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# Evaluation and enumeration of online test providers for sexually transmitted infections, specifically chlamydia, in the Netherlands

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## ABSTRACT

**Objectives** Online testing for STIs might complement regular care provided by general practitioners or STI clinics. Two types of online testing can be distinguished, self-testing and self-sampling (sending sample to a laboratory for diagnosis). Online testing can occur without consultation with a healthcare professional, therefore information given by providers is essential for informed decision-making. We aimed to enumerate online test providers in the Netherlands focusing on chlamydia tests, to evaluate information using quality indicators and to gain insight on the proportion of online testing in the STI testing arena.

**Methods** We performed a systematic internet search to identify online STI test providers. Twenty quality indicators were evaluated on their websites; indicator scores were weighted by level of importance (expert opinion). High scoring providers were recommended, on the condition that the sensitivity and specificity of the test were above 95% and providers included a follow-up procedure in case of a positive result. Finally, providers were contacted to inquire about the number of sold tests, positivity rates and demographic characteristics of testers.

**Results** Five out of 12 identified self-sample test providers could be recommended, versus zero out of eight self-test providers. Self-sample test providers gave complete and correct information on more indicators (67%) compared with self-test providers (38%). In 2015, an estimated 30 000–40 000 self-sample tests were purchased, and 12 000–25 000 self-tests, which is roughly 10%–15% of the total number of STI tests.

**Conclusion** This evaluation shows that some online self-sample test providers could be put forward as way of STI testing complementing regular testing options. None of the self-test providers were recommended. Regularly evaluating online test providers is advised to improve quality of the information on the websites. Finally, self-testing might not be suited for all populations as most information is provided in written format only.

## INTRODUCTION

Worldwide, *Chlamydia trachomatis* (*Chlamydia*) remains the most prevalent bacterial STI, with yearly increasing number of cases diagnosed in the Netherlands.<sup>1</sup> Chlamydia infections are associated with severe reproductive complications, such as pelvic inflammatory disease, ectopic pregnancy and tubal subfertility,<sup>2–4</sup> thus chlamydia control

is of public health importance. Previously, chlamydia control through testing in the Netherlands was mainly the responsibility of general practitioners (GP) or in dedicated STI clinics. However, recently STI clinics have had a hard time coping with increasing demands for testing,<sup>1</sup> and STI and sexuality are still sensitive subjects keeping certain groups of people from visiting the GP.<sup>5–7</sup> Therefore, more and more people are searching for alternatives. As such, online STI testing offers an anonymous testing opportunity that might appeal to those not able or willing to test at the GP or STI clinic.

Indeed, the number of web shops offering online testing for almost every STI has increased over the past few years in the Netherlands.<sup>8,9</sup> Unfortunately, information on the number of people using online STI testing is scarce. One study with an internet panel performed in 2006 reported that 1.4% of their sample had used a chlamydia self-test,<sup>10</sup> a few years later in 2008 1.6% had used a chlamydia self-test.<sup>11</sup> Another study similarly showed that among young people in Amsterdam 1.0% had used a self-test for STI or HIV.<sup>12</sup> In the UK, researchers found comparable numbers, with 1.8% of respondents reporting the use of a chlamydia self-test in the last year.<sup>13</sup> Among people who are testing for STI (instead among people who might not have tested for STI at all), a recent study in England reported that 10% of the total proportion of testing was done with online tests.<sup>14</sup>

Online testing can be done without consultation with a healthcare professional. This means that these online tests often are not part of routine surveillance, and it is not mandatory to follow the same procedure as GPs and healthcare professionals in STI clinics. Also, people who might want to buy an online test need information on, for instance, which STI to test for (tests that are offered include chlamydia, gonorrhoea, syphilis, hepatitis B, HIV, trichomonas, candida), which locations to test (genital, anal or oral) and when to test (window phase). Furthermore, after testing ultimately people should receive information on, for instance, risk prevention, partner notification and treatment. Therefore, it is crucial to gain insight into the quality of information supplied by online test providers.

The information people require might differ depending on the type of test they are considering. There are two types of online tests offered: self-sample tests and self-tests.<sup>15</sup> Self-sample tests are



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sampling kits used at home (or any other suitable place) for self-collection of urine, blood or other material by swab. These samples are sent to a laboratory where diagnosis takes place, similar laboratory methods are used as at GPs or STI clinics. People receive the result (ie, with a code online, via email or telephone), which also provides the opportunity to link people to follow-up procedures, such as post-test counselling and, in case of a positive diagnosis, a referral to a GP and partner notification. Self-tests are performed at home (or any other suitable place); and the diagnosis is obtained there. The self-testing kit shows the diagnosis using symbols or coloration (comparable to pregnancy tests). Therefore, in contrast to self-sample test where the diagnosis is communicated, for self-tests at no point in the procedure people need to have direct contact with a healthcare professional, making the information provided on the website even more essential. Furthermore, most self-tests for chlamydia and other STI have a low sensitivity and are therefore not ready for widespread use.<sup>16</sup> For lay people however, the disadvantage of having a test with low sensitivity is not common knowledge, which means they might unknowingly choose an unreliable test based on the information of the website.

In the present study, we will enumerate the online test providers in the Netherlands. Furthermore, their websites will be systematically assessed and evaluated based on quality indicator criteria, resulting in recommended providers and a quality standard for information of online provided STI testing. The quality indicators used will be based on previous report of STI Aids Netherlands published in 2011 and 2013, in which they made an overview of Dutch providers of online tests.<sup>8,9</sup> Finally, we aimed to explore the proportion of STI testing that is done via online testing in the Netherlands, by contacting all providers and inquire about the number of tests sold within a year, positivity rate and customer demographic characteristics.

## METHODS

### Inclusion self-test providers

The self-test providers were identified using the most used search engine (Google). Dutch terms such as 'SOA zelf-test (STI self-test)', 'SOA test (STI test)', 'SOA lab-test (STI lab-test)', 'thuis-test (home-test)' and 'testen op SOA' (test for STI) were used to find providers. Additionally, providers mentioned in previous reports of STI Aids Netherlands were included.<sup>8,9</sup> Providers just reselling self-tests such as Bol.com, Amazon.de, drogisterij.net, thuiestesters.nl and Google Shopping were not included, but also used to identify providers. Inclusion criteria were: usage of a Dutch web address and product available in the Netherlands.

### Indicator criteria

The information on the websites of the self-test providers on 1 February 2016 was evaluated. First, we described the self-test providers with six characteristics, such as type of self-test, price and type of sampling (data not shown). Then we evaluated the information using 20 quality indicators, an overview of the indicators is shown in [table 1](#). The indicators used in the 2011 and 2013 reports from STI Aids Netherlands<sup>8,9</sup> were updated in collaboration with experts from STI Aids Netherlands and the STI Department of the National Institute of Health and the Environment (RIVM). Each quality indicator could score between 0 and 1. This score was weighted (weights provided in [table 1](#)) based on importance as indicated by the experts from the STI Department of RIVM and STI Aids Netherlands.

The evaluation was implemented for chlamydia tests or, if not applicable, the information for HIV or syphilis tests was

assessed. The maximum score for self-sample test providers was 45 points, and for self-test providers was 42 points, two quality indicators were only applicable for self-sample test providers. Providers who scored two-thirds or higher on the evaluation were deemed satisfactory (30 and 28 points, respectively). Self-sample test providers or self-test providers who scored nine-tenths or higher (40 and 37 points, respectively) were highly recommended. This positive evaluation was dependent on two conditions: (1) the test had to have a sensitivity and specificity of 95% or higher, and (2) in case of a positive diagnosis active follow-up is provided. If one of these conditions was not met, providers could not be recommended, irrespective of the height of their score.

### Provider contact

We attempted to contact all providers by telephone or email to estimate the proportion of testing done via online providers in Dutch STI testing in 2015. They were asked to provide information on (a range of) the number of tests sold, positivity rate and customer demographic characteristics. As this is company information, we only present information on an aggregated level. We will compare the number of tests sold with the number of tests done via GPs and STI clinics.<sup>1</sup>

### Statistical analysis

We calculated total weighed scores for all providers. Subsequently, we calculated the percentage the provider obtained out of the total score that could be obtained, and compared these for both types of test providers using an independent samples t-test with  $p < 0.05$  reflecting a statistical significant outcome. In addition, we performed Pearson's  $\chi^2$  test to compare the scores on each of the quality indicators separately.

## RESULTS

### Providers

We identified 20 websites selling tests (12 self-sample test providers and eight self-test providers). Prices for self-sample tests (mean=€47.42, SD=€17.04) ranged from €33 for a chlamydia test up to €63 for a gonorrhoea and chlamydia combination test. One of the self-sample tests could be ordered for free as this provider is linked to STI clinics. Self-tests (mean=€21.88, SD=€6.92) were available from €15 up to €30 for a chlamydia test.

### Quality indicators

Self-sample test providers scored between 10.8 and 43 points, and 6 out of 12 (50%) scored satisfactory. However, one of these providers did not mention the follow-up procedure, and was therefore not recommended. Two out of 12 (16.6%) self-sample test providers were highly recommended. All self-sample test providers reported sensitivity and specificity of above 95%, 4 out of 5 (80%) recommended providers indicated to use a nucleic acid amplification test (NAAT) and one of the recommended providers did not provide this information.

Self-test providers scored between 5.5 and 29.3 points. Reported sensitivity and specificity ranged from 85% to 99.9%. However, none of the self-test providers reported both sensitivity and specificity above 95%, therefore none could be recommended. Self-test providers (mean=38.0, SD=18.2) scored significantly lower on average on the quality indicators compared with self-sample test providers (mean=66.8, SD=19.7),  $t(18)=3.30$ ,  $p < 0.01$ . Self-sample test providers were more thorough in their information provision; self-sample

**Table 1** The 20 quality indicators used to rate information provided by STI self-test and self-sample test providers on their websites, the used weigh factors, scoring and additional comments

Indicator	Explanation	Weight	Scoring	Notes
<b>Decision making</b>				
Anal/oral testing	Does the provider describe: 1. Possibility of anal/oral infections 2. Advise on anal/oral sampling	4	Good=both (+1) Moderate=1 or 2 (+0.5) Poor=0 (+0)	Providers selling tests including specific kits for anal or oral sampling automatically score 'Good'
STI comorbidity	Does the provider mention that it is possible to acquire more than one kind of STI during intercourse and that it therefore would be advised to test for more than one STI?	3	Yes (+1) No (+0)	
Basic STI information	Basic information about the concerned STI described: 1. Symptoms 2. Incubation time (window phase) 3. Transmission route 4. Type of sample (blood, urine or swab) 5. Risk factors 6. Ways of treatment 7. Easy to find on website, discussed in separate section	3	Good=All 7 (+1) Sufficient=6 or 5 (+0.75) Moderate=4 or 3 (+0.5) Insufficient=2 or 1 (+0.25) Poor=0 (+0)	
Window phase	1. Definition is explained (time between getting infected and moment the infection can be detected by a test) 2. Given in days, weeks or months	3	Good=both (+1) Moderate=1 (+0.5) Poor=0 (+0)	Incubation time (time between infection and symptoms) scores moderate
Testing tool	Decision tool used for triage, what self-test(s) should be bought, based on gender, sexual preferences and sexual activity	2	Yes (+1) No (+0)	
Risk prevention	Basic information about prevention of STI described: 1. Condom use during vaginal, oral and anal intercourse 2. Avoid sharing potentially infected/dirty (drug) needles 3. Tips for successful condom use 4. Condom use is advised (based on sex behaviour) 5. Condoms can be bought on website or link to condom shop 6. Easy to find on website, discussed in separate section	2	Good=all 6 (+1) Sufficient=5 or 4 (+0.75) Moderate=3 (+0.5) Insufficient=1 or 2 (+0.25) Poor=0 (+0)	
<b>Reliability</b>				
Level	The test has a sensitivity+specificity of 95% or higher	4	Yes (+1) No (+0)	
Described	Does the provider describe the sensitivity and specificity of the test and are these numbers explained in a clear way that ignorant customers can understand what these numbers mean?	2	Yes (+1) No (+0)	
Support	Does the provider provide literature on the website, which describes/supports the sensitivity and specificity?	2	Yes (+1) No (+0)	
Quality marks for laboratory	Does the provider describe what marks/labels apply for their laboratory (performing the diagnose)?	1	Yes (+1) No (+0)	Only self-sample test providers
Quality marks for testing kit	Does the provider describe what marks/labels apply for their sampling kit?	1	Yes (+1) No (+0)	
<b>Practical</b>				
Contact healthcare professional	Possibility to call or mail a healthcare professional for questions prior to testing	2	Yes (+1) No (+0)	
Video instructions	Is there a video which shows how the sample kit works and what procedures are needed to gather a sample?	1	Yes (+1) No (+0)	
Dutch instructions	Is there a Dutch leaflet and Dutch text on packaging?	1	Yes (+1) No (+0)	Either be mentioned or derived from pictures on the website
Contact provider	Possibility to call or mail the provider for further questions	1	Yes (+1) No (+0)	
Diagnostic technique	Is the type of test (NAAT or antibody) indicated on the website?	1	Yes (+1) No (+0)	
<b>Follow-up</b>				
Follow-up	What follow-up procedure after receiving result is applied? 1. Partner notification can be performed through provider (P) 2. Ways of treatment explained, instruction given what to do next and how to get treatment (T) 3. Counselling by health professional possible after receiving positive result (C) 4. Get prescription or treatment through provider (R)	4	1. (P)=+0.2 2. (T)=+0.2 3. (C)=+0.4 4. (R)=+0.2 Just result=0	
Referral to GP	Does the provider advise to visit a general practitioner (GP), hospital, nurse, STI clinic or any other professional healthcare worker/institute when the test result is positive?	4	Yes (+1) No (+0)	
Result communication	Result communication: ▶ Active (telephone=T, SMS=M or mail=E) ▶ Passive (internet code=I) =+0.5	2	Active (+1) Passive (+0.5) Not mentioned (+0)	Only self-sample test providers

Continued

Table 1 Continued

Indicator	Explanation	Weight	Scoring	Notes
Partner notification	Does the provider mention that partner notification is important in case of positive result?	2	Yes (+1) No (+0)	

NAAT, nucleic acid amplification test; SMS, short message service.

test providers gave more correct and good information on the quality indicators in comparison to the self-test providers (see table 2 for comparisons per indicator). Notably, the self-sample test providers who were highly recommended satisfied almost all quality indicators.

### Provider information

We were able to contact all 12 self-sample test providers through email or telephone. The estimated total number of self-sample

tests sold in the previous year ranged from 30.000 to 40.000. Positivity rates ranged from 3% up to 18%. The average customer is aged between 18 and 35 years, mostly heterosexual and more often male than female, according to the providers. Four of the self-test providers were reached by telephone or email. These providers sold an estimated 12.000–25.000 self-tests in the previous year. Only one provider gave information on positivity rates, and one provider gave information on customer demographic characteristics, therefore this information is not discussed any further. In total, 42.000–65.000 online tests were sold in 2015. Roughly estimated 10%–15% of chlamydia testing in the Netherlands takes place using self-tests or self-sample tests.

**Table 2** Results of the evaluation of the self-test and self-sample test providers, showing the number of providers scoring positive (answer value indicated between brackets)

	Self-sample test providers (n=12)		Self-test providers (n=8)		$\chi^2$ outcome
	n	%	n	%	
Anal/oral testing (Good)	7	58.3	0	0.0	$X^2(1)=7.18$ , $p<0.01$
STI comorbidity (Yes)	10	83.3	4	50.0	$X^2(1)=2.54$ , $p=0.11$
Basic STI information (Good)	6	50.0	4	50.0	$X^2(1)=0.00$ , $p=1.00$
Window phase (Good)	7	58.3	1	12.5	$X^2(1)=4.20$ , $p=0.04$
Testing tool (Yes)	7	58.3	0	0.0	$X^2(1)=7.18$ , $p<0.01$
Risk prevention (Good)	1	8.3	0	0.0	$X^2(1)=0.70$ , $p=0.40$
Reliability level (Yes)	12	100.0	0	0.0	$X^2(1)=20.00$ , $p<0.01$
Reliability described	3	25.0	3	37.5	$X^2(1)=0.36$ , $p=0.55$
Reliability supported	1	8.3	1	12.5	$X^2(1)=0.09$ , $p=0.76$
Quality marks for laboratory (Yes)	10	83.3	–	–	–
Quality marks for testing kit (Yes)	5	41.6	7	87.5	$X^2(1)=4.20$ , $p=0.04$
Contact healthcare professional (Yes)	9	75.0	1	12.5	$X^2(1)=7.50$ , $p<0.01$
Video instructions (Yes)	1	8.3	2	25.0	$X^2(1)=1.05$ , $p=0.31$
Dutch instructions (Yes)	12	100.0	7	87.5	$X^2(1)=1.58$ , $p=0.21$
Contact provider (Yes)	12	100.0	8	100.0	–
Diagnose technique (Yes)	7	58.3	6	75.0	$X^2(1)=0.59$ , $p=0.44$
Follow-up (2 or more)	5	41.6	0	0.0	$X^2(1)=4.44$ , $p<0.04$
Referral to general practitioner (Yes)	10	83.3	6	75.0	$X^2(1)=0.21$ , $p=0.65$
Result communication (Active)	7	58.3	–	–	–
Partner notification (Yes)	10	83.3	4	50.0	$X^2(1)=2.54$ , $p<0.11$

Bold printed statistics differ, p-values < .05 are considered significant.

### DISCUSSION

We identified and evaluated 20 online STI test providers using 20 quality indicators. Five out of 12 self-sample test providers scored satisfactory and met the two conditions of reliable testing (sensitivity and specificity above 95%) and active follow-up in case of a positive diagnosis. None of the eight self-test providers met these conditions. Notably, besides the reliability of the tests, there was also a big difference between self-sample test providers and self-test providers on the quality of their information. Most providers could improve the information on their websites to help people make an informed and correct choice for an STI test and how to proceed after purchase, but most self-sample test providers gave more and more correct information than the providers of self-tests.

Interestingly, while performing this evaluation many of the providers (especially those who were already positively evaluated in our assessment) used the quality criteria to improve their website. Consequently, soon after this evaluation, the information given on some of the websites was more complete. This is indicative of the concern certain providers have about the quality of their services and the well-being of people purchasing tests.

A strength of this study is that besides knowing how many providers there are in the Dutch online testing market, for the first time we also have an estimation of the proportion of tests that self-testing and self-sampling via online providers hold in relation to testing of chlamydia via GPs and STI clinics in the Netherlands. The number of STI consults of the STI clinics and GP was approximately 400.000 in 2015 in the Netherlands. Based on the raw data we received of the online providers (42.000–65.000 tests sold in the previous year), roughly 10%–15% of chlamydia testing takes place using self-tests or self-sample tests. On the one hand, this number could be an overestimation, as it is unclear whether people who bought an online self-test also used it (and even more unclear is whether it was used correctly).

On the other hand, the estimate might be an underestimation, as we did not include physical stores or resellers that sell STI tests in our evaluation. Importantly, resellers usually do not give any or very little information, and would therefore not be recommended in this evaluation. Physical stores usually sell self-test of undetermined reliability, which also could result in suboptimal choices and a possible problem in management of chlamydia transmission. There is uncertainty in the estimated



number of tests, the providers gave a range, some providers were not reached and new providers start offering self-tests and self-sample test; therefore, these numbers should be used as an indication and should be interpreted with caution. More exact figures into how many people are self-testing, and who they are, would be ideal, but will be hard to obtain due to the anonymous character of online testing and the commercial interest of online test providers. However, recent data from England also indicated 10% of tests were online tests,<sup>14</sup> providing some validation of the numbers in this study.

A limitation is that we evaluated the information on commercial websites, which may provide biased information. One quality indicator that might particularly be affected is the reported sensitivity and specificity. We have not verified the claims, and only few providers presented literature to support the reported sensitivity and specificity. We chose a sensitivity and specificity of above 95% as acceptable, as there is no golden standard. Even with optimistic reporting, none of the self-test providers satisfied this criterion. Of the self-sampling test providers, all reported to satisfy this criterion, and most of the recommended test providers indicated to use NAAT tests including the name of a laboratory. Therefore, most likely these self-sample tests indeed were reliable (even beyond the >95% sensitivity and specificity). Future studies might aim at in-depth investigation to verify these claims.

The fast-changing and dynamic market is reflected in the increase in self-test providers from 6 to 8 since the last report from STI Aids Netherlands in 2013.<sup>8</sup> Two self-sample test providers examined in 2013 did not exist anymore, however four new providers filled the gap. Furthermore, four self-test providers no longer existed, while four new providers were found. Providers and information can change from 1 day to the next. This is positive as evaluations like the one in the current study directly improve quality of the information provided, but it also complicates keeping the overview. For one 'new' provider we know it was the same provider under a different name, for the others this possibility cannot be excluded. Changing names is a known phenomenon in self-test providers,<sup>17</sup> when, for example, there is too much scrutiny on their unsubstantiated claims of test quality.

Apart from data from one self-sampling provider, online testing is currently not included in routine surveillance, which means the number of people who are testing is underestimated, approximately by 10%–15%, and the number of reported cases is incomplete. For now, it is unclear whether online test providers are reaching a different audience. Possibly people who experience more barriers might be testing online, this means positivity rates might be higher. It could also be an easier opportunity for the 'worried-well' to test, leading to lower positivity rates. Surveillance data on the total number of tests might become available—with effort—but complete information on positivity rates cannot be obtained, and would not be meaningful as there are no reliable self-tests (yet).<sup>16 18</sup>

A clear implication is that the development of a reliable self-test for chlamydia is essential to improve the added value of online testing. It is also essential to gain insight into the follow-up of positive cases; although chlamydia is easy to treat (single dose), prescriptions are required. While doing this evaluation we noticed that when searching for self-test, the results of self-test providers (not self-sample providers) are usually shown at the top of the page in the advertised links. This means that people without much knowledge might be enticed to choose a self-test above a self-sample test, which is not warranted by their quality just yet.

A final implication of this research is that we should work towards more information on who is testing online. Our 20 indicators already show that to make the best (or even an acceptable) decision people should incorporate a lot of information. Also, most information provided on the websites is in written format. This means this way of testing is probably not well suited for the most vulnerable populations (ie, people with lower education, people with a migration background or people with low (health) literacy).

## CONCLUSION

Internet is an intrinsic part of everyday life; therefore, the trend in online testing of STI is likely to keep increasing in the upcoming years. In theory, self-sample tests can be a valuable complement to standard care provided by GPs and STI clinics, as they can be cheap, easy, reliable (for now just the self-sample tests) and anonymous. Taking into account that several self-sample test providers provide good quality information to assist people to make well-informed choices, this evaluation shows that self-sample tests could potentially be put forward as an additional test possibility. However, none of the self-test providers could be recommended. Our evaluation shows that regular evaluations are advisable to improve quality of information on the websites and that without official accreditation the quality of online testing cannot be guaranteed. Without these, it is difficult for users of self-tests to know which providers do provide quality services. This evaluation additionally shows that online testing might not be suited for all populations given the emphasis on written information.

## Key messages

- ▶ The known increase in providers offering online STI testing persisted in this study, with an increase of two providers in 3 years.
- ▶ Five out of 12 self-sample test providers could be recommended, self-sample test providers give better and more complete information compared with self-test providers.
- ▶ Roughly estimated, self-testing represents 10%–15% of chlamydia testing in the Netherlands in 2015, which is much higher than previous studies showed.
- ▶ Improving data collection on user characteristics and positivity rates for surveillance is difficult, especially as there are no reliable chlamydia self-tests yet.

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**Data sharing statement** We have the scores per self-test provider (unaggregated) on the 20 quality indicators, which can be made available upon request.

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