ORIGINAL ARTICLE

Sexual behaviour among young Danes aged 15–29 years: a cross-sectional study of core indicators

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ABSTRACT

Objectives Sexually transmitted infections and unwanted pregnancies occur at high rates among youth. Understanding sexual behaviour is essential for planning and implementing future effective preventive interventions. The present study examines the sexual behaviour in the general Danish population aged 15–29 years using the core indicators recommended by the European Centre for Disease Prevention and Control.

Methods A nationwide cross-sectional study was conducted in Denmark among a random sample of 20 000 men and women in 2012. Respondents completed a web-based sexual behaviour questionnaire and data were linked to a nationally held demographic database. Core indicators for sexual behaviour frequency stratified by gender are presented as unweighted and weighted data after consideration of sociodemographic differences between respondents and non-respondents.

Results Response rate was 20.4%. Condoms were used at sexual debut by 69.9% of women and 62.3% of men, while 14.3% of women and 15.1% of men used no contraceptives at sexual debut. Half of the respondents used condom alone at the latest sexual encounter with a steady partner (women 51.8%, men 55.2%), while 10% used no contraceptives. Having a sexual encounter with a casual partner decreased the likelihood of using condoms (women 43.7%, men 49.5%) and increased the likelihood of using no contraceptives (women 14.8%, men 20.9%). Data on sexual behaviour characteristics showed only minor changes when weighted for non-response.

Conclusions The findings call for interventions addressing the use of appropriate contraception at sexual debut and at last sexual encounter; this seems particularly important when the sexual partner is a casual partner.

BACKGROUND

Sexually transmitted infections (STIs) remain a significant public health problem among the youth in Western countries: 75% of all Chlamydia trachomatis infections and 41% of all gonorrhoea infections are reported in the population aged 15–24 years.1,2 In addition, 13.6% of all syphilis cases are reported in the population aged 20–24 years.3 STIs have major medical, social and public health implications in both genders.3–4 Furthermore, Western women aged 20–24 years also have the highest abortion rates compared with women in other age groups.5–7 The high prevalence of STIs and unwanted pregnancies is probably related to risky sexual behaviour. A better understanding of the sexual behaviour is thus essential for ensuring effective preventive interventions in the future.

The European Centre for Disease Prevention and Control (ECDC) made an analysis in 2008 of the STI/HIV3 behavioural surveillance data in Europe on the general adult, the general young population (15–24 years) and six high-risk groups.1,9 Thirteen countries reported to have a national population surveillance system in the general young population, while five reported to collect similar data through consecutive surveys. As considerable diversity was identified among the used indicators in all target groups, the ECDC recommended a set of future core indicators for each group to identify sexual risk behaviour, monitor progress in interventions and facilitate international comparisons.6,9 No systematic data collection has yet been performed in the general Danish youth. Therefore, it is difficult to monitor changes in sexual behaviour over time that may have contributed to the spread of STIs.

A key challenge in sexual behaviour surveys is to generate representative, unbiased and accurate measures of behavioural characteristics at individual and population levels. Previous postal surveys in the general young population have reported response rates between 16.7% and 68%.10,11 Thus, a potential risk of non-response bias is present.

The objective of this cross-sectional study was to examine the sexual behaviour in the general Danish population aged 15–29 years using the ECDC core indicators after considering the sociodemographic differences between respondents and non-respondents.

METHODS

Study design and study population

We conducted a nationwide population-based cross-sectional study of sexual behaviour core indicators3,9 among a sample of Danes aged 15–29 years. The study population included 20 000 men and women who were randomly selected from the Danish Civil Registration System (CRS) and living in Denmark at the time of retrieval. The selection was based on well-established statistical methods for random sample selection from the CRS, which contains records on more than 99% of the Danish population (including updated postal addresses).12 Residents holding publicly recorded protection from research participation (12%–25% of 15–29 year olds) were excluded13 as were residents with unknown address.

Each eligible individual (9735 women, 10 623 men) received a written invitation by surface mail
on 26 October 2012, including description of study objectives, information on anonymity, a personal link to the web-based questionnaire, instructions on how to access the questionnaire and estimated completion time. The invitation letter gave no information on the linkage between questionnaire data and registry-based sociodemographic data since the procedure was decided after the inclusion period had ended (due to the low response rate). Non-respondents received a reminder on 16 November 2012, and the inclusion period ended on 17 January 2013. Respondents received no compensation.

**Questionnaire development**

A comprehensive 95-item self-administered web-based questionnaire was developed on the basis of literature search, the research group's profound experience in the field and a qualitative study on sexual behaviour. Items on sexual behaviour (63 items) concerned: age and use of contraceptives at sexual debut, number of sexual partners during the last year, details of the last three partners during the last year (including type of partner, i.e., casual or steady, and use of contraceptives), and giving or receiving payment for sex (table 1). To ensure that stated information on contraceptive methods was related to either vaginal or anal intercourse, we refer to vaginal (vagina) or anal (rectum) intercourse. Items on STI/HIV testing and earlier STI/HIV diagnosis were added (table 1). The questionnaire also contained items on sociodemography, personality and lifestyle factors (not included in the present study).

All items were evaluated and commented on by a group of experts. The self-administered web-based questionnaire was first pilot tested among 13 students (aged 18–23 years) at a Danish folkehøjskole (i.e., a traditional Nordic 'school of life' boarding academy providing adult education during a full-time stay of 4–12 months) by using cognitive interviewing to identify challenging items and response categories. The survey administration software was then tested, and completion time was 20 min. Finally, the questionnaire was pilot tested in a sample of 120 Danish students at the end of their secondary education (aged 18–20 years). Potential floor/ceiling effects and test–retest reliability were investigated, and the survey was adjusted accordingly.

**Measures**

Data on sexual behaviour were categorised as proposed by the ECDC and supplemented with our own indicators (table 1). Online supplementary material data include testing of STIs in general, not only of HIV as proposed by the ECDC. Sociodemographic data for respondents and non-respondents were obtained from the Integrated Database for Labour Market Research. Included variables were age, ethnicity, and educational level of respondents and their parents. Variables updated at the end of 2012 were used. Data were linked at the individual level by the CRS through a unique 10-digit personal identification number assigned to every Danish citizen at birth or immigration. Missing information for registry-based variables ranged from 0% for age and gender to 3.4% for ethnicity.

Age was categorised into ranges of 15–18, 19–24 and 25–29 years. Ethnicity was divided into Danish, Western immigrant,
and non-Western immigrant and subsequently categorised according to the definition by Statistics Denmark.20 Educational level of respondents was determined according to ongoing or highest completed education according to UNESCO’s classifications, that is, low (≤10 years), middle (11–15 years) or higher education (>15 years). For each respondent, the educational level of both parents was obtained, but only the highest achieved educational level of (any) of the parents was used in the calculations. Level of parents’ education was determined according to UNESCO’s classification (table 1).

Sample size and data analysis
Sample size was calculated to enable detection of 10% differences between individuals engaging in unsafe versus safe sex, with 90% power at the 0.05 significance level and an estimated 25% response rate. The estimated sample size was further multiplied by four to enable subgroup analyses.

All respondents were included in the analysis on sexual experience, except for 13 outliers who reported to be less than 10 years old at sexual debut or their partner’s age to be either less than 10 years or above 45 years at sexual debut. Further analysis of sexual behaviour characteristics was restricted to respondents who already had their sexual debut (n=3127). Frequencies of sexual behaviour core indicators stratified by gender are presented in tables 3 and 4 as percentages of respondents who already had their sexual debut (n=3127). A higher proportion of respondents than non-respondents were engaged in ongoing formal education (71.5% vs 56.7%) and to have parents who completed an education of more than 15 years (43.7% vs 29.9%) (data not shown).

Ethics
The study was approved by the Danish Data Protection Agency (file no. 2010-41-5610). Although no approval was required according to Danish law as no biomedical intervention was performed, the study was conducted with ethical clearance from the National Committee on Health Research Ethics (file no. 162/2010). Respondents gave their consent by completing the web-based questionnaire.

RESULTS
Of the 20 000 individuals invited to participate in the Danish sexual behaviour survey, 4072 (20.4%) completed the questionnaire (63.7% women, 36.3% men). Respondents were generally younger (aged 15–18 years [31.5% women, 32.3% men]) than non-respondents (21.6% women, 22.9% men) (data not shown).

Sociodemographic characteristics
A higher proportion of respondents than non-respondents were Danes (94.0% vs 81.9%). Respondents were more likely to be engaged in ongoing formal education (71.5% vs 56.7%) and to have parents who completed an education of more than 15 years (43.7% vs 29.9%) (data not shown).

Table 2 Sociodemographic factors associated with respondents (women, n=2595; men, n=1477) compared with non-respondents (women, n=7140; men, n=8788); crude and adjusted OR with 95% CIs

| Ethnicity                     | Women (n=2595) | Men (n=1477) |
|-------------------------------|----------------|--------------|
| Age group                     |                |              |
| 15–18 years                   | Ref            | Ref          |
| 19–24 years                   | 0.61 (0.55 to 0.69) | 0.61 (0.50 to 0.74) |
| 25–29 years                   | 0.58 (0.52 to 0.66) | 0.52 (0.42 to 0.65) |
| Ethnicity                     |                |              |
| Danish                        | Ref            | Ref          |
| Western immigrant             | 0.35 (0.26 to 0.46) | 0.33 (0.22 to 0.50) |
| Non-Western immigrant         | 0.23 (0.19 to 0.27) | 0.29 (0.22 to 0.38) |
| Education                     |                |              |
| Ongoing                       |                |              |
| ≤10 years                     | Ref            | Ref          |
| 11–15 years                   | 0.75 (0.66 to 0.86) | 0.69 (0.59 to 0.81) |
| ≥15 years                     | 0.91 (0.79 to 1.05) | 1.13 (0.95 to 1.35) |
| Highest completed             |                |              |
| ≤10 years                     | 0.33 (0.27 to 0.41) | 0.26 (0.20 to 0.33) |
| 11–15 years                   | 0.57 (0.49 to 0.67) | 0.57 (0.48 to 0.68) |
| ≥15 years                     | 1.05 (0.86 to 1.28) | 0.98 (0.70 to 1.36) |
| Highest level of parents’ education |            |              |
| >15 years                     | Ref            | Ref          |
| 11–15 years                   | 0.67 (0.61 to 0.74) | 0.66 (0.59 to 0.74) |
| ≤10 years                     | 0.36 (0.30 to 0.44) | 0.35 (0.28 to 0.45) |

Numbers in bold show a significantly increased or decreased OR for respondents compared with non-respondents.

*Adjusted for age group, ethnicity, educational level and highest achieved level of parents’ education.
After adjustment for sociodemographic characteristics, a reduced association was found between non-Western immigrants and being a respondent; this trend was found for both female (OR 0.30, 95% CI 0.23 to 0.39) and male respondents (OR 0.33, 95% CI 0.24 to 0.45) (table 2). Enrolment in higher education (>15 years) was associated with being a female (OR 0.33, 95% CI 0.24 to 0.45) (table 2). Education of more than 15 years and being a female respondent (OR 1.89, 95% CI 1.39 to 2.56). Finally, parents of respondents were higher educated than parents of non-respondents.

Sexual behaviour characteristics

Table 3 and 4 show the sexual behaviour characteristics stratified by gender and displayed by unweighted and weighted scores. A total of 932 respondents (23.0%) had no sexual experience (table 3) ranging from 28.7% among the youngest age group (20–29 years) to 5.6% among the oldest age group (50–54 years). Women had a higher percentage of sexual experience than men. Interestingly, women with a higher level of education had a lower percentage of sexual experience than men with a lower level of education. After adjustment for sociodemographic characteristics, a reduced association was found between non-Western immigrants and being a respondent; this trend was found for both female (OR 0.30, 95% CI 0.23 to 0.39) and male respondents (OR 0.33, 95% CI 0.24 to 0.45) (table 2). Enrolment in higher education (>15 years) was associated with being a female (OR 0.33, 95% CI 0.24 to 0.45) (table 2). Education of more than 15 years and being a female respondent (OR 1.89, 95% CI 1.39 to 2.56). Finally, parents of respondents were higher educated than parents of non-respondents.

Table 3 Sexual behaviour core indicators related to sexual debut and number of partners among respondents aged 15–29 years (women, n=2592; men, n=1467)

| Characteristics                              | N   | Category        | Respondent’s sexual behaviour | Unweighted data | Weighted data |
|----------------------------------------------|-----|-----------------|-------------------------------|-----------------|---------------|
| Sexual experience                            | 4059| No              | Women                         | % (n) (95% CI)  | % (n) (95% CI)|
|                                             |     |                 |                               | 20.9 (543)      | 26.5 (389)    |
|                                             |     |                 |                               | (19.4 to 22.6)  | (24.3 to 28.9)|
|                                             |     |                 |                               | 79.1 (2049)     | 73.5 (1078)   |
|                                             |     |                 |                               | (77.4 to 80.6)  | (71.2 to 75.7)|
|                                             |     | Yes             | Women                         | 16.1 (2.8)      | 16.4 (2.4)    |
|                                             |     |                 |                               | (6.1 to 22.2)   | (6.6 to 71)   |
|                                             |     |                 |                               | (5.1 to 7.1)    | (5.3 to 8.2)  |
|                                             |     |                 |                               | 83.8 (1714)     | 77.8 (837)    |
|                                             |     |                 |                               | (82.2 to 85.3)  | (75.2 to 80.2)|
|                                             |     |                 |                               | 9.8 (201)       | 14.8 (159)    |
|                                             |     |                 |                               | (6.6 to 11.2)   | (12.8 to 17.0)|
|                                             |     |                 |                               | 0.3 (7)         | 0.8 (9)       |
|                                             |     |                 |                               | (0.2 to 0.7)    | (0.4 to 1.1)  |
|                                             |     | Partner younger | Women                         | 6.3 (128)       | 32.2 (345)    |
|                                             |     |                 |                               | (5.3 to 7.4)    | (29.5 to 35.0)|
|                                             | 3121| No age difference| Women                       | 28.9 (589)      | 37.4 (407)    |
|                                             |     |                 |                               | (27.0 to 30.9)  | (34.8 to 40.6)|
|                                             |     |                  |                               | 58.0 (1183)     | 27.1 (290)    |
|                                             |     |                  |                               | (55.9 to 60.2)  | (24.5 to 29.8)|
|                                             |     | Partner more than 5 years older| Women | 6.8 (139)      | 3.2 (33)      |
|                                             |     |                  |                               | (5.8 to 8.0)    | (2.2 to 4.3)  |
|                                             |     | Dual protection† | Women                         | 16.9 (345)      | 14.3 (154)    |
|                                             | 3117| Condom alone     | Women                         | (15.3 to 18.6)  | (12.3 to 16.5)|
|                                             |     |                  |                               | 53.0 (1082)     | 48.0 (516)    |
|                                             |     |                  |                               | (50.8 to 55.2)  | (45.0 to 51.0)|
|                                             |     | Non-condom contraception alone† | Women | 15.8 (322)     | 22.6 (244)    |
|                                             |     |                  |                               | (14.3 to 17.4)  | (19.3 to 25.3)|
|                                             |     |                  |                               | 14.3 (292)      | 15.1 (162)    |
|                                             |     |                  |                               | (12.9 to 15.9)  | (13.0 to 17.3)|
|                                             |     | Heterosexual     | Women                         | 92.8 (1902)     | 94.1 (1013)   |
|                                             | 3126| Homosexual       | Women                         | (91.6 to 93.9)  | (92.5 to 93.5)|
|                                             |     |                  |                               | 0.5 (11)        | 2.3 (25)      |
|                                             |     |                  |                               | (0.3 to 1.0)    | (1.6 to 3.4)  |
|                                             |     |                  |                               | 5.6 (114)       | 2.9 (31)      |
|                                             |     |                  |                               | (4.7 to 6.6)    | (2.0 to 4.1)  |
|                                             |     |                  |                               | 1.1 (22)        | 0.7 (8)       |
|                                             |     |                  |                               | (0.7 to 1.6)    | (0.4 to 1.5)  |
|                                             |     | Other            | Women                         | 3.8 (77)        | 7.3 (79)      |
|                                             |     |                  |                               | (3.0 to 4.7)    | (5.9 to 9.0)  |
|                                             |     |                  |                               | 62.4 (1278)     | 57.8 (623)    |
|                                             |     |                  |                               | (60.3 to 64.5)  | (54.8 to 60.7)|
|                                             |     |                  |                               | 28.9 (595)      | 27.9 (301)    |
|                                             |     |                  |                               | (27.1 to 31.0)  | (25.3 to 30.7)|
|                                             |     |                  |                               | 4.8 (99)        | 7.0 (75)      |
|                                             |     |                  |                               | (4.0 to 5.9)    | (5.6 to 8.6)  |

Data are shown as unweighted and weighted after correction for non-response. Numbers vary due to missing data. Numbers in bold show statistically significant differences between women and men. *Adjusted for gender, age, ethnicity, educational level and highest level of parents’ education. †Core indicators as proposed by the ECDC. ‡Dual protection indicated both condom and non-condom contraception. Non-condom contraception encompassed hormonal contraception methods, intrauterine devices and barrier methods. ECDC, European Centre for Disease Prevention and Control.
(15 years) to 0.2% for individuals aged 29 (data not shown). The mean age at sexual debut was 16 years, and the majority of respondents were heterosexual (93.3%, 95% CI 92.3 to 94.1).

Most respondents used a condom at sexual debut. Non-condom use was reported by approximately a third of the respondents. A sexual encounter with a casual partner decreased the likelihood of using either condom alone or dual protection for women (43.7%, 95% CI 39.1 to 48.4), but not for men (49.5%, 95% CI 43.2 to 56.0). In addition, a sexual encounter with a casual partner increased the likelihood of not using any contraception for both women (casual 14.8%, 95% CI 12.5 to 17.7 vs steady 8.4%, 95% CI 7.6 to 9.4) and men (18.8%, 95% CI 16.2 to 21.8 vs steady 10.8%, 95% CI 9.1 to 12.5).

More women than men had been tested for STIs. The highest testing rate was found among respondents who had ever been tested for C. trachomatis infection (women 54.7%, 95% CI 51.9 to 57.5 vs men 32.7%, 95% CI 29.9 to 35.7) (table 4) and this was also the most common diagnosis (women 27.6%, 95% CI 24.9 to 30.3 vs men 14.5%, 95% CI 12.2 to 17.0) (data not shown).

Data on sexual behaviour showed only minor changes after weighting for non-response (tables 3 and 4). In addition, when sexual behaviour was examined by each of the key weighted variables (age, ethnicity and education), no significant differences were found between the strata (data not shown).

### Table 4 Distribution of sexual behaviour core indicators related to last sexual encounter and STIs among respondents aged 15–29 years (women, n=2593; men, n=1473)

| Characteristic | N   | Category       | Respondent’s behaviour | Unweighted data | Weighted data* |
|---------------|-----|----------------|-------------------------|-----------------|---------------|
|               |     |                | Women                   |                 | Men           |
|               |     |                | % (n) (95% CI)          | % (n) (95% CI)  | % (n) (95% CI) |
| Contraceptive use at last sexual encounter (within the last 12 months)** | 2284 | Dual protection‡ | 20.8 (317) (18.9 (143) | 20.4 (18.8 to 22.6) |
|               |     | Condom alone   | 31.0 (473) (36.3 (275) | 28.7 (26.2 to 31.2) |
|               |     | Non-condom contraception alone‡ | 39.8 (608) (34.9 (264) | 41.2 (29.1 to 50.5) |
|               |     | No contraception | 8.4 (128) (10.0 (76) | 8.9 (7.3 to 10.8) |
| With a steady partner | 673 | Dual protection‡ | 16.6 (73) (6.8 (16) | 16.2 (12.8 to 20.1) |
|               |     | Condom alone   | 27.1 (119) (42.7 (100) | 25.2 (21.1 to 29.8) |
|               |     | Non-condom contraception alone‡ | 41.5 (182) (29.5 (69) | 42.5 (37.5 to 47.6) |
|               |     | No contraception | 14.8 (65) (20.9 (49) | 16.2 (12.5 to 20.5) |
| With a casual partner | 3127 | Ever tested HIV† | 18.5 (379) (14.8 (159) | 18.8 (16.9 to 20.8) |
|               |     | Ever tested Chlamydia infection | 54.7 (1121) (32.7 (352) | 56.7 (54.3 to 59.1) |
|               |     | Ever tested Gonorrhoea | 14.7 (302) (13.5 (146) | 14.5 (12.9 to 16.4) |
|               |     | Ever tested Syphilis | 10.1 (207) (9.2 (99) | 10.3 (8.8 to 11.9) |
| Have ever paid for sex | 3120 | Yes | 0.2 (4) (9.0 (97) | 0.2 (0.1 to 0.6) |
|               |     | No | 99.8 (2042) (91.0 (977) | 99.7 (99.4 to 99.9) |

Data are shown as unweighted and weighted after corrections for non-response. Numbers vary due to missing data. Numbers in bold show statistically significant differences between women and men. *Adjusted for gender, age group, ethnicity, educational level and highest achieved level of parents’ education. **Core indicators as proposed by the ECDC. †Dual protection indicated both condom and non-condom contraception. Non-condom contraception encompassed hormonal contraception methods, intrauterine devices, and barrier methods.

ECDC, European Centre for Disease Prevention and Control; STI, sexually transmitted infection.
Behaviour

DISCUSSION
This study indicates that a third of the Danish youth had sex without a condom at their sexual debut. Half of the respondents did not use a condom at the last sexual encounter; a higher proportion was found among individuals who had sex with a casual partner compared with a steady partner. A sexual encounter with a casual partner increased the likelihood of not using any contraception for both women and men. The collected data on sexual behaviour showed only minor changes after weighting for sociodemographic non-response.

To our knowledge, no prior studies have examined sexual behaviour in the general Danish youth by systematically using the sexual behaviour core indicators recommended by the ECDC. Nevertheless, this review found condom use at sexual debut to be the most common contraception at sexual debut, but did not identify the proportion of individuals using no contraception. In another Danish study, the rate of young people who did not protect themselves against STIs at sexual debut was lower (20%) than in our study.

With regard to the last sexual encounter, a cross-European study found that condoms were used among more than 65% of the sexually active adolescents compared with the approximately 50% found in our study. In a recent Dutch study, inconsistent or no use of condoms was found in 86.1% of steady relationships and in 66.5% of casual relationships. An Italian study found that inconsistent or no use of condoms occurred in 46.4% of steady relationships and in 9.5% of casual relationships. As different investigative methods have been applied, we cannot carry out direct comparisons with our findings. Nevertheless, we find it interesting that our study revealed a higher proportion of individuals who did not use a condom with a casual partner (women 14.8%, men 20.9%) compared with a steady partner (women 8.4%, men 10.0%).

The number of Chlamydia trachomatis tests in our study is high, which corresponds to the fairly high testing rate in Denmark.

The findings of this paper call for new preventive strategies. A special focus should be directed towards the many young individuals who had condomless sex at their sexual debut and/or at the last sexual encounter. More attention should also be given to the high frequency of unprotected sex at the last sexual encounter with a casual partner, for example, by ensuring easy access to condoms at places where casual partnerships are known to be established and/or by condom promotion campaigns and sex education in primary and secondary schools.

Our results may serve as a baseline study of sexual behaviour among the Danish youth. The use of core indicators further enables comparisons of STI trends and applied preventive strategies at national and European levels in cross-sectional and longitudinal studies, which may be useful for understanding the current spread of STIs. However, future survey administration methods must be considered, including development of new strategies that may better reach the target population, for example, by sampling at schools, web panels or other sources to improve survey response rates.

Key messages

- The general young population is at high risk of getting a sexually transmitted infection (STI) at the sexual debut and 50% at the last sexual encounter.
- Individuals in casual partnerships are more likely to use no protection than individuals in steady partnerships.
- The high number of individuals at risk of getting an STI calls for efficient preventive strategies.
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Sexual behaviour among young Danes aged 15–29 years: a cross-sectional study of core indicators

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