Chlamydia trachomatis testing among 13–25-year-olds in non-genitourinary medicine settings

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Abstract

Objectives In this paper we examine *Chlamydia trachomatis* testing in settings other than genitourinary medicine (GUM) clinics, focusing on the factors associated with chlamydial infection and with postal testing.

Methods Analysis of tests collected from young people aged 13–25 years (n = 4475) between May 2001 and June 2004 via postal testing kits, at a local sexual health clinic, and at further education colleges in Lothian, Scotland.

Results 84.8% of the testers were female and 15.2% were male. 84 men (12.3%, 95% CI 10.1–15.0) and 403 women (10.6%, 95% CI 9.7–11.6) tested positive. The odds of a positive result was nearly doubled for postal and clinic testers, relative to college testers; and increased by 70% for 16–19-year-olds, compared with 13–15-year-olds. Postal testing was the main source for men (80.2%) while 46.1% of women used postal and 48.1% used clinic testing. Postal testing was significantly associated with age, sex and National Health Service (NHS) board area, with odds increasing with age, and lower odds among females than males, and among Lothian residents than those outwith this NHS board area.

Conclusions Substantial chlamydial infection was apparent among the young people in this study and positivity rates were highest among postal and clinic testers and those in the 16–19-year age group. While postal kits were the main source for men, and should be used to target them, the combination of this approach with continuing screening programmes in clinic settings would be most effective at targeting those most at risk.

Keywords chlamydia, postal testing, screening, sexually transmitted infections

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Introduction

Sexually transmitted infections in the UK continue to increase, and in Scotland there was an 88% increase in laboratory diagnoses of genital chlamydial infection between 2000 and 2003.[1] Young people are at particular risk, with 16–24-year-olds accounting for 73% of *Chlamydia trachomatis* diagnoses in women and 55% in men.[2] New ways of reaching those at risk are needed to combat increasing infection rates, particularly given the asymptomatic nature of the disease, and established screening programmes have been associated with reductions in chlamydial infection.[3–6] Most screening programmes have focused on women, but with men having similar, if not higher, levels of infection there have been calls to increase screening among men.[7–9] In England, the National Chlamydia Screening Programme began in 2002, with screening offered to young men and women aged under 25 years in venues not traditionally associated with sexual health services; during the first phase of the Programme, 15 241 women and 1172 men under 25 years of age were screened and positivity was 10% in women and 13% in men.[10]

Key message points

- **In this study of *Chlamydia trachomatis* among 13–25-year-olds in non-genitourinary medicine settings, 12.3% of young men and 10.6% of young women tested positive. With respect to age, infection was highest among 16–19-year-olds (males 13.8%, females 12.4%) and positivity rates were higher among postal (males 12.8%, females 10.6%) and clinic testers (males 14.5%, females 11.2%) than college testers (males 7.5%, females 5.9%).**
- **Postal kits were the main testing source for the majority of young men (80.2%), while just under half of young women (46.1%) used these; in general, use of postal testing increased with age.**
- **Postal kits offer an alternative means of testing, particularly for young men, and the combination of this approach with continuing screening programmes in clinic settings would target testing at those most at risk.**

In Scotland in 2001, Healthy Respect (a Scottish Executive-funded demonstration project to improve young people's sexual health) made *C. trachomatis* testing available to 13–25-year-olds in the Lothian NHS board area in settings other than genitourinary medicine (GUM) clinics: via postal testing kits (distributed through commercial venues), onsite at a local sexual health clinic (Caledonia Youth) and at local further education colleges (and one university). The aims of this paper are to examine *C. trachomatis* prevalence among those tested, and to report on the differences between those who used postal testing kits and those who were tested onsite at the clinic or at the colleges.

Methods

Postal testing kits were distributed to commercial venues not normally associated with *C. trachomatis* screening (e.g. pharmacists, record stores and young people's drop-ins) throughout the Lothian area. Kits were on display in large silver bins with attached signage and information sheets in

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the pharmacists and record stores, and were distributed by workers at the drop-in venues. The kits included a urine specimen bottle, a plastic reply paid envelope, and a leaflet about *C. trachomatis* (including instructions on what to do with the kit). The urine samples were analysed using nucleic acid amplification tests (Cobas® Amplicor, Roche). Of the 10 000 postal testing kits that were distributed to venues, 2295 (23.0%) were returned for testing by June 2004. The local sexual health clinic, Caledonia Youth (formerly Brook Advisory Clinic), is a free comprehensive sexual health and education service for young people. *C. trachomatis* testing was offered by nurses to young people whose consultation included providing a urine specimen, normally for a pregnancy test because of a late period, an episode of unprotected sexual intercourse, or an emergency contraception request. Due to staff time constraints, young people attending the clinic for other reasons, such as to get repeat oral or injectable contraceptives or condoms, were offered postal testing kits. These tests cannot be differentiated from the other postal kits and are included with that group (approximately 20% of the returned postal kits had been given out at the clinic). Onsite testing was conducted at four further education colleges and one university, with urine samples collected by nurses (over a 1-year period in each). Outwith the onsite testing periods, postal testing kits were made available through a free condom service or to pick up at various locations around campus and are included in the postal testing group (approximately 10% of these were from colleges and the university).

Positivity (proportion of tests that were positive) was used as an estimate of prevalence (proportion of population that were positive) because repeat testers could not be identified in the data. It was estimated that the number of repeat testers would be minimal and therefore have little effect on the prevalence estimates.[11] Prevalence is estimated for the population of young people taking part in testing in the non-GUM settings rather than for the population of 13–25-year-olds as a whole. We used the Carstairs deprivation index for Scottish postcode sectors derived from the 2001 census (based on overcrowding, male unemployment, low social class and car ownership) to assess levels of relative deprivation.[12] The index has seven points, ranging from the most affluent (one) to the most deprived (seven) and in this paper the deprivation categories were combined into three groups: deprivation categories 1–2 (most affluent), 3–5 (intermediate) and 6–7 (most deprived).

The Pearson chi-square (χ^2) test was used for bivariate comparisons of male and female testers. Logistic regression was used to produce unadjusted, and multivariate, adjusted odds ratios, to assess their statistical significance and to check for significant interactions between risk factors. Sex, age, health board area, deprivation category and test source were included in the model of *C. trachomatis* positivity, and all except test source in the model comparing postal testing with clinic/college testing. All factors were entered as categorical variables and interactions between all of the variables were checked. Data from 4475 chlamydia tests, collected between May 2001 and June 2004, were included in the analysis.

Ethical approval

Ethical approval for the study was granted by the Healthy Volunteer Studies/Public Health Medicine Research Ethics Subcommittee of the Lothian Research Ethics Committee.

Results

Tester characteristics

Some 3793 (84.8%) of the samples were provided by young women and 682 (15.2%) were provided by young men. The majority of testers were from the Lothian NHS board area and from deprivation categories 3–5. Tester characteristics are shown in Table 1. Males were significantly older ($\chi^2 = 56.41$, $p<0.001$), were more likely to live outwith the Lothian health board area ($\chi^2 = 25.42$, $p<0.001$) and were less likely to come from the more affluent areas than females ($\chi^2 = 7.98$, $p = 0.019$).

C. trachomatis positivity

Overall, 84 young men (12.3%, 95% CI 10.1–15.0) and 403 young women (10.6%, 95% CI 9.7–11.6) tested positive for *C. trachomatis* (this difference was not statistically significant). Positivity rates and 95% confidence intervals by sex, age, test source, health board area and deprivation category are shown in Table 2. Those aged 16–19 years had the highest positivity rates (13.8% for males and 12.4% for females). Looking at test source, clinic testers tended to have the highest positivity rates (14.5% for males and 11.2% for females); with regard to deprivation, those in deprivation categories 6–7 had the highest positivity rates (14.3% for males and 14.6% for females).

In the individual, bivariate logistic regression analyses, positivity was significantly associated with age and test source (Table 3). The odds of a positive test result was increased by 64% among 16–19-year-olds, relative to those

Table 1 *Chlamydia trachomatis* testers' characteristics, overall and separately for males and females

Tester characteristic	Males (*n* = 682)		Females (*n* = 3793)		Overall (*n* = 4474)	
	n	%	*n*	%	*n*	%
Age group (years)						
13–15	58	8.6	537	14.3	595	13.4
16–19	282	41.8	1912	50.8	2194	49.4
20–25	335	49.6	1315	34.9	1650	37.2
NHS board area						
Lothian	535	92.9	3288	97.1	3823	96.5
Other	41	7.1	99	2.9	140	3.5
Deprivation category[a]						
1–2	85	15.0	652	19.5	737	18.9
3–5	420	73.9	2383	71.4	2803	71.8
6–7	63	11.1	302	9.1	365	9.3

[a]Deprivation categories: 1–2, most affluent; 3–5, intermediate; 6–7, most deprived. NHS, National Health Service.

Table 2 *Chlamydia trachomatis* positivity (%) by tester characteristics, separately for males and females

Tester characteristic	Males (*n* = 682)			Females (*n* = 3793)		
	Positive/total	%	95% CI	Positive/total	%	95% CI
Total	84/682	12.3	10.1–15.0	403/3793	10.6	9.7–11.6
Age group (years)						
13–15	2/58	3.4	1.0–11.7	46/537	8.6	6.5–11.2
16–19	39/282	13.8	10.3–18.3	237/1912	12.4	11.0–13.9
20–25	43/335	12.8	9.7–16.8	119/1315	9.0	7.6–10.7
Test source						
College/university	6/80	7.5	3.5–15.4	13/221	5.9	3.5–9.8
Postal testing kit	70/547	12.8	10.3–15.9	185/1748	10.6	9.2–12.1
Clinic	8/55	14.5	7.6–26.2	205/1824	11.2	9.9–12.8
NHS board area						
Other	3/41	7.3	2.5–19.4	14/99	14.1	8.6–22.3
Lothian	68/535	12.7	10.2–15.8	349/3288	10.6	9.6–11.7
Deprivation category[a]						
1–2	7/85	8.2	4.0–16.0	64/652	9.8	7.8–12.3
3–5	53/420	12.6	9.8–16.1	246/2383	10.3	9.2–11.6
6–7	9/63	14.3	7.7–25.0	44/302	14.6	11.0–19.0

[a]Deprivation categories: 1–2, most affluent; 3–5, intermediate; 6–7, most deprived. CI, confidence interval; NHS, National Health Service.

aged 13–15 years. The strongest association was with test source; the odds of a positive result was nearly doubled for postal and clinic testers relative to college testers. There was only a weak association with deprivation category. When all of the factors were entered into the multivariate logistic regression model, there was very little change in any of the effects estimated in the bivariate analyses, and there were no significant interactions between the variables (Table 3). Age and test source remained significant, indicating the independent effects of each after adjustment for all factors in the model.

C. trachomatis testing sources

Of the 4475 tests, 2295 (51.3%) were postal, 1879 (42.0%) were conducted at the Caledonia Youth clinic and 301 (6.7%) were conducted at the colleges. Postal testing was the main source for males (80.2%) but among females postal testing and testing at the Caledonia Youth clinic both accounted for just under half of all tests (46.1% and 48.1%, respectively). Table 4 shows the distribution of testing sources by tester characteristics for males and females. Postal testing was higher for those from outwith Lothian for both sexes. The proportions of males and females from deprivation categories 6–7 who used clinic testing was higher than for those from deprivation categories 1–2 and 3–5.

To investigate if postal testers were different from their counterparts tested in other ways outside GUM, logistic regression was used to compare those who returned postal testing kits with the rest of the sample. In the individual,

Table 3 Association of positive *Chlamydia trachomatis* test result with tester characteristics and test source, assessed by bivariate and multivariate logistic regression (*n* = 4475)

Tester characteristic	OR of positive *C. trachomatis* test result					
	Bivariate analysis			Multivariate analysis		
	Unadjusted OR	95% CI	*p*[a]	Adjusted OR	95% CI	*p*[a]
Sex						
Male	1.00			1.00		
Female	0.85	0.66–1.09	0.192	0.80	0.61–1.05	0.096
Age group (years)						
13–15	1.00			1.00		
16–19	1.64	1.19–2.26		1.67	1.21–2.31	
20–25	1.24	0.89–1.74	0.001	1.29	0.91–1.82	0.002
Test source						
College/university	1.00			1.00		
Postal testing kit	1.86	1.15–3.01		1.89	1.16–3.07	
Clinic	1.90	1.17–3.09	0.034	1.98	1.20–3.26	0.026
NHS board area						
Other	1.00			1.00		
Lothian	0.89	0.53–1.49	0.827	0.92	0.55–1.56	0.409
Deprivation category[b]						
1–2	1.00			1.00		
3–5	1.12	0.85–1.47		1.15	0.87–1.51	
6–7	1.59	1.09–2.33	0.097	1.55	1.05–2.27	0.076

[a]Value of *p* for overall variable. [b]Deprivation categories: 1–2, most affluent; 3–5, intermediate; 6–7, most deprived. CI, confidence interval; NHS, National Health Service; OR, odds ratio.

Table 4 Distribution of testing source (postal/clinic/college) by tester characteristics, separately for males and females

Tester characteristic	Males				Females			
	n	Postal kit (%)	Clinic (%)	College (%)	*n*	Postal kit (%)	Clinic (%)	College (%)
Total	682	80.2	8.1	11.7	3793	46.1	48.1	5.8
Age group (years)								
13–15	58	86.2	13.8	0.0	537	31.3	67.2	1.5
16–19	282	74.1	12.1	13.8	1912	39.6	55.4	5.0
20–25	335	83.9	3.9	12.2	1315	61.5	29.6	8.9
NHS board area								
Other	41	92.7	0.0	7.3	99	71.7	23.2	5.1
Lothian	535	79.3	8.4	12.3	3288	45.5	48.8	5.7
Deprivation category[a]								
1–2	85	84.7	5.9	9.4	652	46.3	49.7	4.0
3–5	420	79.3	7.1	13.6	2383	47.3	45.9	6.8
6–7	63	77.8	15.9	6.3	302	38.1	60.9	1.0

[a]Deprivation categories: 1–2, most affluent; 3–5, intermediate; 6–7, most deprived. NHS, National Health Service.

bivariate logistic regression models, postal testing was significantly associated with age, sex and NHS board area (Table 5). The strongest association was with sex; for females the odds of postal testing was one-fifth of the odds for males. The odds of postal testing increased with age, and in Lothian was about one-third of the odds for other NHS board areas. There was again a weak association with deprivation category.

When all of the factors were entered into a multivariate logistic regression model sex, age and NHS board area remained significant and there was a significant interaction between sex and age (Table 5). In general, the pattern was for lower odds among females than males but the trend with age differed for males compared to females, as evident in the postal testing proportions in Table 4. Among females, postal testing increased with age, from 31.3% among 13–15-year-olds to 39.6% among 16–19-year-olds and 61.5% among 20–25-year-olds. However, among males, postal testing decreased from a high of 86.2% among 13–15-year-olds to 74.1% among 16–19-year-olds, and 83.9% among 20–25-year-olds. Therefore the interaction between age and sex in the multivariate regression model was due to the high use of postal testing among the youngest age group of males (13–15-year-olds). Apart from this interaction effect of age and sex, there was also lower odds of postal testing among those from the Lothian NHS board area than for those from other areas.

Discussion

In this paper we analysed data from 4475 *C. trachomatis* tests collected via postal testing, at a local sexual health clinic and at further education colleges. Overall, positivity was 12.3% for young men and 10.6% for young women. In this study of young people coming forward for testing, a positive test result was most strongly associated with having tested via postal or clinic testing (almost doubled odds compared with college), and with being aged 16–19 years (67% increased odds compared with 13–15-year-olds). While postal testing was the main source for the majority of young men, just under half of young women

Table 5 Association of postal testing (vs clinic/college testing) with tester characteristics, assessed by bivariate and multivariate logistic regression (n = 4475)

Tester characteristic	OR of postal testing					
	Bivariate analysis			Multivariate analysis		
	Unadjusted OR	95% CI	*p*[a]	Adjusted OR	95% CI	*p*[a]
Sex						
Male	1.00			1.00		
Female	0.21	0.17–0.26	<0.001	0.07	0.03–0.15	<0.001
Age group (years)						
13–15	1.00			1.00		
16–19	1.36	1.13–1.64		0.43	0.20–0.96	
20–25	3.37	2.77–4.09	<0.001	0.79	0.36–1.77	0.004
NHS board area						
Other	1.00			1.00		
Lothian	0.29	0.19–0.43	<0.001	0.36	0.23–0.54	<0.001
Deprivation category[b]						
1–2	1.00			1.00		
3–5	1.05	0.90–1.24		0.97	0.82–1.16	
6–7	0.79	0.62–1.02	0.077	0.75	0.57–0.98	0.113
Sex/age group interaction						
Female/16–19 years				3.28	1.44–7.44	
Female/20–25 years				4.33	1.89–9.95	0.002

[a]Value for *p* for overall variable. [b]Deprivation categories: 1–2, most affluent; 3–5, intermediate; 6–7, most deprived. CI, confidence interval; NHS, National Health Service; OR, odds ratio.

used postal testing and a similar proportion were tested at the clinic. Postal testing was strongly associated with age and sex, although complicated by an interaction between them. In general, the pattern was for much lower odds among females than males, and among females for odds increasing with age. The interaction between the two variables was due to the anomalous position of the 13–15-year-old males, who reported the highest level of postal testing. The odds of postal testing was also lower among those who lived in the Lothian NHS board than for those from other areas. While positivity rates were high (and postal testing low) among those from the most deprived areas, relative to those from the most affluent, the effect of deprivation in the final models was weak.

There are some limitations of the study, which should be considered. This paper is not an evaluation of the postal testing programme and it should be noted that it is not known if the young people who returned postal testing kits or were tested at the Caledonia Youth clinic would have tested at GUM if these alternatives were not available to them. Furthermore, the young people in this sample may not be representative of the wider population; these findings only relate to those who chose to test via these settings. A limited number of questions were asked of those tested, and while previous studies have found sexual risk behaviour to be associated with chlamydial infection,[10,13–15] it should be noted that data on this risk factor were not collected as part of this study. Also, while it was estimated that the number of repeat testers would be small and have little effect on prevalence estimates,[11] this study had no measure of these, which could mean that the confidence intervals should be wider. Further research is required to assess testing at the population level and future studies should include measures of repeat testing frequency and positivity in their design.

Overall, the return rate of the postal kits (23%) was lower than rates reported in other home-based postal testing studies (27–48%).[16–22] The postal testing kits were put on display in the commercial venues but were distributed by workers at the other drop-in venues, and some of those tested at Caledonia Youth were tested onsite while others were provided with postal testing kits. However, because of the way the data were collected and coded it was not possible to examine differences between postal testing sites or the two Caledonia Youth groups. It should be noted that onsite testing could increase uptake, given that some of those provided with postal kits could have decided, later, not to use them.

People with a positive test result were given appointments at the local GUM clinic for treatment and standard contact tracing was conducted by sexual health nurse specialists. Of 453 traceable contacts, Healthy Respect nurses successfully identified and treated 188 (42%), giving a contact tracing rate of 0.39 per index case. A further 82 (18%) were reported to have been treated by a general practitioner or other GUM clinic (although this could not be confirmed). Contact tracing rates could not be examined separately for each setting but these figures are consistent with levels reported elsewhere,[10,23] although lower than national GUM recommendations. Partner notification is a crucial prevention area and screening programmes should ensure that adequate tracing procedures are included.

The strengths of this study are that it includes a substantial proportion of young men, identifies factors associated with chlamydial infection in this sample, and how these differed by test settings; information which can be used to predict who is most at risk and where to target screening efforts.[24] While the majority of testers were women, 15% of those tested were men, compared with 7% in the National Chlamydia Screening Programme in England.[10] Among all those coming forward for testing in this study, positivity was highest among 16–19-year-olds (14% for males, 12% for females), although also high in 20–25-year-old men (13%). For females, 16–19 years is a group that is consistently identified as most at risk of chlamydial infection.[2,10,25] In other UK studies, positivity rates have been highest among 20–24-year-old men.[2,10] However, in a US study of asymptomatic men, prevalence was highest among those aged 18–19 years.[26] At the GUM clinic in Edinburgh, increases in prevalence have also been noted among men aged 15–19 years.[27] This requires further monitoring.

Infection was highest among those tested at the clinic and lowest among those tested at college or university; again similar to previous studies.[10,25] Rates among postal testers were also significantly higher than among those tested at college or university; and higher than among men and women tested in studies using direct postal testing (average 5–8%),[13,16,19] but more similar to prevalence among 15–24-year-old women provided with home tests through pharmacies in an Amsterdam study (13–14%).[22] In fact, the rates among postal testers were more similar to those found among clinic samples (average 10–16%).[10,25,26] The postal testers did self-select to submit samples and it is possible that they did so because of known risk or symptoms, which could account for the high rate of positivity.

Three test sources were included in this paper and one of the aims was to examine differences between those who used postal testing kits and those who were tested onsite at the clinic or at the colleges. Most of the young men and women lived in the Lothian area and the small proportion who did not had mainly returned postal testing kits, which was to be expected because the kits were widely available commercially in Lothian and therefore accessible to visitors to the area. Postal testing accounted for the majority of tests among young men, and direct postal approaches have previously been found to encourage uptake of *C. trachomatis* testing among men.[13,16,18,19,21] The extent of postal testing among young men aged 13–15 years does suggest that access to alternative testing sources could be a particular issue for them. However, we should also consider if these were young lads messing about, sending in kits for a joke; particularly given the low rate of chlamydial infection among this youngest age group (3.4%). Conversely, just as many young women were tested at the Caledonia Youth clinic as returned postal tests, suggesting that onsite testing remains an important method of access to this group. However, postal testing increased as clinic testing decreased in each successive age group of young women. With similarly increased odds of a positive test result among postal and clinic testers, compared with college testers, and among those aged 16–19 years, compared with the youngest age group, the use of both approaches is supported. These results suggest that postal testing alone would not be an effective means of targeting those most at risk. However, with limited staff and time resources in clinical settings, the inclusion of postal testing in screening strategies could give further access to testing, while freeing up some clinical resources.

Reducing the incidence of *C. trachomatis* is one of the aims of the national sexual health strategies and the *Choosing Health* White paper;[28–30] achieving that aim requires extensive screening using various testing sites and methods.[7–9,31,32] In particular, there is a need to widen access to screening among young men,[7,8,10,25] and the extent of postal testing among this group suggests that this

could be an appropriate strategy to achieve this.[16,18,21] To identify, treat and ultimately reduce chlamydial infection among young people, testing should be made as widely available as possible. Postal testing kits offer an additional means of access but offering screening programmes in clinic settings would also continue to target testing at those who are most at risk.

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