



Minna Nikula

# Young Men's Sexual Behaviour in Finland and Estonia

Opportunities for prevention of  
sexually transmitted infections

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Academic dissertation

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# Abstract

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*Background.* The incidence of sexually transmitted infections (STIs) in most EU states has gradually increased and the rate of newly diagnosed HIV cases has doubled since 1999. STIs differ in their clinical features, prognosis and transmission dynamics, though they do share a common factor in their mode of transmission – that is, human behaviour.

The evolution of STI epidemiology involves a joint action of biological, epidemiological and societal factors. Of the more immediate factors, besides timely diagnosis and appropriate treatment, STI incidence is influenced by population patterns of sexual risk behaviour, particularly the number of sexual partners and the frequency of unprotected intercourse. Assessment of sexual behaviour, its sociodemographic determinants and time-trends are important in understanding the distribution and dynamic of STI epidemiology. Additionally, in the light of the basic structural determinants, such as increased level of migration, changes in gender dynamics and impacts from globalization, with its increasing alignment of values and beliefs, can reveal future challenges related to STI epidemiology. STI case surveillance together with surveillance on sexual behaviour can guide the identification of preventive strategies, assess their effectiveness and predict emerging trends.

The objective of this study was to provide base line data on sexual risk behaviour, self-reported STIs and their patterns by sociodemographic factors as well as associations of sexual risk behaviour with substance use among young men in Finland and Estonia. In Finland national population based data on adult men's sexual behaviour is limited. The findings are discussed in the context of STI epidemiology as well as their possible implications for public health policies and prevention strategies.

*Materials and Methods.* Data from three different cross-sectional population-based surveys conducted in Finland and Estonia, during 1998–2005, were used. Sexual behaviour- and health-related questions were incorporated in two surveys in Finland; the Health 2000, a large scale general health survey, focussed on young adults, and the Military health behavioural survey on military conscripts participating in the mandatory military training. Through research collaboration with Estonia, similar questions to the Finnish surveys were introduced to the second Estonian HIV/AIDS survey, which was targeted at young adults. All

surveys applied mail-returned, anonymous, self-administered questionnaires with multiple choice formatted answers.

*Results.* In Finland, differences in sexual behaviour between young men and women were minor. An age-stratified analysis revealed that the sex-related difference observed in the youngest age group (18–19 years) levelled off in the age group 20–24 and almost disappeared among those aged 25–29. Marital status was the most important sociodemographic correlate for sexual behaviour for both sexes, singles reporting higher numbers of lifetime-partners and condom use. This effect was stronger for women than for men. However, of those who had sex with casual partners, 15% were married or co-habiting, with no difference between male and female respondents.

According to the Military health behavioural survey, young men's sexual risk behaviour in Finland did not markedly change over a period of time between 1998 and 2005. Approximately 30–40% of young men had had multiple sex partners (more than five) in their lifetime, over 20% reported having had multiple sex partners (at least three) over the past year and 50% did not use a condom in their last sexual intercourse. Some 10% of men reported accumulation of risk factors, i.e. having had both, multiple sex partners and not used a condom in their last intercourse, over the past year of the survey.

When differences and similarities were viewed within Finland and Estonia, a clear sociodemographic patterning of sexual risk behaviour and self-reported STIs was found in Finland, but a somewhat less consistent trend in Estonia. Generally, both, alcohol and drug use were strong correlates for sexual risk behaviour and self-reported STIs in Finland and Estonia, having a greater effect on engagement with multiple sex partners rather than unprotected intercourse or self-reported STIs. In Finland alcohol use, relative to drug use, was a stronger predictor of sexual risk behaviour and self-reported STIs, while in Estonia drug use predicted sexual risk behaviour and self-reported STIs stronger than alcohol use.

*Conclusions.* The study results point to the importance for prevention of sexual risk behaviour, particularly strategies that integrate sexual risk with alcohol and drug use risks. The results point to the need to focus further research on sexual behaviour and STIs among young people; on tracking trends among general population as well as applying in-depth research to identify and learn from vulnerable and high-risk population groups for STIs who are exposed to a combination of risk factors.

Key words: STI, sexual risk behaviour, alcohol, drugs, smoking, men, women, risk factors, public health, epidemiology, prevention, Finland, Estonia

## Abstract in Finnish

Minna Nikula. Young Men's Sexual Behaviour in Finland and Estonia. Opportunities for prevention of sexually transmitted infections [Nuorten miesten seksuaalikäyttäytyminen Suomessa ja Virossa]. Terveiden ja hyvinvoinnin laitos (THL), Tutkimus 26. 156 sivua. Helsinki 2009. ISBN 978-952-245-184-2 (painettu), ISBN 978-952-245-185-9 (pdf)

*Tausta ja tavoitteet.* Sukupuoliteitse tarttuvien infektiotautien (STI) ilmaantuvuus on useimmissa EU maissa tasaisesti lisääntynyt, ja uusien HIV diagnoosien määrä on kaksinkertaistunut vuoden 1999 jälkeen. Vaikka eri sukupuolitaudit eroavat toisistaan kliinisten ominaisuuksiensa, ennusteensa ja tarttuvuutensa suhteen, yhteistä niiden kaikkien leviämislle on yksi tekijä – ihmisen käyttäytyminen.

Sukupuolitautilien ilmaantuvuus määräytyy biologisten, epidemiologisten ja yhteiskunnallisten tekijöiden yhteisvaikutuksesta. Tautien aikaisen toteamisen ja tehokkaan hoidon lisäksi muu välitön tekijä, joka vaikuttaa STI:n ilmaantuvuuteen, on väestön seksuaalikäyttäytyminen, erityisesti seksipartnerien ja suojaamattomien yhdyntöjen määrä. Seksuaalikäyttäytymisen, sen aikatrendien ja sitä määrittävien sosiodemografisten tekijöiden ja muiden käyttäytymistekijöiden tutkiminen lisää ymmärrystä siitä miten STI:t jakautuvat väestön keskuudessa ja mitkä tekijät vaikuttavat tautien taustalla. Lisäksi seksitautien ja -käyttäytymistrendien tarkastelu ottaen huomioon yhteiskunnalliset muutokset, kuten esimerkiksi kasvava maahanmuutto, sukupuolten väliset suhteet ja globalisaation arvoja ja uskomuksia muovaavat vaikutukset, auttavat ymmärtämään ja ennakoimaan STI:n epidemiologiaan liittyviä tulevaisuuden haasteista. Tautien ilmaantuvuuden ja esiintyvyyden tarkastelu yhdessä seksuaalikäyttäytymistrendien kanssa voi ohjata ennaltaehkäisevien kansanterveydellisten toimenpiteiden suunnittelua ja seurantaa.

Tämän tutkimuksen tarkoituksena oli kerätä perustietoa seksuaalisesta riskikäyttäytymisestä, itse-raportoiduista sukupuolitaudeista ja näihin vaikuttavista sosiodemografisista tekijöistä, sekä nuorten miesten päihiteidenkäytön ja seksuaalisen riskikäyttäytymisen yhteydestä Suomessa ja Virossa. Tuloksia tarkastellaan STI epidemiologisessa yhteydessä ja niiden mahdollisia kansanterveydellisiä vaikutuksia pohditaan ennaltaehkäisy näkökulmasta.

*Menetelmät.* Tutkimusaineisto perustui kolmeen poikittaiseen väestökyselyyn, jotka tehtiin Suomessa ja Virossa 1998–2005. Suomessa seksuaalikäyttäytymistä ja -terveyttä oli tiedusteltu kahdessa kyselyssä, jotka olivat Terveys 2000 – nuorten aikuisten terveyskysely ja armeijan alokkaille suunnattu terveyskäyttäytymis-/elämäntapakysely. Tutkimusyhteistyön puitteissa samoja kysymyksiä voitiin liittää Viron toiseen HIV /AIDS kyselyyn, joka oli suunnattu nuorille aikuisille. Tiedonhankinta perustui postitse palautettuun vapaaehtoiseen monivalintakyselyyn, jonka tulokset käsiteltiin anonymisti.

*Tulokset.* Suomessa sukupuoleen liittyviä eroja seksuaalikäyttäytymisessä oli havaittavissa nuorimmassa ikäluokassa (18–19-vuotiaat), mutta erot olivat tasoittuneet 20–24-vuotiailla ja lähes hävinneet 25–29-vuotiaiden ikäluokassa. Siviilisääty oli tärkein sosiodemografinen seksuaalikäyttäytymistä määrittävä tekijä sekä miehillä että naisilla. Yleisesti ottaen naimattomilla oli ilmoituksensa mukaan useampia seksipartnereita ja he käyttivät useammin kondomia kuin naimissa tai avoliitossa olevat. Tämä trendi oli selkeämpi naisilla kuin miehillä. Kuitenkin yhtä suuri osa (15%) miehistä ja naisista, joilla oli ollut satunnaisia seksikumppaneita, oli naimissa tai avoliitossa.

Armeijan terveystutkimuskyselyn mukaan nuorten suomalaismiesten seksuaalisen riskikäyttäytymisen taso ei merkittävästi muuttunut vuosien 1998–2005 aikana. Noin 30 prosentilla nuorista miehistä oli ollut yli viisi seksipartneria elämänsä aikana, 20 prosentilla vähintään kolme seksipartneria viimeisen vuoden aikana ja noin puolet miehistä ei ollut käyttänyt kondomia viimeisessä yhdynnässä. Ilmoituksensa mukaan noin 10%:lla miehistä käyttäytymiseen liittyi useita riskitekijöitä; heillä oli ollut vähintään kolme seksikumppania viimeisen vuoden aikana ja viimeisin yhdyntä oli ollut suojaamaton.

Kun yhtäläisyyksiä ja eroja sukupuolikäyttäytymisen ja sosiodemografisten taustatekijöiden suhteen tarkasteltiin Suomessa ja Virossa, Suomessa seksuaalikäyttäytyminen erosi selkeämmin eri sosiodemografisissa ryhmissä kuin Virossa. Yleisesti ottaen seksuaalinen riskikäyttäytyminen ja sukupuolitaudit olivat yhteydessä alkoholin ja huumeiden käyttöön sekä Suomessa että Virossa. Tämä ilmiö oli havaittavissa selkeämmin päihteiden suhteessa seksipartnerien määrään kuin suojaamattomaan yhdyntään tai seksitauteihin. Suomessa alkoholin käyttö suhteessa huumeiden käyttöön ennusti vahvemmin seksuaalista riskikäyttäytymistä ja sukupuolitauteja, kuin Virossa, missä huumeet olivat vahvempi ennuste riskikäyttäytymiselle.

*Johtopäätökset.* Tutkimuksen tulokset korostavat riskiseksi ennaltaehkäisyn tarpeellisuutta ja erityisesti riskikäyttäytymisen ja päihteiden käytön yhdistävien strategioiden tärkeyttä. Seksuaalikäyttäytymisen trendien seuranta tulisi olla osana aikuisväestölle suunnattua terveystutkimustutkimusta, sekä valtaväestö että riskiryhmät mukaan lukien.

Avainsanat: Sukupuolitaudit, seksuaalinen riskikäyttäytyminen, alkoholi, huumeet, tupakointi, miehet, naiset, riskitekijät, kansanterveys, epidemiologia, Suomi, Viro



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Original publications

## List of original publications

- I Minna Nikula, Päivikki Koponen, Elina Haavio-Mannila, Elina Hemminki. Sexual health among young adults in Finland: Assessing risk and protective behaviour through general health survey. *Scand J Public Health* 2007;35(3): 298–305.
- II Minna Nikula, Mika Gissler, Vesa Jormanainen, Tiina Sevón, Elina Hemminki. Sexual behaviour and lifestyles of young men in Finland, 1998–2005. Cross-sectional survey of military conscripts. *Eur J Contracept Reprod Health Care* 2009;14(1):17–26.
- III Minna Nikula, Mika Gissler, Vesa Jormanainen, Made Laanpere, Heikki Kunnas, Elina Haavio-Mannila, Elina Hemminki. The sociodemographic patterning of sexual risk behaviour among young men in Finland and Estonia. *BMC Public Health* 2009;9:256.
- IV Minna Nikula, Mika Gissler, Heikki Kunnas, Elina Hemminki. Sexual risk taking and substance use among young men in Finland and Estonia. (Submitted).

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# Abbreviations

ACASI	Audio assisted computer assisted self interviewing
AIDS	Acquired immune deficiency syndrome
CAPI	Computer assisted personal interview
CASI	Computer assisted self interviewing
CATI	Computer assisted telephone interview
CI	Confidence interval
DALY	Disability adjusted life years
ECDC	European Centre for Disease Control and Prevention
EU	European Union
FDF	Finnish Defence Forces
FTF	Face to face interview
HIV	Human immunodeficiency virus
HPV	Human papillomavirus
HSV	Herpes simplex virus
IDU	Injecting drug use
IDUs	Injecting drug users
KAP	Knowledge, attitudes, practises
KTL	National Public Health Institute
MSM	Men who have sex with men
N	Number
NA	Not applicable
OR	Odds ratio
REFER	Reproductive health and fertility patterns in Russia
SAQ	Self administered questionnaire
STAKES	National Research and Development Centre for Welfare and Health
STI	Sexually transmitted infection
THL	National Institute for Health and Welfare
UK	United Kingdom
USA	United States of America
WHO	World Health Organization

# Definitions

Eastern Europe	Baltic States (Estonia, Latvia, Lithuania), Belarus, the Caucasus republics (Armenia, Azerbaijan, Georgia), Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan (WHO / EuroHIV 2007).
Central Europe	Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, the Czech Republic, Hungary, Poland, Romania, Serbia and Montenegro, Slovakia, Slovenia, The former Yugoslav Republic of Macedonia, Turkey (WHO / EuroHIV 2007).
Western Europe	Andorra, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxemburg, Malta, Monaco, the Netherland, Norway, Portugal, San Marino, Spain, Sweden, Switzerland, United Kingdom (WHO / EuroHIV 2007).
SEX	Sex refers to the biological characteristics that define humans as female or male. While these sets of biological characteristics are not mutually exclusive, as there are individuals who possess both, they tend to differentiate humans as males and females. In general use in many languages, the term sex is often used to mean “sexual activity”, but for technical purposes in the context of sexuality and sexual health discussions, the above definition is preferred (WHO 2006).
SEXUALITY	Sexuality is a central aspect of being human throughout one’s life and encompasses sex, gender identities and roles, sexual orientation, eroticism, pleasure, intimacy and reproduction. Sexuality is experienced and expressed in thoughts, fantasies, desires, beliefs, attitudes, values, behaviours, practices, roles and relationships. While sexuality can include all of these dimensions, not all of them are always experienced or expressed. Sexuality is influenced by the interaction of biological, psychological, social, economic, political, cultural, ethical, legal, historical, religious and spiritual factors (WHO 2006).
SEXUAL HEALTH	Sexual health is a state of physical, emotional, mental and social well-being in relation to sexuality and is influenced by a complex web of factors ranging from sexual behaviour and attitudes and societal factors, to biological risk and genetic predisposition. It encompasses the problems of HIV and STIs, unintended pregnancy and abortion, infertility and cancer resulting from STIs, as well as sexual dysfunction. Sexual health can also be influenced by mental health, acute and chronic illnesses, and violence (WHO 2006).

# 1 INTRODUCTION

Sexually transmitted infections (STIs) constitute a major public health problem. Nearly one million new cases of STI infections occur every day worldwide (WHO / EuroHIV 2007). STIs are either of bacterial or viral origin and differ in their clinical features, prognosis and transmission dynamics, though they do share a common factor in their mode of transmission – that is, human behaviour (Renton and Whitaker 1994; Mc Gough and Handsfield 2007).

The epidemiological challenge posed by STIs moved into a totally new era following the emergence of HIV, which has had major implications at the individual, community and national level (van Lier EA et al. 2007). STIs other than HIV, in themselves, are among the most important causes of reproductive morbidity (Wasserheit 1992). However, the negative impact of other STIs was overshadowed by that of HIV/AIDS for quite some time, until it was discovered that most STIs have the potential to facilitate the acquisition of HIV infection (Wasserheit 1992).

In Europe, the rates of acute bacterial STIs decreased throughout the 1980s up to the early 1990s. Thereafter STI-incidence in most EU states has gradually increased and the rates of newly diagnosed HIV cases have doubled since 1999 (van der Hayden 2000; Fenton et al. 2004; WHO / EuroHIV 2007; ECDC / WHO 2008). Along with globalization, new challenges have emerged in the STI epidemiology while many EU states continue to experience mobile commercial sex worker networks, changing migratory patterns, human trafficking and illegal drug use, all of which offer new opportunities for STI transmission (Hamers and Downs 2004; Aral 2005).

The evolution of STIs is a complex phenomenon. The drivers and dynamics of STI epidemiology involve a joint action of biological, epidemiological and societal factors. Anderson and Garnett (2000) proposed a simple and thereafter widely used epidemiological formula to assess the infectious spread of STIs in general;  $R_0 = \beta c D$ , where  $R_0$  is the rate of spread of STIs,  $c$  is the rate of contact between infected and susceptible individuals,  $D$  is the average duration of the infection and  $\beta$  the probability of infection in case of exposure (Anderson and Garnett 2000).

Since Anderson and Garnett, Aral (2002) has suggested that the evolution of STIs takes place within the context of human societies that are subject to changes, such as demographic, political, technological and economic. These basic structural changes can influence all of the three parameters  $\beta$ ,  $c$  and  $D$ , through for example the rising levels of poverty, inequity in- and between countries and increased level of migration and racial/ethnic discrimination, changes in gender dynamics and impacts from globalization, with its increasing alignment of values and beliefs (Aral 2002; 2005). A more comprehensive framework by Aral (2002) incorporates

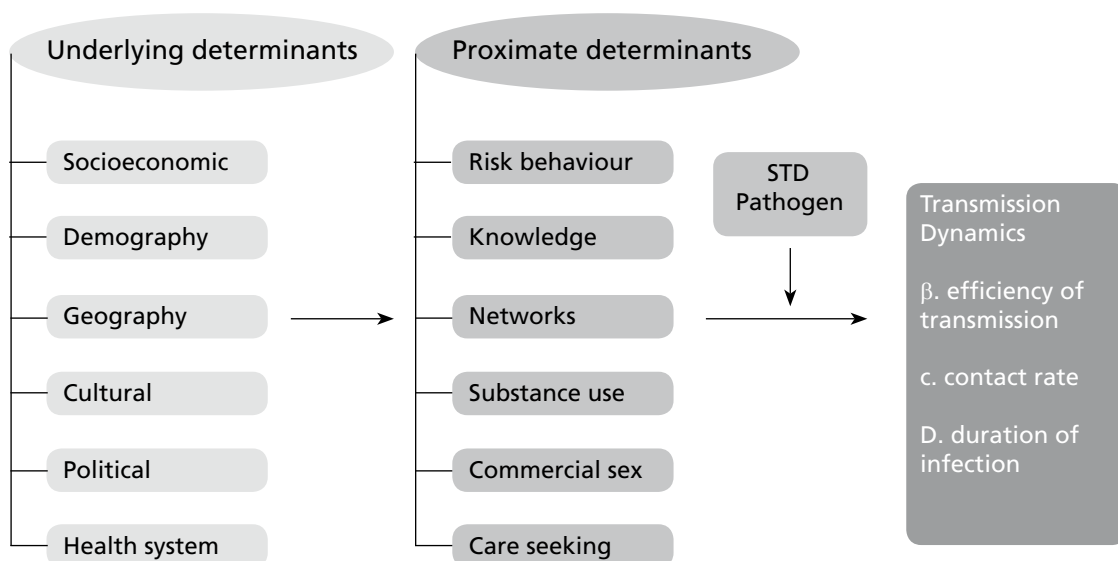


Figure 1. Determinants of sexually transmitted infections epidemics: a crude framework (Adopted from: Aral 2002)

the infectious spread of STIs (individual-/immediate-level determinants) with underlying structural determinants for STI transmission (Figure 1).

Sexual behaviour such as condom use, number of sex partners and rate of sex partner acquisition, as well as timely diagnosis and appropriate treatment of STIs have been considered among the important variables impacting the values of  $\beta$ ,  $c$  and  $D$ . Knowledge of population patterns in sexual risk behaviour (distribution and trends) that are assessed in the light of underlying determinants can enhance our understanding of the driving forces and the possible challenges of STI epidemics and guide the crafting of strategies for public health interventions and policy.

A series of cross-sectional sexual behaviour studies of the general population were conducted in the early 1990s in several European countries, most of which were initiated by sociologists and inspired by the HIV epidemic and a willingness to understand the new conceptual perspectives in sexuality and sexual behaviour (Hubert 1998, pp. 3–4). This is where the focus moved away from exclusively women, reproductive health, and contraception, towards sexual health, with most of these studies also incorporating men as their units of observation (Hubert 1998, pp. 8–15; Dudgeon and Inhorn 2001). Thereafter, follow-up studies or systematic surveys to monitor the distribution of risk factors in the general population have been carried out in less than half of the EU countries; however, peer-reviewed reports are scarce, while data from the Eastern European countries are especially lacking (ECDC 2009).

This study provides evidence on STI-related sexual behaviour, patterns by sociodemographic factors as well as associations with substance use among young men in Finland and Estonia through survey data. It brings additional value to the existing pool of information by first highlighting differences between men and women and trends over time in Finland, and then differences and similarities within two countries that have close geographical proximity, though different political, cultural and socioeconomic trajectories, STI epidemiology and public health footing. This study can facilitate the assessment of existing STI prevention strategies and can furnish suggestions and opportunities for actions needed in future STI prevention.

## 2 STUDY CONTEXT

Finland has been operating under a democratic parliamentary tradition since 1917. In contrast, since its independence from the Soviet Union in 1990, Estonia has faced a rapid transition from communism to democracy, and currently holds the status of the most market-liberalized Baltic state (Vodopivec et al. 2002). While these two neighbouring countries have gone through quite different political histories, both are currently member states of the European Union.

In Estonia, the political changes in the early 1990s led to a decline in public health status (Bobak et al. 2007; Koppel et al. 2008). To combat the rapidly worsening health crisis, Estonia was the first Baltic State to initiate a health care reform, which has been considered successful and has resulted in continuously high rates of patient satisfaction in terms of access and quality of health services (Koppel et al. 2008).

Overall, public health in Estonia is considered typical of Eastern European transitional economies, similar to what was observed in Finland a couple of decades previously (Laaksonen et al. 2001; Puska et al. 2003; Helasoja et al. 2006; Koppel et al. 2008). Clearer socioeconomic inequities in several domains of health care can be seen in Estonia when contrasted with Finland, where earlier improvements in health status were paralleled by the building of a welfare state featuring social cohesion and egalitarian policies (Carlson 1998; Leinsalu 2002; Olsen and Dahl 2007; Bobak et al. 2007; Mackenbach et al. 2008). Nevertheless, the main risk factors leading to ill health are rather similar in both countries and relate to tobacco use, low levels of physical activity, alcohol consumption and obesity (Puska et al. 2003; Koppel et al. 2008).

Along with the political and economic transition, the sexual revolution—which began in the West in the 1960s with the fight for sexual freedom and sexual equality—permeated into Estonia in the 1990s (Haavio-Mannila and Kontula 2003a, pp. 16–17; 2003b). This was manifested in the spread of previously censored sexual content in the media, pornography and prostitution (Kon 1995, p. 804; Pöder and Bingham 1999). In comparison, the Nordic countries have reached a relatively high degree of sexual equality and sexual freedom over the past decades (Haavio-Mannila and Kontula 2003b).

Since its independence Estonia has faced three persistent challenges in the area of reproductive and sexual health: high abortion rates, an increasing incidence of STIs and a dramatic increase in the transmission of HIV infection (Karro 1997; Dehne et al. 1999). In Finland, the comprehensive framework provided by the public health system along with preventive strategies have given rise to a well-functioning health infrastructure and education sector, recognised as the cornerstones of the



good reproductive and sexual health status of the Finnish people (Rimpelä et al. 1996).

In Estonia, new strategies targeted at the youth, their sex education and use of contraception were introduced at the same time as the society at large became more open about sexual health issues (Karro 1997; Part et al. 2008). Subsequently, in Estonia reproductive and sexual health has generally improved, and fertility and abortion rates have declined (Part et al. 2007).

However, STIs have increased in both countries over the past decade while differences in the diagnostics have also emerged. The HIV epidemic remains the most important public health challenge in Estonia (Rüütel and Uusküla 2006). Of particular interest in the case of these two EU states is the different and potentially linked dynamic in the epidemiological development of STIs, given the geographical closeness and active interaction between the two countries.

## 3 SEXUALLY TRANSMITTED INFECTIONS

### 3.1 STIs as a public health challenge

Worldwide about 1 million curable and millions of incurable STI cases occur daily (WHO / EuroHIV 2007). Although some 80–90% of the global burden of STIs centres on the developing world, STIs are recognized as a major public health challenge also in most industrialised countries (Mabey 2005).

At an individual level, STIs can lead to reproductive morbidity, including pelvic inflammatory diseases, infertility, ectopic pregnancy, cervical cancer and neonatal disorders (Paavonen and Eggert-Kruse 1999; Fenton 2003; Altekruse et al. 2003; Joki-Korpela et al. 2009). Additionally, the impact of STIs is magnified with the potential to facilitate the acquisition of HIV through increased susceptibility and infectivity (Wasserheit 1992; Laga et al. 1993; Plourde et al. 1994, Royce et al. 1997). Besides these adverse physical health implications, STIs are associated with social stigma and psychological stress often with a negative impact on human relations. Finally, the burden of STIs continues to fall unequally on different segments of the population. Young people, MSM (men who have sex with men), minority ethnic groups and marginalised groups such as drug users are among the most affected (Nicoll and Hamers 2002; Fenton 2003; Hamers and Downs 2004; Mabey 2005).

Beyond the individual level, the disease burden for the population as well as for the healthcare system in terms of health expenditure is high. HIV infection, estimated by ECDC, has the highest disease burden in the form of DALYs (Disability adjusted life year) of several other common communicable diseases in Europe (van Lier et al. 2007). Infertility is a complex issue (Sundby 1994, pp. 35–71), thus it is unclear of what proportion of tubal infertility caused by Chlamydia infection could be prevented; however primary prevention of Chlamydia would be more cost-effective than infertility treatment. A stronger cause-linkage than between infertility and Chlamydia has been found for cervical cancer and sexually transmitted human papillomavirus infection (HVP) (Walboomers et al. 1999). Cervical cancer is the second most common female cancer in the world, and a vast majority of the cases can be prevented by preventing HVP.

### 3.2 Epidemiology of STIs

In Europe, the most important STIs are *Chlamydia trachomatis*, *Neisseria gonorrhoea*, *Treponema pallidum* (syphilis), *genital human papillomavirus* (HPV), *herpes simplex virus* (HSV1, HSV2) and *HIV* (ECDC 2007).

There has been a clear consistency in the epidemiological trends of STIs Western Europe and Eastern Europe over recent decades (Laukamm-Josten et al. 2006, pp. 173–178). In the West, the time period between 1980s and early 1990s corresponded to the first wave of increasing HIV infection and a general reduction of bacterial STIs (Fenton et al. 2004). This decreasing trend has been attributed to behavioural modification in response to the early HIV campaigns as well as AIDS-related mortality (Fenton et al. 2004; Laukamm-Josten et al. 2006, p. 173). From 1990 to 1997, the incidences of HIV, syphilis and gonorrhoea stabilized in Western Europe, while in the East, syphilis and gonorrhoea incidence peaked, though HIV incidence still remained low (Donoghoe et al. 2005). Some ten years later, a sharp increase in HIV was observed in the East, which was attributable to transmission of the epidemic via injecting drug users (IDUs) in that region (Fenton and Lowndes 2004; Laukamm-Josten et al. 2006, pp. 178–181). Between 1999 and 2006, the rates of newly diagnosed STIs gradually increased in most EU states (Nicoll and Hamers 2002; Fenton and Lownders 2004; Laukamm-Josten et al. 2006, pp. 173–180; WHO 2009).

Finally, there is a clear east–west divide in the HIV epidemic in Europe, with Eastern Europe experiencing one of the world’s fastest growing epidemics, contributing 69% of the newly diagnosed HIV infections in 2006 compared to 29% by the Western and 2% by the Central European countries (ECDC 2007).

Comparison of STI epidemiology between Finland and Estonia may be influenced by differences in case surveillance methods and screening policies in the two countries (Dehne et al. 2002; Domeika et al. 2002; Naaber et al. 2005). In Estonia several changes occurred in the Estonian laboratory system in early 1990s (Naaber et al. 2005). Nevertheless, Estonian STI rates remain higher than those of the neighbouring Nordic and most European countries despite declines in bacterial STIs since early 2000 (Rüütel and Uusküla 2006). Finnish STI incidence has traditionally been one of the lowest in Europe, but particularly Chlamydia infections reported to the national register have gradually increased since the mid-1990s, although some of the increase is likely to be due to the introduction of the national laboratory-based surveillance (1995) and more sensitive laboratory tests (1995–2002) (Hiltunen-Back et al. 2003; KTL 2008a). In 2007, the estimated rates of syphilis and gonorrhoea were higher in Estonia than in Finland, whereas Chlamydia was somewhat lower (Rüütel and Uusküla 2006; THL 2009a; 2009b).

Since 2002 there has been a decline in the number of new HIV cases in Estonia (Ministry of Social Affairs 2008), though the prevalence is estimated to be 1.3%, that is, over ten times the rate of 0.1% in Finland (Ministry of Social Affairs 2008; THL 2009a; 2009b). In Estonia, while the proportion of IDU-related HIV-transmissions has decreased to 44% of all new cases reported in 2005, HIV is increasingly being transmitted from drug users to their partners via unprotected sex, with these transmissions making up a significant share of new infections among young people in the country (Rüütel and Uusküla 2006).

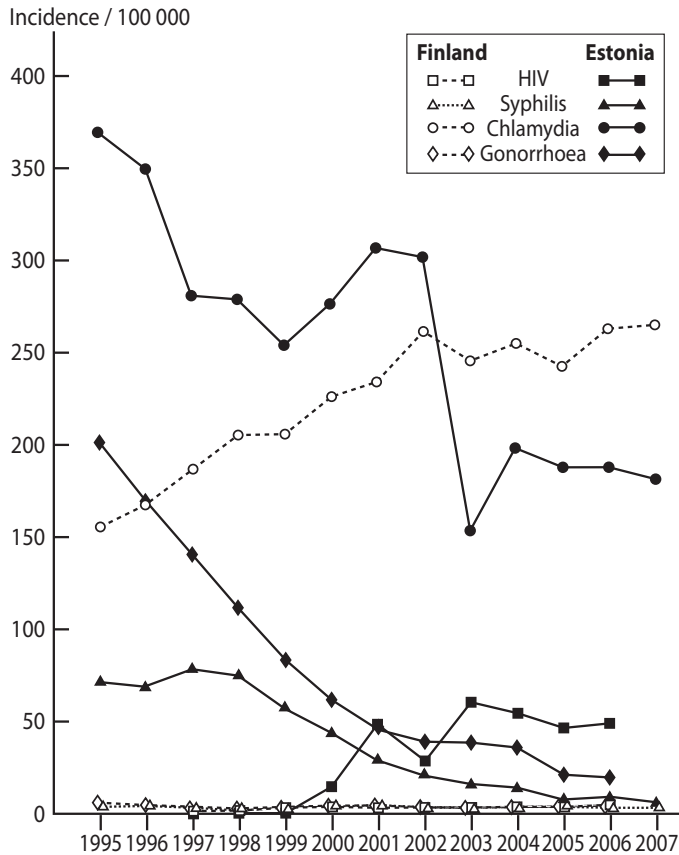


Figure 2. STI incidence per 100 000 population in Finland and Estonia in 1995–2007 (WHO 2009: <http://data.euro.who.int/cisid>)

In Finland the epidemic has followed a western-European type of evolution, with a low annual increase in new cases, mostly related to sexual transmission (THL 2009a; 2009b). A trend analysis in Finland covering the period from 1999–2008 reveals a gradual increase in cases and a proportionally stronger increase in incidence among MSM (men who have sex with men) (THL 2009b).

Although Gonorrhoea, syphilis and HIV rates have remained low in Finland, a recent concern is an increasing proportion of them (diagnosed among Finnish citizens) arising from travel-related transmission occurring in countries where STIs are far more common than in Finland, such as Estonia or Thailand (KTL 2008a; THL 2009a). The crucial question in Estonia is to what extent is HIV going to be transmitted from IDUs to heterosexuals and in Finland whether that is going to affect the Finnish HIV incidence rate at large.

## 4 LITERATURE REVIEW

This literature review focuses on a) peer-reviewed articles reporting on general-population-based cross-sectional surveys of heterosexual men, with indicators for partnering patterns, condom use, self-reported STIs, their sociodemographic patterning, as well as associations with substance use. The studies included were conducted in Europe and covered a time period from 1990 to 2008. Due to the limited number of articles found that complied fully with these criteria, b) books, c) and reports (in English and French) as well as d) USA-based studies, selected on the basis of their high methodological quality and comparable indicators, were included if they also met all the other criteria. The literature reviewed is summarised in Tables 1–4. Additionally, a few meta-analysis, reviews and studies that do not fully comply with the previous criteria but which add value by providing important evidence that is closely related to the topic have been included in the text, though not in the tables. Women are included only when any of the literature complying with any of the previous criteria included a separate analysis for men and women.

The literature search was carried out through online databases, grouping medicine, health and behavioural sciences, accessible through the Helsinki University search system [BIOSIS Preview and Biological abstracts, Medline (Ovid), PubMed, CAB Abstracts, ERIC (CSA), ScienceDirects (Elsevier) DAAI Design & Applied Arts Ind, Academic Search Complete (EBSCO)], as well as by examining the reference lists of the reviewed journal articles, reports and books. The following keywords were used in different combinations: men, sexual OR risk behaviour, sex, risky sex, sexual health, risk factor, condom use, unprotected intercourse, number of partners, multiple partners, partnering pattern, sexually transmitted infections OR diseases, HIV, Chlamydia, gonorrhoea, syphilis, sociodemographic patterning OR determinants, substance use, alcohol use OR consumption, drug use, drugs, smoking, tobacco, Europe, Eastern Europe, Finland, Estonia, USA, survey.

In general **sexual behaviour** encompasses activities related to strategies to find or attract partners, interactions between individuals, physical or emotional intimacy and sexual contact. Of all these aspects, this study focuses on **sexual (risk) behaviour**, including behaviours which, in previous research, have been associated with negative sexual health outcomes such as transmission of STIs or unintended pregnancy. These include early age (below 15 years) at first sexual intercourse, having a high number of sexual partners and new/casual partners, engaging in unprotected intercourse (also referred as non-use of condom) and non-use of contraception (Coker et al. 1994; Kaestle et al. 2005; Ethier and Orr 2007, pp. 284–286; ECDC 2009). The term **sexually active** refers to those who have experienced sexual intercourse (by respondents' subjective definition) at least once during their lifetime.

The summary tables of the reviewed literature are presenting one of the three internationally most commonly used sexual risk behaviour-indicators: 1) number of lifetime partners, 2) number of partners during the past 12 months and 3) condom use (ECDC 2009). The following literature review is reported by highlighting time trends, differences between men and women, cross-national comparisons and sociodemographic determinants of the three indicators (Tables 1–3) as well as their association with substance use, such as alcohol, tobacco and drugs (Table 4).

## 4.1 Behavioural risk factors for STIs

The reviewed studies date back to two time periods. The first set of studies is from the late 1980s and early 1990s, the period immediately after the emergence of the HIV epidemic. These studies represent the first population-based surveys of sexual behaviour in most of the countries, mostly with a focus on sexual lifestyles and attitudes towards HIV (KAP studies, HIV awareness studies, sexuality studies). The second set of studies was conducted in the late 1990s and early 2000s, with an emphasis on sexual risk behaviour in general (general health survey, multi-thematic survey, survey on sexual health). The results are highly representative of their target population based on large samples and relatively high response rates. However, there was some discrepancy in the indicators used, their categorizations and age cohorts between the studies. Thus the following review will highlight mainly trends rather than presenting exact figures.

### *Partnering patterns*

Most of the literature reviewed has reported the number of partners, both, during one's lifetime and over the past year. The number of lifetime partners has been reported as mean and median number of partners, since mean is often influenced by those reporting a very large number of partners. When the number of sexual partners has been dichotomised, most commonly a cut off point of five or more or seven or more partners during one's lifetime, and one or more, two or more or three or more partners over the past year were used. These indicators are often referred as "multiple partners" or "multiple sex partners".

Generally, the over-time trends have been reported by using the indicator "multiple lifetime partners", given that it is less sensitive to sharp variations in any given time period, and associations with sociodemographic factors on "multiple partners over the past year", which is less sensitive to recall bias (Fenton et al. 2001). Tables 1 and 2 summarise results from cross-sectional surveys of the general population detailing these indicators.

Surveys that would allow a closer **analysis of sexual behaviour over time** are limited in Europe. The data that have been reported from Britain, France and Finland indicate that there has been an increasing trend in the mean number of lifetime partners (5+) since the 1990s (Table 1) (Johnson et al. 2001; Haavio-Mannila and Kontula 2001, pp. 111–121; *Contexte de la sexualite en France* 2007). Detailed and comprehensive studies from the UK found a significantly higher rate of new partner acquisition among those aged younger than 25 compared with subjects aged older than 25 between 1990 and 2000 (Johnson et al. 2001). The most recent survey from Finland by Kontula (2007), who focused on the social aspects of sexual behaviour since 1971, suggests that the increase in multiple partners is levelling off (Haavio-Mannila and Kontula 2001, p. 456; Kontula 2007, personal communication). Similarly, a study from Sweden using an indicator of multiple partners in the past year found a significantly increasing trend between 1989 and 2000 as well as 1989 and 2003, however, the rate of increase was much lower in the latter time period (Table 2) (Herlitz and Ramstedt 2005).

Confirming the findings in Europe, a review study from the United States also suggests an increasing trend in the number of partners up until the early 1990s followed by a decreasing trend among young adults as well as students up to 2000 (not shown in the table) (Smith 1998).

Separate **time-trend analyses for men and women** on number of lifetime partners have been reported from Britain, France and Finland, indicating a stronger increase in the mean number of lifetime partners (and multiple partners over the past year in Sweden) for women compared to men, suggesting a greater generational change for women than for men (Table 1) (Johnson et al. 2001; Haavio-Mannila and Kontula 2001, p. 456; Herlitz and Ramstedt 2005; *Contexte de la sexualite en France* 2007).

**Cross-national comparisons** of sexual behaviour are scarce. However, data collected in 11 European countries in the late 1980s and early 1990s were afterwards compared and the results of a European-wide cross-national analysis was summarised in a book edited by Hubert et al. in 1998. Although several methodological issues were limiting the comparability of these independently conducted surveys, little variation was found in the mean and median number of lifetime partners between the 11 different European countries included (Table 1) (Hubert et al. 1998, pp. 178–181). The median number of lifetime partners—a measure less dependent on outliers—was even more alike across Europe than the means (Hubert et al. 1998, pp. 178–181). In this Europe-wide comparison, Finland appeared to be above the European average (Hubert et al. 1998, pp. 178–181). None of the Eastern European countries were included in the study.

According to more recent surveys, the mean and median number of lifetime partners was still higher in Finland in 1999 compared to the UK, France, Slovenia and the USA (Johnson et al. 2001; Haavio-Mannila and Kontula 2001, pp. 456; Mosher et al. 2005; *Contexte de la sexualite en France* 2007; Klavs et al. 2009).

Besides Finland, the median number of lifetime partners in Slovenia was lower than in Britain and France, where these figures were rather similar compared to data from the USA (Johnson et al. 2001; Mosher et al. 2005; Klavs et al. 2009).

Survey data on sexual behaviour among men from Eastern European countries is based on work by Haavio-Mannila and Kontula (2001, p. 45), who conducted a cross-national comparison in the Baltic area focusing on the social aspects of sexual behaviour, and again found a higher mean number of lifetime partners in Finland than in Estonia, St. Petersburg area and Sweden.

The most studied **sociodemographic factors** in connection with sexual behaviour are age, marital status and education. In relation to age and multiple partners (number of partners over the past year), evidence from Europe reported by early studies indicates that younger men were likelier to report having had multiple partners than men of older age (Table 2) (Johnson et al. 1992; Hubert et al. 1998, pp.183–188; Johnson et al. 2001; Herlitz and Ramstedt 2005). The exception was Spain, where the likelihood of men having had multiple partners over the past year was higher in the 20–29 age group compared to those aged 15–19 (Castilla et al. 1998). A similar tendency was found in a study from the United States (Mosher et al. 2005). A potential explanation for this is men's later entry into sexual life compared to women.

Consistently, across all of the studies reviewed, whether early or recent, married men were the least likely to report having had multiple partners compared to singles, those who were separated/divorced, widowed and those cohabiting (Table 2) (Johnson et al. 1992; Castilla et al. 1998; Hubert et al. 1998, pp.183–188; Johnson et al. 2001; Herlitz and Ramstedt 2005). A Swedish study analysed the association of multiple partners grouped into three relationship categories: married/cohabiting, singles with a regular partner and singles without a regular partner. This study found a 20-fold increase in the odds ratios for the singles without a regular partner and even as high as a 10-fold difference for those with a regular partner, compared to married couples (Herlitz and Ramstedt 2005). Differences of a similar magnitude between married, cohabiting and singles (never married or cohabiting and formerly married but not cohabiting) in the number of partners were reported in the United States and Britain (Johnson et al. 2001; Mosher et al. 2005; Fryar et al. 2007).

The analysis of all the 11 European studies found an 'educational gradient' in the number of partners over the past year among women but not so clearly among men, i.e. higher educational level correlated with higher number of partners over last 12 months (also when age stratified) (Hubert et al. 1998, pp 189–190). This trend was confirmed by a well-documented study in Britain in 1990, which found that those in a lower social class were less likely to report having had two or more partners during the past year than those in the higher social classes (Table 2). Also the British study found this trend to be stronger for women than for men (Johnson et al. 1992). A few years later findings in the USA showed a positive correlation



between multiple sex partners and educational attainment only for women (Finer et al. 1999; Mosher et al. 2005). More recent studies conducted in Spain and Sweden in the late 1990s and early 2000s, which analysed data on both men and women, did not reveal a correlation between multiple partners over the past year and educational level for either sexes (Castilla et al. 1998; Herlitz and Ramstedt 2005). There is some evidence that the power of education to differentiate those who have multiple sex partners has been lessening over the past decades. This seems to have occurred for men earlier than for women.

TABLE 1. Review of European and selected American general-population based surveys, on number of lifetime-partners, among men and women in 1990–2008: description of the survey and main results

Reference / Country	Design / Response rate	Survey Year	Age Men n / Women n	Men Mean (Median)	Women Mean (Median)	Men %	Women %	Associations	Observations
<b>Europe, peer reviewed</b>									
<b>Johnson et al.</b> 1992 UK	FTF+	1990-	<b>16-59</b>			5+ partners		Older age ↑ Not married ↑ High social class ↑ Early sex debut ↑	The multiple logistic regression model adjusted for age, marital status, social class and age at first sex. Association of social class was stronger for women than for men.
	SAQ 62	1991	8384/10 492	9.9	3.4	34	19		
			<b>16-24</b> 1984/2264	5.3	2.8	44	20		
<b>Johnson et al.</b> 2001 UK	CASI 65	2000	<b>16-44</b> 5573/5390	12.7 (6)	6.5 (4)	5+ partners 41 36			<u>Time trend:</u> There was a significant increase in the mean number of lifetime partners, number of partners in past 5 years and number of concurrent partnerships between the surveys of 1990 (previous references) and 2000. The increase was stronger for women.
			<b>16-24</b> 1211/1433	6.9 (3)	5 (3)	60	46		
<b>Klavs et al.</b> 2009 Slovenia	FTF+	1999-	<b>18-49</b>						
	SAQ 67	2001	837/844	8.3 (12.9)	3.2 (3.6)				
			<b>18-24</b> 193/181	6.5 (14.3)	2.9 (3.9)				
<b>Reports, selected</b>									
<b>Contexte de la sexualité en France</b> 2007	CATI 75	1992	<b>18-69</b> 20 055						<u>Time trend:</u> Between 1992 and 2006, the mean number of lifetime partners has increased from 11 to 11.6 for men and from 3.3 to 4.4 for women. Difference not statistically tested.
		2006	<b>18-69</b> 5540/6824	11.6	4.4				
<b>Books, selected</b>									
<b>Hubert et al.</b> (Eds) 1998 London	FTF+SAQ CATI	1989- 1993	<b>15-49</b> 859-15 027 total men & women	10–19 (4–5)	3.8–6 (2–3)	5+ partners 49–61 23-41			Frequency distribution weighted by age, education and residence The questions were not standardised between countries.
	NA								
<i>11 European countries *</i>									

<b>Haavio-Mannila &amp; Kontula</b>	SAQ	1992	<b>18-54</b>			5+ partners		Men ↑	Finland 1992 and 1999 data used. MCA (Multiple classification analysis controlled for age, relationship type, gender (combined) length of the relationship, age at first intercourse, sexual desire, own opinion of one's sexual skills, years of education, importance of religion, frequency of drinking to intoxication, study ears). Men and women were analysed together.
2003	76	Finland	790/763	13.8 (7)	6 (4)	63	42	Older age ↑	
Finland	46	Finland	465/477	15.8 (7)	7.3 (4)	66	49	Not married ↑ High education ↑	
<i>Finland</i>	59	Sweden	1079/986	13.6 (8)	7.4 (5)	67	55		
<i>Sweden</i>	41	2000	<b>18-54</b>						
<i>Estonia</i>	61	Estonia	252/417	13.4 (6)	6.3 (4)	59	46		
<i>St. Petersburg</i>		1996	<b>18-54</b>						
		St.Pet.	490/697	12.1 (6)	4.5 (3)	61	31		
US, selected peer reviewed									
<b>Fryar et al.</b>	ACASI	1999-	<b>20-59</b>			7+ partners		Older age ↑	Frequency distribution. Distribution by education did not have a consistent trend. The trend in frequency by sociodemographic factors was similar for men and women.
2007	78	2002	6237	(6.8)	(3.7)	50	31	Not married ↑ Low education ↑	
USA (NHANES)			total men & women						
<b>Mosher et al.</b>	ACASI	2002	<b>15-44</b>			7+ partners		Older age ↑	Frequency distribution. Distribution by education did not have a consistent trend. The trend in proportions by sociodemographic factors was similar for men and women.
2005	79		4928/7643	(5.6)	(3.3)	43	26	Not married ↑	
USA (NSFG)			<b>15-19</b> <b>20-24</b>	(1.6) (3.8)	(1.4) (2.8)			Low education ↑	

FTF = Face to face interview, SAQ = Self-administered questionnaire, CATI = Computer assisted telephone interview, CASI = Computer assisted self interviewing, ACASI = Audio assisted CASI. NHANES = National Health and Nutrition Survey, NSFG = National Survey of Family Growth. NA = Not applicable, ↑ = Statistically significant positive association, - = No association  
\* = Belgium, Finland, France, Germany, Great Britain, Netherlands, Norway, Portugal, Scotland, Spain, Switzerland

TABLE 2. Review of European and selected American general-population based surveys, on number of sexual partners in the past 12 months, among men and women in 1990–2008: description of the survey and main results

Reference / Country	Design / Response rate	Survey Year	Age Men n / Women n	Men %	Women %	Associations	Observations
<b>Europe, peer reviewed</b>							
<b>Johnson et al.</b> 1992 UK	FTF+SAQ 65	1990	<b>16-59</b> 8384/10 492 <b>16-24</b> 1984/2246	<u>3+ partners</u> 6 13	2 6	Younger age ↑ Single/divorced/ widowed/ cohabiting ↑ High social class ↑ Early sex debut ↑	The multiple logistic regression model adjusted for age, marital status, social class and age at first sex. Association of social class was stronger and marital status weaker for women than for men.
<b>Castilla et al.</b> 1998 Spain	FTF+SAQ 81	1996	<b>15+</b> 3573/4528	<u>2+ partners</u> 10	3	Age20-29 vs.15-19/ > 29 ↑ Single/divorced or separated ↑ Education –	The multiple logistic regression model, with combined data for men and women, adjusted for age, sex, education, marital status, work status, size of town and rate of AIDS incidence in province of residence.
<b>Johnson et al.</b> 2001 UK	CASI 63	2000	<b>16-44</b> 4762/6399 <b>16-24</b> 1211/1433	<u>1+ new partner</u> 31 53	21 39	Younger age ↑ Single/ Cohabiting /Previously married ↑	Frequency distribution, with similar pattern for men and women. The proportion of new partners in the past year declined by older age. The mean number of new partners in the past year was higher for cohabiting previously married and singles compared to married. <b>Time trend:</b> There was a statistically significant increase in the concurrent partnerships, past year, between the surveys of 1990 (details in previous reference) and 2000. The increase was stronger for women.
<b>Herlitz &amp; Ramstedt</b> 2005 Sweden	SAQ 56	1989- 2003	<b>16-44</b> 1112-1494/1362- 2028  Combin ed years <b>16-44</b> /6091/7671 <b>18-19</b> /1180/1586 <b>20-24</b> /1267/1604	<u>3+ partners</u> 10 23 22	7 19 15	Younger age ↑ Singles with regular partners/singes without regular partner ↑ Education –	The multiple logistic regression model, with combined data for men and women, adjusted for age, relationship status, education, residence and year of survey. <b>Time trend:</b> Significant increase in the 3+ partners for those 16-44 between the 1989 survey and the 2000 and 2003 surveys for men and women (stronger for women), however the difference was smaller in the latter.
<b>Klavs et al.</b> 2009 Slovenia	FTF+SAQ 67	1999- 2001	<b>18-49</b> 840/855 <b>18-24</b> 192/182	<u>3 + partners</u> 10 20	2 7		The mean number of new heterosexual partners past year increased among those previously married and singles compared to cohabiting or married. The pattern was stronger for men than for women.

Reports, selected						
<b>Lõhmus et al.</b> 2003 Estonia	SAQ 41	2003	<b>19-24</b> 602/822 <b>25-29</b> 408/595	<u>2+ partners</u> 46    29 27    18		NA
<b>Contexte de la sexualité en</b> France, 2007	CATI 75	2006	<b>18-69</b> 5540/6824 <b>18-24</b> 887/985	<u>2+ partners</u> 7    13 27-32    20-22		NA
Books, selected						
<b>Hubert et al.</b> (edit), 1998 London	FTF+SAQ CATI NA	1989- 1993	<b>15-49</b> 859-15 027 total men & women	<u>2+ partners</u> 11-34    2-18		Younger age ↑ Cohabiting ↑ High education ↑
<i>11 European countries *</i>						
<b>Haavio-Mannila &amp; Kontula</b> 2001, Finland	SAQ 46	1999	<b>18-54</b> 465/477	<u>2+ partners</u> 30    23		NA
USA, selected peer reviewed						
<b>Finer et al.</b> 1999 USA (GSS)	FTF+SAQ NA	1988 1994 1996	<b>18-44</b> 1372 -2992 / year total men & women	<u>3+ partners</u> 14    5		Younger age ↑ Never married /formerly married/cohabiting ↑ Low education (women)↑
<b>Mosher et al.</b> 2005 USA	ACASI 78	2002	<b>15-44</b> 4928/7643  <b>20-24</b>	<u>3+ partners</u> 10    7 19    12		Age 20-24 vs. other ages ↑ Never married /formerly married/cohabiting ↑ Low education (women)↑

FTF = Face to face interview, SAQ = Self-administered questionnaire, CATI = Computer assisted telephone interview, CASI = Computer assisted self interviewing, ACASI = Audio assisted CASI  
GSS = General Social Survey. NA = Not applicable, ↑ = Statistically significant positive association, - = No association.

\* = Belgium, Finland, France, Germany, Great Britain, Netherlands, Norway, Portugal, Scotland, Spain, Switzerland

*Condom use*

Table 3 summarises the results from cross-sectional surveys of the general population on unprotected intercourse. Condom use or unprotected intercourse has been studied far more extensively than any other sexual behaviour over the past decades, with great heterogeneity in the indicators used by different studies. The first sex studies applied an indicator of “ever-use of condom”, whereas “condom use or non-use of condom in the last sexual intercourse” or “over the past month” have been applied by most studies.

Comparable population-based surveys among men that allow a **comparison over time** have been reported from Switzerland, Sweden, Britain, France and Finland (Table 3). Although somewhat different indicators were used, four out of five studies found an increasing trend in condom use in the 1990s (Duboois-Arber et al. 1997; Johnson et al. 2001; Haavio-Mannila and Kontula 2001, pp. 543–544; Gremy and Beltzer 2004; Cassell et al. 2006), particularly among the younger generations (Herlizt and Steel 2000; Cassell et al. 2006). In Britain findings among the general population as well as among those at risk (who also reported multiple partners during the past year) consistently showed an increasing trend of condom use between 1990 and 2000 (Johnson et al. 2001). Similarly in France condom use, recorded as use during the past year, increased significantly from 1992 to 1998, but declined significantly between 1998 and 2001 (Gremy and Beltzer 2004). In Finland prevalence data on men’s condom use is extremely limited. Population-based surveys by Kontula and Haavio-Mannila (2001, pp. 543–544) suggest that condom use (non-adjusted proportion of condom use as a current contraception method) decreased between 1992 and 1999, however this should be interpreted cautiously in the context of our study due to differences in question design and response rate.

Women tended to report lower prevalences of condom use than men, independent of the indicator used, in all of the reviewed studies (Table 3). This **discrepancy between sexes** in reporting condom use is universal and has most often been explained by sampling or reporting bias (see method section). The earlier set of studies found that the level among women in reporting “ever use of condom” was 5–20% lower than among men. However, the lowest differences between sexes were found in countries where lifetime experience of condom use had been the highest, such as the Netherlands, Switzerland and Great Britain. This observation may stem from the overall high prevalence of condom use or from the fact that condoms have served as an important family planning method in these countries, both of which may have increased positive attitudes and facilitated reporting condom use in general (Hubert et al. 1998, p. 271). Recent studies have shown a tendency for narrower differences in the levels of condom use for men and women, for those of reproductive age but not necessarily for those aged under 25, compared to the data from studies some ten years earlier (Bajos et al. 1992; Dubois-Arber et al. 1997; Bankole et al. 1999; Herlizt and Steel 2000; Johnson et al. 2001;

Haavio-Mannila and Kontula 2001, pp. 543-544; Cremy and Beltzer 2004; Klavs et al. 2006; Anderson et al. 2006; Cassell et al. 2008).

The European-wide **cross-national analysis** of sexual behaviour by Hubert et al. (1998) reported that the indicators used to assess condom use differed greatly in the 11 countries included in the study (Table 3). The most common indicator at that time was “ever-use of condom”, and among those aged 18–49 its prevalence ranged from 45–90%. The prevalence of condom use (either use in the latest intercourse or during the past month) reported by five more recent European and US-based studies among men of reproductive age ranged from 24 to 30% (Herlitz and Steel 2000; Johnson et al. 2001; Cremy and Beltzer 2004; Klavs et al. 2006; Anderson et al. 2006). The evidence from Estonia in 2003 suggests a rather similar level of condom use as was found in the other comparable European studies and in a Estonian randomised population-based study restricted to Tartu county in 2005, which found 34% of men aged 18–35 reporting condom use in last sexual intercourse (not shown in the table) (Löhmus et al. 2003; Usküla et al. 2008).

In regard to the **sociodemographic determinants** of condom use, age was an important determinant for condom use in all of the reviewed studies, independent of whether they were conducted in early 1990s or later from 2000 on (Table 3). Condom use was most common among the youngest age group, decreasing gradually by growing age as relationships became more established (Bajos et al. 1992; Dubois-Arber et al. 1997; Bankole et al. 1999; Herlitz and Steel 2000; Johnson et al. 2001; Haavio-Mannila and Kontula 2001, pp. 543–545; Cremy and Beltzer 2004; Klavs et al. 2006; Anderson et al. 2006; Cassell et al. 2006).

Another determinant for condom use was marital - or relationship status. Condoms were used consistently more frequently by singles compared to those cohabiting or married (Bajos et al. 1992; Dubois-Arber et al. 1997; Bankole et al. 1999; Herlitz and Steel 2000; Johnson et al. 2001; Haavio-Mannila and Kontula 2001, p. 546; Cremy and Beltzer 2004; Klavs et al. 2006; Anderson et al. 2006; Cassell et al. 2006). This association remained strong after adjustment for age, which is a strong modifier of marital or relationship status (Bajos et al. 1997; Dubois-Arber et al. 1997; Herlitz and Steel 2000; Gremy et al. 2004; Cassell et al. 2006; Anderson et al. 2006). Some conclusions could be drawn from the reviewed literature of marital status being a stronger correlate with condom use for men than for women (Wellings et al. 1994; Bajos et al. 1997; Gremy and Beltzer 2004).

The correlation of education with condom use was not as consistently reported as the correlation with age and relationship status. In the early comparative analysis, the trend in seven out of nine European countries was one of higher prevalence of use with increasing education (Hubert et al. 1998, p. 276). Thereafter, results have not been equally consistent. A study from France in 1992 did not find a significant correlation between condom use and educational level (Bajos et al. 1997). Yet another French study that merged data from 1992–2001 found a positive association between high school education and condom use (Gremy and Beltzer

2004). Evidence of a positive correlation between condom use and educational level has also been reported in the United States (Bankole et al. 1999; Andersson et al. 2006). The latter study presented a stratified analysis by relationship type and made an interesting finding: a correlation between educational level and condom use was significant in a casual relationship, but not in an ongoing relationship (Anderson et al. 2006). In Sweden, with a relatively similar social structure compared to Finland, condom use did not vary by educational groups (Herlizt and Steel 2000). In contrast, use of contraceptive pill and educational attainment has been shown over and over again to be positively correlated (Wellings et al. 1994; Krings et al. 2008).

Other important, strong and consistent correlates with condom use are **the number and type of sex partners and the duration of the relationship**. Condom use has been shown to increase markedly with increasing number of partners. It also increases with the incidence of having a new/non-regular or an occasional partner than with a regular partner independent of the marital status, and decreases with increasing duration of the relationship (Bajos et al. 1997; Haavio-Mannila and Kontula 2001, p. 334; Gremy and Beltzer 2004; Klavs et al. 2006). Cassell et al. (2006) showed that the rate of condom use during last sexual intercourse appeared to fall markedly, quickly reaching a plateau at 6 months after the relationship formation. While this indicates that those with a higher risk of STI transmission are more frequent condom users, a thorough study conducted in Great Britain found that only less than half of those with multiple partners in the previous 4 weeks reported condom use on all occasions (Cassell et al. 2006). Such a high rate of inconsistency in condom use may suggest that the inconsistent condom users who report high numbers of sexual partners may form a pool of people who contribute significantly to the sustaining numbers of STI infections. However, population-based survey data is not ideally suited to describing small groups with high-risk sexual behaviour (Cassell et al. 2006). The observed combination of the potentially high impact of risk groups with regard to STI epidemics with their irregular practice of safe sex warrants further research.

Based on the reviewed literature, it can be concluded that: differences in reported numbers of sex partners and condom use between men and women of reproductive age are narrowing; and the increase observed in the 1990s in the number of sex partners has been levelling off in the first years of 2000s with even some indication of a decline observed in a few countries. Relative to age and education marital or relationship status turned out to be the most important sociodemographic determinant for multiple sex partners and condom use, with age also being an important determinant for condom use; however educational attainment as an indicator for risk on sexual behaviour was more inconsistent. Particularly the power of education to differentiate those who have multiple sex partners has been lessening over the past decades, occurring earlier for men than for women.



TABLE 3. Review of European and selected American general-population based surveys, on condom use, among men and women in 1990–2008: description of the survey and main results

Reference / Country	Design / Response rate	Survey Year	Age Men n / Women n	Men %	Women %	Associations	Observations
Europe, peer reviewed							
<b>Bajos et al.</b> 1997 France	CATI NA	1992	<b>18-69</b> 1508/1376	Condom use, last intercourse 24	15	Younger age ↑ Single ↑ New /occasional partner ↑ Education –	Multiple logistic regression model adjusted for age, marital status, age difference between partners, partner type, partner HIV-tested, partner has other partners, length of the relationship and feelings for partners. For women the likelihood of condom use increased additionally if partner had other partners, but the effect of marital status and unknown partners' HIV-test status were non-significant). Only those in a relationship less than five years were included in the analysis.
<b>Dubois-Arber et al.</b> 1997 Switzerland	CATI 88	1994	<b>17-45</b> 2800 men & women	Condom use, last intercourse 39	21	NA	<u>Time trend:</u> Prevalence of condom use (men and women analysed together) was statistically significantly lower in 1991 compared to 1994. Non-adjusted.
<b>Herlitz &amp; Steel</b> 2000 Sweden	SAQ 71 64	1987 1997	<b>16-44</b> 1421/1457 1138/1389	Condom use min. once, past month 24 26	19 20	Men ↑ Younger age ↑ Single without a regular partner ↑ Education –	Multiple logistic regression model, with combined data for men and women, adjusted using backward stepwise input of mentioned variables. <u>Time trend:</u> Condom use (men and women together) in the past month increased from 1987 to 1997 in age groups 16-17, 18-19 and 20-24 and among singles with and without a regular partner. The overall change was similar for men and women. Model used backward stepwise input of above mentioned variables.
<b>Johnson et al.</b> 2001 UK	CASI 63 65	1990 2000	<b>16-44</b> 6000/7765 4762/6399	Condom use always, past month 18 24	15 18	See Cassel et al.	<u>Time trend:</u> Condom use increased significantly between 1990 and 2000 for those who reported two or more partners over the same time period and for all, among men. The overall change was similar for men and women. Model adjusted for age.
<b>Gremy and Beltzer</b> 2004 France	CATI 75	1992 1994 1998 2001 Comb.	<b>18-54</b> 644/737 481/608 787/800 1284/1685 3196/3830	Condom use, past year 29	26	Younger age ↑ Single/cohabiting ↑ Completed high school ↑	Multiple logistic regressions, with combined data, model adjusted for age, marital status, multiple partners, know at least one PWH, HIV-test in the past year, year of survey. For women condom use increased additionally among those who had HIV-test in the past year, but not among those cohabiting. <u>Time trend:</u> Condom use increased significantly between 1992 and 1998 and decreased between 1998 and 2001. Model adjusted as mentioned above and additionally for year of survey. The overall change was similar for men and women.
<b>Klavs et al.</b> 2006 Slovenia	FTF+SAQ 67	1999- 2001	<b>18-49</b> 782/847 <b>18-24</b> 275/274 <b>25-34</b> 189/210	Condom use always, past month 28 13	14 12	Younger age ↑ Not married or cohabiting ↑ Completed high school ↑	Multiple logistic regression model adjusted for age, condom use at first sexual intercourse, relationship status, use of OC part year and attitude towards condoms. Trend of associations was similar for women.

Table continues

<b>Cassell et al.</b>	FTF+CASI		<b>16-44</b>	Condom use, last intercourse	Younger age ↑ Single ↑	Multiple logistic regression model adjusted for age, ethnicity, religion and marital status. <b>Time trend:</b> Condom use increased significantly in all age groups (16-24, 25-34 and 35-44) from 1990 to 2000, but was most striking in individuals aged 16-24, similarly among men and women. Model adjusted as mentioned above.
2006	63	1990	5013/6574			
UK	65	2000	4016/5499	29 23	Non-white ↑ Non-Christian ↑	
		1990	1094/1473			
		2000	930/1122	52 37		
<b>Reports, selected</b>						
<b>Lõhmus et al.</b>	SAQ		<b>19-24</b>	Condom use, last intercourse	NA	Numbers relate to stratified frequencies by steady, one night and short term partner
2003	41	2003	602/822	29-60		
Estonia			<b>25-29</b>	21-60		
			408/595			
<b>Books, selected</b>						
<b>Wellings et al.</b>	FTF+SAQ	1990-	<b>16-59</b>	see Johnson et al.		
UK	63	1991	8384/	2001		
1994			10 492			
<b>Haavio-Mannila &amp; Kontula</b>	SAQ		<b>18-54</b>	Contraception, last intercourse	NA	<b>Time trend:</b> Frequency of condom use was lower in all age groups in 1999 compared to 1992. Non-adjusted.
2003	76	1992	790/763	40 28		
Finland	46	1999	<b>18-54</b>	27 22		
	59	1996	465/477			
<i>Finland</i>		2000	<b>18-54</b>	22 29		
<i>Sweden</i>	41	1996	1079/986	26 12		
<i>Estonia</i>		1996	<b>18-54</b>	32 23		
<i>St. Petersburg</i>	61	St.Pet.	252/417			
			490/697			
<b>USA, selected peer reviewed</b>						
<b>Bankole et al.</b>	CASI		<b>15-44</b>	Condom use, last intercourse	Younger age ↑ Formerly married /never married ↑	Multiple logistic regression model adjusted for age, marital status, race, education, religion, income, preference for children and no or sex partners in the past 3 months. <b>Time trend:</b> There was a significant increase in condom use among women between 1988 and 1995.
1999	80	1988	8450			
USA		1995	10 847	NA 13	Higher education ↑ Higher income ↑	
(NSFG)		NSFG		17		
<b>Anderson et al.</b>	ACASI		<b>15-44</b>	Condo m use, last intercourse	Men ↑ Age 18-25 ↑ Unmarried ↑ Education ↑*	Frequency distribution. *The prevalence of condom use in casual relationship increased statistically significantly by education, but not in an ongoing relationship. Similar trend was found for women.
2006	79	2002	12 571	31 25		
USA			Combined			

FTF = Face to face interview, SAQ = Self-administered questionnaire, CATI = Computer assisted telephone interview, CASI = Computer assisted self interviewing, CAPI = Computer assisted personal interview, ACASI = Audio assisted CASI. NSFG = National Survey of Family Growth. NA = Not applicable, ↑ = Statistically significant positive association, - = No association

## 4.2 Sexual behaviour and substance use

Table 4 presents a review from cross-sectional general-population surveys on the association of sexual risk behaviour with substance use. In the reviewed studies, sexual risk behaviour (as a dependent variable) was measured mostly using data on multiple partners and unprotected intercourse. The most common substance use indicators were alcohol and drug consumption; far fewer studies existed on smoking and sexual behaviour. In general, sexual health studies rely on alcohol use indicators developed to monitor the alcohol/drug consumption patterns of the general public. A minimum set generally includes indicators of a “usual” frequency of drinking, the “usual” quantity of alcohol intake i.e. frequency of drunkenness and/or heavy drinking, as assessed subjectively by the respondents. Different combinations of these indicators were used in the studies reviewed.

The first large British sexuality survey in 1990 found that higher amounts of alcohol use decreased and smoking increased the likelihood of condom use (Wellings et al. 1994, pp. 373–378). Also Haavio-Mannila and Kontula (2001, pp. 125, 465) in their survey of sexual lifestyles in 1992 and 1999 found that frequency of drunkenness increased the likelihood of engagement with multiple partners in Finland (Table 4). Another interesting observation in this study was the increasing trend in the proportion of those who reported having consumed alcohol before having sex among men and women in all age groups (18–54) from 1992 to 1999 (Haavio-Mannila and Kontula 2001, p. 216).

Although both substance use and STIs, separately, represent highly important public health priorities, only two European population-based reports focusing on sexual risk behaviour and substance use were found. A thorough study has been reported from Spain (Castilla et al. 1999), which found that the amount of alcohol use per day as well as the frequency of drunkenness both had a positive dose response relationship with number of sex partners (Table 4). However, the association of alcohol use with unprotected intercourse was less consistent compared to its association with multiple sex partners. A stratified analysis of casual and regular sexual partners revealed that daily excessive use of alcohol, but not drunkenness, was positively linked with the practice of unprotected intercourse with casual partners (Castilla et al. 1999). Castilla et al. (1999) also reported a positive correlation for drug use; with especially cannabis, cocaine and ecstasy being associated with the practice of unprotected intercourse and sexual activity with multiple partners.

In contrast to the Spanish study, a French study that used a somewhat different methodology (non-controlled, stratified analysis for those in an at-risk vs. not at-risk situation) found that drinking alcohol before having sex correlated with the likelihood of being in an at-risk situation, but drug/alcohol intake and actual unsafe sex were not correlated. The authors suggested that alcohol may function as a different risk marker in the French population than it does in other populations (Messiah et al. 1998).

A more recent cross-national study from nine European cities was based on an opportunistic sample (and therefore not included in Table 4) of 16 to 34 years old male and female clients in pubs, bars and nightclubs. This study found that the observed positive correlation between drunkenness and multiple partners was stronger than that between drunkenness and unprotected intercourse (Bellis et al. 2008). Cannabis, cocaine and ecstasy use was associated with having had multiple sexual partners in the past 12 months, sex without contraception and regretted sex after alcohol or drug use. The exchange of sex for drugs was strongly linked to regular cocaine and ecstasy use.

Another non-population based case-control study in an STI clinic (not included in Table 4) in the UK concluded that the attendees of the STI clinic were binge drinking significantly more than the age-matched comparison cohort (Standerwick et al. 2007). There was a positive correlation between the number of sexual partners and frequency of drinking days, weekly intake and binge drinking for women and between binge drinking and overall weekly intake for men. Men who engaged in unprotected sex had higher daily alcohol intake than those who did not. Patients with an STI diagnosis drank 40% more on a weekly bases than those without an STI. (Based on a consecutive sample of those attending genitourinary medicine and a random sample of matched peers of those who had drunk alcohol in the seven days prior to the survey drawn from General Household Survey data) (Standerwick et al. 2007).

In the North American scientific literature the link between sexual health and substance use has been studied in far greater detail than in Europe. Thompson et al. (2005) analysed a large sample of military personnel and found similar results to those from Europe. They also found an inconsistency in the association of drunkenness and condom use in the stratified analysis for different partner types and by gender. Although there is some variation in the results obtained, several earlier reviews of studies from the United States (not shown in the table) examining the association between substance use and sexual risk behaviour concluded that alcohol and drug use and also smoking appeared to be linked to sexual risk behaviour (unprotected intercourse and multiple partners), but that the relationship is complex (Bolton et al. 1992; Leight and Stall 1993; Fortenberry 1995; Harper-Felsher et al. 1996; Weinhardt and Carey 2000; Cook 2005). A major limitation of the global association studies is their failure to provide information on the degree to which substance use and sexual behaviour co-occur on the same occasion and thus they cannot demonstrate the causal effect of substance use on sexual behaviour (Leight and Stall 1993; Harper-Felsher et al. 1996).

The deficiency in the global association studies of not being able to detect causal relationships led researchers to apply situational association studies, which intend to define whether alcohol or drugs have been consumed proximal to the act of sexual intercourse. In keeping with the global association studies, these studies have also found a positive relationship between risky sexual behaviour and alcohol

use (Leight and Stall 1993; Gordon et al. 1997; Fromme et al. 1999; Weinhardt and Carey 2000).

Dissatisfaction with the global association and situational analysis methods then led researchers to apply a more rigorous approach, i.e. event-level research where more detailed information is gathered regarding specific sexual events during which a substance is consumed (Leight and Stall 1993; Harper-Felsher et al. 1996; Weinhardt and Carey 2000). Weinhardt and Carey (2000) conducted a review of 30 event-level studies in the United States in 2000 and found inconsistent support for the hypothesis that alcohol use increases the likelihood of engaging in risky sex. A later meta-analysis and reviews drew similar conclusions, suggesting that the relationship between alcohol use and unprotected intercourse depends on the context and sexual experience of the partners (Leigh 2002; Cooper 2006).

### *Theories to explain the relation of sexual behaviour and substance use*

Several theories have been suggested to explain the relation of substance use and risky sex, both individual and context based. Alcohol myopia used to be the most commonly referred theory, which states that alcohol or substance use impairs cognitive processes, including the ability to make clear judgements and decisions, thus increasing the probability of risk behaviours (Leigh and Stall 1993; Castilla et al. 1999; Cooper 2006). According to a third-variable theory, alcohol use and risk-taking sexual behaviour may both be indicators of a risk-taking or sensation-seeking personality type, an underlying common cause for both behaviours (Leight and Stall 1993; Cooper 2006). This theory has been supported by various longitudinal studies among adolescents that have indicated that substance use (alcohol, tobacco and illicit drugs) appears to be an early indicator of sexual risk (early sexual debut, low condom use, multiple sexual partners) 2–14 years later (Parkes et al. 2007). An individual may also drink and have risky sex as part of a lifestyle, such as being single or adolescent. Among singles, the social environment of drinking may overlap with an environment that facilitates meeting potential casual sexual partners (Läuchli et al. 1996). In these environments, particular substances may be used to enhance sexual pleasure or facilitate sexual encounter by lowering sexual inhibitions (Myers et al. 2004; Sumnall et al. 2007).

TABLE 4. Review of European and selected American general-population based surveys, on substance use and sexual behaviour, among men and women in 1990–2008: description of the survey and main results

Reference / Country	Design / Response rate	Survey Year	Age Men n / Women n	Associations	Observations
Europe, peer reviewed					
Castilla et al. 1999 Spain	FTF+SAQ 65	1996	18-39 2395/2858	<b>Multiple partners, past year</b> - Increased amount of alcohol use (ml) ↑ - Increased frequency of drunkenness ↑ - Ecstasy ↑ <b>Failure to use condom regularly, past year</b> - Increased amount of alcohol use (ml) (with casual partners only) ↑ - Cannabis, cocaine, ecstasy ↑	Model with alcohol adjusted for age, gender, education, marital status, drug use and no. of partners in the past 12 months. Model with drugs adjusted for gender, age, education and marital status and no. of partners in past 12 months.
Messiah et al. 1998 France	CATI 93	1991- 1992	18-69 2642/2178	<b>At risk for STIs</b> - To have consumed alcohol just before sexual intercourse ↑ <b>Unsafe sex in last sexual intercourse</b> - No significant difference in alcohol or drug use between the groups	Difference in frequencies compared between groups. At risk for STIs (at least one; of having had several partners during the past years, partners having had other partners the same year, first intercourse with new partner) vs. not at risk. Unsafe sex in last intercourse (unprotected last intercourse Similar pattern was found for men and women) vs. not unsafe sex. The results hold when controlled for socio-geographic factors in a logistic regression model.
Books and Reports, selected					
Wellings et al. 1994 UK	65 SAQ	1990	16-59 8384/ 10 492	<b>Condom use</b> - increasing amount of alcohol ↓ - Smoking ↑	Among women only moderate or high alcohol use (vs. low, moderate or high among men) decreased the likelihood of condom use. The model adjusted for age, marital status, partner type, smoking, alcohol use and last sex < 5 years ago.
Haavio-Mannila & Kontula 2001 Finland	SAQ 76 46	1992 1999	18-54 790/763 18-54 465/477	<b>Multiple lifetime-partners</b> - Increased frequency of drunkenness ↑	Difference in frequencies compared between groups of drunk weekly vs. never been drunk during lifetime. (Multiple classification analysis controlled for age, relationship type, gender, length of the relationship, age at first intercourse, sexual desire, own opinion of one's sexual skills, years of education, importance of religion, frequency of drinking to intoxication, study ears)
USA, selected peer reviewed					
Graves et al. 1995 USA	FTF + SAQ 83	1990	18-30 974 women and men	<b>Multiple partners, past year</b> - Increased frequency of alcohol use ↑ - Increased heavy drinking ↑ - Smoking ↑ - Marijuana ↑ <b>Condom use, past year</b> - Heavy drinking ↓	Model adjusted for gender, age and marital status. Independent associations of sexual activity remained with all of the substance use indicators, of multiple partners with heavy drinking and marijuana use, and of condom use in the past year with heavy drinking only, when adjusted additionally for the substance use variables.
Thompson et al. 2005 USA	SAQ 59	1998	18-46+ 13 296 / 3968	<b>Multiple partners, past year</b> - Increased frequency of drunkenness ↑ <b>Condom use, every time past year</b> - Very frequent episodes of drunkenness (with one time partner) ↓	This association demonstrated a dose response relationship in both men and women (separate analysis), being stronger for women than men. The association of condom use with one time sex partners and drunkenness found for men but not for women. The model controlled for age, race, marital status, education and number of sexual partners.

FTF = Face to face interview, SAQ = Self-administered questionnaire, CATI = Computer assisted telephone interview, CASI = Computer assisted self interviewing, ACASI = Audio assisted CASI. NA = Not applicable, ↑ = Statistically significant positive association, ↓ = Statistically significant negative association, - = No association

### 4.3 Major conclusions of the literature review

The literature review demonstrated the scarcity of peer reviewed reports on sexual risk behaviour in the general population as well as the wide differences in selection of indicators and their reference periods, which limits the cross-country comparisons of behaviours in Europe. The number of internationally reported studies from 2000 onwards is less compared to the 1990s, and from Eastern Europe they are almost non-existent.

In Finland, several extensive general health behaviour surveys among the adult population have been conducted since the late 1960s, including coverage of contraceptive practices among women. However, men's sexual health and risk behaviour has not been included in any of these studies.

While standardised comparative research between Finland and Estonia has addressed health compromising behaviours such as substance use and dietary patterns and their sociodemographic determinants (Helasoja et al. 2006; 2007), there is a dearth of research on sexual risk behaviour that would aim in furthering understanding the distribution of STIs and other sexual health hazards within and between the two countries.

Substance use, particularly alcohol consumption, is one of the most important risk factors for the health of young people in western societies. Internationally substance use has been associated with sexual risk behaviour; however peer reviewed reports concerning these two risk behaviours among adult population in Finland or Estonia are absent and scarce even from other European countries.

## 5 AIMS OF THE STUDY

This study aims to provide evidence on sexual risk behaviour, self-reported STIs and their patterns by sociodemographic factors as well as associations with substance use among young men in Finland and Estonia.

The specific aims were:

- 1) To compare men and women for differences in the prevalence and sociodemographic patterning of sexual risk- (multiple sexual partners, casual partners) and protective behaviour (condom use, contraception) as well as for self-reported STIs in Finland among young adults aged 18–29 years.
- 2) To describe temporal trends in sexual behaviour (age at first sexual intercourse, number of sexual partners, and unprotected intercourse, HIV-testing) from 1998 to 2005, among young men aged 18–25 in Finland.
- 3) To assess the sociodemographic patterning of sexual risk behaviour (multiple partners and unprotected intercourse) and self-reported STIs among young men aged 18–25 years, with the main focus on a comparison of patterns of associations found within Finland and Estonia, including Estonians of Russian ethnic origin.
- 4) To study the association of substance use (alcohol and drug use and smoking) and sexual risk behaviour among young men within Finland and Estonia.



## 6 MATERIALS AND METHODS

This study used data from three different cross-sectional population-based surveys in Finland and Estonia conducted during the period 1998–2005; Health 2000 -survey (general health survey) and Military health -surveys (health behaviour survey) in Finland, and the Estonian HIV/AIDS -survey (KAP survey). This thesis research was conducted as part of a REFER-research consortium (Reproductive health, fertility patterns and family formation in Russia), and in collaboration with the research division of the Finnish Defence Forces, as well as with the Estonian National Institute for Health Development. The collaboration enabled to use previously collected survey data on sexual behaviour and -health (Health 2000 study and Military health behaviour survey) and to incorporate similar survey questions to the extent possible in the Estonian survey. This participatory process included the establishment of networks, the preparation of the survey instrument and the analysis and reporting of the data.

Characteristics of the data, study populations and dependent and independent variables by substudy are summarised in Tables 5–7.

TABLE 5. Description of the data sources

Name and origin of data	Type of data	Sample frame	Sample	Year	Corresponding substudy
Health 2000, Finland	Cross-sectional general health survey	The whole Finnish population aged 18 and over	8028 Total 4391 Women 3637 Men	2000	I
Military health behavioural survey, Finland	Cross-sectional health behaviour survey	Approximately 85% of all men of the age cohort 18–29 years	10631 Men	1998–2005	II, III, IV
HIV/AIDS survey, Estonia	Cross-sectional KAP-survey	The whole Estonian population aged 10–29	7617 Total 4274 Women 3343 Men	2005	III, IV

KAP = Knowledge, Attitudes, Practises

TABLE 6. Data used in the original substudies I-IV

Substudy	Data	Country	Year	Age range	Study population	Response rate	Focus
I	Health 2000 Survey	Finland	2000	18–29	738 Women 765 Men 680 Women 602 Men	79% (FTF) 68% (SAQ)	Sexual behaviour, comparison of men and women, Finland
II	Military health behavioural survey	Finland	1998–2005	18–25	10 446 Men	> 95% (of the 85% who enter the military training)	Sexual risk behaviour - time trend 1998-2005, sexual risk behaviour and substance use, Finland
III	Military health behavioural survey	Finland	2005	18–25	1765 Men	> 95%	Sexual risk behaviour and sociodemographic determinants, within Finland and Estonia
	HIV/AIDS survey	Estonia	2005	19–25	748 Men	43%	
IV	Military health behavioural survey	Finland	2005	18–25	1765 Men	> 95%	Sexual risk behaviour and substance use, within Finland and Estonia
	HIV/AIDS survey	Estonia	2005	19–25	748 Men	43%	

FTF =face-to-face interview, SAQ=self-administered questionnaire

## 6.1 Data sources and data collection

### *Health 2000 survey, Finland*

The Health 2000 survey was a large-scale general health survey designed to obtain up-to-date information on the most important public health problems in the country. The survey covered men and women aged 18 and over in Finland and was carried out by the National Public Health Institute (KTL 2008b).

Stratified two-stage cluster sampling was used covering people living in mainland Finland. The sampling frame was regionally stratified according to the five university hospital regions from which 16 health care districts were sampled as clusters, resulting in 80 primary sampling units, including 160 municipalities across the country. The ultimate sampling units were persons who were selected by systematic sampling from the primary sampling units so that the total number of persons drawn from a university hospital region was proportional to the corresponding population size within each university hospital region.

The fieldwork was carried out between March and July 2001. The survey comprised three parts: 1) study of persons aged 30 and over, 2) a follow-up survey of persons who had participated in the previous health examination survey and 3) the study of young adults (persons aged 18–29 years). The instruments and data collection process were tested in two pilot studies and all of the involved staff members attended a three-week training course. Prior to and during the fieldwork, an extensive information campaign was launched through local media. Study

participants were first contacted by means of an information letter followed by a phone call to agree on a schedule for the interview. If the phone number was not available, an interview appointment was proposed by a second letter and confirmed by a return call. The participants who were not reached as scheduled were interviewed by phone, while those that were not reached at all at that point, were sent a final request letter.

Reproductive health topics were surveyed by a personal interview (at the participant's home) and by a self-administered questionnaire which was returned by mail. The computer-assisted interview (CAPI) included questions on 11 health themes. With regard to reproductive health, the interview included questions on contraception and condom use as well as abortion. Most of the more delicate reproductive health-related questions, such as casual partners and intercourse activity were included in the self-administered questionnaire, which incorporated 114 questions.

The sampling frame comprised 10 000 persons aged 18 or over of whom 1894 were young adults (men and women) aged 18–29, of which 1503 participated in the interview and 1282 returned the self-administered questionnaire, forming the sub-sample used in this study (Tables 5-6). A detailed description of the sampling, materials and methods as well as the survey questionnaires can be found at [www.ktl.fi/terveys2000](http://www.ktl.fi/terveys2000).

### *Military health survey, Finland*

The Military health survey is an annually conducted survey designed to follow-up the health, behaviour and lifestyles of military conscripts in Finland. The survey has been conducted each year since 1968 and in its current form since 1996, including questions related to substance use, sexual behaviour, use of health services and medication, common diseases, injuries, accidents and vaccination.

Some 85% of all men in Finland enter the mandatory military service. The majority of young men enter the service at the age of 18–19 years (those who enter at age over 25 years are less than 1%), education being the most important determinant for the age at entrance to the service. The Finnish Defence Forces (FDF) is divided geographically into military units (brigades). Since 1968, a nationally representative number of brigades, 10–12, (geographical location, large number of conscripts, no special or pre-selected troops) have taken a structured health and lifestyle survey. In each study brigade survey participants were selected by selecting 100 or 120 persons born January to May for the 1998–1999 surveys, or, since 2000, every 4<sup>th</sup> to 5<sup>th</sup> person entering the routine medical examination procedure.

The survey was administered during the first two weeks of entry to the service, thus increasing the pool of participants as only a few men had discontinued their service by that time. The local medical officers and nurses in each study brigade

were informed about the study protocol by the staff of the FDF health care division. Selected conscripts independently completed a self-administered anonymous questionnaire in a classroom environment under the surveillance of the military staff, and enclosed them into envelopes to be mailed to the FDF. The questionnaires were optically readable. The questions on sexual behaviour and health, most of which had been used in previous lifestyle surveys, were integrated with general health and lifestyle questions and were repeated unchanged in surveys conducted after 1998 (Haavio-Mannila and Kontula 2001, pp. 586–587).

The sample size varied from 857 to 1 879 during the period 1998–2005. This study used data collected on men aged 18–25 in the surveys from the period 1998 to 2005 (Tables 5–6).

### *HIV/AIDS-KAP survey, Estonia*

The Estonian HIV-KAP (knowledge, attitude and practice) survey was conducted in 2003 and 2005 to gather an overview of HIV/AIDS-related knowledge, attitudes, and sexual risk behaviour and lifestyles of young people (Lõhmus and Trummel 2005). The 2005 questionnaire included questions related to knowledge of and attitudes towards HIV and AIDS, sexual relationships, condom use, contraception use, substance use and infections related to sexual health.

Field work was carried out between March and June of 2005. The survey comprised two parts: A study of pupils aged 10–18 years and a study of young adults aged 19–29. In assuring a representative sample, Estonia was divided into 3 regions (Harjumaa, Ida-Virumaa and the rest of Estonia). In every region, the population of those aged 19–29, both men and women, was divided into two groups, one for those aged 19–24 and the other for those aged 25–29, resulting in 6 groups from which a random sample was drawn using the National Population Register. To ensure a large enough sample, the response rates of the first survey in 2003 in different regions were taken into account (Lõhmus et al. 2003).

The selected participants received a self-administered questionnaire including a description of the survey by mail. The questionnaire was anonymous and it was requested that it be returned by mail. To enhance the response rate, a few weeks later a reminder letter was mailed to all participants. The questions used for comparison with Finland were standardised to the extent possible with the Finnish Military survey questions. The detailed questions by survey are presented in Appendix 1.

The total sampling frame comprised 13 231 participants of which 7 302 were young adults aged 19–29 years (3.4% of the population aged 19–29 in Estonia) (Table 5–6). This study used data on a sub-sample of men in the age-groups between 19–25 years (n=748). A detailed description of the sampling and other methodological details can be reviewed at [www.tai.ee](http://www.tai.ee).

## 6.2 Independent variables

The main independent variables used in this study relate to sociodemographic characteristics and substance use (Table 7). Based on the previous literature, the most used demographic factors in sexual behaviour studies are age, education, marital status or partnership status, residence and age at first sexual intercourse, while the determinants in relation to sexual behaviour and self-reported STIs with substance use are alcohol and drug use as well as smoking.

The variables used are described in the following paragraphs. Appendix 1 (as well as the Additional file 1, substudy III and web supplement 1, substudy IV), illustrates the questions used to draw out the independent variables and their detailed classifications.

TABLE 7. Independent and dependent variables included in the original substudies

Substudy	Independent sociodemographic variables	Other independent variables	Dependent variables
I	Age, Marital status, Education, Residence		Multiple partners (past year), Casual partners (past year), Consistent condom use with casual partners (past year), Contraception currently, Condom use (currently), Self-reported STI (ever), Abortion (ever)
II	Age, Marital status, Education, Residence, Age at first sexual intercourse	Frequency of alcohol use, Illegal drug use history	Multiple lifetime partners, Unprotected last intercourse, High risk sex (definition in the text), HIV-testing
III	Age, Partnership status, Education, Age at first sexual intercourse		Multiple partners (past year), Multiple lifetime partners, Unprotected last intercourse, Self-reported STI (ever)
IV		Frequency of alcohol use, Frequency of drunkenness, Illegal drug use history, Current illegal drug use, Smoking	Multiple lifetime partners, Unprotected last intercourse, Self-reported STIs (ever)

### *Sociodemographic variables*

**Age** was classified in the following groups, in substudy I (18–19, 20–24 and 25–29), and in substudy II (18, 19, 20, 21–25) and in substudy III–IV (18, 19, and 20–25).

**Education** was classified in substudy I as the level of schooling, either ongoing or completed, at the time of the study and categorised as (i) low (comprehensive, up to 9 years), (ii) middle (vocational or high school, up to 12 years) and (iii) high (university, up to 18 years). In the other substudies, education in both Finland and Estonia was measured as the total number of years of studies or educational degrees ongoing or completed. Educational attainment was categorised as (i) comprehensive ongoing or completed (up to 9 years), (ii) vocational ongoing or completed (up to 12 years), (iii) high school ongoing or completed (up to 12 years), and (iv) university or higher technical ongoing or completed (12–18 years).

**Marital status** was used in substudy I and II and categorised as (i) married, (ii) cohabiting and (iii) single. Substudies III and IV examined partnership status and dichotomised it as (i) steady and (ii) non-steady. Partnership status was measured in Finland through questions on marital status and partner type at the occurrence of last sexual intercourse and in Estonia by a direct question on partnership status.

**Residence** was included in substudy I without major significant variation in the outcomes. Thereafter residence was used only in substudy II, since it is known to correlate with the prevalence of HIV-testing, one of the dependant variables in that substudy. Residence was coded as “urban” or “rural” with a sub-categorization according to the size of the population in that locality. Substudy I used a simple classification of urban or rural and substudy II a classification (i) urban with > 100 000 population, (ii) urban with 20 000–100 000 population, (iii) urban with < 20 000 population and (iv) rural.

When **early age at first sexual intercourse** has been used as a dependent variable, it has been shown to be significantly associated with social characteristics such as low economic status of the family, large family size, unstable family environment (Mott et al. 1996), single-parent family or a reconstructed family (Godeau et al. 2008). Likewise early sexual debut, as an independent variable, has been shown to correlate with sexual risk behaviour later in life (Sanford et al. 2008). In this study the age of first sexual intercourse was used as an independent sociodemographic variable (II, III) and classified as (i) age of first sexual intercourse under 15 years; and (ii) age of first sexual intercourse over 15 years (given that the mean age at first sexual intercourse in Finland was 18.1 (1999) and in Estonia 18.3 (2000) (Haavio-Mannila and Kontula 2003, pp. 28–29).

### *Substance use variables*

Substance use is described by alcohol use, illegal drug use, and smoking and is measured with five different indicators (Table 7). The study aimed to approximate the **frequency of events of alcohol consumption** (II, IV) and the **frequency of critical amounts of alcohol intake**, i.e. the degree of ‘being drunk’ (IV). The measures were based on subjective definitions of the amount and type of alcohol as well as on the meaning of “being drunk” as indicated by the respondents. Illegal drug use was measured by **history of having tried and/or then used drugs**, as well as **current drug use** (any illegal drug). Smoking was assessed by **current habitual smoking**. The questions to capture substance use in Finland and Estonia have been used previously in other surveys (Löhmus et al. 2003).

## 6.3 Dependent variables

Indicators of sexual behaviour and self-reported STI were used as dependent variables (Table 7). Appendix 2 (as well as the Additional file 1, substudy III and web supplement 1, substudy IV), illustrates the questions used to draw out the dependent variables and their detailed classifications.

### *Sexual risk behaviour*

This study used the following specific indicators for sexual risk behaviour: **condom use** (yes/no) in the last sexual intercourse (i.e. unprotected last intercourse) (II–IV), current condom use, i.e. condom as a current method of contraception and condom use with casual partners in the past 12 months (I). The answers for the first two were dichotomised as “yes” and “no”, and for the last one as “consistent use” (used always or almost always) and “non-consistent use” (did not use at all or used occasionally).

The indicator “condom use as a current contraceptive method” (I) is a broad indicator of condom use, but it captures only the incidental present experience of use and does not provide any information on the frequency of use. When the target population is young, it is likely that non-condom/condom use at last intercourse reflects risk behaviour better than when measured among the general population, where it mainly reflects use with a stable partner with a short recall interval (II, III, IV). In this study the indicator “non-consistent condom use with casual partners” is probably the most precise indicator for risk (I).

Data on the **number of partners** was collected for two different time periods: in the past 12 months and during one’s lifetime. Number of partners in the past year was dichotomised as either; “less than two” and “two or more” (I), or “less than three” and “three or more” (II), and during one’s lifetime as “less than four” and “four or more” (II), and “less than six” or “six or more” (III, IV). The reason for such a variation in the cut-off points for this indicator was on one the hand the need to find adequate comparability with other studies and inability to influence the original question design (except in the case of some questions in the Estonian survey).

In the case of the indicator “number of partners (multiple partners)”, the choice for the best reference period to use is a trade off. When the time period is shorter, (i.e. the number of partners over the past year), the recall is more reliable, but the indicator is influenced by more seasonal variability (Catania et al. 1990; Fenton et al. 2001). On the other hand, “the number of lifetime partners” is influenced by the number of years of being sexually active (Catania et al. 1990; Fenton et al. 2001). This study used “number of lifetime partners “ mainly as an outcome indicator, since the possible recall bias was likely to have affected less the relatively young

target population (shorter recall interval), and in addition it was less situation-sensitive than the indicator “multiple partners over the past 12 months” would have been (II,III,V).

An indicator of “**high risk sex**” was composed to capture those with multiple risk factors (II). The indicator “high risk sex”, when classified as “yes”, referred to sexually active respondents who reported having had three or more partners over the past year, and not having used a condom at their last sexual intercourse (when classified as “no”, referred to those who reported having had less than three partners and used a condom in their last sexual intercourse). This indicator was created to extract those respondents who reported several risk factors and therefore were at a higher risk of obtaining an STI (Johnson et al. 2001).

Besides obtaining knowledge of testing prevalence, **HIV-testing** can be used as an indicator of risk perception. HIV-testing has been associated with sexual risk behaviours such as higher number of sex partners and also with one’s own perception of risk for HIV-infection in the general population (McGarrigle et al. 2005). The question on HIV-testing was posed only in the survey in Finland. The question did not provide details on whether it was done voluntarily or through screening either to obtain a visa (which is needed only for travelling to Russia) or in conjunction with blood or organ donation, the few occasions when men would be screened for HIV (II). HIV-testing was classified as either “tested” or “not tested” ever during one’s lifetime.

### *Self-reported STIs*

Data for the variable ‘**self-reported STI**’ was collected by questions on one’s life history of STIs based on one’s subjective knowledge of ever having had either human papillomavirus, Chlamydia or herpes infection (I) and in substudy III and IV, Chlamydia, gonorrhoea or syphilis. More, specifically the question listed a combination of sexually transmitted or other gynaecological infections, (additionally to the mentioned, also HIV or Candida), each of which was answered by “yes” or “no”.

## 6.4 Statistical methods

Unadjusted and adjusted prevalence rates and logistic regression analysis were the main methods used in presenting the descriptive statistics and analysing the associations of independent and dependent variables, respectively.

In the first level analysis, unadjusted (I) and adjusted (II, III, IV) annual and also prevalence rates by country and sex were calculated. In substudy I, unadjusted prevalence estimates were calculated for both sexes and for three age categories



for both men and women. The Wald test (Rosner 2006) was used to assess statistically significant differences in prevalences between the sexes as well as age groups for both men and women, with significance set at  $p < 0.05$ . In substudy II, which presented annual prevalence rates from 1998 to 2005, the annual data were adjusted by using the 2005 study population as a standard population. Odds ratios and 95% confidence intervals (CI) were used in the logistic regression model to assess the difference in prevalence estimates by the survey year. In substudies III and IV, country specific age-adjusted prevalence rates were calculated for Finland and Estonia using the Finnish study population as the standard population. In substudies III and IV a double sided t-test for relative proportions, with significance set at  $p < 0.05$ , was used to assess the statistically significant differences in prevalence between countries, Finland and Estonia (IV), as well as the two ethnic groups living in Estonia (III, IV) (Rosner 2006). The Estonian sample which was contrasted with the Finnish sample included also the Russian ethnic group living in Estonia, while when the Estonian ethnic group was contrasted with the Russian ethnic group, the Estonian sample consisted only of those of Estonian ethnic origin.

In the second level analysis, logistic regression models (Stata-corp. 2004, SPSS-inc. 2006) were used to analyse the patterning of socio-economic variables and lifestyle differences in behaviour and self-reported STI outcomes. All models were fitted separately for both sexes, countries and in Estonia for the Russian ethnic group. The potential explanatory or mediatory variables were added to the model a) separately, (IV) or b) in sets in a presumed causal order, (II, IV) or c) all variables were simultaneously included in the logistic regression model (I, II, III). The interaction between substance use variables was tested (II, IV) and an interaction term was added into the model when significant (II, IV). Results are presented in adjusted odds ratios with 95% confidence interval (CI). The Estonian sample that was compared with the Finnish sample also included the Russian ethnic group living in Estonia. The Estonian sample without the Russian ethnic group was not analysed separately, since Finland and Estonia as country populations were the major interest in the comparison, and this would have lowered the statistical power of the Estonian sample.

The categorization of different explanatory variables differed somewhat by substudy to enable sufficient statistical power. In substudy I, in relation to the Finnish population in order to obtain a representative sample of the country the data was weighted to adjust for the unequal probabilities of selection and attrition. All the analysis included only sexually active respondents, except for the analysis of the prevalence of sexual activity (active or not), HIV-testing and self-reported STIs, which included all respondents in the denominator.

## 7 RESULTS

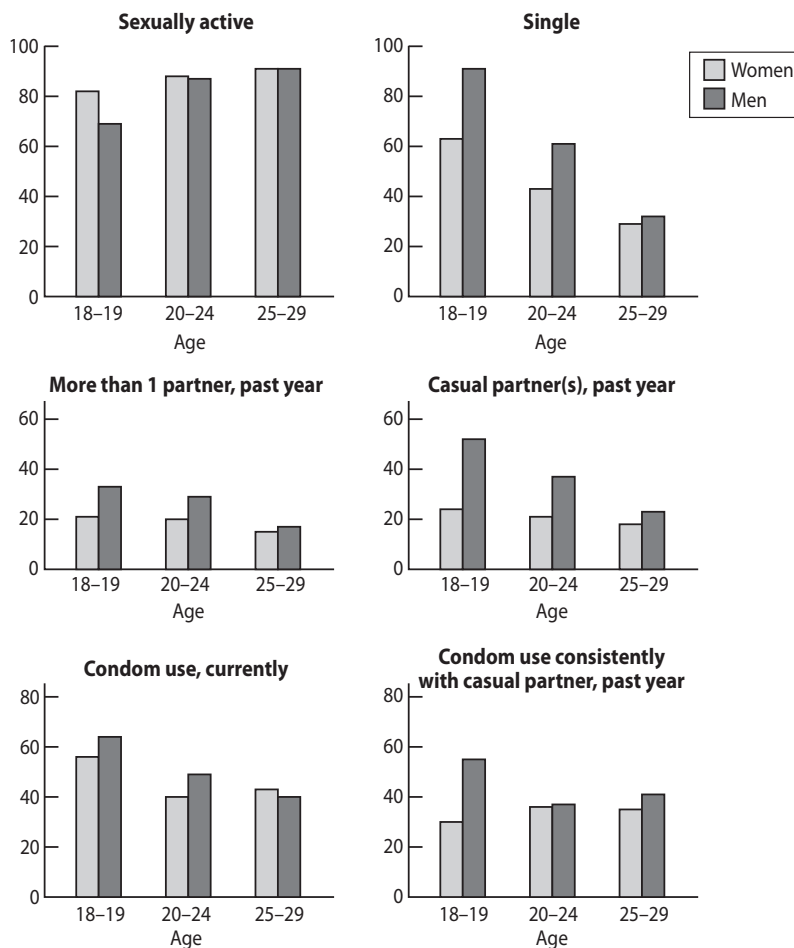
### 7.1 Young men and women in Finland – patterns of sexual behaviour and self-reported STIs (I)

The similarities and differences in sexual risk behaviours (multiple lifetime partners, multiple and casual partners in the past 12 months) and protective behaviours (current condom use and condom use with casual partners) between men and women were explored by using data from the Health 2000 study.

The total proportion of those being sexually active (ever having had intercourse) was similar for men and women aged 18–29 years (Table II, substudy I). A clear majority had started their sexual life before the age of 18 as only about one tenth of both sexes aged 18–29 years had never experienced intercourse. However, age-stratified analysis showed that in the youngest age group the prevalence of those who reported ever having had intercourse was almost twice as high for men than for women, indicating that women had experienced sexual intercourse at an earlier age than men (Figure 3).

Highly statistically significant differences between men and women were found in partnering patterns. Men reported intercourse with multiple and casual partners over the past year as well as condom use with casual partners more often than women (Table II, substudy I). Among those who had experienced sexual intercourse, an average number of partners in the preceding year was 5.0 for men (SD 5.1) and 3.4 (SD 2.1) for women. Of those who had sex with casual partners, 15% were married or co-habiting, with no difference between male and female respondents. In terms of condom use, only consistent condom use with casual partners was statistically significantly more common among men than among women.

The age-stratified analysis revealed that differences in sexual debut as well as in risk- and protective behaviours between men and women were most clear in the youngest age group (18–19), levelling off already in the age group of 20–24 years (Figure 3). This trend was seen most clearly in the partnering patterns when aligned against respondent's marital status. The relative difference between men and women in the proportions of singles and those reporting multiple or casual partners were greater in the youngest age group (18–19 years) compared to the older age groups. In fact, in the oldest age group (25–29 years) the difference in partnering patterns between men and women had almost disappeared. Gender asymmetry in non-response could bias these results; however, the profile of non-response was similar for men and women on the question of multiple partners.



The total number of respondents; (men) 765, (women) 738.

See substudy I, Table II for number of respondents in each age and sex group.

$p < 0.05$  for difference between women and men in age groups 18–19 and 20–24 on more than 1 partner, past year.  $p < 0.001$  for difference between women and men in age groups 18–19 and 20–24 on casual partner(s), past year and in age group 18–19 on condom use consistently with casual partner, past year.

FIGURE 3. Age-stratified prevalence (percentage) of respondents by sexual activity, marital status and sexual behaviour among men and women in Finland, 2000

Of the sociodemographic determinants studied, among both sexes, age, education and location of residence revealed minor differences in risk and protective behaviours (Table IV, substudy I). Among men and women, the likelihood of self-reported STIs increased by age. In terms of education, a positive correlation of higher educational attainment with current contraception use and a negative correlation with self-reported STIs was observed only among women.

Marital status, for both men and women, was the most significant predictor for engaging in risk and protective behaviours. Singles were clearly more likely to report having multiple and casual partners and also of currently using a condom and condom use with casual partners as well as having had an STI (only among women), compared to those who were married. Cohabitation revealed significant differences in the above mentioned behaviour indicators among women, whereas the only significant positive association of cohabitation among men was found with current contraception use. Finally, the effect of marital status on sexual behaviour was stronger for women than for men.

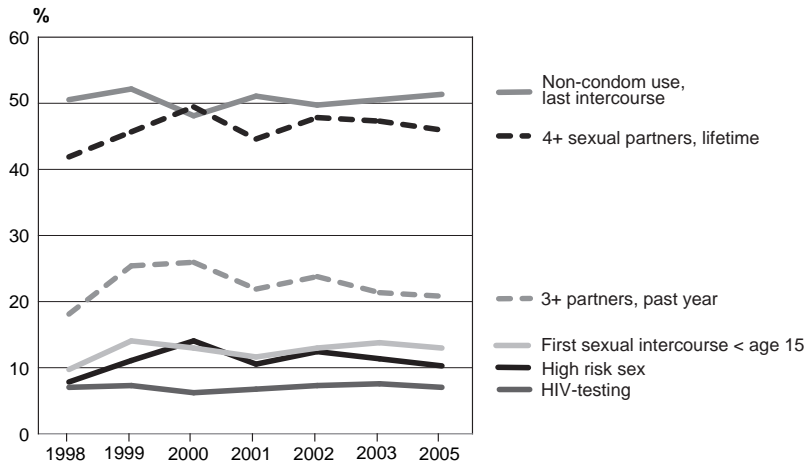
## 7.2 Young men in Finland – time trends of sexual behaviour, 1998–2005 (II)

Another approach to explore the dynamics of sexual risk behaviour was to describe the temporal trends of young men's sexual behaviour, using standardised indicators over time on the data on military conscripts aged 18–25 (those entering service between 1998 and 2005 in Finland) (Figure 4).

The age-adjusted prevalences of all the studied sexual risk behaviour indicators remained generally stable. Approximately half of the young men did not use a condom in their last intercourse and one quarter reported having had at least three sex partners over the past year. One tenth reported positively on several risk factors, indicating a growing vulnerability to transmit an STI. A little bit less than that reported ever having had an HIV-test.

The selection procedure applied in 1998–1999 was slightly different to the procedure applied in 2000–2005 (including a lower percentage of younger and less educated participants), however the proportion of those who reported being sexually active or the median age at first intercourse did not change (Table 1, substudy II).

Although the figures in late 1990s were not significantly different compared to those in 2005, a trend of increasing prevalence rates was observed for the number of partners during one's lifetime (four or more) and over the past year (three or more) as well as for those who had first sexual intercourse while aged under 15, during 1998–2000 (Figure 4). If the latter time period, 2000–2005 is considered, the only statistically significant changes were observed in the prevalence of multiple partners over the past year and engagement in high risk sex, an indicator of an accumulation of risk factors (i.e. three or more partners in the past year and unprotected last intercourse), which both decreased slightly from 2000 to 2005.



Total n (1998–2005) 10 446. See substudy II, Table 1 for per-year-number of respondents.

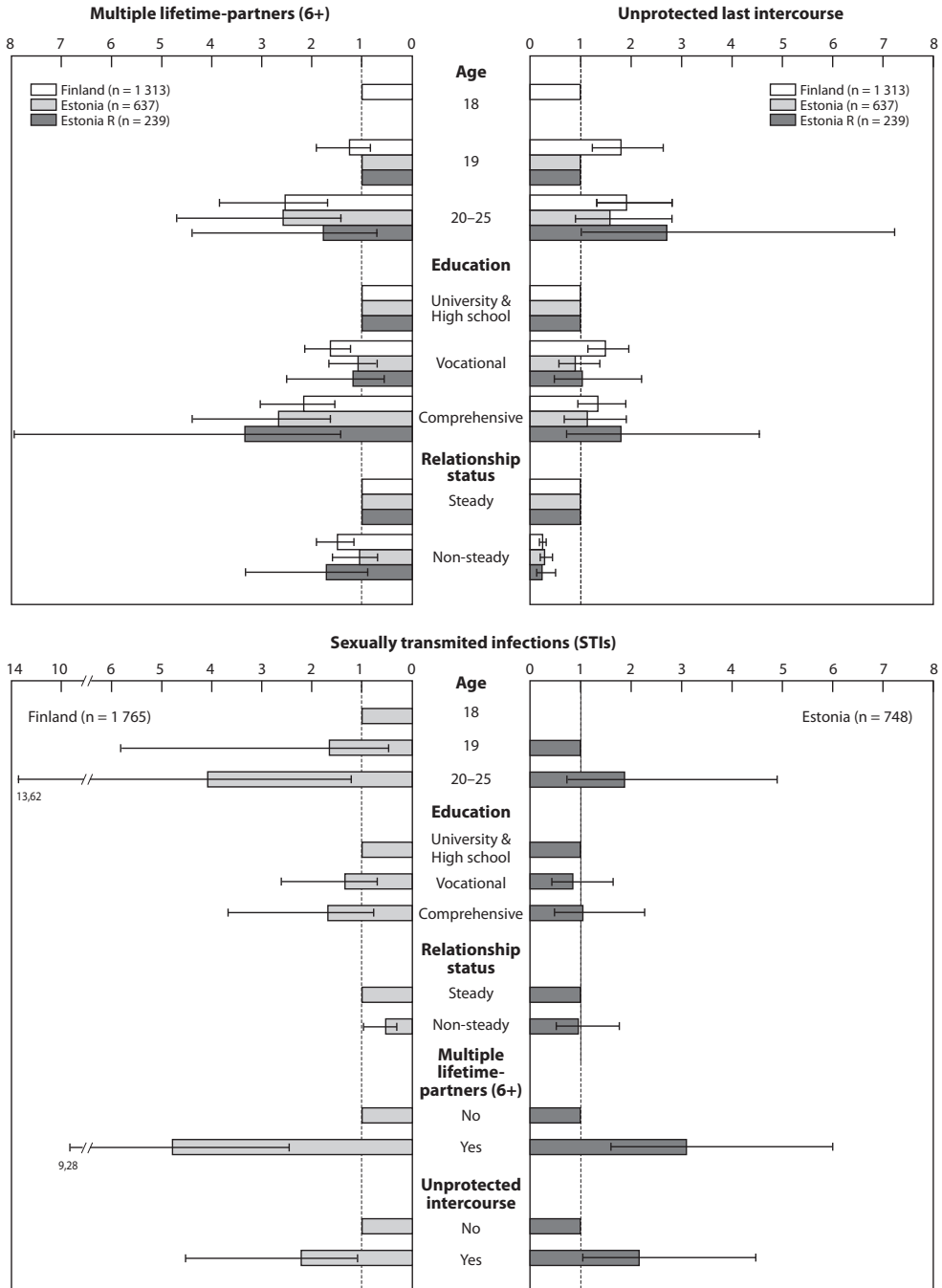
FIGURE 4. Age-adjusted prevalence of sexual behaviour, men 18–25 years of age, 1998–2005, Finland

### 7.3 Young men in Finland and Estonia – patterns of sexual risk behaviour and self-reported STIs (II, III)

The sociodemographic patterning of sexual behaviour and self-reported STIs was assessed by analysing patterns of associations within Finland and Estonia using data from the Finnish military health behavioural survey and Estonia HIV/AIDS-survey. Multivariate regression analysis was used to study the patterns of behaviour and self-reported STIs by age, education, marital / relationship status, residence and early age at first intercourse (Figure 5; Appendix 3).

#### *Multiple lifetime partners*

In relation to the association of multiple lifetime-partners (six or more) and age, education and relationship status, in Finland higher age, lower education and, to a lesser extent, relationship with a non-steady partner were positively associated with reporting multiple lifetime-partners (II, III), while in Estonia only age and education (comprehensive) displayed this effect (III) (Figure 5). The predictive values of age and educational level for having multiple partners were almost equally strong in both Finland (II, III) and Estonia (III). With respect to the Russian ethnic



<sup>a</sup> Adjusted for all variables except for multiple lifetime partners and unprotected intercourse.

<sup>b</sup> Adjusted for age, education and relationship status.

Estonia = all Estonians including those with Russian ethnic origin, Estonia R = only those with Russian ethnic origin.

FIGURE 5. Association of sexual behaviour and sociodemographic<sup>a</sup> and selected sexual behaviour determinants<sup>b</sup> in 2005, men aged 18(19)–25 years, Finland and Estonia (OR with 95% CI)

group, only comprehensive education was positively associated with multiple lifetime-partners as was the case in Finland and also with the entire Estonian sample (III).

Intercourse before the age of 15 increased the likelihood of engagement with multiple lifetime-partners and revealed the most clearly marked differences in reporting multiple lifetime-partners in each of the three groups (II, III).

### *Unprotected intercourse*

The sociodemographic patterning of unprotected intercourse was less consistent than that of multiple life-time partners between Finland and Estonia (III) (Figure 5). In Finland, the likelihood of reporting unprotected intercourse increased by higher age, vocational education and being in a non-steady relationship (III). In Estonia, the same was observed only for relationship status, though statistically significant age and educational differences were absent (III). When a larger sample of Finnish military health data was analysed in substudy II (Appendix 3) with a slightly different categorization of education (by merging high school and university), educational differences in unprotected intercourse were absent. Early age (less than 15) at first sexual intercourse was statistically significantly associated with engagement in unprotected intercourse only in Finland (II, III).

Relationship status (being in a steady relationship), relative to other sociodemographic factors, was the strongest predictor for unprotected intercourse (II, III) in Finland and Estonia as well as among the Russian ethnic group (III). A clear difference between the two Estonian samples was observed, with age and unprotected intercourse being positively associated only among men of Russian ethnic origin (III).

### *Self-reported STIs*

In Finland the likelihood of self-reported STIs increased in the older age group and decreased for those having a non-steady partner (Figure 5). In Estonia, differences in self-reported STIs by sociodemographic factors were absent (III). However the risk of self-reported STIs increased among those who reported having had multiple lifetime partners (six or more) or engaged in unprotected intercourse, in both countries.

### *Accumulation of risk factors and HIV-testing*

Indicators of high risk sexual practice and HIV-testing were assessed in Finland (II) (Appendix 3). The accumulation of risk factors (high risk sex) showed a similar sociodemographic pattern as was found for other risk indicators, particularly

for unprotected intercourse, i.e. an increase was observed by older age, lower educational level and among singles.

The sociodemographic patterning, particularly variability by educational level, on HIV-testing was different to the other risk indicators studied (Appendix 3). Older and more educated men as well as men with a steady partner were likelier to report having had an HIV-test. Also a significant urban–rural difference was observed, HIV-testing being less frequent in rural areas.

## 7.4 Young men in Finland and Estonia – sexual risk behaviour, self-reported STIs and substance use (II, IV)

The Finnish military health survey and Estonia HIV/AIDS-survey data were used and a multivariate regression analysis was conducted to study the patterns of behaviour and self-reported STIs by substance use as measured through five different indicators; frequency of alcohol use and drunkenness, history of illegal drugs and drug use (tried drugs and used illegal drugs after trial) as well as current illegal drug use and smoking.

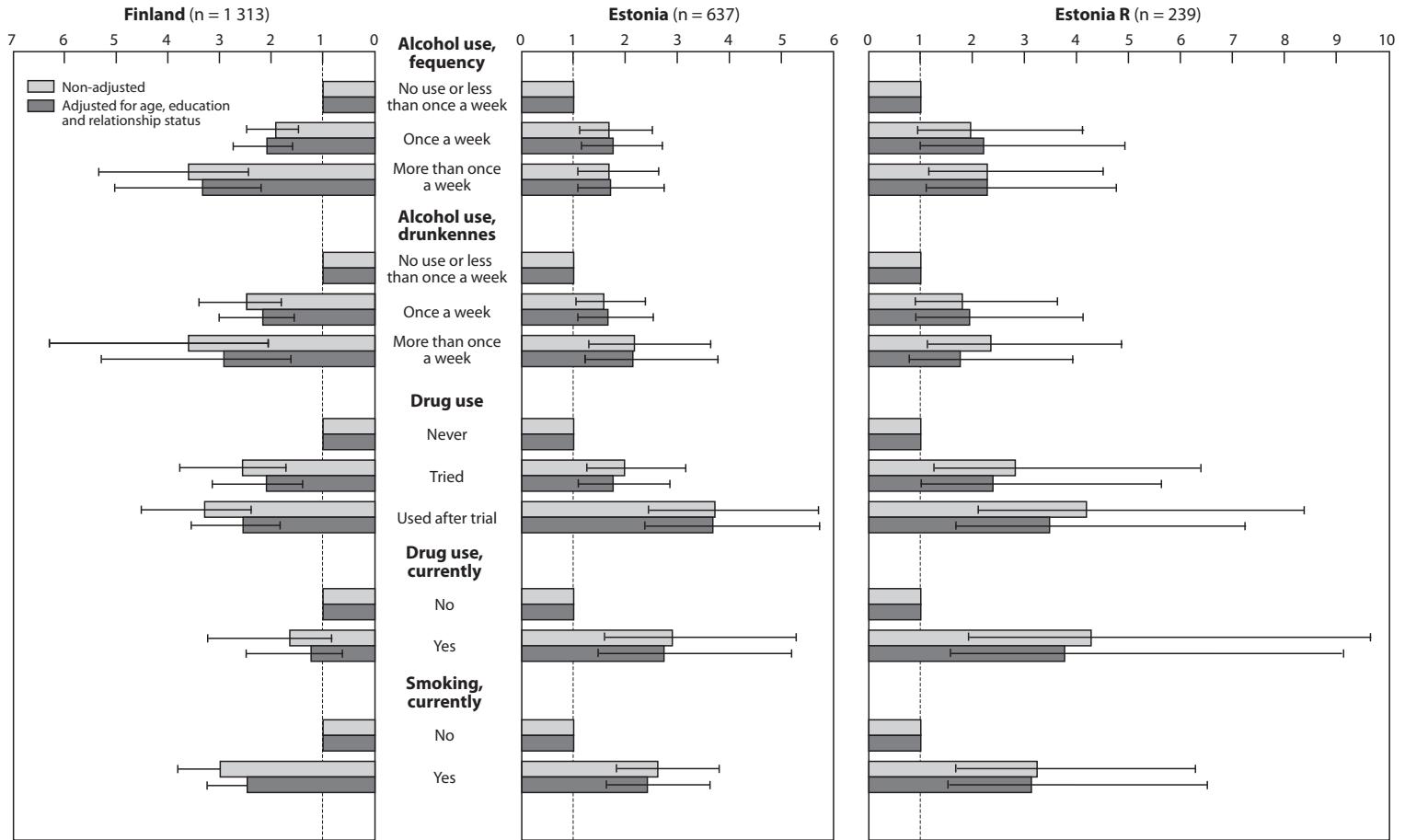
### *Multiple lifetime partners*

In general, substance use increased the likelihood of reporting multiple lifetime-partners and a clear dose-contingent relationship was observed for frequency of drunkenness as well as for drug use history (tried or used drugs) in both study countries, and in Finland additionally for frequency of alcohol use (Figure 6).

In Finland, of all the studied substance use indicators, alcohol consumption (frequency of use and drunkenness) was the strongest risk factor for having had multiple partners (II, IV) (Figure 6; Table 4, substudy II). While drug use history (tried or used drugs) had a similar though weaker association as alcohol use, current drug use was not statistically significantly associated with multiple partners in Finland (IV). The association of smoking with having multiple partners was clear, although it too was weaker than that of alcohol use (IV). Contrary to Finland, in Estonia as well as among the Russian ethnic group, a history of having tried or used drugs and current drug use were the strongest correlates for engagement with multiple sex partners. The likelihood of reporting multiple partners increased by alcohol use indicators also in Estonia, however, to a lesser extent than drug use or even smoking (IV).



**Multiple lifetime partners (6+)**



Estonia= all Estonians including those with Russian ethnic origin, Estonia R = only those with Russian ethnic origin.

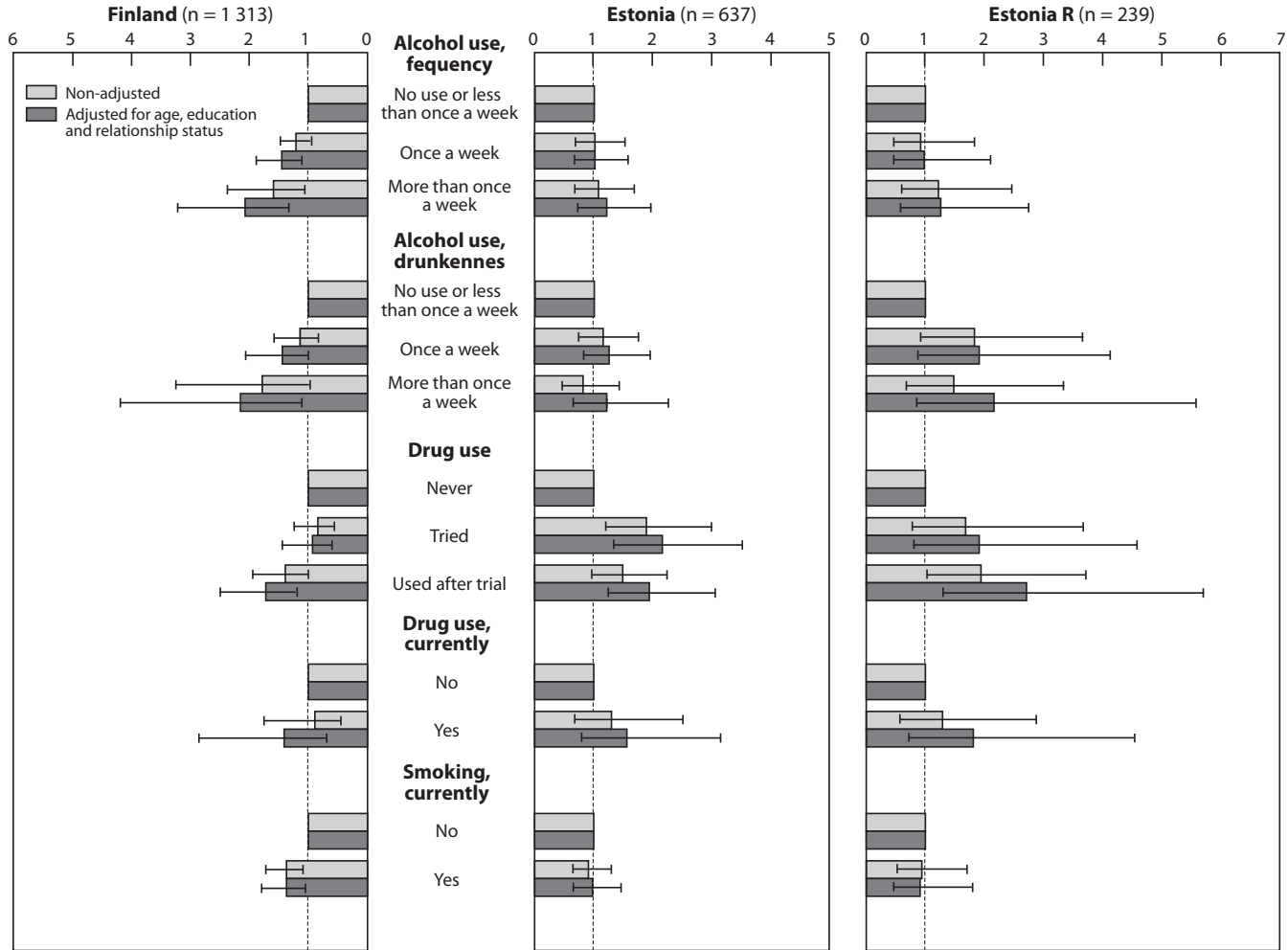
FIGURE 6. Associations of multiple lifetime-partners and substance use in 2005, men aged 18(19)–25 years, Finland and Estonia (OR with 95% CI)

*Unprotected intercourse*

An analysis of unprotected intercourse by substance use did not reveal such clear differences as were found for engagement with multiple partners; however, a similar trend of alcohol use being a stronger positive predictor in Finland and drug use in Estonia for unprotected intercourse was observed (II, IV) (Figure 7; Table 4, substudy II).

In Finland, the pattern of associations between different substance use indicators and unprotected intercourse was similar to that found for multiple lifetime-partners (II, IV) (Figure 7; Table 4, substudy II). Frequent alcohol use and drunkenness and having used drugs increased the likelihood of engagement in unprotected intercourse, while current drug use did not reveal this effect (II, IV). In Estonia, however, both having tried and used drugs correlated with unprotected intercourse, while no significant correlation was found for frequency of alcohol use or frequency of drunkenness. The two Estonian samples did not differ in their pattern of correlations for substance use indicators and unprotected intercourse. Smoking was not a risk factor associated with unprotected intercourse in either country.

### Unprotected last intercourse



Estonia= all Estonians including those with Russian ethnic origin, Estonia R= only those with Russian ethnic origin.

FIGURE 7. Associations of unprotected intercourse and substance use in 2005, men aged 18(19)–25 years, Finland and Estonia (OR with 95% CI)

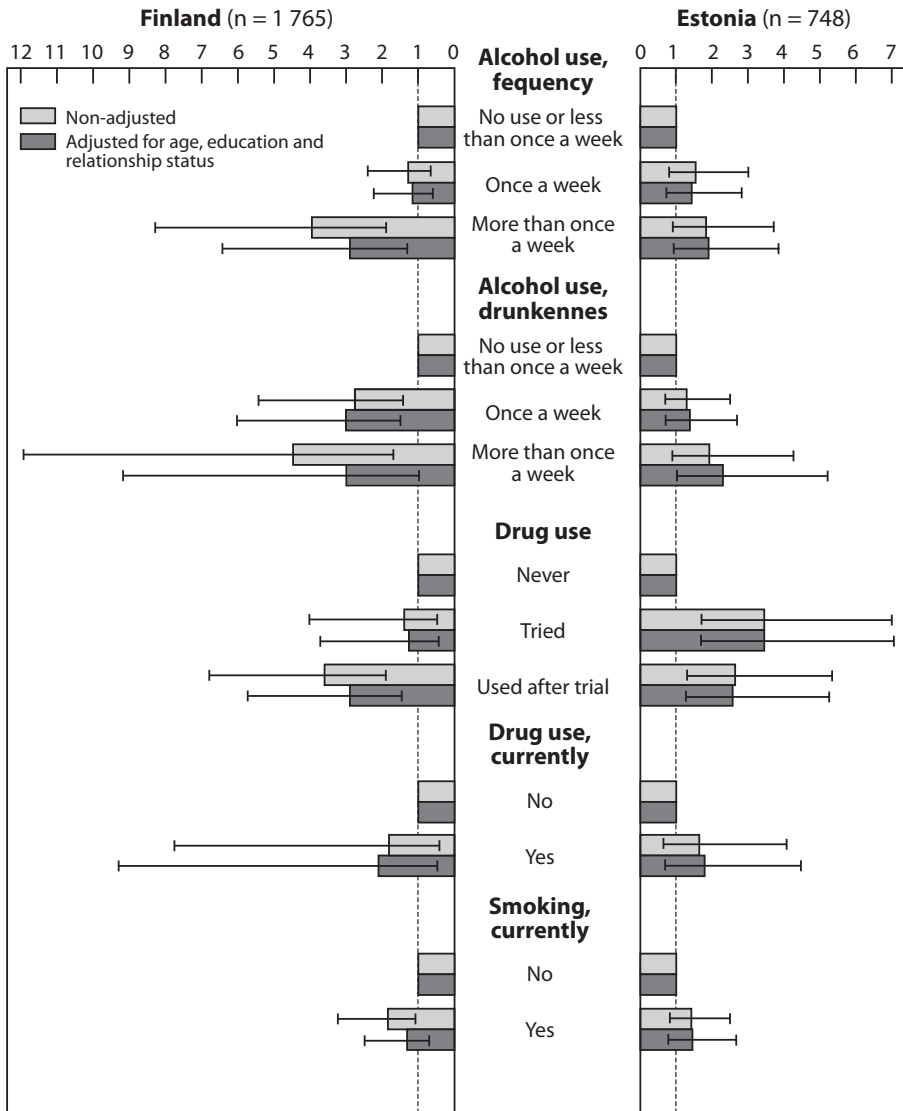
*Self-reported STIs*

Besides the small number of those who reported having ever had an STI, the pattern of associations between self-reported STIs and substance use indicators again showed a similar tendency of alcohol use being a stronger positive predictor in Finland and drug use in Estonia for self-reported STIs (IV) (Figure 8).

In Finland frequency of using alcohol and of being drunk (in the non-adjusted model) more than once a week increased the likelihood of self-reported STIs (Figure 8). In relation to drugs, only drug use after trial of drugs had this association with STIs. In Estonia, a positive association with self-reported STIs and alcohol use was observed only among those who reported drunkenness more than once a week. Previous drug use, both having tried and used after trial, increased the likelihood of self-reported STIs. Current drug use or smoking did not reveal a positive correlation with self-reported STIs in Finland or Estonia.

Separate models (not shown) that additionally to the socio-demographic factors, adjusted for frequency of alcohol use and current drug use did not reveal major differences or change the level of significance of the odds ratios.

### Self-reported STIs



Estonia = all Estonians including those with Russian ethnic origin, Estonia R= only those with Russian ethnic origin.

FIGURE 8. Associations of self-reported STIs and substance use in 2005, men aged 18(19)–25 years, Finland and Estonia (OR with 95% CI)

## 8 DISCUSSION

### 8.1 Main findings in view of previous literature

This thesis provides baseline data on sexual behaviour discussed in the context of STI epidemiology of young men in Finland and Estonia. Up to now, population-based data on men's sexual behaviour has been limited in Finland. Thus this information is particularly timely for the public health authorities, as Finland is one of the few European countries which in 2007 initiated an action program for the promotion of sexual and reproductive health (Sosiaali- ja terveystieteiden ministeriö 2007).

As expected, young Finnish men hardly differed in their reporting of sexual behaviour from women. Somewhat surprisingly, however, the prevalence of those with early sexual debut, multiple sexual partners and practice of unprotected intercourse, previously associated with STI epidemiology, remained relatively stable among 18–25 year old Finnish men between 1998 and 2005.

When differences and similarities were viewed within Finland and Estonia, while additionally using data from the Estonian HIV/AIDS survey, a clear sociodemographic patterning of sexual risk behaviour and self-reported STIs was found in Finland, and a somewhat less consistent trend in Estonia. An important finding in both countries with implications for policy makers was that both alcohol and drug use in general and to some extent also smoking were strong risk factors for sexual risk behaviour.

To conclude this thesis will discuss the public health implications of the findings.

#### *Sexual behaviour of men and women in Finland*

The main finding from the analysis contrasting men and women reveals that gender differences in the reporting of sexual behaviour are minor among young adults in Finland. In spite of the hypothesis that the number of partners in a closed population should be the same for both sexes, over the past decades cross-sectional surveys have universally reported higher prevalence of multiple and casual partners for men than for women, of all ages. This holds true for mean, median or frequency distributions (Wellings et al. 1994, pp. 101–102, 113–114; Laumann et al. 1994; Leridon et al. 1998, pp. 165–194), including a study from Finland in 1999 (Haavio-Mannila and Kontula 2001, pp. 456–459). Although we found that men and women reported different partnering patterns; i.e. multiple or casual sex

partners, the difference observed in the youngest age group (18–19 years) levelled off already in the age group of 20–24 years and almost disappeared in the age group of 25–29 years.

The discrepancy between men and women in reporting of partnering patterns has been explained by several sampling-related issues such as greater use of sex workers by men, the sex related age-differences between partners leading to non-sampling of the partners at both age-limits of the samples, variation in definitions of sexual relationships and a greater number of statistical “outliers” among men, having very high number of partners (Wellings et al. 1994, pp. 100–102; Leridon et al. 1998, pp. 177–179; Haavio-Mannila and Kontula, 2001, pp. 114–122).

In addition to the mentioned methodological considerations, it is likely that social factors relating to accepted and desired masculine and feminine cultural identities have influenced sexual partner reporting in a way that has led to exaggeration of the number of partners by men and under-reporting by women (Johnson et al. 1990; Breakwell and Fife-Schaw 1992). This hypothesis is supportive of our results. The fact that we found the greatest discordance between sexually active men and women in reporting on casual sex partners and consistent condom use with these partners, (men reporting higher numbers than women), but concordant reporting on intercourse frequency or current contraception use, is likely to reflect the difference in attitudes between men and women.

The time trend analysis indirectly supports the assumption that the differences in reporting of sexual behaviour among men and women are levelling off (Johnson et al. 2001; Haavio-Mannila and Kontula 2001, pp. 406–407; Herlitz and Ramstedt 2005; Mosher et al. 2005; *Contexte de la sexualite en France* 2007). For example, Johnson et al. (2001) in Britain analysed the sex discrepancy by comparing two cross-sectional studies between 1990 and 2000 and found significant increases in the prevalence of multiple partners (during one’s lifetime and in the past 5 years) and casual partners in all demographic groups, however the change over time was greater among women than men. They suggested, that additionally to all the methodological considerations discussed above, the differences arise from women’s greater willingness to report previously socially censured behaviours. In the light of the previous reports, the findings of this thesis research indicate that in Finland, the attitudinal difference between young men and women is narrowing already at a relatively early age.

Another finding, when comparing men and women, showed that marital status revealed the strongest differences in sexual behaviour for both sexes. As could have been expected, those who were singles or cohabiting were more frequently reporting engagement in risk behaviours (multiple partners, casual partners). However, they also more often reported practicing protective sexual behaviours (condom use, contraception use), as did those who more often reported adverse sexual health outcomes (self-reported STIs and abortions). This is an encouraging

indication of successful safe sex promotion and adaptation of safe sex strategies and practices among the general population.

Our results confirm the few existing population-based studies from, both, other EU countries and the United States showing that marital status, relative to age or education, is the most important sociodemographic determinant of sexual behaviour for men and women (Johnson et al. 1992; Castilla et al. 1998; Herlitz and Ramstedt 2005; Mosher et al. 2005; Fryar et al. 2007). Furthermore, the trend of marital status being a stronger predictor for condom use among men compared to women, and for multiple partners among women compared to men, was also found in both, the present research and the studies reviewed (Wellings et al. 1994; Bajos et al. 1997; Herlitz and Steel 2000; Gremy and Beltzer 2004; Herlitz and Ramstedt 2005; Mosher et al. 2005; Cassel et al. 2006).

When sex among the unmarried became more universally accepted in western cultures in the 1960s, changes began to take place in men's and women's sexual behaviour, particularly in regard to age of sexual debut, having multiple and casual sex partners, as well as their sociodemographic patterning of these behaviours (Johnson et al. 1992; Wellings et al. 1994, p. 244; Haavio-Mannila and Kontula 2003, pp. 20–21, 37). Nowadays, varying stages of evolution of sexual culture can be seen across the EU states. During this evolution, marital status has functioned as a socio-cultural "regulator" or "contextual factor" influencing sexual risk behaviour and STI transmission as well as for unwanted pregnancies (Wellings et al. 1994, pp. 244–252). Gradually the divided views of men and women on infidelity are converging, and a relatively universal trend of partnering patterns are being observed that is becoming less connected to the institution of marriage (Johnson et al. 2001; Haavio-Mannila and Kontula 2003, pp. 211–214).

Marital status still remains an important correlate in Finland, with singles reporting higher numbers of sex partners. However, of those who had sex with casual partners, 15% were married or co-habiting, with no difference between male and female respondents. This supports the idea that the role of the moral and ethical commitment entered into in a marriage is less of a barrier to engage in sexual practices (Schmidt 1998). These more relaxed attitudes towards casual sex with concurrent partners may imply increasing interaction between sexual networks, which are strongly influenced by concurrent partnerships, and further facilitate STI transmission (Adimora and Schoenbach 2005; Aral et al. 2005).

### *Time trends of sexual behaviour in Finland*

Somewhat surprisingly, this study revealed that the prevalence of all the studied risk behaviour indicators remained relatively stable among 18–25 year old Finnish men between 1998 and 2005. Given that for example Chlamydia, the bacterial STI most common among young people, increased over 30% among men aged 15–24



years in that same time period, an increasing trend of sexual risk behaviour would have been expected (THL 2009a; 2009b).

Instead of observing clearly increasing trends in risk behaviour, the rates of multiple lifetime-partners and highly risky sexual behaviour (defined as having three or more partners past year and engaging in unprotected intercourse), increased slightly between 1998 and 2000, and then declined between 2000 and 2005. The slightly increasing trend of behaviours found in 1999–2000 may reflect a difference in the data collection method (as compared to the latter time period 2000–2005) and/or a real increase in the risk indicators. Supportive of the latter assumption is the Falah-Hassani et al.'s (2009) findings on an increasing trend from 1996/1997 to 2000/2001 followed by a decreasing trend between 2000/2001 and 2006/2007 for the indicator of multiple lifetime-partners (at least three) among Finnish adolescents (eighth and ninth graders).

Time trend studies are rare in Europe and earlier findings from Finland as well as other European countries and the USA refer to a shift in the mean number of lifetime partners in 1990s (Smith 1998; Johnson et al. 2001; Haavio-Mannila and Kontula 2003, pp. 111–121; *Contexte de la Sexualite en France* 2007). Detailed and comprehensive studies from Great Britain found a significantly higher rate of new partner acquisition among those aged under 25 compared with those aged over 25 for the period of 1990 to 2000 (Johnson et al. 2001).

The most recent time trend study from Sweden, extending into the 2000s, confirms our study, suggesting that the increasing trend observed in having multiple partners (over the past year) in the 1990s is levelling off, while a contradicting study in France found a continuum of an increasing trend between 1992 and 2006 (Herlitz and Ramstedt 2005; *Contexte de la Sexualite en France* 2007).

While trends on partnership patterns have been studied previously, this study is the first in Finland to report population-based time trends on engagement in unprotected intercourse among adult men. The present study is in agreement with earlier findings, which reported an increasing trend of condom use for men, in the 1990s particularly among younger generations (Dubois-Arber et al. 1997; Smith 1998; Bankole et al. 1999; Santelli et al. 2000; Herlitz and Steel 2000; Johnson et al. 2001; Gremy and Beltzer 2004; Anderson et al. 2006; Cassel et al. 2006). Thereafter, an international tendency has pointed towards a decrease in condom use (Gremy and Beltzer 2004; Moreau-Gruent 2004). European studies among risk groups such as MSM—often considered indicators for future trends among the general population—have also found a decline in protective behaviour such as condom use (Moreau-Gruent 2004).

Undoubtedly, the internationally observed increasing pattern of condom use in several EU countries in the mid-1990s was related to the appearance of HIV/AIDS and subsequent strategies that linked condom promotion to HIV prevention. Particularly the evolution of condom use with casual partners was far more rigorous among the younger generation (17–20 years) compared to people aged over 25

years (Dubois-Arber et al. 1997; Klavs et al. 2005). It has been claimed that younger people are more responsive to HIV/STI prevention strategies (Dubois-Arber and Spencer 1998, p. 274). It is also possible that the recent decrease in condom use may be linked to expanding access to antiretroviral drugs, which have positively changed the prognosis for HIV patients, particularly in western societies. In Finland it is likely that the low HIV incidence, which has remained relatively constant over the past years, is reflected in the stable trend found in condom use as well as in the rate of HIV-testing. The downside is that the relatively low incidence of HIV has made the impact of condom promotion efforts rather modest in Finland. In this scenario the advantage of condom use to prevent other STIs, such as Chlamydia, is also lost.

Another possible explanation for the rather constant practice of condom use in Finland could be a shift in the role of the condom from a method of family planning more towards a means to prevent STIs. It is possible that when young women enter into a stable relationship and/or opt for birth control pills at an earlier age, condom use as a contraceptive method declines. While at the same time others leave a stable relationship and/or perceive their risk for STIs to be increasing and opt for a condom. The net effect of this may well lead to inconsistent condom use (Sundby et al. 1999) and/or no change in condom use, since double protection (pill use together with condom use) has not been widely adopted (THL 2008). The trade off between promotion of a pill with its demonstrated higher efficacy to control unwanted pregnancies without an effect on preventing STIs and condom use as the only method with evidence to prevent STIs, but with a slightly lower efficacy to prevent pregnancy, is a difficult one. Clear differences in teenage pregnancy and STI rates have been observed in Europe as well as in the USA; however it remains unclear whether they are related to variation among sexually active adolescents in their decisions and choices to either prevent a pregnancy or an STI or both (Darroch et al. 2001). Thus definitive policy implications are difficult to elaborate on, but it seems clear that public health professionals from both fields, reproductive health and sexual health, need to agree on a more integrated approach for policy formulation, which considers varying and changing needs of young people.

Finland has a strong tradition of school sex education and -health services, which are considered as corner stones for good national sexual and reproductive health indicators. These services were subject to budgeted cuts during 1994–2003. After 2003 school sex education became a mandatory topic in Finnish schools by the amendment of the Basic Education Act (Opetushallitus 2004). Our findings showing a stable trend in risk indicators for period 1998–2005 for an age cohort of 18–25 years do not clearly reflect these past changes. Thus, further time trend analysis to monitor the effectiveness of the most recent changes in sex education and service provision is needed, accompanied by analysis on quality and availability of these services.

‘Core groups’ have been conceptualised as subpopulations, with high prevalence and incidence of infection and practice of risk behaviours, who

contribute particularly significantly to the spread of an infection in a population (Aral 2004). Approximately 10% of our sample included those reporting clustering of risk behaviours (having had multiple partners over the past year and unprotected last intercourse). But this result might have been skewed, since about 15% of the age cohort was excluded from the analysis because they did not enter military service. The sexual behaviour of those exempted from the military training is unknown, however, the non-participants of the military or civil service are often less educated and more likely to smoke, use alcohol or drugs than those who participate in the training (Stengård et al. 2008). Thus another explanation for the observed condom use trend could be that this study did not capture entirely the core group-members; an indication for future research.

### *Sociodemographic patterning of sexual risk behaviour in Finland and Estonia*

When the study analysed whether the associations of sociodemographic determinants with men's sexual risk behaviour and self-reported STIs found in Finland hold up in Estonia, a clear sociodemographic patterning for sexual risk behaviour and self-reported STIs was observed in Finland, but a less consistent trend in Estonia, in spite of the close geographical proximity of the two countries.

Based on the reviewed literature, the relatively strong effect of relationship status or marital status on partnering patterns, as compared to that of education, has been reported widely in the EU and USA. Therefore one might have expected to find this correlation within both study countries (Johnson et al. 1992; Castilla et al. 1998; Leridon et al. 1998, pp. 187–190; Johnson et al. 2001; Herlitz and Ramstedt 2005; Mosher et al. 2005).

While low education was a strong predictor for multiple lifetime-partners in both countries (including the Russian ethnic group), the most outstanding difference between Finland and Estonia was observed in the association of relationship status and engagement with multiple sex partners. Contrary to what was expected, based on the previous literature as well as observations in Finland, in Estonia (including the Russian ethnic group), relationship status did not correlate with multiple lifetime-partners.

Cross-national differences may be attributed to the methodological issue, which possibly applies also in our study. However, while cross-national differences, rather than similarities, are often harder to interpret, they point to a direction for cultural explanations and idiosyncratic features (Kohn 1989, pp. 77–102). One explanation for the difference in correlation of multiple lifetime-partners and relationship status in the two countries could be higher tolerance for casual sexual contacts outside a long-term partnership as well as permissiveness towards commercial sex in Estonia—which has previously been described as part of the existing sexual culture in Estonia (Haavio-Mannila and Kontula 2003b).

Furthermore, the within-country patterns of relationship status—relative to education—that predicted the likelihood of unprotected last intercourse were similar in Finland and Estonia. As in previous studies, steady relationship was a strong predictor for engaging in unprotected intercourse. In terms of education, some degree of educational differences in relation to unprotected intercourse was found only in Finland, confirming findings from elsewhere on the inconsistent association of educational attainment and condom use compared to that of relationship status and condom use (Bajos et al. 1997; Bankole et al. 1999; Herlizt and Steel 2000; Gremy and Beltzer 2004; Andersson et al. 2006).

A study from the USA conducted a stratified analysis by relationship type and made an interesting finding: educational level was significantly correlated with condom use in a casual relationship, but not in a steady relationship (Anderson et al. 2006). This is suggesting that the power of education to differentiate non-condom users is specific to partnership characteristics. In Sweden, with a relatively similar social structure to Finland, condom use did not vary by educational groups (Herlizt and Steel 2000; Herlizt and Ramstedt 2005). However, the same study also demonstrated the importance of the specific partnership characteristics (single with regular partner and single with non-regular partner) in determining the likelihood to engage with multiple sex partners (Herlizt and Ramstedt 2005). Thus, an indication for future research is to differentiate risk behaviour not only by marital status but also by partnership characteristics.

Although the differences in prevalences for self-reported STIs between Finland and Estonia were minor and susceptible to survey limitations, they do echo similar differences found in STI epidemics observed through case surveillance systems (Rüütel and Uusküla 2006; THL 2009a). The association of self-reported STIs with multiple partners and unprotected intercourse was clear and similar in Finland as in Estonia, confirming the association of the commonly used sexual risk behaviour indicators with STIs, found also in several other population and clinic based studies (Johnson et al. 2001; Hiltunen-Back 2002, p. 45; Fenton 2005).

### *Substance use and sexual behaviour*

This study is among the first to report the association of substance use and sexual risk behaviour in Finland and in Estonia. It adds value to the very narrow pool of information on this topic in the general population in the EU region. An important finding was that both alcohol and drug use and to some extent also smoking were strong correlates with sexual risk behaviour in both countries, with alcohol having a stronger effect in Finland than in Estonia.

In Europe, the large sexual lifestyle survey from the UK in 1990 found already that a higher amount of alcohol use decreased the likelihood of condom use (Wellings et al. 1994, pp. 373–378). A similar sexuality survey by Haavio-Mannila and Kontula (2001, pp. 125, 465) reported that the frequency of drunkenness was

related to engaging with multiple sex partners. Thereafter studies on this topic among the general population in Europe are scant and show somewhat conflicting results.

Only two population-based studies with a focus on sexual behaviour and substance use among adults (alcohol use and drug use) have been reported in Europe (Messiah et al. 1998; Castilla et al. 1999). Our findings confirm the results from the Spanish study, which found that the amount of alcohol use per day as well as the frequency of drunkenness both had a positive dose response relationship with having multiple sexual partners (Castilla et al. 1999). Similar to our findings in Finland, the association of alcohol use with unprotected intercourse was less consistent compared to its association with having multiple sex partners (Castilla et al. 1999). Supportive of the findings of Castilla et al. (1999), our study as well as also a recent study among Finnish adolescents (8<sup>th</sup> and 9<sup>th</sup> graders) found drunkenness related drinking style being strongly associated with unprotected intercourse and multiple partners (Lavikainen et al. 2009).

With regard to drugs, a more recent cross-national European study (of 9 countries), using an opportunistic sample collected in pubs, bars and nightclubs (Bellis et al. 2008), supported the findings of the Spanish study by Castilla et al. (1999). Besides the different sampling methodology, both Castilla et al. (1999) and Bellis et al. (2008) also reported a positive correlation with drug use; consistently cannabis, cocaine and ecstasy were associated with the practice of unprotected intercourse and sexual activity with multiple partners.

In contrast to the present and the Spanish studies, a French study reported that drinking alcohol before having sex was correlated with being in an at-risk situation, but drug/alcohol intake and actual unsafe sex were not correlated (Messiah et al. 1998). The inconsistency in the findings could be due to difference in the analytical approach, (non-controlled, stratified analysis for those in an at-risk vs. not at-risk situation). The authors of the French study suggested that alcohol may function as a different risk marker in the French population than it does in other populations (Messiah et al. 1998). Also the particularities of the French drinking culture, characterised by wine drinking, may be a factor influencing the French study's contradictory results.

Another interesting finding in this thesis was that in Finland alcohol use was a stronger risk factor for having multiple lifetime-partners, unprotected intercourse and self-reported STIs than drug use or smoking, whereas in Estonia drug use was the strongest risk factors linked with sexual risk behaviour, including for the Russian ethnic group, where drug use was clearly the most important correlate for sexual risk behaviour.

The differences in the pattern of the association of substance use and sexual risk behaviour may have resulted from the non-participation bias, although, it is likely that the non-participants were overrepresented by both alcohol and drug users. Additionally the differences in substance use patterns may also explain the

contrasting findings in the two countries. In terms of drug use, the two countries differ to a significant extent both in prevalence as well as types of drugs used. Drug use has increased markedly in Estonia since its independence in the early 1990s, and lately particularly among the youth, while in Finland drug use is below the European average and among young people has shown signs of stabilization (EMCDDA 2006; 2008a; 2008b; Hibell et al. 2009). The two countries share a similar drinking culture, characterised by excessive weekend-based binge drinking, although, Estonia has a somewhat higher alcohol consumption rate compared to Finland (Anderson and Baumberg 2006). However, further research is needed to delineate the conditions underlying the association of substance use and sexual risk behaviour, and the individuals for whom the interplay of substance use and unsafe sex is most likely to operate in Finland and Estonia.

In North American scientific literature the link between sexual health and substance use has been studied in far greater detail than in Europe. Global association studies and situation studies (combination of sex and alcohol) in the United States, have mostly focused on the relation between multiple partners and/or unprotected intercourse and alcohol use (Leight and Stall 1993; Fortenberry 1995; Herper-Fischer et al. 1996; Gordon et al. 1997, Fromme et al. 1999; Weinhard and Carey 2000; Thompson et al. 2005; Cooper 2006). Although they were unable to establish any causal relationship, the vast majority of them conclude that alcohol use and sexual risk behaviour are linked, however, event level (diary based) studies have reported less consistent conclusions (Fortenberry 1995; Graves 1995; Donovan and McEwan 1995; Herper-Fischer et al. 1996; Lauchi et al. 1996; Weinhard and Carey 2005; Cook and Clark 2005).

In addition to the studies among the general population, studies involving participants of STI clinics and substance use treatment programs, in the EU and the USA, have reported a positive relationship between substance use and STIs (Scheidt and Windle 1996; Wilson et al. 2001; Standerwick et al. 2007).

Several theories have been suggested to explain the relation of substance use and risky sex, both individual and context based. Perhaps the most recent assumption is that none of the theories are mutually exclusive and the interplay between alcohol or drug use and sexual behaviour is likely to be part of a context that incorporates elements of personality, situation and relationship (Leigh 2002; Cooper 2006; Brown and Vanable 2007). The results of this study do not allow drawing specific conclusions. However, a stronger and consistent pattern of associations of substance use with multiple partners compared to that of unprotected intercourse was observed. This finding may indicate the overlapping of the social environment of drinking with an environment that facilitates meeting potential casual sexual partners, but is less indicative of the potential disinhibiting effects of alcohol or drugs on condom use (Lauchli 1996). Overlapping of social environments of drinking and meeting with people are particularly important in

new sexual mixing among young people and in bridging STI transmission from one group to another (Potterat et al. 2002; Mehta et al. 2003; Foxman et al. 2006).

The strength of the relationship between smoking and sexual risk behaviours, relative to other substance use indicators, was moderate in both countries, with a tendency to be a more important correlate for sexual risk behaviour in Finland compared to Estonians, and of being really only related to engagement with multiple partners. Tobacco is likely to act differently to alcohol or drug use in relation to sexual risk behaviour. Leigh and Stall (1993) proposed that the association of tobacco use and risky sexual behaviour stems from personality-based or lifestyle related explanations rather than impaired judgement.

Against this background, regardless of whether alcohol use is a true risk factor or a marker for some other behaviour, our results suggest that substance use and STI epidemiology are closely linked and that substance use in the context of STI prevention should be a public health concern in both Finland and Estonia.

## 8.2 Results in the public health context – opportunities for prevention

### *Behavioural prevention*

The public health goal in the control of STIs is to identify 1) a mix of interventions with synergistic effects in terms of biomedical and behavioural interventions as well as 2) to identify the key target populations with low or high risk behaviour (Aral et al. 2008).

Behavioural change in the prevention of STIs is challenging. There has been a considerable gap in the evaluation of efficacious interventions, particularly in real-life settings rather than in the context of randomised controlled trials (Aral et al. 2008; Coates et al. 2008). This has led to disagreement on which sexual behaviour, if any, can be changed and can in turn reduce STI transmission.

Meta-analyses and reviews of randomised trials (among risk groups and also the general population) that investigated behavioural interventions to prevent transmission of STIs have found several interventions to be effective (Weller and Davis-Beaty 2002; Manhart and Holmes 2005; Crepaz et al. 2007; Lyles et al. 2007; Johnson et al. 2008). Based on successful evidence from developing countries, Kirby (2008) and Coates (2008) have suggested that STI/HIV transmission can be markedly reduced by introducing a powerful behavioural prevention strategy - both between individuals and across groups of people-at-risk.

Based on the results and current knowledge on behavioural interventions, in Finland prevention strategies should focus on infected or high risk populations i.e. singles with lower educational level; while in Estonia, focus should be on IDUs (high HIV prevalence), as well as on the young uninfected population, irrespective

of their sociodemographic background, given that HIV is increasingly affecting sex partners of IDUs (Cohen et al. 2004; Bloom and Cohen 2007; Lawrence and Fortenberry 2007).

The important policy implications related to the findings of this study are to direct efforts and resources towards prevention strategies that integrate sexual risk behaviour with alcohol and drug use risks and/or accumulation of risk factors among young people. Both in Finland and Estonia, this message could be considered in the context of the existing school based sex education and health services, as well as part of needle exchange programs for IDUs.

There is a unique opportunity in Finland to use this study as a baseline to monitor the implementation and evaluation of prevention programs that will be planned in the context of the recently launched decree by the Finnish Ministry of Social Affairs and Health, on welfare services for children and youth (Sosiaalija terveysministeriö 2008). The decree describes, among others, the content for regular health examinations including an assessment of the health status of a child or youth and also an assessment of the wellbeing of the entire family, arranged in student health services, as well as content of health education. Sexual health counselling has been mentioned in this decree.

Although alcohol beverage control measures such as alcohol taxes are not considered a form of STI prevention, evidence from elsewhere indicates that increases in alcohol taxes have specifically been followed by a reduction in STIs (Scribner et al. 1998; Chesson et al. 2003). Thus, the recent increase in alcohol taxes in Finland will allow us to view the STI incidence in the context of a changing policy on general availability of alcohol.

While the current dynamic of enhancing economic integration, increasing migration, labour exchange and ease of travel between Finland and Estonia are conducive to potentially impacting negatively the STI epidemic, it is also an opportunity to strengthen the cross-border co-ordination of STI prevention.

### *Behavioural surveillance*

The need for a Europe-wide collaboration on STI surveillance and prevention has been recognised, since many EU states continue to experience changing migratory patterns, increasingly mobile commercial sex worker networks and illegal drug use, all of which offer new opportunities for STI transmission (Fenton et al. 2004). This, more comprehensive view calls for both structural and policy level approaches supported by cross-national collaboration in research as well as interventions. Finland, Estonia and the Russian Federation are good examples of the increasing fluidity of national borders within the region.

Disease surveillance of STIs is an essential tool for baseline "risk" assessment in the spread of epidemics and as a surrogate for early monitoring of the impact of prevention strategies and interventions. However, behavioural surveillance parallel



to traditional disease surveillance has an important role in enabling understanding of the distribution of STIs and the factors driving their transmission, as well as in guiding public health professionals to take preventive actions, whether bio-medical or behavioural.

This study revealed that internationally reported studies on sexual behaviour in Eastern Europe as well as those of sexual behaviour and substance use in the whole EU region are rare. Additionally differences in response rates and definitions of indicators and their reference periods used have complicated the cross-national comparison. There is a clear gap in the availability of standardised indicators for surveillance purposes across Europe as well as disagreement on which indicators to use, leading to a situation where EU-wide collaboration, co-ordination and alignment remains rather weak (Fenton et al. 2001; Lowndes and Fenton 2004).

### 8.3 Methodological considerations

Sexual behaviour is a private activity, subject to social, cultural, religious, moral and legal norms and constraints. This sets a challenge for sex survey research to produce unbiased and precise measures that map behavioural patterns of individuals and populations. Strengths and limitations are assessed through analysing the main sources of potential measurement error, which relate to sampling procedures, non-response and inaccurate response.

#### *Strengths of the study*

To avoid unequal probabilities of selection in the Health 2000 survey, a two-stage cluster sample and corresponding weights to match the age, sex, residential districts, and language profile of the Finnish population were used. Representativeness in the military training context was targeted by sampling in 12 brigades chosen for their regional location and large number of conscripts, excluding specialized or pre-selected troops. In the case of the Estonian survey, a two-stage stratified (by region and age group) random sample was used. The sample of those aged 19–29 was not fully representative of the Estonian population (according to the Estonian population statistics), however, weights were not used, which may have affected the frequency estimates, though it is less likely to have biased the analysis of trends in association to behaviour and background characteristics.

In sexual health surveys a response rate of 60% and over is considered average (Fenton et al. 2001). Thus the two Finnish surveys, (response rates of 68% and over 95%), can be considered successful in reaching this level of coverage. This was achieved by thorough planning and execution of survey procedures in both surveys. Overall the military service context provided for a unique opportunity

to conduct surveys on young men who are generally hard to reach and convince to participate in such surveys

The proportion of item non-responses was relatively low in all of the surveys; in the Health 2000 survey, it was mostly between 0–4% (condom use with casual partners 14–33%, higher among women compared to men), in the military health survey between 1–2%, and in the Estonian HIV/AIDS survey mostly between 5–10%, (condom use in last intercourse 23%). Specific reliability or validity checks were not conducted. Based on studies by Copas et al. (2002) and Dunne et al. (1997), older age, problems of comprehension, and ethnicity were associated with refusal to complete more detailed and sensitive questions. They also concluded that those who declined to answer the most sensitive questions were likely to be at lower risk (more conservative) of HIV, leading to overestimation (Dunne et al. 1997; Copas et al. 2002).

While anonymity, privacy and questionnaire design are important in gaining high response rates overall, they are also key in minimising a social desirability bias. The overall assumption is that anonymity, privacy and the self-administration design typically elicit higher rates of response on sensitive behaviours than face-to-face interviews in sexual health surveys (Fenton et al. 2001). All of the three surveys used in this study applied self-administered and anonymous questionnaires, which were returned by mail. The exceptions were the questions on abortion and contraception included in the Health 2000 survey, which were applied in a face-to-face interview. Further, the reporting and recall bias were taken into consideration by selecting questions (on sexual behaviour) that have been widely applied in other surveys in Finland (Haavio-Mannila and Kontula 2001, pp. 586–587; Haavio-Mannila and Kontula 2003a, pp. 253–271), and tested internationally, including both incidence (generally more reliable, but may be less informative in terms of risk) and frequency reports with defined reference intervals (Catania et al. 1990; Hubert 1998, p. 11; Jeannin et al. 1998; Fenton et al. 2001).

In the Military health behavioural survey, the questions related to sexual health have been unchanged since 1998. The 2005 Estonian HIV/AIDS KAP-survey was a repetition of a similar survey conducted in 2003, thus the lessons learned from the previous survey were used in the planning of the 2005 survey. The fact that our research group was able to collaborate in the questionnaire design with the Estonian public health authorities enabled comparable questions, to the extent possible, to be incorporated into the Estonian HIV/AIDS-survey.

### *Limitations of the study*

The major limitation of this study, typical for self-administered surveys, was the low response rate of the Estonian survey, which may have biased the Estonian results as well as affected the cross-national approach. Non-response analyses were not conducted; however, some information on the non-respondents can be derived

from a comparison of sociodemographic profiles with census data, in addition to comparing other characteristics with experience from previous sexual surveys.

In relation to the Health 2000 survey, the background characteristics were in accordance with the general distribution of marital status and education drawn from the Finnish population statistics, for men and women of the corresponding age cohort, indicating that the data was highly representative of the general population in Finland. However, it is likely that certain groups such as substance addicts or the homeless may systematically be under-represented among both sexes. The difference in response rates for women (74%) and men (61%) was minor; however it might have potentially interfered with the comparison of the absolute prevalence of behaviour between sexes.

Participation bias in Military health behavioural surveys mainly reflects the behaviour of the 15% of the age cohort who are exempted from military training. Approximately 5–7% of them opt for civilian service, who might generally be slightly more health conscious than the participants in the military service. Another 8–10% is exempted for health reasons mainly due to physical conditions, followed by mental conditions. Analysis conducted separately from this study in 2004–2005 indicated that men who were exempted from military training are more likely to be less educated and often unemployed. They are also likely to over-represent those who would have contributed to epidemiologically important behaviour such as heavy substance users or men who have sex with men (participation rate in the military training among the latter is about 70%) (Lehtonen and Mustola 2004; Stengård et al. 2008, pp. 74–76).

The information available on non-respondents in the Estonian survey relies on facts based on previous studies. It is likely that this group included people who did not participate for social reasons, such as alcohol or drug addiction or homelessness. Particularly alcohol and drug use is known to correlate with sexual risk behaviour. Thus the low response rate was likely to lead not only to underreporting of alcohol and drug consumption, but also of sexual risk behaviour. The magnitude of 40% of non-response in postal sexual surveys is relatively common (Fenton et al. 2001). In Estonia the non-response was almost 60%, which most likely biased the Estonian results, and thus the absolute prevalence and consumption levels should be treated with caution.

While some information could be revealed about non-participants, their sexual behaviour ultimately remains unknown. Some estimation can be made based on findings from other probability sample surveys, which consistently suggest that non-responders are more likely to be male, older, urban residents with lower educational attainment than respondents, with no consistent relation being noted with marital status or occupational status (Fenton et al. 2001; Purdie et al. 2002). In regard to sexual behaviour, those with conservative or normative lifestyles are less likely to participate in self-reported sexual surveys (Catania et al. 1990; Bogaert 1996; Dunne et al. 1997; Fenton et al. 2001).

The second set of limitations common in studies that assess sensitive or adverse issues with self-reports across some retrospective time frame are recall and reporting biases, which may lead to under- or overestimates (Fenton et al. 2001; Schroder et al. 2003). The selection of the indicators aimed to minimise the possible recall bias related to question on condom use and number of partners (see method section). However, it is likely that the results are affected to some degree by recall bias.

The indicator of “self-reported STIs” is susceptible to several biases, such as older age meaning longer exposure time and greater likelihood of positive results. The general assumption is that people have problems to understand (due to different diagnostics) or remember the details of their STI history, which leads to underestimates, posing a challenge on the reliability of the indicator. However, a European cross-national survey that converged the sex ratio and distribution of the four major STIs with epidemiological surveillance concluded that errors do not contribute a major bias in STI reporting (Hubert et al. 1998, p. 226).

There is a lack of a clear consensus among researchers on which indicators would measure alcohol use in the most relevant way (Brick 2006). The data on substance use were based on self-reported information and thus is subject to recall and reporting biases. The measure of alcohol use was based on self-assessment of drunkenness, which may hinder comparability. In countries such as Finland and Estonia, which share a similar drinking culture, it is likely, however, that the subjective measures do not deviate markedly.

In relation to reporting bias, behaviours that are perceived as socially desirable are likely to be exaggerated and behaviours that are perceived as disapproved of socially are likely to be underreported. In a survey mainly of men, over-reporting is likely to have occurred for the number and type of sexual partners and for condom use, and under-reporting for substance use (Fenton et al. 2001; Helasoja et al. 2007; McKee et al. 2008). Sex-related bias may also have occurred. It is likely; however, that gender specific reporting bias has shaped the surveys of men alike and thus interferes with the comparability only in substudy I, where women were also involved (see discussion).

Another factor that may influence social desirability bias is the credibility of an assessment. The differences in the setting (military and household) and purpose (general health survey and HIV KAP-survey) of the three surveys, may have added to the direction in reporting biases (and also in selection) in sexual as well as substance use behaviour. This should be considered in interpreting the results of substudies III and IV with a comparative approach.

The third limitation concerns substudies III and IV and relates to the slight differences in question design on a few survey questions in Finland and Estonia, which may have interfered with the comparability of those indications.

The net effect of these limitations has a potential to lead either to an under- or overestimate in prevalence levels of behaviour (Fenton et al. 2001). With this in

mind, when contrasting Finland and Estonia we have focused mainly on the pattern of associations found within each country. Thus absolute prevalence levels were treated with caution and analysis focused on a comparison of patterns and trends. Clement (1990), Dunne (1997) and Copas (2002) have argued that participation bias may lead to overestimation of risk behaviours, since those with more conservative lifestyles are less likely to participate. On the other hand several studies have shown a tendency for survey respondents to minimise or underestimate the frequency and diversity of their sexual behaviour and the discrepancy between reporting by men and women. Thus it is likely that participation and recall and reporting biases are counteractive to some extent and have a similar effect for both Finnish and Estonian surveys.

## 9 CONCLUSIONS AND IMPLICATIONS FOR FUTURE RESEARCH

In Finland, differences in risk- and protective sexual behaviour for young men compared to women were minor. Marital status still remains an important sociodemographic correlate for sexual behaviour in Finland. This effect was stronger for women than for men. However, of those who had sex with casual partners, 15% were married or co-habiting, with no difference between male and female respondents.

Young men's sexual risk behaviour in Finland did not markedly change over a period of time, as would have been expected, since for example Chlamydia, the STI most common among young people, increased remarkably during that same time period.

In general, unsafe sex remained relatively common among young Finnish men: Approximately 30–40% of men had had multiple sex partners in their lifetime, over 20% multiple sex partners over the past year and 50% did not use a condom in their last sexual intercourse. Some 10% of men reported accumulation of risk factors, having had multiple sex partners and not used a condom in their last intercourse, over the past year of the survey. The results in Finland are suggesting the need for;

- ♦ Standardised internationally comparable indicators on sexual behaviour and health to be incorporated into an already existing continuous population based health survey to track trends among the general population. This would facilitate both the assessment of existing STI prevention strategies and the identification of emerging trends requiring further research.
- ♦ In-depth research to identify and learn about vulnerable and high-risk population groups for STIs who present a combination of risk factors related to sex, alcohol use and drugs use. This group may not be reached by a general population survey, such as analysed in this study, while its behavioural change can have a high impact on STI epidemic and needs go beyond normal health care provision.
- ♦ In-depth studies on concordance of need and availability as well as quality of sexual health services offered to young people.

In contrasting Finland with Estonia, a clearer sociodemographic patterning of sexual risk behaviour was found in Finland than in Estonia.

- ♦ Given the overall context of Finland and Estonia with different STI epidemiology and close cross-border interaction, further collaboration to enhance comparable behavioural research would strengthen the regional co-ordination in STI prevention between the two countries.

In Finland and Estonia, countries characterised by relatively high levels of alcohol use (and drug use in Estonia), substance use and sexual risk behaviour were strongly associated. Considering this finding regardless of whether substance use is a true risk factor or a marker for some other behaviour, the results suggest that substance use and STI epidemiology are closely linked and that substance use in the context of STI prevention should be a public health concern both in Finland and Estonia.

- ◆ It would be useful to examine STI incidence in the context of alcohol use and its availability in both countries.
- ◆ Future research could unveil the conditions under which the association of substance use and sexual risk behaviour exist, and the individuals for whom the interplay of substance use and unsafe sex is most likely to operate.

Considering cross-national behavioural surveillance in a larger context, this study also showed that there is a gap in the availability of and agreement on the standardised indicators for surveillance purposes, suggesting that;

- ◆ For a more unified surveillance, it would be beneficial to agree on standardised EU-wide indicators for sexual behaviour that could further be related to other aspects of sexual and reproductive health as well as health-related behaviours.

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## Appendix 1. Questions and classifications of the independent variables used in original substudies

Questions		Classifications	Sub-study
FINLAND	ESTONIA	Independent variables	
<b>Military behavioural health survey</b>	<b>HIV/AIDS survey</b>		
How old are you?	How old are you?	<b>Age</b> 0 = 18 1 = 19 2 = 20–25 (20, substudy II) 3 = 21– 25 (substudy II only)	II, III IV
Your education (or ongoing studies)? a) only comprehensive (no other education) b) vocational c) technical or polytechnic d) high school e) university f) other than the previous	What best describes your educational level? a) only comprehensive b) high school ongoing c) high school with 12 years completed d) vocational ongoing e) vocational with 12 years completed f) higher technical or university ongoing g) higher technical or university from 12 years upwards completed	<b>Education</b> 0 = high school, university or (higher) technical ongoing or completed 1= vocational ongoing or completed 2= comprehensive completed  0 = university 1 = high school, technical or polytechnic 2 = Vocational 3 = Comprehensive	III, IV  II
What is your current marital status? a) unmarried b) engaged or cohabiting c) married d) divorced or widowed	What best describes your partnership status during the past 4 weeks? a) I live with my steady partner b) I have a steady partner who does not live with me c) I have a non-steady partner d) I do not have a steady partner, or a non-steady partner e) I have not started sexual life yet	<b>Marital / Relationship status</b> 0= steady partner 1= non-steady partner  0 = unmarried, divorces, widowed 1 = married, cohabiting, engaged	III, IV  II
Was your partner with whom you had your last sexual intercourse? a) your spouse or steady partner b) some else's spouse or partner c) single person who you know d) single person who you did not know e) prostitute f) I don't know			
How often do you use alcohol? (beer, wine or spirit) a) I don't use b) less often than once a month c) once a month d) once a week e) more often than once a week	Describe your lifestyle during the past 4 weeks. I have used alcohol a) not at all b) less than once a week c) once a week d) several times a week e) daily	<b>Alcohol use, frequency</b> 0 = do not use 1 = < once a month 2 = < once a week 3 = once a week 4 = > once a week  0 = no use at all or <once a week 1 = once a week 2 = > once a week	II  IV

<p>How often do you use alcohol up to being drunk?</p> <p>a) never b) once a year or less c) 3-4 times a year d) about once in 2 months e) about once a month f) twice a month g) once a week h) twice a week i) more often than twice a week</p>	<p>Describe your lifestyle during the past 4 weeks. I have been drunk</p> <p>a) not at all b) less than once a week c) once a week d) several times a week e) daily</p>	<p><b>Alcohol use, drunkenness</b></p> <p>0 = no use at all or less than once a week 1 = once a week 2 = &gt; once a week</p>	IV		
<p>Have you ever tried any drugs?</p> <p>a) no b) yes, more than 5 years ago c) yes, 1-5 years ago d) yes, during the past year e) yes, during the past month</p>	<p>Have you ever tried or do you currently use any drugs?</p> <p>a) I have never tried b) yes, I have tried once c) yes, I have tried occasionally d) yes, I have tried repeatedly e) yes, I use regularly</p>	<p><b>Illegal drug use</b></p> <p>0 = never (tried) 1 = never used after first trial 2 = used after first trial</p>	II, IV		
<p>Have you used any drugs after you first had tried some drugs?</p> <p>a) no b) yes</p>				<p><b>Illegal drug use, currently</b></p> <p>0 = no 1 = yes</p>	IV
<p>If you have used drugs during the past 4 weeks, what have you used?</p> <p>a-k) list of different drugs</p>					
<p>Are you currently smoking?</p> <p>a) no b) yes, occasionally c) yes, 1-10 cigarettes daily d) yes, more than 10 cigarettes daily</p>	<p>Describe your lifestyle during the past 4 weeks. I have smoked cigarettes</p> <p>a) not at all b) less than once a week c) once a week d) several times a week e) daily</p>	<p><b>Smoking, currently</b></p> <p>0 = no 1 = yes</p>	IV		

## Appendix 2. Questions and classifications of the dependent variables used in original substudies

Questions			Classifications	Sub-study
FINLAND		ESTONIA	Dependent variables	
Health 2000	Military behavioural health survey	HIV/AIDS survey		
<p>How often do you engage in sexual intercourse with another person? a) not at all b) once a month or less c) almost weekly d) once or twice a week e) more than twice a week</p>	<p>Have you ever engaged in sexual intercourse? a) yes b) no</p>	<p>Have you ever engaged in sexual intercourse? a) yes b) no c) I do not want to answer</p>	<p><b>Sexual activity, ever</b> 0 = no, not at all 1 = yes</p>	I-IV
<p>Have you had intercourse with other than regular partner(s) during the past 12 months and used condoms in these occasions? a) yes, always b) yes, almost always c) occasionally d) I didn't use e) I haven't had sexual intercourse, with other than my regular partner or at all</p>			<p><b>Intercourse with casual partner, past year</b> 0 = no (intercourse with regular partner only) 1 = yes (intercourse with casual partner) <b>Condom use with casual partner, past year</b> 0 = no or occasionally 1 = consistently (always or almost always)</p>	I
<p>How many persons have you had sexual intercourse with during the past 12 months? a) with no one b) with one c) with many, how many?</p>	<p>How many persons have you had sexual intercourse with during the past 12 months? a) with no one b) with two c-f) with three... g) with &gt; five</p>	<p>How many sex partners (previous question guides to intercourse) you have had during the past 12 months? a) # sex partners b) I haven't had sexual intercourse</p>	<p><b>Number of partners, past year</b> 0 = 1 1 = &gt; 1  0 = &lt; 3 1 = 3 +</p>	I  II,III
	<p>How many persons have you had sexual intercourse with during your lifetime? a) with one b-e) with two ... f) with &gt; five</p>	<p>How many sex partners you have had during your lifetime? a) # sex partners b) I haven't had sexual intercourse</p>	<p><b>Number of partners, lifetime</b> 0 = &lt; 4 1 = 4 +  0 = &lt; 6 1 = 6 +</p>	II  III,IV
<p>What method you use currently or have used recently for contraception? a) we don't use/need any method b-l) different methods listed</p>			<p><b>Contraception, currently</b> 0 = no method used 1 = yes, some method <b>Condom use, currently</b> 0 = no 1 = yes, with or without other method</p>	I  I

	Did you use a condom in your last sexual intercourse? a) no b) yes c) don't remember	Did you use a condom in your last sexual intercourse? a) I haven't had sexual intercourse b) yes c) no	<b>Non-condom use in last sexual intercourse or unprotected last intercourse</b> 0 = no 1 = yes	II-IV
	Two previous questions used		<b>High risk sex</b> 0 = < 3 partners, past year and used a condom in last sexual intercourse 1 = 3 + partners, past year and did not use a condom in last sexual intercourse	II
	Have you ever been tested for HIV antibodies (AIDS-test)? a) no b) yes c) don't know or remember		<b>HIV-testing, ever</b> 0 = no 1 = yes	II
How many abortions you have had?			<b>Induced abortion, ever</b> 0 = 0 1 = 1 or more	I
Have you had any of the following diseases or infections in the genital area? - diseases listed a) no b) yes c) don't know	Has your doctor ever diagnosed on you? - diseases listed a) no b) yes		<b>STI = Chlamydia, condyloma or/and gonorrhoea (herpes substudy I), ever</b> 0 = no, none 1 = yes, at least one	I-IV

### Appendix 3. Association of sexual behaviour and sociodemographic determinants, men ages 18–25 years, Finland (OR with 95%), in 1998–2005

