testing: Guidelines state that at least one specified group of asymptomatic people is offered chlamydia tests.
- Screening programs: Organized chlamydia screening is available to a substantial part of the population. It is a planned program with clear objectives.

Switzerland is classified in "no organized activities" with eleven other European countries. This group includes countries with the highest per-capita GDP (Liechtenstein and Luxembourg) and the lowest per capita GDP (Turkey and Bulgaria). There is non consistent association between the per-capita GDP of a country and the intensity of chlamydia control activities (figure 18) [24].

Figure 18: Category of chlamydia control activity by country and per-capita GDP in €, for countries

participating in project SCREen [24].



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5.3 WHY IS IT IMPORTANT TO PREVENT CHLAMYDIA, SYPHILIS AND GONORRHEA INFECTIONS?

Chlamydia, syphilis and gonorrhea are three infections with high burden on the society. They have an impact on the health of the population, but they are also a financial burden. As we have seen in section 2, those STI have consequences on women's reproductive health such as pelvic inflammatory diseases, tubal infertility and ectopic pregnancies and among men they may cause proctitis, epididymitis and also infertility. Not withstanding the human costs, a major problem is also the healthcare costs. The United Kingdom has estimated the healthcare costs of chlamydial infections at 50 million pounds per year [49]. The total economic burden of a disease in the society includes both direct and indirect costs. Regarding direct medical costs, the screening, diagnosis and treatment of *C. trachomatis* only represent a fraction of this amount. It requires relatively little money to screen for infection and to treat infected individuals with antibiotics. However, when irreversible tissue damage has already taken place, the cost of treating the sequelae is high. Furthermore, indirect costs also have to be considered. Those are composed of the loss of workplace productivity attributable to morbidity. Loss of productivity is not negligible and it imposes a notable burden on society in general and on employers in particular [50].

Apart from being serious diseases in their own rights, STI enhance the sexual transmission of HIV infection. The presence of untreated STI, ulcerative or non ulcerative can increase the risk of both acquisition and transmission of HIV by two to four-fold [51]. Ulcerative STI increases male susceptibility approximately fourfold and female susceptibility about threefold, whereas non ulcerative STI increase male susceptibility threefold and female susceptibility twofold. Due to the greater frequency of non-ulcerative STI in many populations, they may be responsible for more HIV

transmission than ulcerative STI [52]. The evidence points towards important positive bidirectional interactions between HIV and STI. They may therefore reinforce the spread of each other and lead to a synergistic amplification [53].

Results from a study conducted in Tanzania suggested that improving the management of STI can reduce the incidence of HIV-1 infection in the general population by about 40% [54]. Furthermore, this intervention has been shown to be highly cost-effective. However, this finding was not confirmed by a trial carried out in Uganda [55]. Mathematical modeling studies that investigated differences in the results of the general population trials in Tanzania and Uganda suggest that improved services and mass treatment had much the same effect on STI. The effect on HIV transmission, however, was dependent on the role of concurrent sexually transmitted infections in promoting new HIV infections in epidemics at different stages. The earlier phase of the HIV epidemic in Tanzania and higher frequencies of risky sexual behaviour at the time of the intervention could explain the greater effect on HIV incidence in Tanzania than in the Uganda trials [21]. Regarding chlamydial infections, there are few studies on this infection and increased transmission of HIV. One group found that PID was strongly associated with HIV acquisition. Although PID itself would be unlikely to increase HIV transmission risk, it may be assumed that PID is a proxy for previous infection with gonorrhea, chlamydia or other pathogens. For syphilis and gonorrhea infections, there are strong evidences that they facilitate HIV transmission [51].

Chlamydia, syphilis and gonorrhea infections are a real public health burden in Switzerland. The quantity of infections in Switzerland has been rising in the past decade and consequences of untreated infections are still present, implying both direct and indirect costs. The fact that these infections are easily diagnosed and treated with antibiotics should encourage the SFOPH to take measures to prevent them. Furthermore, STI and HIV epidemics are interdependent. Early STI treatment should therefore be a part of a high quality, comprehensive HIV prevention strategy [52]. Monitoring trends in STI provides also valuable insight into the likelihood of the importance of sexual transmission of HIV within a country [26]. Even if, in the end, it is found that STI have only a limited impact on HIV transmission, it is impossible to miss the potentially cost-effective chance of decreasing and controlling HIV transmission through their treatment [53].

5.4 THE EXAMPLE OF THE UNITED KINGDOM

The United Kingdom, like Switzerland, is experiencing rising levels in the number of cases of chlamydia, syphilis and gonorrhea that are recorded. The United Kingdom's surveillance system is based on a network of genitourinary medicine clinics (GUM clinics) that are treatment centers solely for the management of acute STI. Statistical returns from GUM clinics form the basis of their national STI surveillance programs. Data on STI diagnosed outside of this setting are captured by laboratory reporting or special sentinel surveillance programs [36].

N. gonorrhea is the second most common bacterial STI diagnosed in the United Kingdom after *C. trachomatis*. In 2005, the rate of diagnoses in men was more than twice as high as that seen in women. There has been a gradual decline in the number of diagnoses since 2002 (figure 19). The fall consisted of an 11% decrease among men, of which 18% was among heterosexual men and 18% among women. This is an encouraging sign, however, over the past decade, there has been a rise in diagnoses of gonorrhea among MSM with the highest numbers diagnosed among those aged 25 to 34 (figure 20). Between 2000 and 2005, there was a 39% increase among MSM. This point towards the fact that gonorrheal infections are getting concentrated among high risk groups, such as MSM. Diagnoses are still increasing among MSM, while there is a decrease in the general population.

Figure 19: Rates of uncomplicated gonorrhea infection by gender and age group, United Kingdom: 1996-2005 [56]

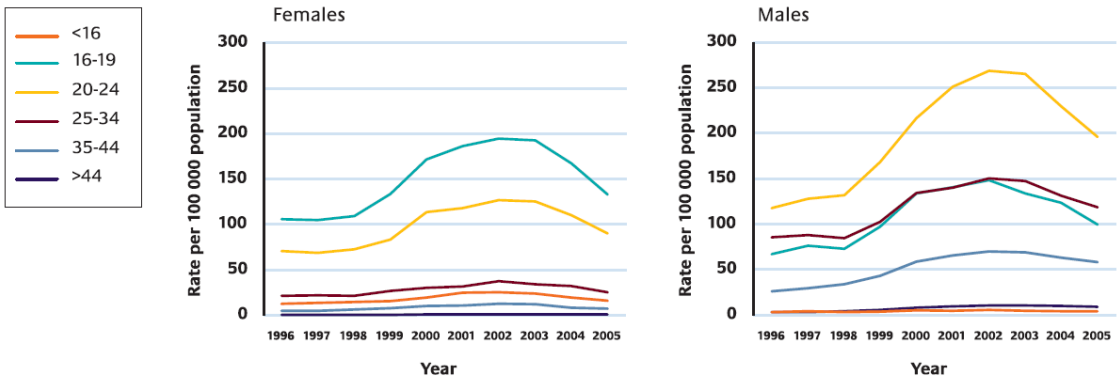
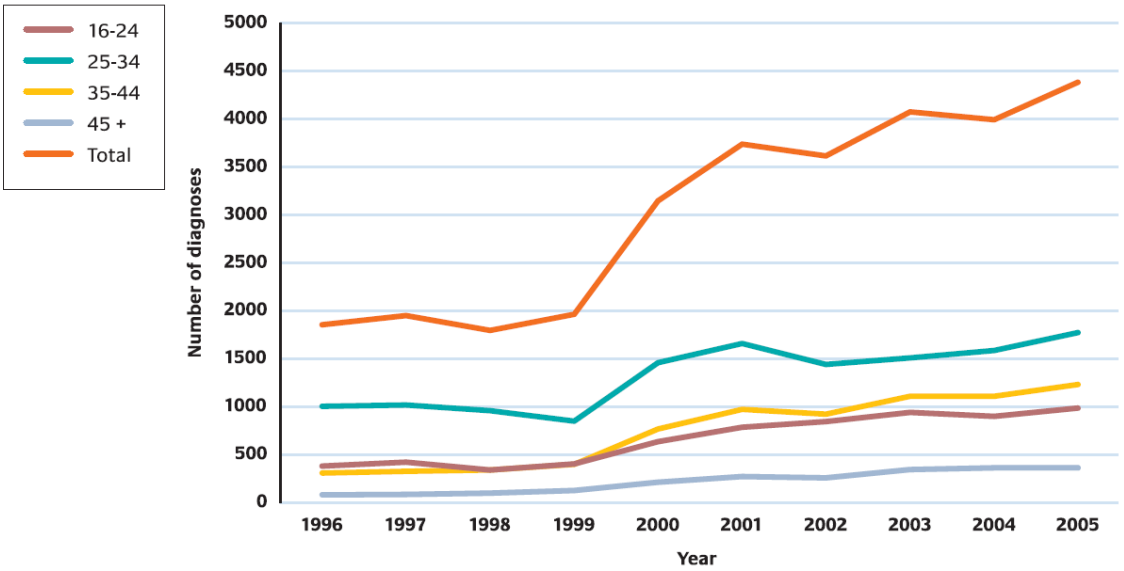
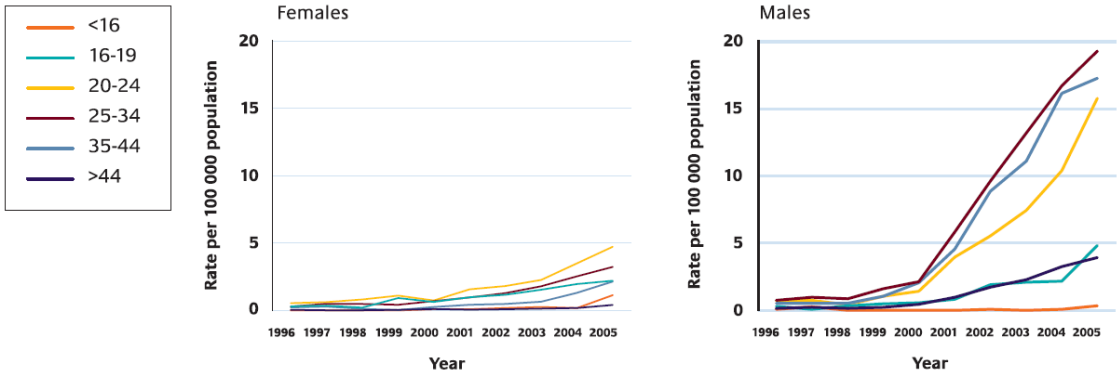


Figure 20: Diagnoses of gonorrhea among MSM by age group, United Kingdom: 1996-2005 [56]



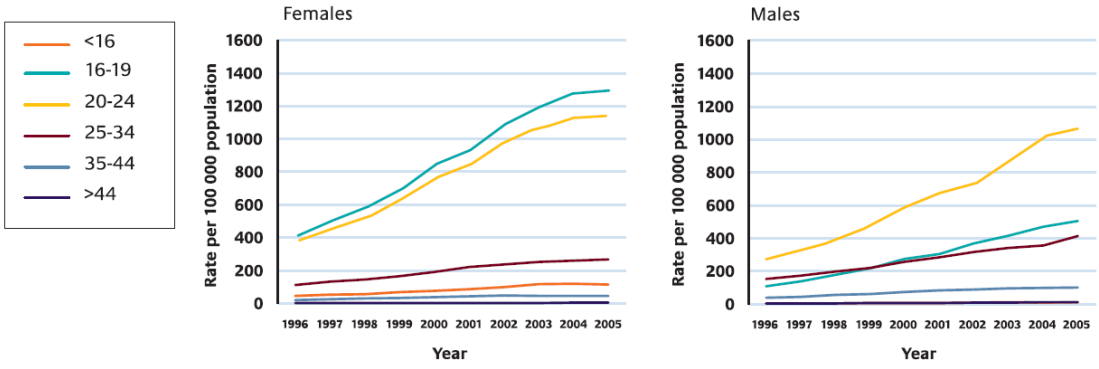
Unlike Switzerland, the United Kingdom has edited national guideline on the diagnosis and treatment of gonorrhea in adults in order to standardize the case management of patients with gonorrheal infections [57]. This guideline encourages physicians to give information on the infection, and its long term consequences as well as oral and written information on STI and their prevention. It encourages also screening for chlamydial infections for every positive gonorrheal diagnosis and partner notification. The United Kingdom has also established in the year 2000 a program named the gonococcal resistance to antimicrobials surveillance program (GRASP) which monitors antimicrobial resistance to *N. gonorrhea* in England and Wales [58]. As explained before, the multi resistance of *N. gonorrhea* to antibiotics might have been one of the reasons for the increase observed in the past years. Therefore, GRASP is an important strategy for controlling gonorrhea infections.

Figure 21: Rates of primary and secondary syphilis infection by gender and age group, United Kingdom, 1996-2005 [56].



Between 1996 and 2005 (figure 21), there was a huge increase in diagnoses of infectious syphilis in GUM clinics in the United Kingdom. This increase has been punctuated by a series of outbreaks occurring mainly in large cities. The largest outbreak started in London in 2001 and since then there has been a steep rise in infections, particularly among men [56]. In 2005, 829 cases were reported. Of these, 68% were among MSM and 45% were reported as acquired through oral sex. Failure to effectively rupture transmission chains within the initials spread network has probably resulted in extension of the outbreak to adjoining and distant cities (through migration, travel…) and to lower risk networks [34]. As for gonorrhea infections, there is a guideline implemented for syphilis infections [59]. The fact that the United Kingdom has national guidelines indicate that they have realized the burden that bacterial STI represent and are trying to find innovative intervention to control their spread. An intervention that is really interesting is the implementation of a national screening program for early detection of chlamydial infection, named National Chlamydia Screening Program (NCSP). Screening is testing for asymptomatic chlamydia in people who do not know they are infected with the intention of preventing future morbidity [22].

Figure 22: Rates of uncomplicated genital chlamydial infection by gender and age group, United Kingdom: 1996-2005 [56].



The number of diagnoses of chlamydial infections made in GUM clinics has increased of three fold between 1996 and 2005. Between 2004 and 2005, the increase appears to be slowing down with an increase of only 7% among men and 3% among women. In 2005, highest rates of diagnoses in women were among the 16-19 and 20-24 year groups, and in men highest rates were among those aged 20-24 years. This distribution is similar to the one observed in Switzerland. The rise in

diagnoses of chlamydial infection since the mid-1990s is probably due to the same combination of factors described for Switzerland. Additionally, in the United Kingdom the increase in chlamydia diagnoses might also be explained by the implementation of a national chlamydial screening program. Therefore, there is increased awareness to chlamydia through population-level campaign and also increased availability of diagnostic services leading to an increase in diagnoses of chlamydial infections [56].

In UK, the case for screening began in earnest in 1998 with the publication of a report on chlamydia infections which outlined the public health importance of this disease and the need to screen high risk individual [60]. Chlamydia pilot testing sites confirmed the significant disease burden in the general population (10.1% positivity among women and 13.3% among men) and the demographic and behavioural factors associated with prevalent undiagnosed infection [60]. The vision was to implement a multifaceted, evidence based, and cost effective national prevention and control program for genital chlamydia by 2008. All sexually active adults should by then be aware of genital chlamydia and its effects and should be able to access a range of prevention and screening services to reduce their risk of infection or onward transmission. Goals for chlamydia screening programs are, for the individual, to reduce likelihood of experiencing important health complications and sequelae, and, for the population, to reduce the incidence and prevalence of chlamydial infection in the population at risk. Reducing prevalence and incidence should also reduce transmission, preventing additional cases of reproductive complications. Screening programs, in theory, should reduce incidence through reductions in the duration of the infection [27].

The screening program implemented in England is an opportunistic screening program, which is offered to women and men under 25 year old attending traditional and non-traditional health service setting [60]. Opportunistic screening is the approach where individuals who are attending a health care setting for any reason (not necessarily related to sexual or reproductive health) are offered the opportunity to have chlamydia screening test [24]. A broad number of locations are offering chlamydia screening. These include contraceptive clinics, general practices, young people's services, antenatal services, infertility units, and termination of pregnancy clinics. Screening is also encouraged to those within the target age group through innovative outreach strategy, such as days at military bases, youth clubs, university campuses or health fairs, mobile vans or buses for contact with young people and prisons. People falling within the screening guidelines are offered a chlamydia test when attending a venue participating in the program, regardless of the reason for their attendance. The attendance, itself, is the opportunity created to educate and encourage the uptake of screening for chlamydia [61]. In 2006, among women, community contraceptive services is the most common screening location (38%) and for men the highest proportion of screens occurred in educational settings (17%) [62]. Data from the first year confirm that the epidemiological profile of both men and women screened is nearly identical to that found in numerous studies in the UK and in Europe. Highest chlamydia positivity is found in women aged 16-19 years and men aged 20-24 years [61].

When diagnosed, patients are offered the choice of notifying their own partners (patient referral), or supplying information for the health adviser or local chlamydia coordinator to notify the partner, without the patient's name being given (provider referral) [62]. NAAT is the diagnosis test used and the recommended interval between screening tests is one year if the previous test was negative, or after a change of sexual partner. People with a positive test are recommended to have a test for re-infection at least five weeks after treatment [24]. There is, at the present, no national guidance about how annual repeat screening is to be implemented or monitored [24].

The NCSP has been rolled out in phases with full participation in 2008. The first phase started in 2003. Screening has been increasing year after year, from just over 17 000 in year 1 to almost 150 000 in year 4 (2006-2007). In year 4, there is still a positivity rate of around 10% in those screened for both young men and women under 25 year old [62]. Coverage aim is to achieve annual chlamydia screening coverage of 15% of the population of 15-24 year old.

5.4.1 Effectiveness of the national chlamydia screening program

The NCSP was fully implemented this year. The performance of the NCSP is measured through coverage and partner notification.

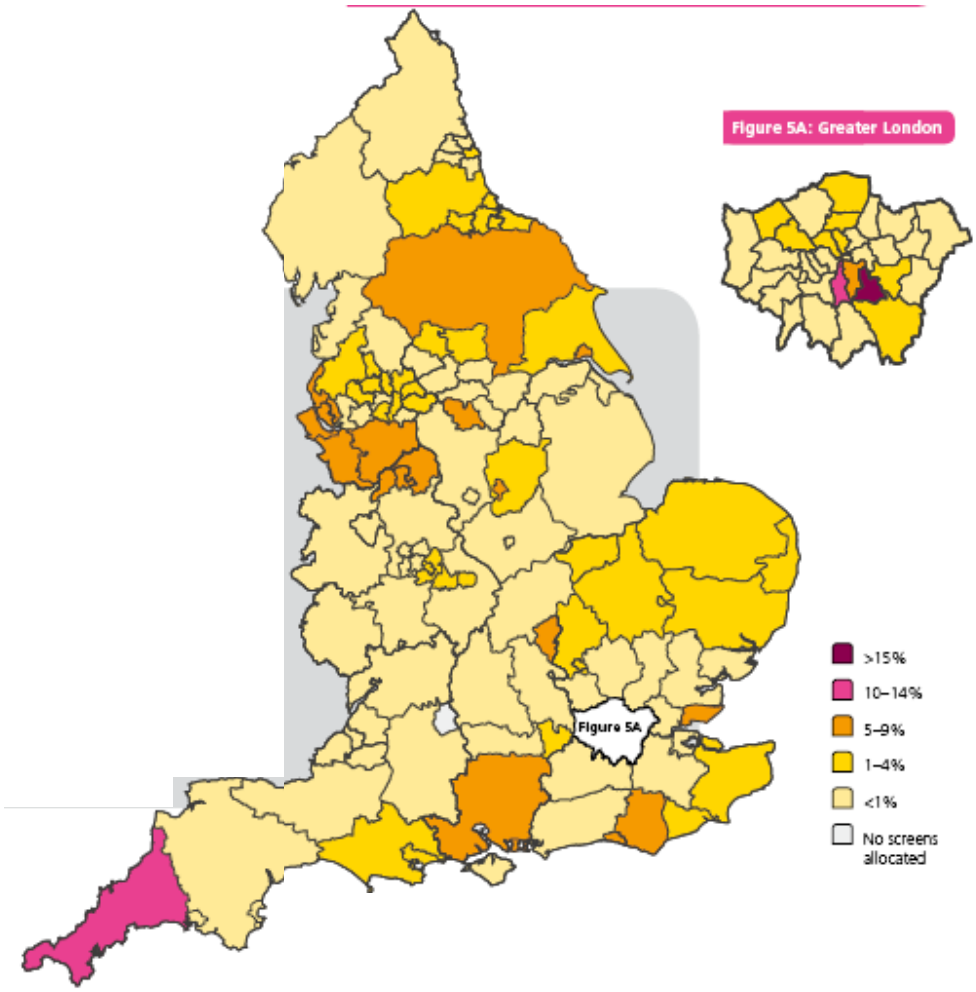
Coverage is calculated by dividing the number of screens by the estimated eligible population. Of note, tests done in GUM clinics are excluded from these totals as they are regarded as diagnostic rather than screening test. This differs from estimates in other countries taken from surveillance data, which cannot differentiate between screening and diagnostic test and might therefore overestimate the coverage of screening [24]. As seen in figure 23, the coverage varies from one region to another. The coverage ranges from less than 1% to 15%. Their target coverage of 15% is still not achieved. The long term strategy is to aim for even higher NCSP coverage levels in order to attain the volumes needed to reduce prevalence. The new aim for 2008-2009 is a 17% coverage level in the target population. One of the keys to success for screening program is to screen sufficiently high proportion of the target population and sufficiently regularly. However, effective screening rates are 30 to 40% [64]. But the effective screening rate will be difficult to attain, because opportunistic screening requires presentation to a clinic for screening. Many adolescents and young adults have few encounters with health care professionals [27]. Additionally, men are also a difficult target group to approach through opportunistic screening. Greater effort will be needed to ensure that men themselves are aware of chlamydia, its effects and strategies for its prevention and control [60]. If men are not sufficiently tested, rates of re-infection among women will rise. The general practice remains the single healthcare setting attended by most young men, perhaps more effort should be put into getting young men screened there [65]. The next steps for 2009 are to increase access for vulnerable populations, including street youth, young offenders, ethnic minorities and men [62].

Partner notification is also an important prevention strategy, because if the partner is not treated re-infection or further transmission can occur. The aim of the NCSP for partner notification is 0.64 contacts per case. The average partner notification for the period April to September 2007 is 0.4 contacts per case, ranging from 0.03 to 0.99 [62].

It is difficult to assess the effectiveness of the NCSP because there are no performance indicators on key outcomes such as reduced reproductive tract complication, prevalence of chlamydial infections and repeat screening [64]. Furthermore, it has only been fully implemented this year. However, two countries are often cited as having controlled transmission of chlamydial infection and reduced morbidity of the female reproductive tract. They are Sweden and the USA.

Sweden was the first country in the world to make free testing, treatment and partner notification for chlamydia available throughout the country, and to have a national diagnostic and reporting system [24]. Swedish researchers were key players in demonstrating the importance of chlamydial infection in the 1970s and 1980s. The first documented "program to identify asymptomatics" started in 1982 [64]. Intensive chlamydia control activities in Sweden were associated with marked falls in chlamydia and ectopic pregnancy rates in women under 35 years, even though, the fall in rates of chlamydia infections in Sweden coincided with the national campaign to prevent HIV[66]. Furthermore, comprehensive surveillance showed that chlamydial rates doubled in Sweden between 1997 and 2003 to prescreening levels. However, reports of the effectiveness of screening in Sweden persist [64]

Figure 23: Proportion of population of the individuals counties screened in UK by the NCSP [62]



In the USA, opportunistic chlamydial screening, the Infertility Prevention Program implemented in 1995, has also been credited with decreases in rates of chlamydial infections [64]. However, this might not be true as the results are not promising so far. A recent report showed that chlamydia positivity in women decreased in two of 10 regions from 2003 to 2004, increased in six, and remained the same in two [64].

Despite these results, desire to believe in the effectiveness of chlamydia screening is maintained and is often supported by these two countries [64]. Furthermore, the Swedish and the American chlamydial control activities cannot be classified as organized chlamydia screening programs. There is misinterpretation of the definition of a screening program [64]. A program has been defined by specific criteria and Sweden and the USA do not fulfill all these criteria (figure 24). A screening program is defined as an ongoing public health service in which screening is delivered to a sufficiently high proportion of the target population at sufficiently regular intervals to achieve a defined level of benefit, while minimizing harm, at reasonable cost. It requires a level of organization that ensures that the quality of the structures and processes can be assessed and the primary outcomes of the program can be monitored [24]. The SCREen project has classified the NCSP as an "organized chlamydia screening program". Only one other country in Europe has been assessed as

having an "organized Chlamydia screening programs", and it is the Netherlands [24].

Figure 24: Components of national screening programs [24]

Characteristic
Cover a defined population
Have a simple set of objectives
Develop valid and reliable criteria to measure performance and produce an annual report
Relate performance to explicit quality standards
Organise quality assurance systems to help professionals and organisations prevent errors and improve performance
Communicate clearly and efficiently with all interested individuals and organisations
Coordinate the management of these activities, clarifying the responsibilities of all individuals and organisations involved

The misinterpretation of what comprises a screening program and the desire to believe in them has led to uncritical acceptance of the effectiveness of screening programs and the funding of the NCSP in England before the benefits and the harms were evaluated [64]. No randomized controlled trials have ever evaluated opportunistic screening as they are currently practiced [64]. Randomized trials have shown that if people at high risk of chlamydia, because of young age or high risk behaviour, are invited to be screened, the incidence of PID one year later can be reduced by about a half [64]. These trials provide the evidence supporting the NCSP screening program. The problem is that the screening programs in these trials were population based. Women were either solicited to present for screening or mailed test-kits directly. On the contrary, the English program is opportunistic, offering screening only to people presenting to a clinic for other reasons [27]. Evidence from trials of proactive screening cannot be extrapolated to opportunistic screening [64].

Despite an absence of evidence of effectiveness and increasing rates of chlamydia in countries that are assumed to have such programs, belief in the success of opportunistic screening persists [64]. Countries, such as France, Romania, Slovenia, Ireland, the Netherlands and Australia are currently considering introducing screening policies or programs [64]. The Netherlands has already a pilot program in three regions of the country that began in March 2007. Chlamydia screening will be delivered using a proactive register-based approach, with annual postal invitations sent to men and women aged 16 to 29 years. Compared with the NCSP, the target population will be broader and the strategy implemented is different (opportunistic screening vs register based screening). Once the program is completely implemented in the Netherlands, results from both screening programs will be important to compare.

Screening programs may indeed be an important strategy towards limiting the complications of chlamydia infections [27]. However there is a need for a rigorous assessment of the benefits and harms of screening programs [64]. Different issues have to be examined before launching a screening program: 1) the epidemiology and natural history of *C. trachomatis* (studies on the progression of lower genital tract infection to PID, incidence of neonatal complications, appropriate screening intervals), 2) the effectiveness of screening for reducing morbidity (randomized controlled trials to examine the effectiveness of opportunistic and proactive chlamydia screening, including more than one round of screening) 3) the value for money (cost effectiveness and cost-utility analysis) [64].

6. CONCLUSION

In line with other European countries, Switzerland has seen the number of cases of syphilis, gonorrheal and chlamydial infections rise in the last decade. The medical as well as financial consequences engender by these infections should not be underestimated, neither should the risk of increased transmission and acquisition of HIV via STI. The situation regarding gonorrheal, chlamydial and syphilis prevention in Switzerland needs to change. Rates of STI, but more importantly their medical consequences will not decrease without Public Heath interventions. Therefore, the SFOPH must take measures in order to control the rising rates of bacterial STI. The potential improvements suggested are: 1) the optimization of the surveillance system, 2) providing information to vulnerable populations on the risks associated with bacterial STI and ways of protection, 3) issuing of clinical guidelines for medical professional.

Firstly, it is necessary to optimize the surveillance system, because epidemiological data are an important basis for formulating aims and developing countermeasures. Laboratory reports and complementary reports are a good combination towards obtaining good surveillance data and also good demographic and sexual behaviors data. But this combination still needs to be optimized. Regarding the laboratory reports, a very important improvement that has to be envisaged is the obligation for the laboratories to declare the total number of tests. This is a necessary step in order to assess the evolution of STI and also to evaluate the real burden of the infections [19]. Furthermore, the limitation of laboratory reporting is the underestimation of asymptomatic infections, especially chlamydial infections. This points towards the need for prevalence studies to complete the surveillance data on STI. Regarding complementary reports, they are, at present, not representative of the general population or of sub groups, because of lack of compliance from physicians. An improvement in health might be obtained by promoting a greater collaboration between laboratories, medical staff and the SFOPH. Furthermore, initiation of a culture of reporting would also enhance the surveillance and prevention of STI [19].

Secondly, vulnerable populations must be informed and be conscious of the consequences of STI. For gonorrhea and syphilis infections, the target population is the same as for HIV infections; those are MSM, sex workers and their clients, migrants and travelers. The failure of these subgroups to protect themselves against STI is worrying and indicates either a lack of knowledge about transmission risks or complacency about the individual risk of acquiring a STI. Intensive and focused control measures in the target groups, especially among MSM, to bring syphilis and gonorrhea under control are required, such as targeted health promotion campaigns in Internet chat rooms, in saunas, clubs and other meeting points for sex partners. When possible, synergies with HIV campaigns should be used, but without neglecting the provision of specific information regarding the risk factors associated with gonorrhea and syphilis. In relation to chlamydial infections, a high proportion of the target population doesn't belong to the principal target group of HIV prevention. The target group for chlamydial infections is sexually active young women and men. As it is the most prevalent of the three infections studied in this "mémoire" and as its target groups are different from the HIV's target groups, it should benefit from more attention from the SFOPH. As chlamydia infections are mainly asymptomatic, it is clear that a solution for controlling its spread might be a screening program. The primary reason for untreated chlamydial infection is that a large proportion of infected persons never have symptoms. This situation points towards the screening program as being the most effective way to control chlamydial infections. However, before implementing a chlamydial screening program, rigorous assessment of its benefits and harms is required. The long term reduction in the prevalence of chlamydial infection seems improbable with the current programs, unless a sufficiently high proportion of the target population is screened and that the

screening is done at sufficiently regular intervals.

Thirdly, national Swiss guidelines should be drafted for syphilis, gonorrhea and chlamydia infections. These guidelines should contain information on diagnosis, antibiotic treatment, partner notification, clinical follow up and reporting of cases. They should also contain recommendations for repeat or follow up testing of people with a diagnosed STI [24]. This will standardized the case management for these three infections and should make physicians more implicated in prevention of STI. Guidelines have already been issued in other countries. An adaptation of these guidelines to the Swiss situation is recommended.

There are many measures that Switzerland could implement to optimize the prevention of STI. The country however has not moved quickly enough. This is presumably due to the institutional and political frame of Switzerland. It is a federate state with three institutional levels: the Confederation, the cantons and the communes. The breakdown of responsibilities between the Confederation and the cantons is defined by the federal Constitution in which the article 118 gives the responsibility of combating transmitted diseases to the Confederation [67]. It is the Confederation therefore that takes decisions concerning STI. However, when decisions are taken in Switzerland, there are many actors, governmental and non governmental, that act at the national level, canton level and commune level for the prevention and promotion of health [67]. Implementing long term prevention measures will therefore need the collaboration of many actors at different levels and high social acceptance [68]. Both of these elements are challenging, because making collaboration work between all the actors is already complicated and the society might also need to overcome the stigma and prejudice associated with STI [21].

In 2005, 1.13 billion francs were invested in the prevention and promotion of health. This only represents 2.1% of the total Swiss health care expense. The budget for health prevention and promotion is situated below the average of the OCDE countries, which is of 2.7% [69]. With its budget for health prevention being lower than in other OCDE countries, the Confederation has chosen to invest money in themes with high visibility such as alcohol, smoking and obesity [67]. The problem is that STI lack political visibility and consequently their burden stays unrecognized. The decision-makers must be persuaded that strategies to control STI should not solely be tied to HIV prevention programs and that investing in high quality and effective intervention will bring its independent benefits [21]. For HIV infections, governments have been convinced to invest in prevention mainly by macroeconomic arguments about the negative effect of poor health on economic growth. The same type of arguments could also convince decision makers for STI. However, studies on the economic burden of STI and its prevalence in Switzerland are expensive. The solution might be in a wide collaboration with Europe. The consistency of trends across Europe points to common causative factors, common priorities and a need for shared solution [40]. Swiss decision makers might only realize the burden of STI, when the EU asks for wide collaboration to control these infections.

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Appendix 1: Syphilis: Complementary reports, 2006 [19]

		Nouveaux cas uniquement*				Tous cas ayant fait l'objet d'une déclaration complémentaire			
		Hommes	%	Femmes	%	Hommes	%	Femmes	%
		166	100	59	100	358	100	140	100
Stade	primaire	41	26	6	10	60	17	8	6
	secondaire	44	27	6	10	58	16	10	7
	latence précoce	8	5	2	3	12	3	3	2
	latence tardive	7	4	4	7	9	3	4	3
	latence de durée indéterminée	20	12	12	20	30	8	21	15
	tertiaire	2	1	0	0	4	1	3	2
	inconnu	5	3	14	24	15	4	28	20
	pas de réponse	39	24	15	26	170	48	63	45
Préférence sexuelle	hétérosexuel(le)	36	22	43	73	80	22	68	48
	homosexuel(le)	88	53	2	3	140	39	18	13
	bisexuel(le)	10	6	0	0	11	3	0	0
	pas de réponse	32	19	14	24	127	36	54	39
Type de relation	relation stable	28	17	26	44	56	16	42	30
	relation occasionnelle	75	45	10	17	123	34	25	18
	avec un-e prostitué-e	6	4	0	0	9	2	0	0
	avec un client	0	0	2	4	0	0	4	3
	inconnu	25	15	12	20	50	14	30	21
	pas de réponse	32	19	9	15	120	34	39	28
Nombre de partenaires au cours de 6 derniers mois	pas de réponse	158	99	58	99	347	97	138	99
Antécédents d'IST	oui	22	13	11	19	120	34	36	26
	pas de réponse	144	87	48	81	238	66	104	74
Consommation de drogues par voie intraveineuse	oui	1	1	2	3	3	1	4	3
	non	119	72	47	80	212	59	88	63
	inconnu	19	11	3	5	28	8	10	7
	pas de réponse	27	16	7	12	115	32	38	27
Mode de contamination	oral	56	34	3	5	76	21	5	4
	anal	30	18	1	2	58	16	2	1
	vaginal	15	9	20	34	30	8	36	26
	autre	3	2	0	0	6	2	2	1
	inconnu	38	23	27	46	86	24	58	41
	pas de réponse	24	14	8	13	102	29	37	26
Lieu présumé de l'infection	Suisse	71	43	13	22	114	32	18	13
	ville	44	27	4	7	59	16	6	4
	banlieue	4	2	1	2	9	3	2	1
	région rurale	0	0	2	3	1	0	3	2
	non précisé	23	14	6	10	45	13	7	5
	Pays étranger	24	14	15	25	49	14	33	24
	inconnu	35	21	23	39	73	20	45	32
	pas de réponse	36	22	8	14	122	34	44	31
Notification du/des partenaires(s)	oui	54	33	27	46	83	23	45	32
	non	22	13	4	7	50	14	14	10
	inconnu	43	26	16	27	76	21	25	18
	pas de réponse	47	28	12	20	149	42	56	40

Appendix 2: Gonorrhea, Complementary reports 2006 [19]

		Hommes	%	Femmes	%	Total	%
Cas de gonorrhée avec déclaration complémentaire		467	100	77	100	544	100
Préférence sexuelle	hétérosexuel(le)	227	49	64	83	291	54
	homosexuel(le)	156	33	1	1	157	29
	bisexuel(le)	11	2	0	0	11	2
	inconnu	42	9	6	8	48	9
	pas de réponse	31	7	6	8	37	7
Type de relation	relation stable	142	30	46	60	186	34
	relation occasionnelle	195	42	23	30	218	40
	avec un(e) prostitué(e)	34	7	0	0	33	6
	inconnu	66	14	4	5	70	13
	pas de réponse	31	7	4	5	35	7
Nombre de partenaires au cours des 6 derniers mois	pas de réponse	462	99	77	100	539	99
Antécédents d'IST	oui	90	19	5	6	95	17
	non	191	41	46	60	237	44
	inconnu	116	25	16	21	132	24
	pas de réponse	70	15	10	13	80	15
Lieu présumé de l'infection	Suisse	275	59	51	66	326	60
	Pays étranger	68	15	5	6	73	13
	inconnu	77	16	15	20	92	17
	pas de réponse	47	10	6	8	53	10
Facteur de risque	Rapports sexuels payants en tant que prostitué(e)	8	2	2	3	10	2
	Rapports sexuels payants en tant que client	49	10	0	0	49	9
	Consommation de drogues par voie intraveineuse	3	1	0	0	3	1
	pas de réponse	407	87	75	97	482	88
Symptômes cliniques	oui	404	87	42	54	446	82
	non	11	2	15	20	26	5
	pas de réponse	52	11	20	26	72	13
Notification du/des partenaire(s)	oui	188	40	55	71	243	45
	non	81	17	6	8	87	16
	inconnu	127	27	7	9	134	24
	pas de réponse	71	16	9	12	80	15

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