Screening for *Chlamydia trachomatis* in Denmark

Attitudes among professionals and youth towards a strategy for sexual and reproductive health
The potential of 'The Aarhus Model' for healthy public policy

Master of Public Health Thesis
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English summary

Chlamydia trachomatis (CT) is the most widespread sexually transmitted bacterial disease in Denmark as well as worldwide. It has negative effects on the entire spectrum of sexual and reproductive health from fecundity and fertility to neonatal complications. CT infection is often asymptomatic and discovered during the investigation of unexplained infertility. Thus, in spite of the presence of effective treatment options, CT infection is usually undetected. 'The Aarhus Model' (TAM) is a suitable model for a national strategy for CT infection control by detecting asymptomatic infection and for contact tracing. It is based on obtaining a test sample at home and mailing it directly to the laboratory. To be able to plan an integrated strategy for CT control based on TAM, there is a need to gather information about the acceptance of TAM by physicians and the sexual and cultural attitudes of Danish youth that are associated with CT infection.

Thus, the aim of the MPH thesis was 3 fold:

I. To describe the existing sexual and reproductive health strategies in Denmark with special focus on legal issues in regard to primary prevention of CT and contact tracing.

II. To assess attitudes towards primary and secondary prevention strategy based on a proposed organization of TAM for CT prevention and contact tracing

III. To describe and analyze determinants among diverse Danish youth that are associated with CT (and sexually transmitted diseases [STD]) infection with special focus on the role of sex education.

In the first part of MPH thesis, an overview of the history of current sexual and reproductive health strategies was performed based on literature review. This study showed that Denmark was among the first countries to have a venereal law that included mandatory treatment and partner notification and a right to free treatment. However, after one hundred years of presence, this law was revoked in 1988. This is in striking contrast to other Scandinavian countries e.g. Sweden and Norway. Currently, the national board of health (NBH) is the responsible organ for providing recommendations for prevention and control of STD. It is plausible that the lack of venereal law in Denmark is responsible for the high prevalence of CT compared with other countries. In spite of the presence of several local and national initiatives, the absence of venereal law has created a vacuum and led to the absence of a coordinated national strategy for contact tracing and partner notification.

In the second part of the MPH thesis, the acceptability of a proposed organisation of TAM to Danish physicians was tested as part of Health Technology

Assessment (HTA) performed by TAM group in Århus. It is a questionnaire termed 'intensified endeavours towards diagnostics of *Chlamydia'* (April 2001). It was mailed together with a review article on *Chlamydia trahomatis* infection in Denmark and an article on TAM. The study population included 500 GP (approximately $1/7^{th}$ of Danish general practitioners [GP]) and all the administrative chief physicians (MD) of dermatology (number [n]=42), clinical microbiology (n=16), gynaecology (n=43), and all public health officers (PH) (n=47). The questionnaire contained 43 statements regarding the organisation of TAM and the responses were chosen among a 4 point Likert scale from strongly disagree, somewhat disagree, somewhat agree and strongly agree. The overall response rate was 61.5% and 73.2% were males. The majority among physicians were in favour of intensified CT control by primary prevention improving sex education for youth (91%), intensified CT diagnostics by secondary prevention using opportunistic screening (75%), improved contact tracing (83%), and population-based screening (62%). The majority were in favour of TAM as a potential model for a CT screening program (71%) and that TAM should be run by an administrative unit, belonging to the counties (80%). However, using logistic regression analysis differences between participants depending on their speciality and gender were detected. For example, for the acceptability of TAM, MD were less in favour for TAM compared to GP (OR 0.29, $p=0.05$) and male GP favoured population-based screening compared to female GP (OR 1.83, $p<0.05$). Also, MD were more in favour of including both men and women aged 26-35 in a screening program compared to GP (OR 1.91-2.61, $p<0.05$ for all). Male physicians were generally more in favour of the idea of establishing a national unit in charge of screening irrespective of their speciality (OR 2.06, $p<0.01$). Regarding CPR-number registration of the tested persons, PH were in favour compared to GP (OR 2.71, $p<0.05$) and males GP compared to female GP (OR 2.07, $p<0.05$). Thus, from an organisational point of view, there is a general acceptance of a national strategy for CT screening based on TAM and through an administrative unit belonging to the counties, among Danish physicians.

In the third part of the MPH thesis, determinants of self-reported prevalence of CT or STD were studied using antecedent data from a national representative sample of 7355 Danish youth aged 13-25 years. The study (known as 'youth 99-sexual profile') was based on a questionnaire of sexual knowledge, practice, use of stimulants and drugs, attitudes towards received sex education, and experience of CT/STD (defined as being treated at least once). Data consisted of 409 questions with

closed answer slots. Logistic regression was used to determine associations between the background, knowledge scores, attitudes and practices and these factors association with CT/SOS, adjusted for county, gender, age, social network, education, and sexual debut age. Fifty seven percent of all respondents had debuted sexually with a median age of 16.8 years. CT infection was significantly associated with the following variables: age at sexual debut: before 15 year (OR 2,78 CI 1,95-3,96 p=0.000), age 15-17 (OR 1,98 CI 1,43-2,74 p=0,000), use of alcohol: at debut (OR 1,91 p=0,000) at latest sexual encounter (OR 2,04 p=0,000); use of hormonal contraception: often (OR 3,06 CI 1,57-5,95 p=0,001) sometimes (OR 2,96 CI 1,37-6,43 p=0,006) seldom (OR 2,56 CI 0,87-7,55 p=0,090); having had more than one partner (OR 4,54 CI 2,27-9,07 p=0,000); homosexual experience (OR 2,0 CI 1,24-3,23 p=0,004); engaging in one-night stands: often (OR 2,94 CI 1,52-5,71 p=0,001) some times (OR 2,0 CI 1,34-2,98 p=0,000) seldom (OR 1,45 CI 0,99-2,12) p=0,056). Also, there was a significant, inverse 'dose-response' association between CT infection and amount of sexual education received: a lot (OR 0,26 CI 0,21-0,56 p=0,001) some (OR 0,42 CI 0,21-0,85 p=0,012) a little (OR 0,44 CI 0,22-0,88 p=0,02) and the amount of sexual education about STD: too much (OR 0,32 CI 0,15-0,69 p=0,004) suitable (OR 0,37 CI 0,24-0,57 p=0,000) too little (OR 0,58 CI 0,38-0,89 p=0,013). Among youth having at least one parent born outside Denmark, self-perception of 'being Danish' was associated with CT (OR 3,07 CI 1,05-9,01 p<0,041). Thus, youth self-reporting on social and sexual practices seem an important source of information that needs to be integrated in national strategies of sex and reproductive health. The association between self-reported sex education and CT infection may encourage increasing the quantity and improving the quality of sex education in schools.

Dansk resume

Chlamydia trachomatis (CT) er den mest udbredte seksuelt overførte bakterielle sygdom (SOS) i Danmark som i verden i øvrigt. Infektion med CT indvirker negativt på hele spektret af reproduktiv sundhed fra fekunditet og fertilitet samt komplikationer for nyfødte. CT infektion er ofte asymptomatisk og opdages først i forbindelse med udredning for ufrivillig barnløshed. Trods tilstedeværelsen af effektiv behandling, bliver CT ikke diagnosticeret. 'Århus Modellen' (TAM) er velegnet som en national strategi for kontrol af CT infektion ved at opspore asymptomatisk CT og til kontakt opsporing. Modellen baseres på hjemmetagne prøver, som sendes direkte til et diagnostisk laboratorium. For at kunne planlægge en integreret strategi for CT kontrol baseret på TAM er der behov for at afdække holdning blandt læger om acceptabiliteten af TAM, og blandt forskellige unge om seksuelle og kulturbetingede holdninger, som er associeret med CT infektion.

På denne baggrund var formålet med denne MPH trefoldigt:

I. At beskrive eksisterende strategi for seksuel og reproduktiv sundhed i Danmark med fokus især på lovgivning i forbindelse med primær profylakse af CT og smitteopsporing.

II. At afdække holdning blandt danske læger til primær og sekundær forebyggelse og til organisation af TAM som del af en strategi for CT forebyggelse og smitteopsporing.

III. At beskrive og analysere determinanter blandt forskellige unge, som er associeret med CT/SOS infektion med fokus på betydningen af seksualundervisning i skoleregi.

Del I omhandler en historisk gennemgang af strategier for seksuel-og reproduktiv sundhed baseret på oversigts litteratur. Danmark var blandt de første lande til at indføre en venerealov som inkluderede pligt til testning og smitteopsporing og ret til behandling. Imidlertid, efter et hundrede år, ophæves loven i 1988. Dette er i stærk kontrast til for eksempel Sverige og Norge. For nuværende er Sundhedsstyrelsen ansvarlig for at rådgive og udarbejde anbefalinger i forbindelse med forebyggelse og kontrol af SOS. Det er muligt, at fravær af en venerealov (lov om bekæmpelse af kønssygdomme) i Danmark kan forklare en relativt højere prævalens af CT/SOS her, i forhold til for eksempel Sverige. På trods af flere lokale og nationale initiativer har ophævelsen af venerealloven skabt et vakuum og fravær af en koordineret national strategi for smitteopsporing.

Del II omhandler holdninger til primær og sekundær indsats for CT og acceptabilitet af en foreslået organisation af TAM, som blev afdækket i forbindelse med en national Medicinsk Teknologi Vurdering (MTV) forestået af TAM forskningsgruppen

i Århus. Det er en spørgeskemaundersøgelse ved navn 'intensiveret indsats for diagnostik af klamydia' (april 2001), som blev udsendt med en oversigtsartikel om CT infektion i Danmark og en artikel om TAM. Studiepopulationen bestod af 500 GP ($1/7^{th}$ af alle praktiserende læger [GP] og alle administrerende overlæger [MD] i dermatologi (antal [n]=42), klinisk mikrobiologi (n=16), gynækologi (n=43), og alle embedslæger (PH) (n=47). Spørgeskemaet indeholdt 43 udsagn om organisation af TAM på en 4-punkt Likert skala fra meget uenig, delvis uenig, delvis enig og meget uenig. Svarprocent totalt var 61.5%, og 73.2% var mænd. Flertallet af lægerne var for intensiveret CT bekæmpelse ved bedre undervisning af unge i seksuel sundhed (91%), sekundær forebyggelse i form af bedre CT diagnostik ved opportunistisk screening (75%), en bedre partneropsporing (83%) og populationsbaseret screening (62%). Flertallet var for TAM som mulig model for et CT screeningsprogram (71%) med en administrativ enhed i amts regi (80%). Imidlertid viste logistisk regression analyse nogle forskelle mellem lægerne afhængigt af ansættelse og køn. For eksempel var MD mindre for TAM end GP (OR 0.29, $p=0.05$) og mandlige GP mere for end kvindelige GP (OR 1.83, $p<0.05$). MD var mere for at inkludere både mænd og kvinder mellem 26-35 år i et screeningsprogram sammenlignet med GP (OR 1.91-2.61, $p<0.05$). Mandlige læger var generelt mere for at etablere en national enhed med ansvar for screening uanset speciale (OR 2.06, $p<0.01$). Med hensyn til kun at teste med CPR-nummer, var PH mere for sammenlignet med GP (OR 2.71, $p<0.05$) og mandlige GP mere for end kvindelige GP (OR 2.07, $p<0.05$). På den baggrund, ud fra et organisatorisk perspektiv var der generel accept af en national strategi for CT screening baseret på TAM og med en administrativ enhed i amts regi, blandt danske læger.

Del III omhandler studiet af selv-rapporterede determinanter for CT/SOS på baggrund af antecedente data fra en national repræsentativ stikprøve på 7355 danske unge mellem 13-25 år. Undersøgelsen, kendt som 'Ung99-en seksuel profil' var baseret på et spørgeskema omhandlende seksuel viden, adfærd, brug af prævention og stoffer, modtaget seksualundervisning, og erfaring med CT/SOS (defineret ved at have været behandlet mindst en gang). Data bestod af 409 enkeltspørgsmål med lukkede svar-muligheder. Betydningen af de unges baggrund, faktuelle viden, holdning og adfærd og disse faktorers sammenhæng med CT/SOS og holdning til seksualundervisning blev analyseret med logistisk regression, med kontrol for amt, køn, alder, netværk, uddannelse og seksuel debutalder. Nioghalvtreds procent var debuteret seksuelt med en median alder på 16.8 år. CT infektion var signifikant associeret med følgende variable: seksuel debut

alder: før15 år (OR 2,78 CI 1,95-3,96 p=0.000), 15-17år (OR 1,98 CI 1,43-2,74 p=0,000), brug af alkohol: ved debut (OR 1,91 p=0,000) ved seneste samleje (OR 2,04 p=0,000); brug af hormonel prævention: ofte(OR 3,06 CI 1,57-5,95 p=0,001) nogle gange (OR 2,96 CI 1,37-6,43 p=0,006) sjældent (OR 2,56 CI 0,87-7,55 p=0,090); har haft mere end én partner (OR 4,54 CI 2,27-9,07 p=0,000); homoseksuel erfaring (OR 2,0 CI 1,24-3,23 p=0,004); praktiserer 'one-night stands': ofte (OR 2,94 CI 1,52-5,71 p=0,001) nogle gange (OR 2,0 CI 1,34-2,98 p=0,000) sjældent (OR 1,45 CI 0,99-2,12) p=0,056). Der var ligeledes en signifikant, omvendt proportioneret 'dosis-respons' association mellem CT og omfang af modtaget seksualundervisning: meget (OR 0,26 CI 0,21-0,56 p=0,001) nogen (OR 0,42 CI 0,21-0,85 p=0,012) lidt (OR 0,44 CI 0,22-0,88 p=0,02) og omfanget af indhold om STD: for meget (OR 0,32 CI 0,15-0,69 p=0,004) passende (OR 0,37 CI 0,24-0,57 p=0,000) for lidt (OR 0,58 CI 0,38-0,89 p=0,013). Blandt unge med mindst en forælder født udenfor Danmark var en selvopfattelse af at 'være dansk' signifikant for CT (OR 3,07, 1,05-9,01 p<0,041). Unges selvrapporterede oplysninger om social og seksuel praksis forekommer vigtige kilder af information, som må integreres i en national strategi for seksuel og reproduktiv sundhed. Associationen mellem selvrapporteret seksualundervisning og CT/SOS infektion kunne anspore til at øge omfang og kvaliteten af seksualundervisning i skolen.

Background

Sexually transmitted diseases (STD) are a major public health care problem (1). Its incidence is rising throughout the world including Denmark due to personal factors (changes in sexual behaviors) (2-4) and community factors (increased mobility, migration, societies in transition) (4-6). Thus, a national response and preferably in concordance with other countries is needed in order to contain this emerging epidemic (7-9). The present thesis deals with the development of a national strategy to limit the spread of *Chlamydia trachomatis* (CT) infection.

The problem of *Chlamydia trachomatis* (CT) infection and control

Chlamydia trachomatis (CT) is the most widespread sexually transmitted bacterial disease in Denmark as well as worldwide. It is also the most costly in terms of private and public costs, due to its negative impact on the entire spectrum of sexual and reproductive health from fecundity and fertility to neonatal complications, in the form of co-infection of the eyes (conjunctivitis) and/or lungs (pneumonia) (1;10). CT has been known since 2700 B.C. and it still lives up to its Greek name of *chlamys* meaning 'cover up' or 'disguise' as 75-90% of cases are asymptomatic (11). As all sexually transmitted diseases (STD) infect the reproductive tract as their primary site, the greatest risk of infection is found among the sexually active and in infants born to infected mothers. In the case of CT however, the infection susceptibility for CT probably peaks in the age groups of 18-20 (25-30) years for females when the cervical surface matures, and thus the young and females carry a relatively higher burden of CT (1). The impact on male fecundity and fertility caused by a single infection, and/or repeat CT infections, has not yet been fully assessed, but evidence has emerged which elicits gender-dependent susceptibility for CT infections and re-infections, and links male factor infertility with CT (12).

The natural history of CT infection

The natural history of CT infection is not fully known. Some cases of spontaneous cure have been reported, and some partners of infected persons do not seem to contract infection. These findings may be related to inter-individual susceptibility for infections or may be dependent on the CT serotype

(13;14). Douching has been reported as an individual factor increasing CT susceptibility. It is interesting that douching is perceived as a health promoting and hygienic behavior by those engaging in it (15;16). It may be an example of other interventions that are sold as health promoting through media and commercials but it fact they may have negative effects on health. (17). The "infectivity" of CT has been estimated as 10 in 100 sexual contacts. In comparison the infectivity of gonorrhea has been estimated to 70 in 100 sexual contacts (18). Multiple CT infections within the same individual due to practices of unsafe sex are frequently seen, and so is re-infection if partners have not been adequately treated. Recently, repeated CT infections were reported associated with long-term complications (19). An association between suboptimal treatment and the development of drug resistance has been shown and is generally accepted (20).

Spontaneous cure of CT is believed to be the exception more than the rule. The cure rate for CT infection approaches 95% by Deoxycycline treatment (twice/day for seven days) or a single dose of the antibiotic Azithromycin in non-pregnant (10). Unfortunately, the presence of multiple-drug resistant CT has been reported about cases from 1997 and was in 2000 suggested as an emerging public health problem at that time (21). At present, study protocols have been formulated to investigate the role of recurring CT infections on the development of multi-drug resistant CT (22).

Prevalence and incidence of CT infection

In Denmark, approximately 13.000 cases of CT (equivalent of 250 cases per 100.000) annually have been detected out of 275.000 tests performed each year since CT was made a reportable disease in 1995. In 2001-2002 an increase in incidence of CT infection was noted where 302 cases per 100.000 were diagnosed and 16.203 cases were notified. In 2002 the gender ratio was less skewed as males accounted for 1/3 of all detected cases. Male infection between 1994-2000 accounted for 23%-30% of total infected population. The vast majority of CT positive cases were detected in the age group between 15-29 years: 81% among males, and 90% among females (23;24). About 90% of tests for CT infection are made in general practice because of uro-genital symptoms, invasive procedures e.g.

termination of pregnancy (TOP), or consultations for contraception. Thus, 90% of the tested are females.

Several cross sectional studies have estimated the prevalence of CT infection in various groups ranging from 3-5% among high school students, 3-7% among pregnant (25), 4.9% among male clients of female sex workers (26), 7-10% among military recruits (27), differs according to ethnic groups (28) and 10-30% among women undergoing TOP has been found (29-31). The extent of the undiagnosed CT pool has been estimated to 11.700 cases among males and 12.700 among females each year in Denmark (31).

Current practice for CT management

Thus, there is a large pool of undetected CT infections that may be created due to different reasons e.g. the absence of a Danish venereal law and decentralized and variable prevention strategies. But an important factor is the great variety in diagnostic and treatment protocols among general practitioners. Also, they leave contact tracing and partner notification for the infected person (13;32-34). A Danish study was performed among 388 GP in the County of Aarhus and aimed at evaluation of GP' knowledge and attitudes regarding management of CT infection. Two questionnaires were used. The first questionnaire inquires about the actual treatment given to a patient with urogenital CT infection that was seen by the GP within the latest 4 weeks and the second questionnaire was related to their protocols of diagnosis, medical treatment, follow-up and contact tracing. Great variations among GP' management protocols were observed and also a discrepancy between the CT management protocols and the actual performance with regard to obtaining an urethral swab-sample in women and for contact tracing of previous partners. This study suggests that there is a need for continuous medical education of GP regarding modern management protocols for CT infection as well as introducing auditing procedures for management of urogenital CT infection in general practice as a way to control the spread of CT infection (35).

'The Aarhus Model' (TAM)

As mentioned above CT infection is most often asymptomatic and often discovered during the investigation of unexplained infertility. Thus, in spite of the presence of effective treatment options, CT infection is usually undetected. Several attempts for providing test algorithms for identifying the groups at risk of CT infection have failed (36-39). In a Ph.D. study of screening for asymptomatic CT, carried out in an inner city population in Holland (30) and using selective screening criteria (age under 25; unmarried; number of partners during the last six months; and minority ethnic group), found the calculated area under ROC (receiver operator characteristics) curve (a measure of diagnostic accuracy) to be low [0.67 (95% C.L.: 0.65-0.69)]. Also, a Danish study has demonstrated the inability to detect the persons with high risk for CT infection based on self-reported sexual behavior (39).

In response to the low predictive values of self-reportable screening criteria (30), a screening tool known as "The Aarhus Model" (TAM) has been developed and proposed as a model for a national health policy with the aim of detecting asymptomatic infection and as an acceptable method for contact tracing to enhance control of CT infections in Denmark (34;40). The idea behind TAM is that asymptomatic persons take the test sample at home (in contrast to the usual way of seeking physician help) and mail the test material directly to the laboratory (home screening). TAM was first described in 1996 and it utilizes a test kit that includes: invitation to participate in the screening program, general information about CT infection, information about how to obtain test material, a container for a self-obtained specimen to be mailed directly to the diagnostic laboratory in an enclosed pre-stamped and addressed envelope, with a card to fill in to where the test result should be sent. The test material is urine for males and a vaginal swap or flush (pipette containing isotonic NaCl) for females. Urine samples can also be used in the female population but female's urine contains substances that interfere with test method and therefore vaginal swap is recommended (41). Since the test material obtain at home contains limited amount of CT, the test is analyzed by a sensitive and specific laboratory method that is based on DNA/RNA amplification which is several fold more sensitive than the usual immune

fluorescence and ELISA method (42). If CT is detected (a positive test result), treatment by the person's general practitioner (GP) and contact tracing are recommended, and a letter to the GP explaining the background of referral is included. For quality control and documentation, the letter to the GP contains a fax-back slip that should be signed and faxed back to the diagnostic center when the patient has received treatment. If CT is not detected (a negative test result) an examination by GP is recommend only in presence of subjective urogenital symptoms. Routine test-of-cure is not part of the TAM model (31).

The Aarhus Model – effectiveness, acceptability, contact tracing

The main aim of a screening program for CT infection is to reduce the risk of complications e.g. ectopic pregnancy and infertility. Because of the long time interval between infection and the development of complication, there is no direct evidence that screening for CT can reduce these complications. However, there is indirect evidence from some clinical studies. Swedish studies have demonstrated a negative correlation between the degree of use of testing for CT infection and the prevalence of ectopic pregnancy (11;43). Also, two randomized clinical trials studies have utilized pelvic inflammatory disease as an indicator for potential complication of CT infection. In selected populations these studies have been able to demonstrate that screening for CT infection reduced the risk for treatment for pelvic inflammatory disease by around 45% one year after the screening was performed (44;45).

Review of the diagnostic effectiveness of laboratory method of DNA/RNA amplification for CT diagnosis has been recently published (31). For urine analysis in males, test sensitivity varies between 67-100% and test specificity between 96-100%. For urine analysis in females, test sensitivity varied between 49-100% and test specificity between 94-100% and for vaginal samples test sensitivity varied between 81-100% and test specificity between 99-100%. Variations result from differences in the test method used and also in how the positive and negative tests have been determined (i.e. which 'gold standard' method against which the DNA/RNA amplification method is compared). Nevertheless, the

clinical performance of TAM model for screening has been examined in a multi-practice comparative study among 222 women aged 18-25 years who had undergone a gynecologic examination for various reasons and had an overall CT prevalence of 11.2%. The test sensitivity was determined in samples obtained by general practitioners versus samples obtained at home (these samples were examined by two different laboratory methods: polymerase chain reaction (PCR) and ligase chain reaction (LCR)). Test sensitivity was 91%, 96%, and 100% respectively. The corresponding specificities were 100%, 92.9%, and 99.5%. These findings suggest that the diagnostic efficacy of home-obtained samples is as good as samples obtained by a GP when using the DNA-based LCR analysis (46).

The acceptability of TAM among the screened was high, as less than 4% women and 1% men disliked the test method (39). Also, in a study of 63 women regarding the subjective evaluation of various methods to obtain home samples, it was found that vaginal samples caused more discomfort than obtaining urine samples but this did not affect their participation in the study (31). Thus, because of test analysis problems when using urine as test material vaginal samples is recommended in TAM.(41).

The Aarhus Model is also suitable for contact tracing. Among the male contacts to infected partners 68% accepted the home-obtained test offer compared to 28% who accepted to be examined by general practitioners (47). Testing according to TAM is also acceptable for ethnic minorities in Denmark in spite of the presence of differences between their acceptance rate and that of their counterparts with Danish-born parents. A survey among ethnically diverse youth of both sexes found that less than half (47%: 43/91) having parents born in a Muslim country approved of having a test offer sent by mail, compared to 60% (75/126) if parents were born in a Catholic country, and 63-64% (122/179-104/140) if parents were Danish Protestants (31).

The Aarhus Model - organization issues

Health technology assessment (HTA) is used proactively in relation to emerging new technologies in the health care sector and thus it has been used to evaluate a CT population-based screening by home-obtained samples (TAM)(31). During recent years the acknowledgment of the impact exerted by socio-

cultural and organizational factors have encouraged the incorporation of patient and organizational perspectives within the HTA in addition to technology and economical assessment (48;49). The organizational aspect of TAM as studied by HTA is important since culture factors and attitudes can hinder or promote the implementation of the proposal population-based screening for CT. Since the CT prevention program has to be administered by physicians of different specialties, their attitudes towards the screening program are of paramount importance. Few studies have tried to assess the acceptability and performance (audit) of screening for CT on the administrative level. A postal survey of attitudes among general practitioners in England towards opportunistic screening and contact tracing revealed a preference for genital-urinary medicine (GUM) clinics to provide the contact tracing (50). Other studies have shown quite varied attitudes towards CT management and contact tracing among physicians (35;50-57). A recent study has shown that a clinical practice improvement intervention is able to change clinical practice by adopting a 'system approach' to overcome barriers that keep health care professionals from changing their practice and to reduce external pressures that hinder change e.g. increased workload and lack of time (58;59). Thus, lack of success for CT screening seems to be due to several factors that also include factors related to health care provider and health care system.

Behavioral and cultural attitudes as risk factors for CT and STD infection

The nature of CT infection and the promising findings of TAM have suggested the feasibility of a national screening program as a strategy to improve current CT infection status in Denmark. Implementation of a national strategy needs assessment of attitudes and behavior of those being most susceptible of CT/STD infections. This is illustrated by a considerable high rate of re-infection detected as positive test results during 4 months follow-up (39). Thus, the general strategy for sexual and reproductive health should be based on understanding the behavior and cultural attitudes of target population. Several studies have documented the impact of different cultural patterns on health behavior. A study from UK on the sexual behavior and CT life time prevalence (cumulated incidence)

among a random sample of the population have elicited several determinants associated with CT/STD infection including age at sexual debut, concurrent and number of partners, and single status (60). A cross-cultural comparative study demonstrated that consumption patterns of stimulants, e.g. excessive alcohol intake is a marker for not practicing safe sex and condom use among young males (61). This in turn is influenced by the concepts and interpretation of sexual roles (e.g. 'macho' behavior) and hence the social norms in different cultures. In Southern Europe (e.g. Portugal, Greece) males perceive being drunk as 'losing control' and this is not socially acceptable, whereas males in Northern Europe (e.g. Germany, Norway) link alcohol intoxication with being 'cool' and 'tough' (61).

Perception of 'susceptibility to STD infection' among adolescent women has been linked to STD as they were found to underestimate their risk of STD infection (62). Also, perception of risk of STD infection in female sex workers was also found to differ depending on whether the sexual encounter was with their clients (used condoms) or with casual and regular non-paying partners (no condoms use) (63). However, this perception of risk was false since those reporting at least one STD over the last year had more non-paying sexual partners than the others (63).

Sexually transmitted diseases are also known to be more prevalent among minority groups, including mentally ill, homosexuals and others non-practicing strict heterosexuality as well as traders in the sex industry (64;65). Also, several studies have shown that social inequity and political instability are associated with high risk of STD infection (66). And likewise, war and migration (populations in transitions) are associated with increased spread of infectious diseases (67).

Danish studies have also demonstrated a higher prevalence of STD among ethnic minorities (68). Analysis of surveillance data from 1990-2000 for HIV infection, and from 1994-2000 also for gonorrhea and syphilis, revealed an estimated annual incidence (per 100,000 population) among immigrants versus (vs.) native Danes of HIV: 22.3 vs. 4.1; of gonorrhea: 68.7 vs. 21.4; and of syphilis: 1.7 vs. 0.2 respectively (68). Among the newly diagnosed patients with HIV, 28% were immigrants. Similarly, 18% of newly diagnosed patients with gonorrhoea and syphilis were immigrants among which

64% from Africa and 14% from Europe (68). Due to the lack of infection surveillance data regarding CT infection, it is not known whether CT infection is more prevalent among the ethnic minorities in Denmark. The descriptive report 'youth 1999 – a sexual profile' (youth99) has also demonstrated the presence of differences in behaviors and knowledge among ethnically diverse groups of youth in Denmark (69). Differences regarding sexual debut age, sexual experience and CT/STD prevalence have been found between males and females and whether their parents were born in Denmark or not. However, the relationship between contribution of sex education to CT/STD prevalence was not studied (70).

Aim of study

To assess the potential need for a differential approach for planning and implementation of a new strategy for reproductive health, the following aims were formulated:

I. To give an overview of existing strategy for reproductive health in Denmark and its historical context. A special attention has been given to the legal issues regarding primary prevention by sex education of youth in schools and contact tracing.

II. To assess attitudes towards existing CT diagnostic test strategy and towards proposals for potential implementation of alternative strategy for prevention of CT infection in Denmark.

III. To assess determinants for behaviors among youth that affect with their sexual and reproductive health. **The specific aims of the study are:**

I. To review the existing sexual and reproductive health strategies in Denmark with special focus on history of the Danish venereal law and the newer implemented strategies in response to to hiv/aids epidemic regarding sex education in schools.

II. To assess attitudes expressed by Danish general practitioners (GP), public health officer (PH), chief physicians of venerology, gynecology, and clinical microbiology (MD) towards existing test strategy, prevention, and control of CT infections among youth and the organization of a population-based CT screening (TAM). This study was a part of a national HTA regarding TAM (home screening for CT infection) (48).

III. To describe and analyze background determinants among diverse Danish youth to elicit determinants for CT/STD infection with special focus on the role of sex education.

Structure of the thesis

The thesis is divided into three parts (I,II,III). Each part includes sections of material and methods, results and discussion. Since the first part is a literature review, results and discussion are combined. The last part of the thesis includes, a general discussion where I try to integrate all the elements obtained in part I, II and III into a possible national strategy for sexual and reproductive health.

Part I

Danish public policy towards sexual & reproductive health: historical perspective

Material and Methods

The background information for this part and also for part II and III of the study was based on information obtained from different resources. Initially a literature search was performed on history, prevention strategies and their effectiveness, costs, and acceptability. I utilized 'Medline' as the main source and I combined the key words: *Chlamydia trachomatis*, sexually transmitted diseases, history, evidence-based, primary prevention, sexual education, screening, public health, policy, health care services, decision analysis, health impact analysis, history, costs, evaluation, attitudes, acceptability, ethics, minorities, and organization. Limits employed were randomized controlled trials, guidelines, meta-analysis, adolescents, young adults, different time spans, and Danish and English languages. In addition to Medline, Cochran, SIGN, YORK, HTA, and governmental sites for public health organizations and issues in Denmark, Norway and England, including the WHO web sites and NICE were searched for national strategies for sexual and reproductive health and for evidence of the effectiveness of various interventions (71;72). Furthermore, the search strategies mentioned in 'Health dimensions of sex and reproduction' published by WHO(1) and in the Norwegean strategy for STD prevention (18) was employed. In addition I used the reference lists in the Danish HTA on CT screening (31) and in two Phd studies (29;30). Finally, related books, personal contacts, hand searching of relevant journals, scientific and lay articles in Denmark from 1999-2003, and news media have been added to the material.

Results and discussion

The first legal response by the Danish authorities to control the spread of STDs was to provide free treatment to the infected persons during a syphilis epidemic in Funen in 1773. Fifteen years later, Aarhus county followed the policy of Funen county and introduced a law obliging the infected persons to be treated. This first Danish venereal law (the word 'venereal' is derived from the female goddess

Venus indicating the impact of history of blaming the females as 'reservoirs of infection'(73)) was ratified in 1790 for all the Danish counties. The venereal diseases have been since then specified by the venereal law and hence only those known by the medical establishment at the given point of time (29). In 1970, an epidemic of gonorrhea took place in Denmark and led to intensified contact tracing and partner notification, as well as the first sex education campaign. These interventions got both this epidemic and a concurrent syphilis epidemic under control (74;75). From 1970 teaching about family planning, but not STD was made obligatory in public schools after some disputes among religious groups (69;76;77).

The emergence of hiv/aids

In 1983 the first case of aids was registered. HIV became a notifiable disease but anonymity was granted the hiv infected persons. Three years later, the Aids-secretariat was established to inform, educate, and counsel on hiv/aids infection. In 1987, a political debate led to the consensus that it is the responsibility of the individual to avoid contracting and contaminating others with STD and the role of society is to provide information that promotes healthy sexual behaviors. Registering of infected persons was considered a way for their stigmatization and may prevent them from seeking medical help including testing and treatment (78).

The Danish venereal law is revoked – and new recommendations followed

In 1988, an updated version of the venereal law with the recommendation of including hiv/aids among STDs and probably also CT infection was proposed. Instead, the entire venereal law was revoked and the national board of health (NBH) became responsible for providing recommendations for prevention of STD, including hiv/aids. It is thus paradoxical that the political atmosphere at the time accepted to finance expensive in vitro fertilization (IVF) treatment for infertile couples due to complications of CT infection instead of adopting a prevention programs for limiting CT infections (75).

Documentation of possible flaws and recommendations for improvement

A comprehensive review and overall assessment of the Danish surveillance of hiv/aids was published in 1992 and compared with those present in Norway and Sweden during the same time period (79). The effect of the absence of venereal law in Denmark on the incidence and prevalence rates of STD and CT infection was apparent and was highlighted. A more efficient strategy for contract tracing was recommended. The NBH published the report and acknowledged its recommendations (79).

New guidelines for management of STD

In 1992 new guidelines for the management of STD were published by the national board of health. The lack of a venereal law or financial incitements for contact tracing was not discussed. The NBH launched the project 'Fewer unwanted pregnancies' in collaboration with the counties between 1993 and 1996 and it was allocated 3.5 million DKK from the Ministry of Health. This project included information to health professionals, media campaigns targeting 15-29 year olds, a new educational material to public schools that included information about safe sex.

Surveillance of Chlamydial trachomatis

Reporting of CT infections to Statens Serum Institute (SSI) (the National Microbiology Laboratory) was made mandatory in 1994. The reported data include gender and age but no data regarding the social or ethnic background. The NBH recognizing the rising prevalence of CT conducted during the following year an information campaign in the public schools about CT that included a video movie. The evaluation of this campaign revealed that it had a poor impact on information related to CT infection (80). Focus group interviews revealed that the concept of a 'popular movie' was successful in increasing the awareness of CT's asymptomatic nature and the need to break the chain of infection by practicing 'safe sex' (80).

A change of policy, and an evaluation of initiatives to prevent unwanted pregnancy

In 1998 the screening of pregnant women for syphilis was stopped due to declining prevalence. The following year, updated recommendations on the management on STD were published in May 1999 by

the NBH. The NBH declared that 'intentional repeated exposure of hiv/aids is not allowed' but it is not clear what are the legal consequences of intentionally exposing a partner to HIV infection. In November 1999, the Ministry of Health published a review on the initiatives performed to avoid unwanted pregnancies. This review mentioned the lack of formal coordination of tasks and responsibilities among general practitioners (GP), school nurses, and health visitors and that counties varied greatly in their primary prevention efforts to control STD. Few counties have established collaboration with the health visitors in public schools to provide the mandatory family planning education, one county planed upgrading the sexual education curriculum by providing one hour weekly of obligatory sexual education; another utilized the gynecological outpatient clinics for sexual education of the 9th graders and finally, some counties established 'peer group' education; called 'sex runners' and 'sexualists' (81).

Unequal access to primary prevention across the country

A common observation in sex-education programs is that they are highly variable in content and approach and do not always take into consideration the differences in background of minority groups, those living in care institutions or living alone. Suggestions have been made to assess the suitability and efficiency of sexual education programs for these groups and also to assess the content of the GP' contraception advice (81).

Restructuring at the strategic level - political and economic changes

In 2000 the 1st office (responsible for communicable diseases, children and expecting mothers) was closed because of economic restraints. Its tasks were distributed among three different offices: the communicable disease area is transferred to 2nd office (control); the primary sector and health visitors, including maternity care, is transferred to 5th office (health care planning and education of health professionals); and the area of non-medical education is transferred from 5th office to 7th office (medical professions) (82). Also a new strategy was launched by the NBH by explicitly integrating endeavors for the prevention of HIV/AIDS with other STD and unwanted pregnancies (77).

Need for a national strategy for reproductive health

The absent national strategy for control of STDs and CT infection as well as the lack of a venereal law should be viewed in context with the absence of a national strategy for reproductive health.

In 1997 Denmark was criticized by the UN's CEDAW committee (Convention on the Elimination of All forms of Discrimination against Women) for not adhering to the ratified UN convention on the human rights of women in China 1995 (83). Other reproductive health areas also suffer from the lack of a national preventive strategy. For example, there is about 20.000 women receiving emergency care due to domestic violence and 12.000 women seeking assistance in women's shelters per year. Police statistics report of 4400 women being assaulted each year by their present or previous partners. During the 1990s an increase in the incidence of rape has been reported. Also, some recent studies suggest that one in ten children is exposed to sexual crime and that punishment for sexual crime is mild and insignificant. The imprisonment for rape was on average reduced from 17-18 months during the 1980s to 15 months in the 1990s (84) (85). CEDAW documented that neither the 1988 recommendations nor the 'Convention of the Child' have been incorporated by the Danish legal authorities, contrary to Norway (83).

Part II

Materials and methods

Doctors 2001: 'Intensified endeavors towards diagnostics of Chlamydia' A study of the attitudes expressed by Danish physicians towards existing test strategy, prevention and control of CT infections among youth and the organization of potential TAM population-based CT screening

This is a questionnaire-based study which aimed at investigating the organisation aspect of TAM as a national screening strategy for detecting asymptomatic CT infection and for contact tracing. Thus, it served as a part of Health Technology Assessment (HTA) of TAM performed by TAM group in Århus in 2001. The questionnaire was first sent to a group of 50 general practitioners (GP) chosen at random among 14 counties (pilot study) to test the response rate and whether the formulation of the questions was understandable and acceptable. The response rate without 'reminders' was 58%. None commented on the wording/meaning of questions. One GP suggested changes in title of the introduction letter to stress the organisational focus of the questionnaire. In order to obtain permission for sending the questionnaire to GP, the questionnaire was examined and approved by the Danish Society for GP and General Medicine. The questionnaire was not evaluated by the Scientific-Ethical committee, as the questions were non-personal and purely professional.

The questionnaire was titled **'intensified endeavours towards diagnostics of *Chlamydia'*** (enclosed in appendix 1)**.** The study population included 500 (approximately $1/7^{th}$ of Danish GP. This was based on power calculation with an a priori assumption of 60% response rate. In addition, the study included all the administrative chief physicians of dermatology (number (n)=42), clinical microbiology (n=16), gynaecology (n=43) (this group of physicians termed MD), and all public health officers (PH) (n=47). The later group was included due to their roles in the control of infectious diseases. All name labels were provided by the Danish Physicians' Registry (DADL). The GP were randomly sampled by DADL. The dermatologists included both chief physicians in hospitals, or

specialists in a private practice. Since the study participants were promised anonymity the specific employment status of the participants could not be verified. In addition, the type of practice among GP, year of birth, and the gender among hospital physicians were not provided and thus known only for the responders. The counties are those stated by the responders. The questionnaire was mailed to the participants together with an introduction letter of the background for the survey (national HTA on population-based screening among 18-25 year olds in Denmark by use of home obtained and mailed samples [The Aarhus Model, TAM]), a review article on *Chlamydia trahomatis* infections in Denmark (13), an article on TAM (40), and a sheet explaining the procedure for the teleform questionnaire. The doctors were asked to fill the questionnaire and return it in a provided addressed and prepaid envelope.

Each participant was asked to respond to 18 questions by filling out each of the answer slots for a sub-set of a total of 45 statements on a 4 point Likert scale: (1) strongly disagree (2) somewhat disagree (3) somewhat agree (4) strongly agree. For non-respondents, a reminder together with a modified introduction letter, the questionnaire, and a sheet explaining the procedure for the teleform questionnaire was sent after 6 weeks. The questionnaire (enclosed in appendix 1) contained:

- Five questions (q) (statements) (six for GP) related to gender, year of birth, specialty, year of graduation from medical school, county, (and kind of GP-practice).
- Five q concerned strategies for CT control by primary prevention; secondary prevention by opportunistic screening and contact tracing, and population-based screening, and in that later case by (5) The Aarhus Model (TAM).
- A total of forty-three sub-q concerned attitudes towards organisation of a potential TAM and population-based screening program for CT in relation to target group (q9a-h), administration (q10a-c), sending out invitations for participation in screening (q11a-c), information related to the screening test (q12a-c), analysis of tests (q13 a-d), communication/correspondence of test results (q14a-f), treatment, advice and contact tracing in case of a positive test (q15a-c), as well

as organisation and coordination of a screening program (q16a-c), monitoring and surveillance (q17a-c), and economy ad tax financing (q18a-b).

Data Analysis

Data analysis included a descriptive part and analytical part. In the descriptive part all participants' responses were examined in relation to gender, age, speciality and place of employment (county).

The analytical part included:

a. The responses were recoded into a dichotomised variable: 'strongly disagree' [meget uenig] and 'somewhat disagree' [delvis uenig] were grouped together and given a value (1) and 'strongly agree' [meget enig] and 'somewhat agree' [delvis enig]) were grouped together and given a value (0). A mean score <0.5 was considered 'for' (0 = agree) and a mean value >0.5 was considered 'against' (1=disagree). The overall responses according to the county were determined. In addition, the impact of gender and specialty, kind of employment on the response (for vs. against) was analysed by logistic regression analysis.

b. The respondents were divided into two groups, consisting of GP and combined MD/PH for two reasons. First, GP usually perform about 90% of all CT tests. Second the small sample size MD precluded classification of MD by their specialities. The responses 'somewhat agree' and 'strongly agree' were combined for each of these two groups and reported as percentages of total responses. In addition, to assess the impact of gender and employment status, the respondents were divided in three groups consisting of GP (private practitioners), MD (employed by the counties) and PH (employed by the state).

Analysis of non-respondents

After the electronic scanning of the received questionnaires terminated, the non-respondents could be elicited by hand-search of an identical set of name-labels in order to determine gender and county. Name-labels of the administrative chief physicians of clinical microbiology and gynaecology were given

as titles, so their gender could not be ascertained. Analyses of the effect of age, years of practice, and kind of practice have not been determined because of the absence of data.

Results

Response rate

The overall respondent rate was 61.5% (395/642) and 73.2% were males. The response rates varied, however across subspecialties and the highest response rate was found among gynaecologists (79.1%; 34/43) and the lowest among venerologists (57.1%; 24/42) and PH (57.4%; 27/47), followed by GP (63.2%; 312/494), and clinical microbiologists (68.8%; 11/16). In the GP group, 6 were excluded due to residence outside Denmark (Greenland or Faeroe Islands), retirement or for just not responding to the letter. Also, 13 responses were discarded because 6 of them were returned blank and 7 with responses to only the 5 first questions. Table 1 shows the responders and non-responders grouped by speciality, age and gender. The female/male (f/m) ratio among GP was 0.37 and for PH 0.42 and there was no statistically significant differences in gender among respondents and non-respondents. The f/m ratio was lowest among gynaecologists (0.17) and microbiologists (0.22) and this ratio was reversed among the venerologists (0.71). As seen in Table 1, the gender and age distribution among MD could not be ascertained.

Response content

The overall results are presented in two forms. An overview of all responses obtained across subspecialties is presented as a group of histograms enclosed in appendix 2. In addition, I enclosed in appendix 3 a table showing the analysis of the role of gender and type of employment (MD,PH, GP) on all responses as assessed by logistic regression analysis. As there was a high degree of agreement among participants, in the following paragraph, I will mainly emphasize areas of differences. Table 3 shows the variables that were different among physicians depending on their gender and type of employment (MD,PH,GP).

Attitudes towards strategies for CT prevention and diagnostics

From appendix 2 and table 2, it can be seen that the majority among physicians were in favour of all the proposed 'intensified endeavours towards CT' prevention that included: intensified primary prevention by education of youth (q7a), secondary prevention by opportunistic screening (q7b), improved contact tracing (qc), and population-based screening (q7d). Similarly, in the event of a population-based CT screening, a program based on home obtained and mailed samples (TAM) (q8) was favoured by the majority (table 2). In addition, table 4 showing the response of physicians to these 5 important areas across different counties, demonstrate the high rate of agreement. Among the questions related to the organisation of a possible population-based screening program, differences among respondents were apparent in 23 questions (table 3). Doctors disagreed with regard to the need for secondary prevention by opportunistic screening (q7b) with MD in favour compared with GP (odds ration (OR) 2.79, $p<0.01$). All physicians also favoured population-based screening but they differed in their acceptability to TAM as an acceptable tool for its accomplishment (q8). MD were less in favour for TAM compared to GP (OR 0.29, $p=0.05$). Doctors differed also in their opinions related to age of the target screening groups (q9c). MD were more in favour of including both men and women aged 26-35 in a screening program compared to GP (table 3, $p<0.05$).

While PH responses were similar to GP, they did not recommend screening for females aged 31-35 y (q9h) (OR=0.32, $p<0.05$). Also, MD and PH were more in favour that test results should be sent to the tested person's physician compared with GP (q14d) (OR 3.17 and 3.39 respectively, $p<0.05$ for both) but they did not agree on the need for extra-telephone consultation in addition to what is available through the person's general practitioner (q14e) (OR 0.54 for MD and 0.28 for PH, $p<0.05$ for both). Furthermore, MD found that there is no need for the treating physician to fax documentation for treatment and contact tracing to the administrative unit of the screening program (q15a) (OR 0.49, $p<0.05$). MD and PH were in favour of providing more information to target groups and treating physicians about the screening project (in addition to what is present in the screening

invitation) (q16a) (OR 2.06 and 5.85 respectively). PH however did not agree on the need for the screening project to be integrated within a national strategy for sexual health (q16c) (OR 0.22, $p<0.05$). In addition, compared to GP, they were in favour of CPR-number registration of the tested persons (q17a) (OR 2.71, $p<0.05$).

The gender of the doctors seemed to play a role in their attitudes towards CT screening. Male GP favoured population-based screening (q7d) (OR 1.83, $p<0.05$) and male physicians were also more in favour of the idea of establishing a national unit in charge of screening irrespective of their speciality (q10b) (OR 2.06, $p<0.01$). In addition, male physicians were in favour for having the administrative unit to be in charge for sending invitations for screening (q11c) (OR 2.13, $p<0.05$) and in the need of the screening program to be integrated within a county strategy for sexual health (q16b) (OR 2.19, $p<0.01$) which may be in contradiction of their preference for a national body responsible for the administration of the screening program. Interestingly, the same results were obtained if the group of GP was analysed alone (table 3). On the other hand, males compared with females did not favour a private unit in charge of screening (q10c) (OR 0.27, $p<0.05$) nor CT tests be analysed by a private Danish lab (q13c) (OR 0.39, $p<0.05$). Males GP were also in favour of CPR-number registration of the tested persons compared to female GP (OR 2.07[1.03-4.15]). Male GP were more in favour of enabling effect documentation of screening program by use of research registries than female GP (q17c) (OR=3.11, $p<0.01$).

Analysis of the GP group alone, showed similar responses across the type of practice (appendix 3 and table 3) except in one area. Only GP working in solo practice did not accept the monitoring of CT screening program by the administrative unit (q17 b) (OR 0.30, $p<0.01$).

Discussion

Doctors2001 questionnaire was a part of HTA of TAM and therefore, the questions asked were restricted to specific areas present in the proposed organisation of a national strategy for CT screening suggested by TAM group. This study demonstrates the high acceptance rate among

physicians across different specialities for CT screening program for all females and males between 15-30 years based on TAM and run by an administrative unit located in the counties. While one previous study from UK has demonstrated a high acceptance rate among physicians for opportunistic screening through a genitourinary disease clinic (50;86), this is the first study that documents the wide acceptance of a population-based screening program for CT infection by a home-obtained sample (TAM), by a nationally representative sample of physicians.

While a response rate of 61.5% is considered acceptable, I had expected a higher participation since all physicians presumably know that the validity of questionnaires depends on a high response rate, and it was stressed that the questionnaire was contributing to a national, and thus tax-funded HTA. However, the response rate of this study was almost similar to what was obtained in a similar study involving Danish physicians (35). We have adopted some strategies that were found to increase the response rate of postal questionnaires (87). For example we used coloured ink, stamped return envelope, and increased the interest of the participants by providing background information. Unfortunately, we were not able to use personalized letters or to provide economical incentives to the participants, which were found to double the response rate to questionnaires (87). The response rate varied according to the speciality of the physicians. The highest was found among gynaecologists, which support the mentioned study that the topic of the questionnaire determines the rate of participation (87). The microbiologists had the second highest response rate and this could be explained by the same reasons (87). Thus, it was unexpected that venerologists had the lowest response rate of all followed by the PH and GP. Lack of time and reimbursement may be the main reasons for not participating as suggested by some GP. Also, seven GP did not accept the proactive character of the HTA and others expressed that they did not support screening. In regard to the PH, the relative low response rate may be due to the fact that they are no longer directly involved with CT/STD control. As mentioned above differences existed among the attitudes of physicians depending on their speciality and gender. It is not possible to determine the reasons for these differences because of the

quantitative nature of the study (questionnaire study with no open questions). However, several previous studies have demonstrated that the gender, speciality and age of health care provider influence their recommendation and use of a specific clinical procedure (88-90).

Over 90% of the participants agreed, that better sex education should be given to the youth. However the study did not examine the physicians' attitude to the sources of this information. It is possible, that the responsibility for formulation of this information should be in the National Board of Health (e.g. in Centre for Disease Prevention). Alternatively it can be formulated in each county. This solution however, may not be optimal, as it will lead to increased use of resources and to the absence of standardisation of information provided. One can imagine, that the formulation of a national information material, including possibly audiovisual material for a differential communication would be acceptable to an ethnically diverse society and enable equal access to information, like materials made by the national IIPF 'Sex and Society' [sex & samfund] (77;91;92).

The physicians were also asked about a possible organisation or TAM since TAM is based on obtaining test samples at home by test kits. One important issue is, who should be responsible for sending the screening invitation and test kits. 80% of all the physicians agreed, that an administrative unit in the counties should be responsible organ. Only 40% agreed to a national centralized unit and 10% to private-owned unit. It is however plausible that a unit belonging to 'Statens Serum Institute' where surveillance and prevention of infectious diseases is already taking place, will be more cost-effective and efficient.

The current study demonstrated that 88% of the participants agreed that laboratory analysis for CT infection should be in the counties, 60% agreed to a centralized-laboratory, 15% in private laboratory and only 13% in a European laboratory after EU-requirements. Currently, only four laboratories in Denmark are using the DNA amplification method for diagnosis of CT infection (24). It may be appropriate, that testing for CT be centralized in a state-owned laboratory. This presumably will result in stream- lining of the analytic method, minimize variations in test results and decrease the costs

of testing due to bulk testing. It is not plausible that centralization will affect the quality of test material. One previous study has shown, that sending test material by A-post (in 95% of cases reaches whatever location in Denmark after one day) did not affect the test results (31).

Eighty five% of all participants agreed that test results (positive as well as negative) should be sent to the participants. The main groups of GP vs. MD & PH did not agree on the need for extra-telephone consultation, in addition to what is available through the person's GP nor on the need for a central telephone line (24-hours/day, 7 days/week) to provide additional information. From the patient's perspective, the presence of this 'hot line' to provide information is advantageous. This service can in addition collect information regarding the most frequently asked questions to be included in the formulation of information materials. In the previously mentioned HTA, the cost of establishing such a service was determined and proved not to be substantial (31).

One of the most important aspects of a screening program is to monitor its effects. The majority of the participants agreed on the need for monitoring a potential population-based screening program for CT. There were differences in the acceptance of CPR-number registration of the tested persons between GP and PH but a large percentage in both groups agreed on this registration [76% of GP and 66% (combined) of MD&PH]. Monitoring of the screening programs is an essential part of the organisation. It can provide information regarding the efficacy of the screening program and changes in the pattern of incidence and prevalence that may indicate changes in the sexual practices. The presence of CPR-number register on the tested persons can help monitoring treatment of infection, rates of re-infection and rates of non-treatment and of course rates of complication. However, this CPR-number registration may need the re-introduction of the venereal law (see below).

Limitations of the study

Like any postal survey using Likert scaling for given statements, the responses provided are influenced by the formulations and the sequence of these statements. We did not include open questions and we did not offer any 'indifferent' or 'don't know' option. This may have affected the response rate and the

response content of the questionnaire. We have also enclosed articles about CT infection in Denmark and the efficacy of TAM, which may have introduced a bias towards positive attitudes for CT screening based on TAM. However, we did not include a question related to whether the participants have actually read the enclosed papers and thus, I am not able to detect the reasons of differences between different specialities and whether they are based on 'scientific evidence'. Because of the small sample size and small number of participant MD, I reported the data as differences between GP and MDs, which may have oversimplified the existent differences between MD physicians from different specialities. Also in some analyses I grouped MD and PH which may have skewed the descriptive statistics. However, in the analytical part, GP were tested against PH and MD respectively. Finally, highly relevant organisational issues such as surveillance, reimbursement, contact tracing and partner notification as well as their attitudes towards the absence of venereal law in Denmark were left out the HTA study. This important and highly relevant information needs to be determined in future studies.

Part III.

'youth99' study: A population-based study named 'youth 99- a sexual profile', to elicit determinants for CT/STD infection among a sample of ethnically diverse Danish youth

Material and Methods

Youth 99 study is related to a similar study that was conducted in 1989 in Frederiksberg commune (69) about the sexual attitudes and practices of 2307 school pupils aged 13-20 y. Between 1989 and 1999 the hiv/aids campaign was launched and a new 'curriculum for sex education (sex ed) [faghæfte for Sundheds- og seksualundervisning samt familiekundskab] (93) for public school pupils was distributed by the Ministry of Education in 1995. It introduced the 'positive health definition, launched by WHO of health being more than the absence of disease but 'well-being', emphasizing a broader concept of health. Thus, the overall objectives of 'youth99' study were to assess if 10 years of aids campaigns have made an impact on sexual attitudes and practices of the youth, and to improve the sexual education according to elicited self-determined needs and demands as expressed by diverse youth in Denmark.

The design of 'youth '99 – a sexual profile' (youth99) was described previously (69). In brief, it was a questionnaire study and it was based on a pilot study conducted in 1997 among one a sample of 10^{th} class pupils of a public school to obtain information about the time needed to answer questions and understandability of the terms 'often' [ofte], 'on and off' [af og til], and 'seldom' [sjældent]. The respondents were asked to describe these terms in their own words. Their descriptions were subsequently employed to define these terms: 'often = almost every time; 'on and off =once in a while'; 'seldom=something which almost does not happen or happens rarely'.

The collection of data took place between October 1997 and December 1998. In Frederiksberg commune all 8^{th} -10^{th} grade pupils in public school and from the commune's 'youth school' [ungdoms-skole], the three biggest private schools, all pupils in high schools and HF education as well as a representative number of youth at Frederiksberg Technical school and HTA education were chosen for participation. The other counties (Storstroem, Funen, Viborg, Aarhus and Bornholm) included a

representative sample of youth within each age group from 8th grade to 25 years and participated in the data collection so it could be conducted in the same way as in Frederiksberg commune. In each class the necessary time for filling out the questionnaire was granted. A person from the AIDS-secretariat informed about the background and objectives of the study. It was stressed, that the study was anonymous and voluntary. The pupils were placed so that it was not possible to see each other answers, and were asked to answer as correct as possible according to their own point of view. The person in charge was available to answer questions related to the questionnaire. The filled in questionnaires were then collected in a manner not allowing anyone to see the answers and the data were anonymized.
The questionnaire consisted of 409 single closed sub-questions in order to assess the cultural background; when and under which circumstances a potential sexual debut took place; present sexual practices and use of protection/contraception/stimulants; sources of received sex ed; judgment and assessment of the content of received sex ed; testing their factual knowledge about 'safe sex', and female and male physiology in regard to reproduction. Having a specific hiv/aids focus, the knowledge of Danish hiv/aids policies, and potential effects by aids campaigns on self-reported sexual practice; including sources of information about hiv/aids; were elicited, and the perception of hiv positives' rights and duties in regard to sexual practices.

Ethics

The Scientific Ethics Committees within the respective counties had approved of the questionnaire without objections (69) but due to a newspaper article a debate was initiated about the acceptability for 13 years olds to be asked about potential sexual debut and knowledge in regard to sex and reproduction. This debate caused a delay in regard to the distribution of questionnaires and hence the collection of data (69).

Data preparation

Initially, the data was translated from the soft ware package (by Rådgivende Sociologer/Holstein og Due) into a readable format for employing SPSS statistical package (10.0). Then, all 409 variables were

renamed. Due to the large number of variables, several were sought condensed by computing dummy variables (e.g. age, age at sexual debut, and educational groups were reduced into groups). Other variables were computed as additional variables e.g. of ethnic origin of the respondents. The participants were asked whether they had two Danish-born parents or not and if they answered 'no' they were asked from which country the mother and father came from, respectively. A total of fifty countries were then recoded, and from the groups who had one Danish–born parent, or the group who had no Danish-born parents, the country of birth, and country of residence for the mother and father respectively were determined. In the following step variables were computed according to four reasons for migrating ('refugee', 'marriage', 'work', 'other') and according to the dominant religion of the listed countries for each of the parents (Muslim, Catholic).

Data analysis

Descriptive and analytic methods were applied to the data. In the descriptive analyses, a safe sex knowledge (SSK) score was computed based on 13 questions about safe sexual behavior 'safe sex' (14). Effect of age, education, ethnic background and religion, social network, sexual debut age, place of residence (geographical location) (city vs. rural areas) on SSK score as well as history of CT/STD infection was determined. In the analytical part, initially bivariate analyses were made for each of the questions using CT/STD as the dependent variables but due to the large number of respondents, all variables were nearly statistically significant (data not shown). The significant factors were then included in logistic regression analyses, in order to elicit their impact on SSK scores and on CT/STD infection after control for important confounders. An example of analysis strategy is demonstrated in table 5 where the row (A) shows results of bivariate analyses, (B) results after control for missing values, (C) results after control for age, gender and county (due to different CT/STD test policies across the country), (D) results after control for the same variables as (C) in addition to knowledge scores of contraception and (E) results after control for the same variables as (D) but knowledge score was for protection (safe sex) instead of contraception, all in relation to STD prevalence. The latter two factors

were analyzed separately to enable comparison with the descriptive results. Finally, all variables were tested on the group who had sexual debut (N=4200 equals 57% of all respondents) after adjusting for county, gender, age, residence/social network, education, and age at sexual debut for CT and STD respectively.

Results

Descriptive part

Study participants

7355 youth participated in the study. None of the pupils refused to participate in the study and only 22 (0.3%) of the answered questionnaires were discarded because of absence of data consistency (69). Female/male ratio was 1.1 (3854 vs. 3479). Table 6 shows the age distribution among the 7355 participants. The majority (79%) lived with their parents and 21% lived either alone, with a partner, or at an institution. Only 2% did not attend formal education. On the other hand, 41% attended different forms of post-public school educations; 35% attended public school (folkeskole) and 20% were in upper secondary (gymnasium). In the following the effects of various variables on SSK score and on CT/STD prevalence will be presented.

Age groups

As seen in table 6, the age group of 13-14 y made up 11.6% of total sample. In this age group, the prevalence of CT/STD was 0.1%/0.8% and the median SSK score was 5.0 for females and 6.0 for males. For the age group 15-17 years that made 51.3% of total sample, the prevalence of CT/STD was 0.9%/3.7% and their median SSK score was 8 for both genders. The age group of 18-25 y made up 35.6% of total sample and their prevalence of CT/STD was 6.6%/14.1%, with a median SSK score of 10 for both genders. The age group of 26+ y made up only 1.5% of the total sample and prevalence of CT/STD infection was 16.7%/28.6%, and both genders had a median SSK score of 10.

Place of residence (county)

The participants were not evenly distributed across the counties and variations existed in the prevalence of CT/STD as well as SSK score according to the county of residence (table 6). Youth living in Frederiksberg commune made up 30.7% of total sample, had a prevalence of CT/STD 2.8%/7.4% and a median knowledge score of 9 for both genders. On the other hand, youth living in Funen county contributed only 2.6% of total sample, had a CT/STD prevalence of 1.6%/9.0% and a median SSK score of 7. Youth living in Storstroem county represented 28.8% of the total sample had CT/STD prevalence of 6.6%/14.1% and a median SSK score of 8 for both genders. Those who lived in Viborg county provided 12.3% of total sample had a CH/STD prevalence of 1.8%/4.8% and a median SSK score of 8 for both genders. Finally, youth living in Aarhus county, contributed 20.5% of the total sample, prevalence of CT/STD was 4.5% and 9.5% and their SSK score was 9 for both females and males. These data are shown in table 6.

Geographical location

In order to describe the effect of geographic location on CT/STD prevalence and SSK score, the participants were divided according to their place of residence into three areas: village, town and city in the original data analysis of 'Youth99' study (69) (table 6). Among the 23.1% who lived in villages, the prevalence of CT/STD was 1.7%/4.1% and the median SSK score was 7 for both genders. On the other hand, among 32% of the participants who lived in towns the prevalence of CT/STD was doubled to 4%/9.2%, respectively and the median SSK score was 8 for both genders. Finally, for 44.9% of the participants who lived in cities the prevalence of CT/STD was 3.2%/8.2% and median SSK score was 9 for both genders.

Ethnic background

Ethnicity was defined according to the native countries of the respondents' parents. The majority had two parents born in Denmark, 14% had either one or two parents born outside Denmark and 7% had two parents born outside Denmark (table 6). Participants who had one or two Danish-born parents (n=6276) represented 85.8% of the total sample and those with one or no Danish-born parents

(n=1041) made up 14.2% of the sample. Among the participants with two Danish-born parents, the prevalence of CT/STD was 3.1%/7.6% and their median SSK score was 8. Among those with one or none Danish-born parents, the prevalence of CT/STD were 3.5%/6.8% and the median knowledge score was 7. The population of youth with one or none-Danish born parents was further classified according to whether they were born in Denmark or not. In this group, the prevalence of CT/STD was 4.0%/6.8% versus 2.4%/6.6% and the median SSK score was 8 for both genders versus 5 (for females) and 6 (for males), respectively.

Citizenship

The participants were asked whether they were Danish citizens or not. Danish citizens represented 67.6% of the total sample, had a median SSK score of 8 and a prevalence of CT/STD of 4.5%/7.4%. On the other hand, non-Danish citizens represented 32.4% of the total sample, had a median SSK score of 4 for females and 5 for males and a prevalence of CT/STD of 1.2%/5.7% (table 6).

Sexual debut age

A total of 4200 youth had a sexual debut, which equals 57% of all respondents. The mean age of sexual debut among all respondents was 15.4 years (median age was 16.8 [16.7 for females and 16.9 for males] (70)). Table 7 shows the age and age at sexual debut according to the ethnic background of the participants. Youth having two Danish-born parents had a mean age at sexual debut of 15.4 for females and males alike. Among youth having one or none parent born in Denmark, the mean age at sexual debut was 15.0 years for males and 15.5 years for females. The age of sexual debut was also dependent in the later group on their self-perception of being 'Dane' [based on response to the question 'do you perceive yourself as a Dane?' (without making further specifications)]. Youth answering 'yes' (52%) had a mean sexual debut age of 15.2 for males and 15.3 for females. Participants who answered 'no' (27%) had a debut age of 14.6 y for males and 15.8 y for females and for those who answered 'don't know' (21%), the sexual debut age was 15.0 y for males and 15.6 y for females (table 7).

Since sexual debut exerts major influences on SSK score and CT/STD prevalence, analyses were carried out for all participants irrespective of their sexual debut, and for the group with sexual debut. I will present here the results of the group with sexual debut as it is more relevant to the subject matter of the thesis.

Ethnic background

As seen in table 8, differences in SSK score and CT/STD prevalence were observed between different ethnic groups. For those with Danish-born parents mean SSK score was 8.4 and 8.0 for females and males and their corresponding CT/STD prevalence 5.2/13.0%. The lowest SSK score of 4.7 was observed in males with one or non Danish-born parents and do not perceive themselves as Dane and their CT/STD prevalence was 3.9/12.4%. Those who perceived themselves as Danes, their respective SSK score were 7.6 for males and 7.8 for females and CT/STD prevalence was 9.8/15.8%. The group who answered that they 'do not know' whether they perceive themselves as Dane, had mean SSK score 6.0 for females and 6.5 for males and their corresponding CT/STD prevalence was the lowest of 1.1% /7.7% (table 8).

Sexual and reproductive health education and its content

The effects of sexual education and the participants' assessment of its quality on SSK score and prevalence of CT/STD infection were determined. As seen in table 9, among those who 'did not receive sexual education in school' had the lowest mean SSK score (5.56 females and 5.70 males) and a prevalence of 9.9% CT and 15.0% STD infection. For the group that received 'a lot of education' had a higher mean SSK score (7.84 for females, 7.85 for males) and a lower prevalence of CT and STD infection (3.8% and 4.5% respectively). An inverse relationship was found between the content of sexual education and prevalence of CT/STD infection but not the SSK score (Table 9). For example, those who stated 'too much education about prevention of STD' had a low prevalence of CT/STD infection (2.4 and 7.1% respectively) and their SSK score was 5.99 for males and 7.22 for females. On the other hand, those with 'far too little education about prevention of STD' had high CT/STD

prevalence (7.5 and 14.3%, respectively) but their SSK score was 7.10 for males and 6.68 for females. Table 9 shows also other elements related to sex edu: the relationship between 'who taught sex edu?' and 'attitudes towards content of received sex edu' and SSK score as well as CT/STD prevalence.

Religion *(table 9)*

In order to determine the effect of religion on the prevalence of CT/STD and SSK score, I grouped the participants according to their religions determined by the dominant religion in their parents' native countries and also by whether one or both parents belonged to the same religion (Table 9). Thus, the participants who did not have two Danish-born parents were divided into a group of Muslims (native countries e.g. Turkey, Lebanon) and a group of Catholics (native countries e.g. Poland, Brazil). Youth having two Danish-born parents was classified as Protestants. The group with two protestant parents had a median SSK score of 8 and a CT/STD prevalence of 3.1%/7.6%. The group with one protestant parent had a SSK score of 8 and CT/STD prevalence of 4.2%/7.9% irrespective of the other parent's religion. The group who had one Muslim parent has a median SSK score of 4 among females and 5 among males and CT/STD prevalence of 2.0%/4.7%. Finally, the group with one catholic parent had a median SSK score of 7 among females and 8 among males and a CT/STD prevalence of 2.4%/6.1%.

Type of education

The effect of type of education at the time of questionnaire administration was also examined. I have divided the participants into different groups according to the following types of education (table 9):

Public or private school (folke-privatskole)

In this group none in the 8th grade had CT/STD and their median SSK score among females/males was 5/6. For the 9th graders, the median SSK score was 7/8 (female/male) and CT/STD prevalence was 0.3%/1.0%. The 10th graders had a median SSK score of 7/8 (female/male) and a prevalence of CT/STD of 1.7%/4.6%.

"Youth" school (ungdomskole)

In this group, the 8th graders had a median SSK score of 4.5/5 (female/male) and CT/STD prevalence 0%/3.1%. The 9th graders had a median SSK score of 5.5/6 (female/male) and none had CT/STD while the 10th graders had a median SSK score of 6/6 (female/male) and a CT/STD prevalence of 2.2%/7.5%.

Boarding school (efterskole)

This group had a median SSK score of 7/7 (female/male) and a CT/STD prevalence of 1.1%/4.0%.

Upper secondary school (gymnasium)

The 1st graders had a median SSK score of 9/9 (female/male) and CT/STD prevalence of 0.9%/5.0%. 2nd graders had a median SSK score of 10/10 (female/male) and CT/STD prevalence 1.7%/5.2%. For the 3rd graders a median SSK score of 10/10 (female/male) and a CT/STD prevalence of 2.8%/7.5% was found.

Other types of education

'HF' students in the 1st year had a median SSK score of 10/10 (female/male) and CT/STD prevalence of 8.9%/20.8%; in 2nd year they had a similar median SSK score but CT/STD prevalence was 10%/21.9%. 'HG' students had a median SSK score of 6/7 (female/male) and CT/STD prevalence of 3.9%/8.5%.

'HTX' students had a median SSK score of 10/9 (female/male) and CT/STD prevalence of 0.8%/3%. 'HH' students had a median SSK score of 8/8 (female/male) and CT/STD prevalence of 4%/9.9%. Technical college students had a median SSK score of 8/8 (female/male) and CT/STD prevalence of 3.5%/9.1%. Finally, participants that stated that they are attending 'other education' had a median SSK score of 9/10 and CT/STD prevalence of 8.2%/15.4% and those 'not attending education' had a median SSK score of 10/8 (female/male) and CT/STD prevalence of 7.8%/14.6%.

Social network

I assessed the social network of participants according to whether they lived by their parents or alone and in the later case according to the type of living arrangements (table 9). The group who lived with

their parents had a median SSK score of 8/8 (female/male) and CT/STD prevalence of 1.3%/4.2%. On the other hand, those who did not live by their parents had SSK score of 10/10 (female/male) and CT/STD prevalence of 9.9%/19.5%. The group not living with parents was further divided into 4 subgroups. One group lived at 'youth pension' [ungdomspension] had a median SSK score of 8/7 (female/male) and CT/STD prevalence are 3.6%/8.9%. A second group lived with other family and had a median SSK score of 7/8 (female/male) and CT/STD prevalence of 7.1%/12.9%. A third group lived alone, had a median SSK score of 10/10 (female/male) and CT/STD prevalence of 12.2%/22.4%. Finally, a group lived with a partner and had a median SSK score of 10/10 (female/male) and CT/STD prevalence of 11.5%/22.2%.

Analytic part

Determinants of CT/STD infection using logistic regression analysis and adjustments for confounders

In order to analyze determinants among Danish youth that are associated with CT and STD infection, logistic regression analysis was employed and included the following variables: county of residence, gender, age, education level, social network and sexual debut age (tables 10a). The data are presented as OR [95% confidence interval (C.I.)]. County of residence was significantly associated with high prevalence of STD and not CT infection. Residence in the county of Funen was associated with higher prevalence of STD infection when comparing with other counties (OR 2.12, [1.15-3.92] p=0.01). Gender was a significant predictor for CT and STD prevalence. Females were twice as likely to be treated for STD (OR 2.04 [1.67-2.50]), p<0.001) and for CT (OR 1.73 [1.27-2.35] p<0.001). Age was a significant predictor for susceptibility for CT and STD infection. I considered age group 18-25 y as reference and compared prevalence of STD and CT in three other age groups. Being in age-group <14 y was inversely associated with STD (OR 0.36 [0.14-0.91] p= 0.03) and to a lesser degree with CT (OR 0.14 [0.02-1.16] p= 0.069). Age group 15-17 years was associated with a significant lower

prevalence of CT (OR 0.56 [0.42-0.73] p<0.001) and STD (OR 0.35 [0.21-0.57] p<0.001) infection. Participants 26 y or elder were more likely to have STD (OR 1.79 [1.06-3.01] p<0.001) or CT (OR 2.11 [1.10-4.04] p<0.001). Using the same age group as reference, sexual debut before age 14 was significantly associated with STD (OR 2.78 [1.95-3.96]) and with CT (OR 4.55 [2.69-7.68] p<0.001 for both). Sexual debut between 15-17y doubled the susceptibility for STD (OR 1.98 [1.43-2.74] p<0.001) and for CT (OR 2.20[1.34-3.61] p=0.002). Education level was not a significant indicator for CT or STD risk of infection. Social network was a significant indicator for CT/STD infection prevalence. The group living with parents had lowered STD prevalence (OR 0.49 [0.39-0.61]) and even more for CT (OR 0.39 [0.27-0.55]) p<0.001 for both.

In order to determine the association of other variables with the prevalence of CT/ STD, logistic regression analysis was performed after control for the above mentioned confounders (i.e. county, age, education, social network and sexual debut age). The results of this analysis are presented in table 10b.

Geographic location Living in a village, town or city was not significantly associated with prevalence of CT/STD infection. Ethnic background of the parents was not a significant indicator for STD (OR 0.88 [0.66-1.18] or CT (OR 0.69 [0.46-1.05]). However, a closer look at the parents' ethnic background revealed some differences. If the parents were migrated to Denmark as refugees an inverse association was found for CT (OR 0.50 [0.32-0.79] p=0.003) but not for STD (OR 0.84 [0.60-1.18]). Religion Using Protestants as a reference, Muslims or Catholic background was not significant indicator for CT or STD infection. Perception of 'being Danish' Participants from non-Danish background stating 'they perceived themselves as Danes' were associated with three times higher prevalence of CT (OR 3.07 [1.05-9.01]) compared to youth stating 'no' or 'don't know'.

Several variables related to sex edu received by the youth were tested. Sources of sex edu were significantly associated with CT infection with sex edu at 'school' had a protective impact (OR 0.49 [0.28-0.87]). On the other hand, sexual education received through health professional/doctor had

a predicting impact for CT (OR 1.99 [1.42-2.79]). Other sources of sex edu (parents, Internet, and the media/books) were not significant indicators for CT infection. For STD, a similar picture was found except that sexual education at school was not a significant indictor for infection and media was predictive (OR 1.53 [1.17-2.01]) (table 10b). Several other questions elicited the impact of who gave which kind of sexual education by sub-groups of facts about protection of STD, contraception and feelings and relationship on CT/STD infection. For information about protection of STD, parents and family as well as peers have protective effect on prevalence of STD (table10b). All sources of information about contraception were protective for STD and CT especially if parents, peers and professional were the source of information (OR 0.40[0.24-0.65] for STD and OR 0.41[0.20-0.83]). Similar tendency was observed for 'talking about feelings and relationship'. In this group, those who did not talk with any of the sources, this was predictive for STD (OR 2.62[1.04-6.60]) and for CT (OR 14.93[2.81-79.24]) infection. Participants were also asked about the quality of their sex edu (who gave 'best sex education'). Combining parents, peers and professionals and using them as reference, for CT the protecting sources were parents and family (OR 0.46 [0.23-0.91]), and peers (OR 0.45 [0.23-0.89]). Similar tendency was found for STD (table 10b).

Several questions inquired into school sex edu. The quantity of sex edu was protecting and showed a dose-response effect from 'a lot' (OR 0.26 [0.12-0.59]), 'some' (OR 0.42 [0.21-0.85]) and 'a little' (OR 0.44 [0.22-0.88]). The timing of school sex education was not significant for CT and STD infection with few exceptions: when sex edu was given in the 8th grade (OR 0.75 [058-0.97]), 1st grade in upper secondary for STD (OR 0.62 [0.40-0.94]) and in the 10th grade for CT (OR 0.43 [0.20-0.92]) (Table 10b).

It seems that the amount of information of specific topics of sexual education were important. Information about STD had a protective impact irrespective of the amount of information received (table 10b). Similar results were obtained for information about hiv/aids (table 10b) and 'talking about feeling and relationship' (only for STD). The amount of information about contraception

had no effects except in the group who received 'too much' in relation to CT infection prevalence (OR 0.38 [0.15-0.93]).

Finally, as an overall evaluation of the youth knowledge, knowledge scores about basic sexual facts, facts about safe sex, vocabulary of sexual topics as well as female and male physiology had neither significant impact on CT, nor STD infection. For example maximum versus minimum knowledge about safe sex (OR 1.08 [0.83-1.40]) and about contraception (OR 0.83 [0.66-1.04]) for STD and knowledge about safe sex (OR 0.98 [0.64-1.52]) and about contraception (OR 0.71 [0.49-1.03]) for CT were not statistically different (table 10b).

Furthermore, an additional analysis was performed after control for knowledge score of prevention of pregnancy (contraception) and knowledge score of prevention of STD (protection), in addition to other confounders (county, gender, age and geographical residence) with regard the impact of a selected group of variables on STD prevalence. Some factors showed to be important: who taught sex edu at school and the subjective evaluation of the youth of the best source of sex edu For teachers, biology teacher and health visitors showed predictive impact on STD prevalence (for knowledge score about contraception: OR 0.75, $p<0.01$ and OR 0.77, $p<0.01$, respectively). Similar tendency was observed for knowledge about protection. This was not observed for 'class teacher' (OR 0.98 $p>0.05$ and 0.99 $p>0.05$) or 'others' (OR 0.96 $p>0.05$ for both) (table 5). For best source of sex edu chosen among 8 different sources, only school education was protective (OR 0.44 $p<0.001$, for both contraception and prevention knowledge scores) (table 5).

Several questions elicited information about the type and pattern of use of contraception and their impact on STD/CT prevalence. These results are shown in table 10b. Question related to general use of contraception (or protection) (the term used in the questionnaire did not distinguish between contraception and prevention), revealed that the response 'seldom' predicted STD (OR 2.25[1.23-4.13]) and CT (OR 2.50[1.08-5.83]). The use of contraception in the latest sexual encounter was protective for STD (OR 0.66[0.54-0.88]) and for CT (0.63[0.46-0.86]) infection (table 10b).

Discussion with partners about contraception was not significantly associated with CT or STD infection. I have also examined the impact of the type of contraception used on CT/STD infection prevalence. The use of condoms alone was not protective for STD or CT except when it was 'employed in the latest sexual encounter' (OR 0.66 [0.54-0.82]) for STD and 0.63 [0.46-0.86] for CT). Condom use 'often' with either p-pills or other kinds of contraception (also known as 'Double Dutch or 'Double Danish') was predictive for CT/STD (OR 1.62 [1.07-2.46]) and 1.69 [1.27-2.25]) respectively) (table 10b). Furthermore, in additional analysis presented in table 5, experiences related to condom use were predictive for STD infection. The following statements regarding condom experience were highly significant for STD infection: 'impotence' (OR 2.9 $p<0.001$), 'interrupts' (OR 2.4 ($p<0.001$), 'desensitizing' (OR 2.8 $p<0.001$), 'don't feel ejaculation' (OR 2.4 $p<0.001$), 'slips off' (OR 2.2 $p<0.001$), and 'other problems' (OR 1.56 $p<0.05$).

As seen in table 10, the use of hormonal contraception was predictive for CT infection and exhibited a dose-response effect from 'often' (OR 3.06 [1.57-5.95]), 'sometimes' (OR 2.96 [1.37-6.43]), 'seldom' (OR 2,56 [0.87-7.55]). Similar trend was observed for the use of mini-pills. Predictive effects of using hormonal contraception, and mini-pills, were also observed for STD infection (table 10b). Predictive effects were also observed for those who used post-coital contraceptive pill ['morning after'] (for CT (OR 2.35 [1.62-3.40]) and STD (OR 1.50 [1.14-1.99]). Interestingly, 'not telling the partner about taking a 'morning after' pill was highly predictive of CT infection (OR 4.06 [2.40-6.88]) and STD (OR 3.28 [2.17-4.96]). The use of other contraceptive methods: 'coitus interruptus' was also predictive for CT infection irrespective of the frequency: 'often' (OR 2.16 [1.25-3.73]), 'sometimes' (OR 2.23 [1.39-3.59]) and 'seldom' (1.74 [1.11-2.72]). The use of 'safe periods' was likewise predictive for STD infection: 'often' (OR 2.47 [1.39-4.38]), 'sometimes' (OR 1,77 [1.11-2.81]) and 'seldom' (OR 2,01 [1.35-2.99]). Similar results were obtained for STD infection (table 10). Thus, the answered 'never' use of whatever contraceptive method was generally highly predictive for both STD and CT infection (table 10b).

Questions related to sexual partners were also tested in relation to CT/STD infection. The number of partners was predictive for CT with having more than one lifetime partner increasing the prevalence of CT infection (OR 4.54 [2.27-9.07]). When 'more than 10 partners' was employed as reference, a protective dose-response relationship became apparent with 2-3 partners (OR 0.11 [0.07-0.18]); 4-5 partners (OR 0.28 [0.18-0.42]) and 6-10 partners (OR 0.35 [0.24-0.51]). Interestingly, circumstances related to sexual debut were also indicators of CT and STD infection. 'talking about it (=sexual debut) for some time' was protective (OR 0.66 [0.49-0.88]) and 'dating <1 month' predictive (OR 1.38 [1.04-1.84]) for CT. For STD, 'peer pressure' (OR 1.45 [1.12-1.87]) and 'fear of being left alone' (OR 1.33 [1.00-1.76]) were also significant predicting factors. For CT and STD infection, 'being in love' and a 'wish to be like peers' were not significant indicators (table 10b). Frequency of 'one-night-stand' showed a dose-response relationship with highest predictive CT infection with 'often' (OR 2.94 [1.52-5.71]), 'sometimes' (OR 2.0 [1.34-2.98]), and lowest with seldom (OR 1.43 [1.11-1.85]). Similar trend was observed for STD (Table 10b). Furthermore, the following attitudes towards concurrent relationships were examined: 'okay for oneself to have concurrent relationships but not for partner' was protective for STD and CT infection (OR 0.59 $p<0.001$ and 0.46 $p<0.001$, respectively) (table 10b). Sexual practices: that included homosexual experience was associated with CT (OR 2.00 [1.24-3.23]) and STD infection (OR 1.89 [1.33-2.67]), the sexual encounters below 50/life time, was protective for CT infection (OR 0.42 [0.27-0.65]). Similar trend was observed for STD (Table 10b). The mixing of sex and drugs/stimulants was also significant predictor for CT and STD infections. 'Use of stimulants during sexual encounters' was predictive for CT infection (OR 1.62 [1.21-2.17]), while not using drugs or stimulants was found protective (no use of ecstasy (OR 0.06 [0.01-0.22]), no use of alcohol (OR 0.74 [0.55-0.99]), and no use of hashish (OR 0.39 [0.21-0.73]). I have performed additional analyses after control of knowledge score of protection and prevention that are shown in table 5. the use of drugs and stimulants at the time of sexual debut and at the latest sexual encounter were significantly predictive for STD infection ($p<0.001$, for both): for 'alcohol' (OR 1.85 and 1.96), 'hashish' (OR 2.95

and 2.78), 'speed' (OR 9.41 and 5.00), 'ecstasy' (OR 8.58 and 6.17), 'smoke-heroin' (OR 19.67 and 7.50), 'pills' (OR 11.16 and 29.93), and 'other' (OR 10.57 and 2.77) Interestingly, use of 'nothing' was also significant predictor (OR 2.09 and 2.81).

Finally, the perception of susceptibility of contracting aids was tested, using 'never' as reference, thinking about the probability of becoming infected with aids 'often' was predictive (OR 1.63 [1.02-2.59]) but not 'sometimes' (OR 1.42 [0.93-2.17]) and 'seldom' (OR 1.15 [0.74-1.78]) (Table 10b).

Since one of the main objectives of the thesis was to investigation attitudes towards policy of sexual and reproductive health, the responses of the youth to policy questions are shown in an independent table 11 where the county of residence is also shown. Table 10b shows results of logistic regression analysis of the responses to a selected group of these policy question and STD and CT infection prevalence. The effect of financial cost of condoms was examined. The answer 'will not use condoms even if freely available' was predictive for CT and STD infection (OR 2.24{1.57-3.20] and OR 1.75[1.40-2.20]) and similar tendency was observed for the answer' do not know' (for only STD) (table 10b). The presence of a misconception regarding registration of hiv-positives 'being registered' (kartotek)', predicted CT infection (OR 1.76 [1.13-2.74]) and 'hiv-positives are not allowed in schools' predicted CT (OR 3.60 [1.63-7.94]). Other policy questions did not show significant relationship to CT or STD infection (Table 10b).

Discussion

The aim of the Youth 99 study was to assess the need for a differentiated approach in regard to a potential population-based screening program for CT infection. Because of the large number of variables present in Ung99 questionnaire, I have selected a group of variables that cover 4 different areas: demographic background, knowledge, attitudes and practices. These variables can thus be used to assess the presence of an equal access to reproductive health is associated with CT and STD prevalence. The variables included ethnic background, sexual debut age, sexual and reproductive health education and its content, place of residence (county), geographical location, citizenship, religion,

education type, social network and knowledge scores about 'safe sex' (SSK score) as well as contraception. Only after controlling for county, gender, age, social network, education, and age at sexual debut as well as knowledge score (protection and contraception), it was possible to look at the association between each of the study factors and prevalence of CT/STD.

I found that several factors are significant determinants for CT and STD infection. Gender was associated with a higher prevalence of infection with females more than twice as likely to be treated at least once for CT/STD compared with males. This can be explained by a higher degree of contacts of females with health professionals due to opportunistic screening (e.g. cervix cancer), historical tradition of focusing on females' reproductive health needs {882}, seeking prescription of contraceptives pills and other available contraceptive methods (94), as well as the media and commercial market targeting primarily female contraception (17). This is also supported by the findings in youth 99 data that use of contraceptive hormones was highly predictive of STD and CT infection.

The county of residence seems to influence the prevalence of CT/STD infection suggesting that different test policies or campaigns for CT testing have influenced the results. For example in Aarhus county where TAM is well known among health professionals due to the studies conducted during the latest decade, a high prevalence of CT infection was found. This may be expected due to increased screening activity and is supported by the finding that the CT incidence has consistently been high in Aarhus county compared to other counties in Denmark (24). It is not clear why the participating youth living in the county of Funen, was twice as likely to be associated with STD (and not CT) infection compared to those living in other counties. It is possible that this reflects also differences between counties in their reproductive health policies.

The age at sexual debut was an important determinant for CT/STD infection among females and males with a sexual debut age before 16. This is at variance with the findings of a recent British national survey on sexual behavior in a population sample of 11 161 where sexual debut age in females has not been associated with high risk for STD infection after adjusting for several

confounding variables e.g. socio-economic status of parents, family structure, education levels (70). However, this study population included persons up to 44 years, which is quite different from youth99 study population.

Most of previous studies have shown that non-white ethnic background was associated with high prevalence of STD infection (95;96). However, a recent study of surveillance of CT and Neisseria gonorrhoeae (GC) infections in women in detention in Baltimore, USA has found a higher CT and GC prevalence among white-Americans compared to African-Americans (97).One of the limitations of these studies is that they are conducted in highly selective groups and thus are not representative national samples. In youth99 data, I did not find a statistically significant association between the ethnic background of parents and the prevalence of CT/STD infection in Denmark. On the contrary, 'parents not born in Denmark' seems to be a protective factor against STD and CT infection if they migrated to Denmark as refugees. This is the first study to suggest a relationship between parents' reasons for migration and the prevalence of CT in an ethnic minority of youth and may be explained by several factors including the slow assimilation of the refugee population in the recipient societies. Similarly, the perception of not 'being Danish' was associated with low CT prevalence. These observations may be related to differences in cultural and religious traditions including differences in age of sexual debut (see above) and possibly a reduced use of stimulants and/or hormonal contraceptives in this group (61). A Danish study has reported differences in the use of alcohol and other stimulant drugs between youth of Danish-born parents versus parents with non-Danish background (98). However, because of the small number of participants in this group, it was not possible to control for these factors, nor for the effect of gender. Thus, more studies are needed to explore the validity of these findings in a Danish context.

Few previous studies have demonstrated a trend towards a protective effect of sexual education on the prevalence of STD infection in particular by using interactive teaching methods and counseling (99) (100). Youth99 data corroborate these findings. In addition, in the current study the

influence of content, amount, sources, and timing of sex education on the prevalence of CT/STD infection was examined. A significant association between prevalence of CT infection and having received sex education in 'school' (protective) and by 'doctors' (predictive) was found. For STD infection, 'doctors' and 'media' were both found 'predictive'. This could be explained by the fact that contact to 'doctors' includes consultation regarding hormonal contraception is an indicator of sexual activity. The term 'media' was not clearly defined and thus may include pornographic literature that generally does not encourage safe sex practices (101). Timing of sex education was another determinant for CT/STD infection where teaching in the10th grade and 1st year upper secondary was protective for CT and STD infection respectively. Interestingly, teaching in the 1st year upper secondary is the only time where information about STDs is mandatory as a part of the biology curriculum. Also, in the 10th grade, the school health visitor and the school physician usually provide information on the subject as a part of the mandatory physical check-up (102). Interestingly, receiving sex edu only by biology teacher and school health visitor was observed to be protective for STD infection which may be explained by their better knowledge on the subject due to their professional training. The amount and content of sex education as judged by the youth themselves seem to be the most important factor associated with the prevalence of CT/STD. Sex edu at school was the only protective factor against STD compared with other sources of information (parent, peers, siblings..etc). Also, the youth stating that they received 'too much' and 'ok' sex education about 'STD', 'aids', 'conception' and 'feelings and relations' had the lowest prevalence of STD/CT infection. Furthermore, I found that receiving 'too much information about feelings and relations' was associated with the highest protection against STD followed by 'too much information about STD'. In comparison, 'far too much' as well as 'far too little information about aids' was found to be the least protective. These findings suggest the importance of amount and content in the success of sex edu programs and they corroborate the results of previous studies. For example, the impact of content of sex edu (including practicing communication and negotiation skills) as well as teachers' qualifications were important factors in the success of sex education programs

(103;104). Providing 'talking about feelings' and 'communication skills' in sex education sessions was associated with a trend towards safe sex practices (108;109). Also, parents involvement and adjusting the content of sex edu to cultural needs have been prerequisite for success of these sex edu programs (105;106). These findings can also explain why in some studies, the efficacy of sex edu programs that was part of abstinence programs and counseling in family planning clinics did not improve reproductive health status in young people measured by absence of effect on the number of unwanted pregnancy and the use of contraceptions (107). In fact 'sex abstinence education programs' were associated with an increase in number of pregnancies among partners of young male participants (107) but fewer pregnancies were found among young women, who received a multifaceted program (107). In addition, to the content of sex education programs, the amount of sex education was found to be important 'protective' factor against CT infection in youth99 data. This supports the findings of an inverse association between rising rates of teenage pregnancies and decreasing the amount of sex education given in schools in Finland (108;109).

The relative impact of parents and peers on health behavior has been studied in a sample of Danish youth as part of a WHO-sponsored cross-national study among pupils in 28 countries, which documented declining health among Danish youth between 11-15 years (110). In this study, youth behavior was classified as being either integrated, peer-oriented, parent-oriented or isolated (110). The authors found that depending on each behavior type, peers and parents can exert synergistic effects on the promotion of a specific behavior in the youth (110). Similar findings were observed in youth99 data. For example, when 'best sex education' was given by parents and by peers it was associated with the lowest CT and STD prevalence. These findings suggest the importance of involving both parent and peers in any sex education programs. Thus, the amount and content of sex edu as well as teacher's qualifications are important factors to consider in planning a successful sex education program.

Timing and conditions related to the sexual debut (e.g. the use of stimulants (alcohol), not knowing the partner in advance, lack of contraception/protection and peer pressure) were

associated with high CT/STD prevalence in youth99 data. These findings are similar to what have been reported in the British study (111) despite differences in methodology and in the formulations of questions.

The use of condoms can be a cheap method for CT/STD prevention but several factors affect its widespread use. Previous studies have shown that the low use of condoms was related to the perception of low susceptibility for infection, fear of being designated as promiscuous and use of alcohol or drugs (63;112;113). In youth99 data, experiences in relation to condom use (e.g. impotence, loss of sensation etc) were factors significantly associated with high CT/STD prevalence after control for knowledge scores on protection and contraception. This may be due the lack of information about condoms' use (48). One way to increase the use of condoms is to distribute them freely. This has been shown to be effective in some studies (114;115). In youth99 data, around 50% of participants who had sexual debut, 'will use condoms if freely available'. The group who responded 'don't know' as to whether they will use condoms every time if free of charge, was found significantly associated with STD prevalence. Thus, free availability of condoms can be a cheap preventive measure for decreasing CT/STD infection. In Norway, free distribution of condoms to HIV-positive persons was proposed (116) and health economists have found that free distribution of condoms may be cost-effective for prevention of hiv/aids (117;118).

Strength and limitation of the study

One of the major strengths of the study is the large number of participants and the high response rate obtained (99.3%) and thus a good external validity. Also, the authors included several control questions (variables) which improved the internal validity of the study. Another important feature is the detailed information about the parents of the respondents and for the ethnic minorities, the reasons of the parents' migration to Denmark. However, the geographical distribution of the samples was not even with some counties represented with few participants (sampling bias which affects the external validity of the study). The findings presented in this study were based on reported behavior and thus are

susceptible to recall bias. This is in particular relevant to the main outcome in this study, which is CT/STD infection. It was not possible to verify this information from hospital or GP records due to the anonymity of participants. Another important factor associated with recall bias, is the fact that the ability to recall an event is dependent not only on the time lapsed since its occurrence but also on its emotional content. Thus, previous CT/STD infection may have influenced the responses to questions related to knowledge, attitudes and behavior (119). Definitions of several terms associated with attitudes and behavior were not clear. For example the definition of 'sexual debut' may have different meanings. 'Non-sexually debuted' youth may be engaged in sexual practices other than vaginal intercourse that are associated with susceptibility for STD. Also the formulation of questionnaire affected the responses obtained. For example, there exist multiple answers to many questions and large number of missing data. It is my impression that the questionnaire was designed in order to perform descriptive and not analytical statistics.

Because of the cross-sectional nature of the study, no cause-effect relationship could be ascertained. However, various methods of statistical analyses have been performed in order to determine the relative impact of study variables after controlling for known confounders, on CT/STD prevalence. The findings obtained in this study are therefore suggestive of causal relationship and they need to be confirmed in a larger and if possible prospective studies.

General Discussion

> *"What is needed is an integrated net of strategies, which are mutually reinforcing and that are age, gender, culture, and context specific. Quite a challenge"!* (120)

Inspired by this challenge, the present study aims at contributing to an overview of what might be needed to meet this challenge, by assessing the age, gender, culture, and context-specific attitudes among physicians towards a population-based national screening program for CT among youth and also among a representative sample of Danish youth towards their sexual and reproductive health. Together with the historical perspective of the Danish strategies for sexual and reproductive health, the thesis may contribute to the knowledge base for decision-making regarding population-based CT screening as a part of a new strategy for reproductive health. In the following paragraph I will discuss TAM as the currently proposed model for a nationwide screening tool for detection of CT infection, in the context of establishing healthy public policy.

Component of a national screening strategy

According to the National Board of Health, before implementation of any screening program, the following elements should be assessed and fulfilled:

1. The presence of a valid test system and documentation of its technical effectiveness and its predictive value
2. An assessment should be made of ethical and psychological consequences for those tested: stigmatization and consequences of false positive and false negative test results
3. An economic assessment and evaluation of cost-benefit, cost-effectiveness, and/or cost-utility analysis as well as marginal analysis
4. A detailed description of:

   organization of the program/steering committee (professionals, competences) responsible for the screening program, registration system, information of the target group (intention-to-screen population), education of personnel, communication of test results

Several studies have demonstrated that a screening method based on TAM is valid, technically effective and has a high positive and negative predictive value of positive and negative test results respectively (31). The proposed organization responsible for carrying out screening according to TAM and its acceptability for health professionals has been tested in my current thesis. It is perceived that an administrative unit in each county is responsible for sending out screening invitations. Information of test results and counseling should be the responsibility of this administrative unit. Thus, it seems that we have a viable population-based CT screening program that can fulfill most of the above listed criteria. However, recent data have shown that this strategy may have limitations.
The test acceptability among both females and males has been high but 'the screening process' can cause several psychological challenges. A study from UK related to opportunistic screening has demonstrated the problem associated with having a positive test result (121). It was shown that the majority of those interviewed who had received a positive test result, were shocked and distressed. Similar study was carried out as part of the HTA on TAM screening. A total of 66 youth answered a survey including questions about stigmatization, fear of impaired fertility, and partner related questions (31). The majority of both sexes were affected by a positive test result, in particular regarding their prospective fecundity. The need for additional information to alleviate the anxiety elicited by test results may not be helped by the availability of a telephone information line 'hot line'. A study by the TAM group found a low utilization rate of such service 2.7% (124/4622 participants)(31).

It is also interesting that differences exist in the screening strategy between males and females according to TAM (31). Males will receive test kits and females will receive request flyers and they will receive test kits only after sending these requests. This strategy is based on the findings of the absence of differences in the number of female respondents between those who received request flyers and those who received test kits in a study performed by TAM group (31). However, such strategy may minimize males' responsibility for sexual and reproductive health and may aggravate gender inequalities

as suggested by one study (121). These findings draw attention to the fact that the ethical implications of screening, the perceptions of susceptibility and communication of the findings are complex and need careful consideration before introducing primary screening programs (86;122-124).

The proposed TAM model is based on the assumption that early detection of CT infection in the asymptomatic population will reduce the probability of CT complication. However, this view has been challenged by a study from the Netherlands that demonstrated that 44.7% of asymptomatic CT infected females cleared CT infection within one year without clinical evidence of pelvic inflammatory disease (125). These data are consistent with clearance rates found in 1979 by McCormack et al, using a time frame of 16-17 months (126). All these findings do have important consequences for cost effectiveness calculations in screening programs that involve asymptomatic CT infections (see below). Furthermore, there is a concern that over-zealous treatment of asymptomatic carrier may encourage the development of drug resistant CT infection (21).

One of the strengths of TAM for screening for CT infection is the presence of cost-effectiveness analysis as part of its HTA (31). TAM has been demonstrated to be cost-effective for CT screening in the Danish context (31). However, no cost-utility, cost benefit, [kasseanalyse] or incremental cost analysis has been made. These aspects are highly relevant and may be included in an ongoing British HTA on nationwide screening for CT infection (86;127). A systematic review of economic studies of CT screening as part of this British HTA, has demonstrated that the sensitivity of the obtained results depends on the model used (127). The authors found that only 2 out of 24 economic evaluations used an appropriate model that incorporates the potential of re-infection and the population effects (e.g. the impact of transmission). Also, a study from the Netherlands has reported the absence of cost-effectiveness of a population-based screening for asymptomatic CT infection (47). It is not clear from the Danish HTA on CT screening whether the economical evaluation of TAM has incorporated the re-infection rates in the mathematical mode used (31). Also, some of the made assumptions e.g. using human capital methods when the age group is attending education (as it is the

case in the majority of target population for CT infection) may be debatable (31). However further details into the assumptions made in the cost effectiveness analysis and choice of major outcomes adverted (MOA) go beyond the scope of this thesis.

Finally, one of the major limitations of TAM model is that it does not provide a complete model for a national strategy for sexual and reproductive health. The need for integrating a potential screening program within a strategy for reproductive health has been recommended by physicians who participated in the questionnaire doctors2001. In the following, I have tried to outline additional elements that need to be included in such a national strategy. I was inspired by a report published by the DANIDA that aimed to map out key issues for promoting the integration of sexual and reproductive health and rights (SRHRs) into the planning, implementation and reviews of DANIDA's sector program support (128). Five elements are mentioned and discussed with some suggestions relevant to the Danish context.

Equity including gender equity

Currently, there is no gender equity in screening and treatment for STD. Due to the available contraception (94) no males are offered opportunistic screening as they, in contrast to females, do not currently seek their GP for contraception or protection (129). The acceptability of TAM has been reported higher among males than females and males are more in favor of CT screening, in particular when the test kits are sent directly to home address. However this may not be true for youth from another ethnic background. A study conducted as part of the Danish HTA on TAM, found that youth from an ethnic background were less inclined to accept a screening offer using TAM (31). Similar findings of less usage of screening interventions have been found for other screening programs. As an example cervix cancer was recently found to be less used by ethnic groups in Denmark. Thus, it is important to devise and study new ways for increasing the participation and access of ethnic minorities to health promotion services.

Human Rights for information related to reproductive health

The first year students of upper secondary education are the only youth having the right and duty to learn about STD. However, the IPPF charter (International Planned Parenthood Federation) that was approved by Denmark to secure the necessary skills needed to obtain sexual and reproductive potential has not been implemented. The absence of a venereal law obliging the individuals with STD infection to undergo testing, treatment and participation in contact tracing to help contain the spread of infections is an obstacle for ensuring SRHR for the whole population. Only few professional contract tracers are at present available in Denmark and they concentrate on newly diagnosed hiv-patients and not other STD infection. Furthermore, the GP do not get financial incentives to encourage contact tracing (130). Thus, contact tracing is to a large extent left for the infected persons' moral and practical means. A Swedish survey among 192 consecutive youth in STD clinics in 1997 was conducted to evaluate how patients with CT infection perceived the legal enforcement of partner notification and to elicit their views on legislations impinging on their own behavior (131). Among the respondents, 90% considered it beneficial that CT infection was regulated and that a named partner could be forced to undergo STD testing and partner tracing included the latest six months (131). It could be noted that in youth99 questionnaire, similar attitudes were expressed in regard to the need for law enforcement to control the spread of hiv/aids infection.

Importance of understanding sexuality within its existing socio-cultural contexts

An effective strategy for combating CT and other STD infection needs to be based on understanding the ecology for STD since the cultural context may further aggregate the inequality in health. Three Danish studies might demonstrate the importance of these cultural factors. The studies examined health behavior of Danish youth. One study was a cross-national study among pupils (11-15years) in 28 countries. This study revealed a declining health of Danish youth, over the latest 14 years. Danish youth reported unhealthy habits, e.g. drug use (tobacco, alcohol), consumption of sweets, lack of physical exercise, lack of use of seat belts and had low scores on self-rated health parameters. The study also

revealed that the parents exert major influence on the youth behavior (115). A second study was performed within a WHO and International Center for Migration and Health frame. It was a qualitative study conducted among 100 refugees and immigrants between ages 12-30 years in Aarhus county, primarily of Arab Muslim origin. This study showed that sexual encounters were mainly among 'immigrant' males and 'non-immigrant' females and that sexual exposure of immigrant females was limited. The study in addition documented the cultural conflicts between the youth and their parents with regard to views related to sexual activity outside marriage and the use of alcohol (98). This study demonstrates the importance of including positive cultural factors in sexual health promoting programs. Also, results from the present youth99 study suggest the importance of differential approach to reproductive health interventions. Youth99 data demonstrated that youth with non-Danish born parents had lower SSK score. A finding in concordance with a study among 9th grade pupils in Viborg county which reported that males not born in Denmark had a poor knowledge of contraception (132). In addition, the importance of interventions related to sexual minority groups has also been shown by Danish studies that have demonstrated the need for assessing which information about hiv/safe sex among groups of high exposure e.g. among prostitutes is wanted and required (133).

Surveys (Knowledge, Attitude, Practice (KAP) surveys including health beliefs relating to STDs, aids, and contraception)

Implementing and adjusting national strategies for reproductive health should be based on national prospective KAP surveys that are performed at regular intervals after implementation of these strategies. The British NATSAL is an example of a validated KAP survey (111). The questionnaire 'youth89 and 99- a sexual profile' are Danish examples of KAP surveys. Several other surveys have been conducted also among diverse sub-groups e.g. homosexuals, but unfortunately they all lack the methodological requirements for proper evaluation (132;134). A recent explorative study in regard to evaluation of health in health economic terms has included sexual activity as one among 15 dimensions relating to self-rated health (135). These data might be included in future evaluations incorporating sexual health issues.

Attention to reproductive health perception in the overlooked groups:

Youth99 questionnaire assessed the impact of ethnic-cultural background on the adolescents' perceptions of their reproductive health needs. Immigrants and refugees have specific problems due to lack of literacy or access to translated material. It is not known to what extent the private schools recruiting mainly children from a religious or migrant background provide sexual education (136). Other groups in need of special attentions are aggressive males. In the county of Northern Jutland, a self-help service for males convicted for domestic violence was described in positive terms, but no formal evaluation has been made (137). There are no specific interventions towards other vulnerable groups e.g. inmates, sex-industry workers, homeless, drug addicts, drug addicts, the mentally ill, people with disabilities or handicaps, and youth living in institutions on a national coordinated level with a specific focus on sexual and reproductive health.

Information. Education, Communication (IEC)

a) Identify effective strategies to alter high-risk sexual activities:

One of the major issues for CT prevention is how to promote safe sexual behaviors. In 2001, an evaluation of 'ecstasy prevention campaign among youth' recommended that authorities ought to play a central and coordinating role in prevention campaigns, and mass media campaigns should be launched as part of an overall prevention strategy (138). It is also recommended that campaigns to alter behaviors and attitudes should be supplemented with factual information, be tailored to different groups, make use of the TV, youth-to-youth communication and focus on new situations of risk, as well as to involve role models. These strategies seem effective in all fields of human behavior and thus can be extrapolated to CT prevention campaigns. Some studies have provided evidence of effective strategies for promoting safe sex practice based on using some of these recommendations (100) while other recommend further and better conducted studies (107).

b) Clarify useful indicators of sexual behavior that are suitable and acceptable for monitoring

Monitoring sales for hormonal contraceptives, IUDs and condoms and the registration of medication used for treatment of CT and STD are useful tools for research and may add to the understanding of the ecology of STD. For example hormonal contraceptives have been the dominant methods for contraception since they were launched 37 years ago. Approximately 30% of women in the fertile age use them, and in the age group of policy relevance in regard to CT screening, 50% among 20-14 year olds use hormonal contraceptives (94). Part of this information is currently available by use of Statistics Bank Denmark and the Prevention Registry but so far, these parameters have not been explored for prospective studies and continuous monitoring.

c) Assess dissemination methods for SHRH-related information and skills

This can be performed, e.g. by ensuring continuous political and financial support to the present national IPPF non-governmental organization (NGO). The Danish Family Planning Organization 'Sex & Society' [sex & samfund] which is financed by Danish authorities thus the per se NGO status could be questioned, has initiated several networks for professionals across the country e.g. on HIV/AIDS. It also advocates the IPPF Charter in Denmark, and participates and contributes to the international networks to ensure sexual and reproductive health. Latest activities include a network for educators with focus on minority groups' special needs for obtaining SRHR. The members are mainly working for the authorities and national endeavors to provide better information about SRHR issues and include different grass root groups and networks working in the field of SRHR in Denmark, often doing outreach activities among youth and encouraging youth to youth services including telephone services, websites etc. So far it has been mainly offered education to schools in the Copenhagen area. When a new strategy for SRHR was launched in April 2003 it was however voiced that wider dissemination to other areas of Denmark is welcome, and members are currently asked to help increase the number of members of the association.

d. Field testing of educational materials and programs

In addition to producing and distributing new educational material, there is also a need for evaluating their efficacy. For example a folder on contraception has been translated into Arabic and Turkish in 2001 filling a huge demand for educational material among health visitors and others groups involved in family planning (91). However, there is no evaluation as to whether this approach is effective. Due to the illiteracy among spouses united with their husbands (in youth 99 terms 'migrate to marry') [familiesammenføring], a written folder may not actually be the best choice. The use of audiovisual material, e.g. like the video launched by the NBH about female genital mutilation and specifically directed to the Somali community but this initiative has not been evaluated. As far as sexual minorities are concerned, there have been no coordinated initiatives launched on a national scale. Recently however, new educational material for sexual education among diverse groups has been published (92). Some of these elements of the above mentioned points have been integrated in the latest strategy for prevention of STDs (2000-2004) but not on an operational basis (139).

Reproductive health policy and the role of law

In considering the establishment of a national sexual health care strategy, we may consider enforcing this strategy by laws. Laws are the tools of the State to implement appropriate health policies and have historically been regulated by moral- or principle-based consensus with roots in religion or political philosophy. In the modern society, laws have evolved into the politically composed legislatures. However, adherence and obedience is still determined by the general acceptability within the civil society. On a global level, the WHO concept of sexual and reproductive health based on secular vision may challenge the religious authorities and traditions, thus obstructing enactment of laws designed to achieve health (140).

The effect of moral or principle-based law on women's health and status has historically been discounted since institutions of moral authority such as religious institutions, legislatures, academic institutions, and professional associations have tended not to include women and in many cases expressly excluded women. In addition, before introducing legal means, attempts should be made

to assess their possible impact. For example, attempts of protecting intended spouses against their partners' HIV infection by mandatory HIV testing has proved counter productive; resulting in couples moving about, co-habiting or not to marry as well as to have a prolonged engagement. This is in contrast to same-sex couples that remained unaffected by the law (legally not allowed to marry in most countries) (140).

What have other countries done? - A tale of three countries

Due to the huge economical costs of CT infection imposed on individuals and public, several countries have tried to implement a national public health policy. Two Scandinavian countries are chosen due to geographical proximity and USA due to a published follow-up study on the outcome of seven years of CT screening in several states.

In Sweden, CT is a reportable disease since 1982. In 1988 the venereal law was updated to include CT and detected CT infections made notifiable. In the Swedish venereal law the right for free treatment and the obligation of participation in contact tracing are emphasized. Declining incidence and prevalence rates of CT and 40% decline in ectopic pregnancies followed in the period during 1994-98 (131).

In Norway testing for CT infection increased in the 1980s. In 1995 the Norwegean venereal law was updated and the strategy for prevention of each of the STD was reviewed and renewed in 2001 by adopting the Swedish example. The CT incidence and prevalence rates have declined during the latest decade. Similar to the situation in Sweden, Norwegean health care professionals have a legal duty to conduct contract tracing and follow-up as well as providing free medical treatment for infected sexual contacts (18).

In USA there is no venereal law in USA. In the 1980s a screening programs for asymptomatic CT infection were launched in several North American states in 1980s. Among vulnerable groups (e.g. socio-economic poor, women inmates, attendees in housing projects) declining rates of incidence and prevalence of CT infection has been reported indicating a positive effect.

However, re-infection with CT has been observed associated with increased risk for long-term complications (19).

Elements for inclusion in a suggested national strategy for sexual and reproductive health in Denmark

I think that a new venereal law should be re-introduced based on the Swedish and Norwegean model. It should include the rights of receiving information about sexual and reproductive health in public schools and this should be a mandatory part of the exam curriculum. In addition, mandatory teaching courses should be organised for public school teachers and school health visitors since they are the sources responsible for sexual and reproductive health information. In particular, the importance of health promotion by focusing on self-efficacy skills and inclusion of the pupils' own experiences should be stressed (93). Of major importance is to include the social and cultural context e.g. peer pressure and factors surrounding sexual debut (use of stimulants and substances). Also, it should be stressed that reproductive health is a mutual responsibility and not the sole responsibility for the female. Finally, CT should be a notifiable disease with registration of the affected persons and they should be legally obliged to trace and notify their sexual partners in the latest six months.

In conclusion, we need in Denmark a strategy that calls for a population approach of primary prevention by education or 'to screen for knowledge'. A supplementary approach is secondary prevention either by opportunistic screening and contact tracing by TAM. This approach is acceptable to physicians and targeted population. As these approaches are not mutually exclusives and they compliment each other, they can fit into the national guideline for management on CT. Thus, it is an important task to plan, implement, monitor and ensure surveillance of this prevention strategy. This challenge is the responsibility of health care practitioners, educators, researchers and decision makers to work for its implementation and assess benefits of their endeavors.

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List of Tables

Doctors 2001 study

Youth 99 study

Appendices

Appendix 1: Doctors 2001 questionnaire.

Appendix 2: Figures illustrate responses of physicians according to their specialty to all questions in doctors 2001 study.

Appendix 3: Impact of gender and type of employment of participants in doctors 2001 study on their attitudes towards organization of a population-based screening program for Chlamydia trachomatis (CT)