

Declining Trends in Some Sexually Transmitted Diseases in Norway between 1975 and 1991 with Special Reference to a Lapp Population

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Trends of *N. gonorrhoeae* (1975–1991) and *C. trachomatis* (1988–1991) infections in Norway were analysed by the National Institute of Public Health (SIF) using data reported by physicians. The validity of the reporting system was evaluated by comparing reported data from the three northernmost counties and particularly the Kautokeino community to SIF with confirmed positive specimens analysed by the two microbiological laboratories serving this area. The incidence of gonorrhoea in Norway has declined continuously from 300 cases per 100,000 annually in 1976 to 15 in 1991, whereas *C. trachomatis* infections with annual rates of 300 cases per 100,000 during the last 4 years has shown no significant decrease. The incidence of gonorrhoea in the county of Finnmark has shown the same declining trend as for the rest of the country, but is still four times higher than the national average. *C. trachomatis* infections show no obvious declining tendency in any part of the country and is three to four times higher in Finnmark than the average for the country. Kautokeino experienced a dramatic decrease in gonococcal infections from more than 1000 cases per 100,000 in 1976 to almost eradication in 1991, whereas *C. trachomatis* infections show a four times higher annual incidence than the national average. Although gonorrhoea is almost eradicated in Norway, *C. trachomatis* infections remain an important public health problem. This study indicates that young, sexually active individuals need to be targeted for effective health education in order to modify behaviour patterns which put them at risk of acquiring STDs. **Key words:** *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, declining trends, Lapp population, National Institute of Public Health (SIF), microbiological laboratories.

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Over recent years, changes in the trends of some sexually transmitted diseases have been reported in various European countries such as the Nordic countries (1), the Netherlands (2), Belgium (3), France (4), Great Britain (5) and Switzerland (6). Also, a variety of new sexually transmitted pathogens has been added to the list of venereal diseases.

Since January 1975 a national notification system in Norway has been collecting epidemiological data about infectious diseases, including some sexually transmitted diseases. For several years Northern Norway and particularly the county of Finnmark has experienced a considerably higher incidence of sexually transmitted diseases than the average for the country. Reported cases of gonorrhoea have decreased dramatically during the last 15 years, whereas chlamydial infections, which since late 1987 have been notifiable in Norway, have shown a fairly constant occurrence (7).

The purpose of this study was to explore the underlying reasons for the trend in the incidence of gonorrhoea and

chlamydial infections in Norway, particularly in northern areas. In many countries, including Norway, the incidence of gonorrhoea has been suggested as an index of sexual promiscuity (8). Fluctuations in the incidence may reflect changes in sexual activity that have occurred in the recent past, possibly as a result of the awareness of the AIDS epidemic. Gonorrhoea is particularly relevant in this respect because the incidence is known to change rapidly in response to changes in epidemiological factors (9). These factors include social aspects such as contact rates among individuals or groups of the population, sizes of the affected populations, and intervention and control programmes. They also include clinical aspects such as average infectious periods, for example due to asymptomatic infection in women, virulence of the agent, resistance to antibiotics, and availability and quality of medical care (9).

This paper describes the trends observed in *N. gonorrhoeae* and *C. trachomatis* infections in Norway over some years, with particular interest in data concerning the population of Kautokeino. The data reported to the National Institute of Public Health (SIF) (Statens Institutt for Folkehelse, Oslo, Norway) are also discussed in relation to diagnostic criteria laid down by the reporting doctors and the number of positive specimens found by the regional microbiological departments.

MATERIALS AND METHODS

Notification data

Notification data were collected from the National Institute of Public Health (SIF). In Norway gonorrhoea, among other sexually transmitted diseases, has been subject to the law of sexually transmitted diseases and as such a notifiable disease since 1947. Data on *N. gonorrhoeae* by date and place of reporting, however, have only been available since the national reporting network was established in 1975, from late 1987 data on *C. trachomatis* have also been included. Most cases (80%) of *N. gonorrhoeae* and *C. trachomatis* infections are diagnosed by general practitioners and the rest by venereologists at the university clinics. Reported data, of which 85–90% come from general practitioners, are based on identification of *N. gonorrhoeae* by a positive cultivation and thus recorded on the date of diagnosis. The diagnosis for the remaining 10–15%, however, is based on clinical criteria only and, therefore, immediately recorded. Identification of *N. gonorrhoeae* by microscopy in addition to cultivation is not used by general practitioners and only included for patients seen by venereologists at the university clinics. *C. trachomatis* is recorded as soon as an identification of the organism is available from the laboratory. Report forms concerning documented or strongly suspected cases of gonorrhoea and *C. trachomatis* infections should be returned weekly even if no cases are registered.

Laboratory procedures and registration

Two clinical microbiological laboratories, both hospital laboratories, investigating all (questionable) specimens of *N. gonorrhoeae* and *C. trachomatis* from the three northernmost counties in Norway served as sources in the registration. The Department of Microbiology, University Hospital, Tromsø, did all microbiological investigations of

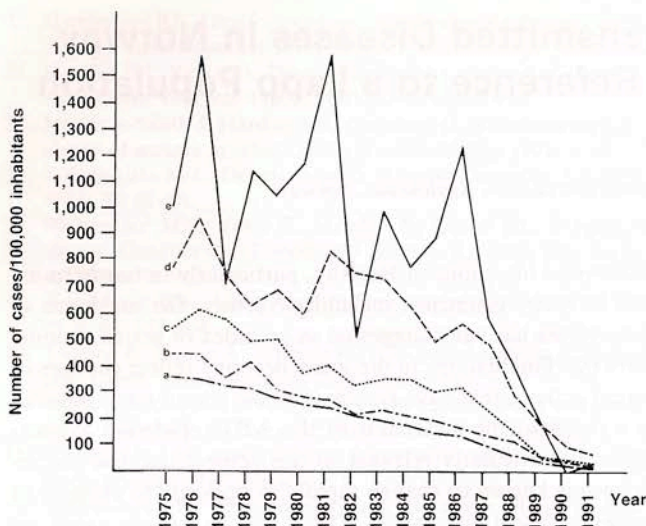


Fig. 1. Annual incidence of notified cases of gonorrhoea per 100,000 inhabitants in 1975–1991 in (a) Norway, (b) the county of Nordland, (c) the county of Troms, (d) the county of Finnmark and (e) the community of Kautokeino.

specimens from the counties of Finnmark and Troms, whereas the Department of Microbiology, Nordland Centre Hospital, Bodø, received all specimens from the county of Nordland.

N. gonorrhoeae

Material from the endocervix of women and from the urethra of men were collected with charcoal swabs and transported to the laboratories on Stuart's medium. Culture and identification followed conventional procedures, including Gram staining, oxidase reaction, and carbohydrate utilisation.

C. trachomatis

Endocervical (women) and urethral (men) specimens obtained with calcium alginate swabs were, as soon as possible after collection, transferred to one of the two laboratories (mentioned above) for further analyses. Initially, a case of chlamydial infection was defined as a patient from whom the respective microorganism was isolated by culture; however, only 5% of the total amount of specimens currently undergo this procedure. Since 1984, the immunofluorescence test (IF) and since 1986, bacterial antigen detection by enzyme immunoassay (EIA) have predominantly been used for diagnostic purposes.

The advantages of the EIA are threefold, i.e. it is of high specificity (99.5%), the specimens do not deteriorate with time, and because it allows simultaneous processing of large series it is extremely efficient.

General practitioners' registration in the Kautokeino community

By reviewing 2,950 medical records in the local health centre of Kautokeino comprising 99.6% of all 2,963 people (85% pure Lapps) living in Kautokeino, all cases of gonococcal (from 1987 to 1991) and chlamydial (from 1988 to 1991) infections which had been confirmed by a positive culture or EIA/IF, were registered.

The significance of the variations was evaluated using χ^2 analysis.

RESULTS

Notification data

Fig. 1 shows that nationally and in the three northernmost counties as well as in the community of Kautokeino, the in-

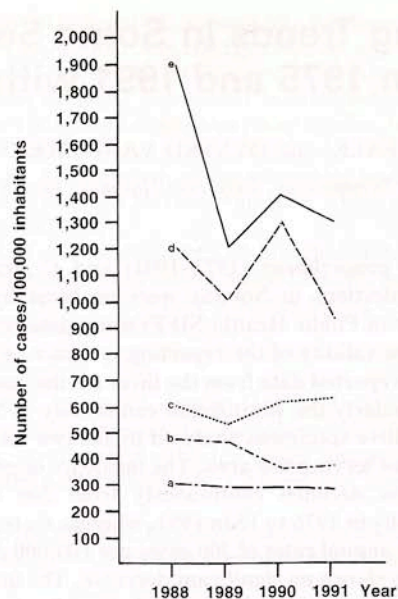


Fig. 2. Annual incidence of notified cases of *C. trachomatis* per 100,000 inhabitants in 1988–1991 in (a) Norway, (b) the county of Nordland, (c) the county of Troms, (d) the county of Finnmark and (e) the community of Kautokeino.

cidence of gonorrhoea has declined dramatically between 1976 and 1991. The incidence of gonorrhoea in Finnmark was initially more than twice and in Kautokeino three to four times higher than the average for the country. The incidence reached a peak in 1976, 1981 and 1986 for Finnmark and Kautokeino. Since 1986, however, the overall annual decline for all regions has been about 40%. The total number of gonorrhoea

Table 1. The number of gonorrhoea cases reported by doctors in Troms and Finnmark to the National Institute of Public Health (SIF) in relation to confirmed gonorrhoea cases at the Department of Microbiology, University Hospital, Tromsø. The number of investigated specimens and year of isolation are indicated

Year of isolation	Number of investigated specimens	Number of gonorrhoea cases reported to SIFF	Laboratory-confirmed cases	Notification in relation to confirmed cases (in %)
1975	21,824	1,392	1,142	122
1976	28,893	1,636	1,798	91
1977	30,942	1,437	1,524	94
1978	32,097	1,220	1,644	74
1979	32,857	1,284	1,510	85
1980	31,706	1,022	1,284	80
1981	28,561	1,233	1,444	85
1982	26,095	1,080	1,135	95
1983	25,938	1,087	1,238	88
1984	25,901	1,011	1,048	96
1985	23,383	847	988	86
1986	23,415	916	952	96
1987	22,946	724	727	100
1988	23,104	440	353	125
1989	23,281	220	204	108
1990	24,445	140	135	104
1991	26,144	92	68	135

Table II. The number of gonorrhoea cases reported by doctors in Nordland to the National Institute of Public Health (SIFF) in relation to confirmed gonorrhoea cases at the Department of Microbiology, Nordland Centre Hospital, Bodø. The number of investigated specimens and year of isolation are indicated

Year of isolation	Number of investigated specimens	Number of gonorrhoea cases reported to SIFF	Laboratory-confirmed cases	Notification in relation to confirmed cases (in %)
1983	12,565	571	320	178
1984	15,861	512	454	113
1985	17,677	489	298	164
1986	16,855	415	u	u
1987	17,416	344	u	u
1988	17,072	289	228	127
1989	17,039	139	95	144
1990	19,004	81	54	150
1991	20,125	48	29	166

u = unknown

cases for 1991 is less than 5% of that from 1975–1976. Nowadays, the trend for Finnmark is the same as before with a four times higher rate than the average for the country, whereas gonorrhoea in Kautokeino, with no cases in 1990 and one case in 1991, is almost eradicated as in the rest of the country.

Fig. 2 shows a fairly constant incidence of reported *C. trachomatis* cases in Norway during the last four years. The trend for *C. trachomatis* is the same as for gonorrhoea, i.e. the frequency increases with increasing latitude. Initially, the incidence of *C. trachomatis* in Finnmark was four times higher and in Kautokeino six times higher than the average for the country, and it is still more than three and four times higher, respectively, than the national average.

Laboratory data

Table I shows the number of laboratory-confirmed gonorrhoea cases identified by the Department of Microbiology, University Hospital, Tromsø and the corresponding numbers reported to SIFF by doctors. As can be seen the reporting rate is relatively constant and exceeds 90% for Troms and Finnmark.

Table III. The relation between chlamydial infections reported by doctors in Troms and Finnmark to the National Institute of Public Health (SIFF) and chlamydia positive specimens confirmed at the Department of Microbiology, University Hospital, Tromsø. The number of investigated specimens and year of isolation are indicated

Year of isolation	Number of investigated specimens	Number of gonorrhoea cases reported to SIFF	Laboratory-confirmed cases	Notification in relation to confirmed cases (in %)
1988	21,283	1,788	2,241	80
1989	21,595	1,538	2,248	70
1990	25,870	1,846	2,172	85
1991	27,379	1,616	1,920	84

Table IV. The relation between chlamydial infections reported by doctors in Nordland to the National Institute of Public Health (SIFF) and chlamydia positive specimens confirmed at the Department of Microbiology, Nordland Centre Hospital, Bodø. The number of investigated specimens and year of isolation are indicated

Year of isolation	Number of investigated specimens	Number of gonorrhoea cases reported to SIFF	Laboratory-confirmed cases	Notification in relation to confirmed cases (in %)
1988	16,795	1,141	1,589	72
1989	20,694	1,110	1,319	84
1990	20,941	863	1,096	79
1991	20,532	884	1,129	78

The total number of investigated specimens remained fairly constant at an average of 26,000 during the period 1976–1991.

Table II shows the corresponding figures from the Department of Microbiology, Nordland Centre Hospital, Bodø. As can be seen we have no data prior to 1983 and from 1983 onwards the figures are ambiguous. There seems, however, to be a considerable overreporting for gonorrhoea of about 50%. The number of investigated specimens was on average 17,000 during the period 1983–1991.

The number of laboratory-confirmed chlamydia cases has shown a slight decrease from 1988 to 1991 for Troms and Finnmark (Table III) and for Nordland (Table IV) with a notification rate of about 80% for both regions. On the other hand, the number of investigated specimens has increased slightly from 21,000 to 27,000 in Troms and Finnmark (Table III) and from 17,000 to 21,000 in Nordland (Table IV). For all three counties the number of investigated specimens was independent of the decrease in positive specimens, which may be explained by the fact that if genital symptoms occur, specimens for both gonococcal and chlamydial investigations are taken. Altogether, notification rates of about 80% must be considered satisfactory.

By reviewing the medical records in Kautokeino a slight under-reporting (85%) of laboratory-confirmed cases of *N. gonorrhoeae* was found (Table V). On the other hand, *C. trachomatis* seems to be over-reported by 60% compared to laboratory-confirmed specimens (Table V). Overall, more women were infected than men, in fact 47% of the age-specific population (females) accounted for 57% of the infections, whereas 53% (males) of the same population accounted for 43% of the infections (Table VI).

Gonorrhoea was more frequently found among males (18/28) than females (10/28), whereas *C. trachomatis* infections were more frequent in women (44/71) than in men (27/71) (Fig. 3). Of the 40 cases of gonorrhoea recorded, 30% were also infected with *C. trachomatis*; this was most conspicuous in females where 44% (8/18) had both infections compared with 16% (4/22) of the males (Fig. 3). When considering the ages of people infected, gonorrhoea was related to older age groups than *C. trachomatis* infections (Fig. 3); the difference being statistically significant ($p < 0.001$).

Table V. The number of gonorrhoea and chlamydial infections reported to SIFF in relation to laboratory-confirmed positive specimens from Kautokeino community. Year of isolation is indicated

Year of isolation	Number of reported gonorrhoea cases	Positive cultures	Notification in relation to positive cultures (in %)	Year of isolation	Number of reported chlamydial cases	Positive cultures	Notification in relation to positive cultures (in %)
1987	17	19	90	1988	55	33	167
1988	12	14	86	1989	34	20	170
1989	5	6	83	1990	42	30	140
1990	0	0	—	1991	37	u	u
1991	1	1	100				

u = unknown

When reviewing the case records of young women a very high frequency of *Gardnerella vaginalis*, confirmed by a positive culture, was observed. Condylomata acuminata and scabies were relatively common in both sexes whereas herpes simplex, vaginal candidiasis and pediculosis pubis were seldom found. No cases of syphilis were discovered during this examination.

DISCUSSION

In Norway the gonorrhoea incidence rates, both those reported to the National Institute of Public Health (SIFF) and the laboratory-confirmed ones, revealed a continuous decline from 1976 onwards, hereby preceding the onset of the AIDS epidemic. In 1976 the occurrence of penicillinase producing *N. gonorrhoeae* was discovered in Norway and in several other western countries (10). This, in addition to the generally high incidence rates of *N. gonorrhoeae*, led to a national campaign promoting the use of condoms. The declining incidence rate might at least partly be ascribed to behavioural changes, such as an increase in the use of condoms or less frequent change of partner.

Similar trends of gonorrhoea have been reported in several western countries. In Sweden the incidence rate started to decline in the early 1970s and was partly ascribed to the national campaign promoting the use of condoms and a 150% rise in the sale of condoms (11, 12). In Denmark the number of cases of gonorrhoea officially reported has dropped since 1983. The number of laboratory-confirmed cases has also decreased, but only since 1985 (1). A declining trend of gonorrhoea has been apparent in the Netherlands since 1981, thus preceding the onset of the AIDS epidemic (2). Since 1983 the decline has been further reinforced. In France, a decrease in the number of isolations of gonococci has been registered

Table VI. Sex-related laboratory-confirmed cases of *N. gonorrhoeae* during 1987-1991 and of *C. trachomatis* infections during 1988-1990 in Kautokeino

Sex	N. gonorrhoeae	C. trachomatis	Doubleinfections of N. gonorrhoeae and C. trachomatis
Males	18	27	4
Females	10	44	8

through a network of laboratories since the initiation of a similar surveillance system in 1986 (4). Furthermore, the number of gonorrhoea cases diagnosed in a sexually transmitted disease clinic in Paris fell between 1986 and 1987 (13). In England and Wales, gonorrhoea has been declining in frequency since 1978. The number of new cases of gonorrhoea was reduced by 66% from 1978 to 1988 with the reduction being particularly dramatic between 1986 and 1988 (5). Since 1983 a decrease has been observed in the number of gonorrhoea cases diagnosed in six dermatological clinics in Switzerland (6). In 1980 the gonorrhoea incidence started to decline sharply in the USA (14); this decline was partly due to an extensive screening programme, implemented in 1972 and designed to detect asymptomatic female cases.

Since 1986 the decline of gonorrhoea in Norway has been further reinforced, presumably reflecting a change in sexual behaviour resulting from educational campaigns and intensified surveillance of AIDS. The downward trend is not only observed in gonorrhoea infection rates but also in syphilis and scabies, i.e. a reduction from 328 new cases in 1975 to 52 cases in 1991, and from 37,300 cases in 1975 to 3350 cases in 1991, respectively. In the same period most cases of syphilis in Norway have been related to homosexuality which, presumably, reflects behavioural changes in this group, e.g. less frequent change of partner and/or more frequent use of condoms. Besides changes in sexual behaviour disease incidence is affected by other factors which are difficult to quantify. In Nor-

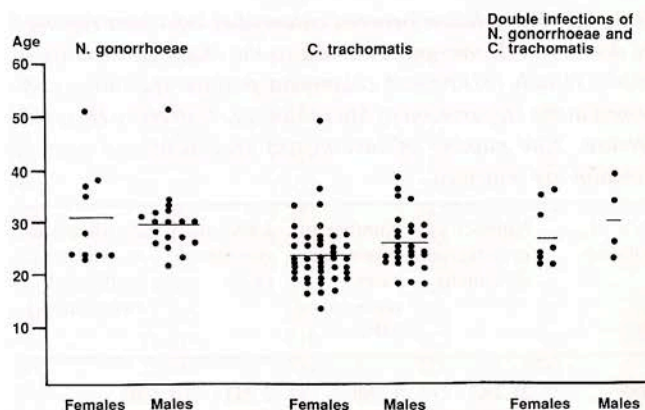


Fig. 3. Age- and sex-specific occurrence of *N. gonorrhoeae* (1987-1991) and of *C. trachomatis* (1988-1990) in Kautokeino. — = mean age.

way it is recognised that about 60% of communicable disease cases are reported to the National Institute of Public Health (SIFP). This estimate is based on a comparison of the number of cases reported per physician with results from interviews among physicians. At present, there is no evidence of change in reporting, despite the probably increased general awareness of sexually transmitted diseases (STDs) due to media news coverage of AIDS.

However, the trends in cases of *C. trachomatis* and *N. gonorrhoeae* infections in Norway seem to diverge. Whereas the number of cases of gonorrhoea has fallen drastically, chlamydial infections have remained largely unchanged, both laboratory-confirmed ones and those reported to the National Institute of Public Health (SIFP). Possible explanations include that gonorrhoea is generally diagnosed at an early stage due to pronounced symptoms and is therefore treated effectively resulting in an overall decimation of gonorrhoea in the population. On the other hand, the reservoir of *C. trachomatis* infection is more difficult to reach due to unsatisfactory case detection, improper treatment, and/or insufficient compliance with given treatment. Gonorrhoea and *C. trachomatis* infections may affect certain groups of people and be dependent on the type of educational campaigns promoted. The opposite trends with a decrease of gonorrhoea and an increase of chlamydial infections documented in Sweden during the first half of the 1980s were explained by the fact that chlamydial infections are relatively less common in homosexual men and, therefore, the overall incidence of *C. trachomatis* infections is less affected by changes in their behaviour (1).

A history of STD infections is often indicative of a high rate of partner change. This core group may be important in maintaining STD infection within the general population. The increasing percentage of individuals with an STD history may indicate that repeat infection is increasing among *C. trachomatis* patients and suggests that there is a group of highly sexually active individuals whose continued high risk behaviour makes them prone to STDs. The conclusion from this might be that the change in behaviour in this population group may be less marked than in sectors of the population who have not previously had an STD. It is, therefore, possible that the incidence of chlamydial infection will begin to decline when high risk heterosexual behaviour is reduced (1).

There may be several explanations for the higher incidence of STD in Northern Norway and particularly in the county of Finnmark and its community, Kautokeino, than the national average. Discrepancies between reported cases of gonorrhoea and positive cultivations may occur due to the time it takes to transport specimens from the investigating doctor to the laboratory; in some parts of this area it takes two days or even more, which may result in false negative cultivations. Moreover, as symptoms for gonorrhoea and *C. trachomatis* infections are very similar, some cases notified as gonorrhoea where the diagnosis is based on clinical criteria only could, in fact, be *C. trachomatis* infections and thus lead to over-reporting of gonorrhoea which appears to be the case for the county of Nordland (Table II). *C. trachomatis* infections, on the other hand, are said to be reported only when a positive specimen is confirmed by a laboratory. As 95% of all cases are currently

based on EIA, underreporting of *C. trachomatis* infections caused by false negative cultivations, as has been the case for *N. gonorrhoeae*, can be ruled out. In fact *C. trachomatis* has been over-reported in Kautokeino (Table V). However, the reason for this is not known.

Previous studies have shown that sexually transmitted diseases are frequently found in sexually active young girls. Early initiation of sexual intercourse, often in connection with alcohol intake, and a considerable number of sexual partners clearly increases the risk for STD. The infections are in most cases asymptomatic and clearly constitute an important concealed reservoir for the infective agent. On the other hand, young girls involved with male partners who are older, who have multiple partners and who have a higher prevalence of genital infections, are more prone to contract STDs (15). Besides, frequent change of partner, limited use of contraceptives, negligence of treatment offered and insufficient partner tracing may enhance the risk of spreading STD.

Although knowledge about contraception and the fear of infection and unwanted pregnancies is high, regular use of contraception is rare among young individuals. They seem to have well established patterns of high risk behaviour, often combined with alcohol abuse, and the AIDS epidemic has not managed to change sexual practices or methods of contraception (16).

The higher frequency of unwanted pregnancies, illegitimate children and terminations of pregnancies (procured abortions), may reflect more liberal norms of sexual behaviour (lifestyle) particularly in Finnmark than in other parts of the country and thus be responsible for the higher incidence of STD in this area.

These facts underline the need for routine screening programmes for *C. trachomatis* in young sexually active individuals followed up with treatment, partner tracing and recommendations for effective contraception which can protect against sexually transmitted infections.

We conclude that the incidence of gonococcal infections has shown a drastically declining trend in Norway as in other Western European countries, but that genital chlamydial infections remain an important public health problem. Continuous registration of sexually transmitted diseases by laboratories, general practitioners and venereologists may serve as an indicator in the evaluation process of sexual behaviour.

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