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Access to, usage and clinic outcomes of, online postal sexually transmitted infection services: a scoping review

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ABSTRACT

Background There has been considerable expansion in online postal self-sampling (OPSS) STI services in many parts of the UK, driven by increasing demand on sexual health services and developments in diagnostics and digital health provision. This shift in service delivery has occurred against a backdrop of reduced funding and service fragmentation and the impact is unknown. We explored characteristics of people accessing and using OPSS services for STIs in the UK, the acceptability of these services and their impact on sexual health inequalities.

Methods A scoping review was conducted of studies published in English-language based on pre-agreed inclusion/exclusion criteria, between 01 January 2010 and 07 July 2021. Nine databases were searched, and 23 studies that met the eligibility criteria were included. Studies were appraised using the Mixed Methods Appraisal Tool.

Results Study designs were heterogeneous, including quantitative, qualitative and mixed-methods analyses. The majority were either evaluating a single-site/self-sampling provider, exploratory or observational and of variable quality. Few studies collected comprehensive user demographic data. Individuals accessing OPSS tended to be asymptomatic, of white ethnicity, women, over 20 years and from less deprived areas. OPSS tended to increase overall STI testing demand and access, although return rates for blood samples were low, as was test positivity. There were varied results on whether services reduced time to treatment. OPSS services were acceptable to the majority of users. Qualitative studies showed the importance of trust, confidentiality, discretion, reliability, convenience and improved patient choice.

Conclusion OPSS services appear highly acceptable to users. However, uptake appears to be socially patterned and some groups who bear a disproportionate burden of poor sexual health in the UK are under-represented among users. Current provision of online self-sampling could widen health inequalities, particularly where other options for testing are limited. Work is needed to fully evaluate the impact and cost-effectiveness of OPSS services.

INTRODUCTION

'Home testing' whereby an individual tests for STIs and/or blood-borne viruses (BBVs) remote from traditional healthcare settings, encompasses user self-sampling (the laboratory processes and tests the samples) or self-testing (the user tests their own samples).¹ The most widely used option in the UK is online postal self-sampling (OPSS) in which users order specimen collection kits via the internet. Kits

KEY MESSAGES

- ⇒ An increasing proportion of STI testing in the UK is occurring via online postal self-sampling (OPSS) services.
- ⇒ Service users tend to be asymptomatic, white, women, over 20s and from less deprived areas.
- ⇒ OPSS services are acceptable to users and can improve choice.
- ⇒ There is a need for a wide-ranging evaluation of OPSS services to determine their impact on sexual health inequalities, access, clinical outcomes and service delivery.

are delivered by post or may be collected from a sexual health clinic. Users obtain their own samples (typically urine or vulvo-vaginal swab, blood, and anorectal and pharyngeal swabs where appropriate), and repack before posting back to a laboratory for testing. Test results are made available by text message or online. OPSS is increasingly provided in high-income countries.²⁻⁴ England's earliest online chlamydia testing services began in 2006,⁵ but the other devolved nations of the UK introduced OPSS rather later.⁶⁻⁸ The BASHH recommends online testing and care provision as an adjunct to in-person services to increase choice for service users.⁹

The UK had seen a sustained rise in diagnoses of several STIs, and increase in demand for sexual health service (SHS) consultations, until the start of the COVID-19 pandemic.¹⁰ Between 2015 and 2019 in England, there was a 23% increase in the number of SHS consultations (3 143 144–3 852 121). Total sexual health screens for chlamydia, gonorrhoea, syphilis and HIV increased by 31% (1 657 425 to 2 175 525) in this period. Internet-based services have assumed an increasing proportion of consultations and screening activity. In 2018–2019, while overall consultations and tests in England rose by 7% and 10%, respectively, consultations and STI screens provided by internet-based services surged by 94% and 69%.¹⁰ This trend of an increasing proportion of testing and consultations being accessed and provided online has accelerated as a result of the COVID-19 pandemic.¹¹ Young people, people from ethnic minority groups, men who have sex with men (MSM), people who are gender diverse, and those living in more deprived areas have borne a disproportionate burden of STIs

and poorer sexual health for many years.^{12–17} The reasons for this disparity are not sufficiently understood.¹⁸

Some evidence suggests that OPSS might improve access to STI services for those who feel uncomfortable or struggle to attend face-to-face services,¹⁹ and might cost less than in-person care.^{20,21} However, relatively little is known about the characteristics of people who use OPSS and the existing literature is heterogeneous and has not previously been comprehensively reviewed. With a drive towards further online sexual health provision in the UK,²² the pre-existing unequal burden of sexual ill health in the population and well-described inequalities in access to sexual healthcare, it is important to understand the impact of this shift in service delivery. We aimed to evaluate the current evidence on access to and usage of OPSS services. We have restricted our scope to the UK because online care has been relatively mainstreamed in at least one country (England) for many years and sexual healthcare is provided free at the point of access without the need for specialist referral. Our specific objectives were to: (1) describe characteristics of people accessing and using STI self-sampling services in the UK; (2) assess whether OPSS increases demand for testing; (3) assess the impact of OPSS on clinical outcomes; (4) assess levels of acceptability of OPSS services in the UK.

METHODS

We conducted a systematic scoping review in order to map and synthesise the current research evidence, in an area where the existing literature is heterogeneous and has not previously been comprehensively reviewed.²³ We followed the Joanna Briggs Institute Framework of Evidence Synthesis (<https://jbi.global/scoping-review-network/resources>) and Preferred Reporting Items for Systematic Review and Meta-Analyses extension for scoping reviews guidelines.²⁴ A review protocol has not been registered. The Population/Intervention/Comparators/Outcome framework was used to identify the research question and objectives:

Population

People residing in the UK who are engaging in sexual activity and accessing online SHS.

Intervention

Self-sampling STI testing kits which are posted to individuals' homes by online SHS.

Comparators

The alternatives to this intervention are for individuals to visit sexual health clinics, general practice, or community outreach services to be tested by healthcare professionals, self-sample in a clinical setting, or collect kits to bring home. This review will compare OPSS with these comparators where included studies have done so.

Outcome

Accessibility and usage of OPSS services, with a focus on inequalities in access and acceptability of services, and the impact of these on sexual health inequalities.

Study selection criteria

Studies were included if they described the use of home self-sampling kits provided by online SHS in the UK, published between 1 January 2010 and 30 June 2021 in the English language. All non-theoretical study types with full-text online access were included. Studies were excluded if they described

services outside of the UK, published prior to 2010 or not in English, and not focusing on home self-sampling kits provided by online SHS (for example, STI education, contraception or self-testing kits). We also excluded 'siloes' (HIV only) HIV self-sampling services because the national HIV self-sampling service targets specific key populations such as MSM and black African groups²² rather than the general population, and one of our key objectives was to evaluate access to, including potential inequalities with, the use of OPSS services. Protocols of studies and research displayed via conference or other forms of presentation were excluded if there was no full-text access.

Study selection

De-duplication and title screening was conducted by the first author; 20% of the abstract screening and 100% of the full-text screening were verified by a second reviewer (KCL and JG, respectively) independently to reduce selection bias.²⁵ The inter-reliability rate of the two reviewers was over 90% at the abstract screening stage and was 100% for full-text screening.

Search method

A systematic search and data extraction was conducted on 22 June 2020 to fulfil requirements of KS' Masters dissertation and was rerun on 7 July 2021 by JG in nine databases: Medline, EMBASE, PsycInfo, the Health Management Information Consortium, Web of Science, CINAHL Plus, Scopus, Open Grey and Ethos. The use of two grey literature databases (Open Grey and Ethos) aimed to reduce potential publication bias and provide a more comprehensive view of the evidence.²⁶ The search consisted of a selection of medical subject headings terms, where appropriate, and free-text. Limits were used in applicable databases which limited by date and language. The search comprised of four concepts: types of STI, type of online or self-sampling service, accessibility or inequalities, and UK filters. For example, terms such as 'STI', 'Chlamydia', 'Self-Sampl*', 'eHealth', 'Access*', 'Inequalit*', 'United Kingdom' and 'England' were used. To ensure the search strategy was fully comprehensive, additional terms for 'eHealth' were included,²⁷ and adapted and simplified versions of two verified filters for the UK were used in database searches, where appropriate.^{28,29}

The search only included studies published between 2010 and 2021; this was due to the very low numbers of users of OPSS services prior to 2010⁵ (see online supplemental file 1 for details of the full search strategy).

Data extraction

The phases of data identification, de-duplication, screening and eligibility checks are shown in figure 1. For included studies, a data extraction form (online supplemental file 2) was used to extract the demographics of the study participants (online supplemental file 3), the study design and key findings from each study (online supplemental file 4).

Empirical appraisal and analysis of included articles

Study designs were heterogeneous, including quantitative, qualitative and mixed-methods analysis, and were therefore appraised using the Mixed Methods Appraisal Tool (MMAT).³⁰ Quantitative data were analysed using descriptive statistics, and qualitative data were analysed using inductive thematic analysis.³¹

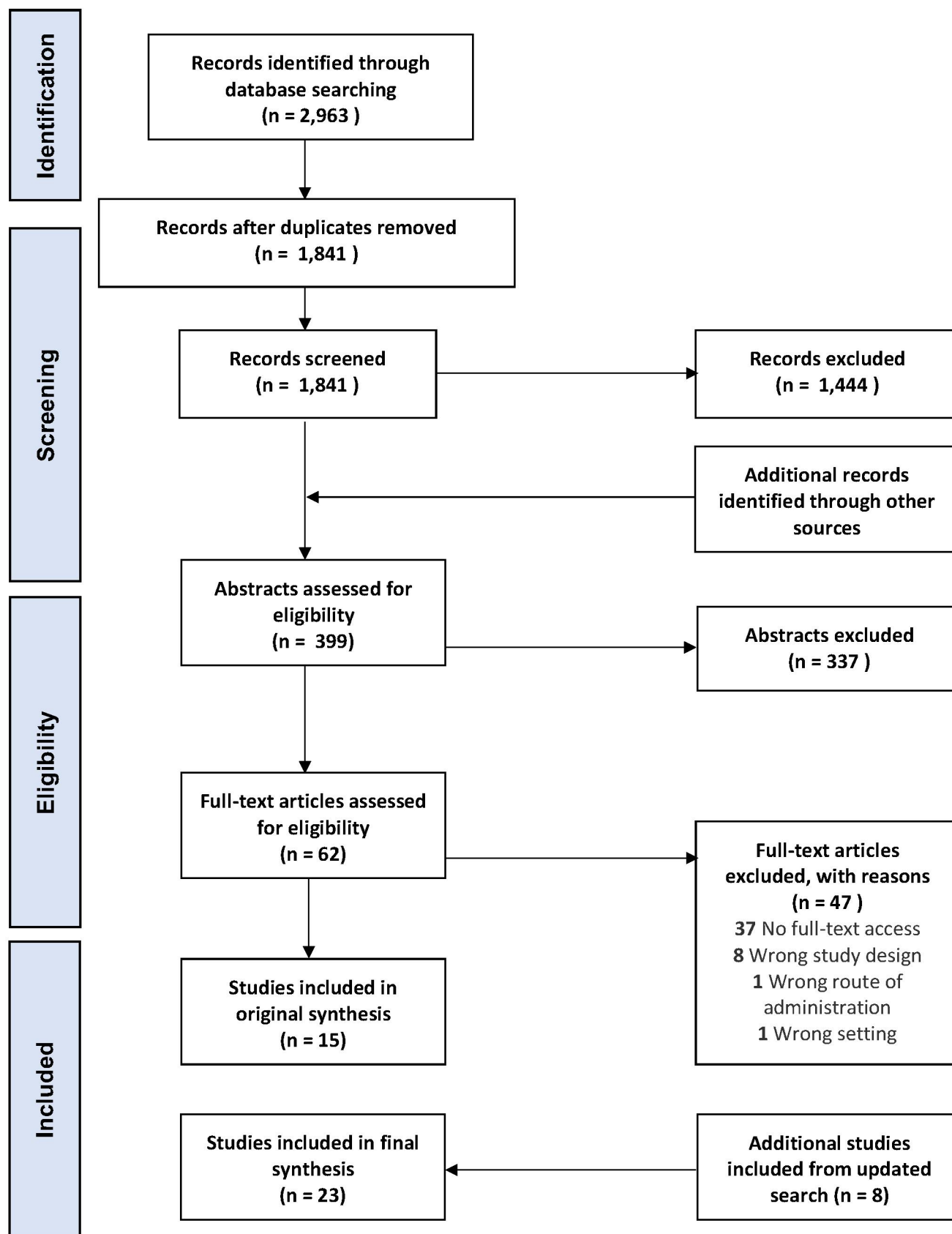


Figure 1 Flow of Information, based on the Preferred Reporting Items for Systematic Review and Meta-Analyses flow diagram.³²

RESULTS

Overview of included studies

This search strategy identified 23 relevant articles that described

10 different OPSS services, all located in England (see [table 1](#) and online supplemental files 3 and 4). The overall quality was variable, with the majority either evaluating a single-site/

Table 1 Overview of included studies

Service	Author (year)	Study type	Study aims	Demographic characteristics captured			
				Gender	Age	Ethnicity	Sexual orientation
eSexual Health Clinic (eSHC)	Aicken <i>et al</i> 2018 ⁵¹	Qualitative interviews	To understand use and experience of the eSHC to inform future evaluation and refinement	Binary	18–35	✓	✓
	Estcourt <i>et al</i> 2017 ⁴⁹	Quasi-experimental	To assess the safety and feasibility of eSHC	Binary	18+	✓	✓
	Gibbs <i>et al</i> 2018 ⁴⁸	Mixed-methods evaluation of quasi-experimental study	To evaluate the eSHC results service	–	–	–	–
FreeTest.me	Dolan and Rudicill 2014 ³⁹	Quasi-experimental	To explore the effect on chlamydia test return rates of non-cash financial incentives, and the influence of socioeconomic status	Binary	16–24	✓	–
Letstalkaboutit	Gasmelid <i>et al</i> 2021 ³⁴	Observational	To determine whether online screening is accessible by those patients most at need by comparing the demographics and number of asymptomatic chlamydial infections detected online and in clinic	Binary	<25, 25+	✓	✓
National Chlamydia Screening Programme (NCSP)	Woodhall <i>et al</i> 2012 ⁵	Observational	To describe and evaluate access to the NCSP's online chlamydia testing service	Binary	15–24	✓	–
North East Essex Primary Care Trust (PCT)	Bracebridge <i>et al</i> 2012 ⁴⁰	Observational	To quantify uptake and test-positivity rates, identify factors associated with screening and compare costs of the intervention with the NCSP	Binary	17–25	✓	–
Saving Lives	Page <i>et al</i> 2019 ⁴⁷	Observational	To ascertain how DBS HIV kits compared with MT kits in this postal testing service	Female, male, trans	Median 26	✓	✓
Sexual Health London (SHL)	Day <i>et al</i> 2020 ⁵⁰	Observational	To report the rate of recent sexual assault disclosure among users of SHL and identify the outcomes of their call-back discussions	Female, male, trans or non-binary	18–55	✓	✓
	Day <i>et al</i> 2021 ⁴³	Observational	To assess the sexual health needs, sexual practices, STI/HIV positivity and satisfaction rates of trans and non-binary users of Sexual Health London	Female, male, trans, non-binary/gender fluid	15–82	✓	–
	Day <i>et al</i> 2020 ⁴⁸	Observational	To report the safeguarding concerns and outcomes of those aged 16–17 years old accessing SHL	Female, male, trans or non-binary	16–17	✓	✓
	Day <i>et al</i> 2021 ⁶¹	Observational	To identify the characteristics and transfer to care rates of those who have a reactive HIV test result via SHL	Binary	21–50	✓	✓
SH24	Barnard <i>et al</i> 2018 ³²	Observational	To compare the characteristics of e-STI service users with clinic users, and OPSS kit returners with non-returners	Binary	16+	✓	✓
	Barnard 2020 (Chapter 6) ³²	Qualitative interviews	To describe the experiences, barriers and facilitators of SH24 in Lambeth and Southwark	Female, male, trans	16–30	✓	–
	Syred <i>et al</i> 2019 ³⁷	Observational	To describe user choice of OPSS orders and diagnoses in a 'choose to test' intervention	Binary	16–24	✓	✓
	Turner <i>et al</i> 2018 ⁴⁰	Observational	To investigate the effect of decision-making on resource allocation in a clinic after the introduction of an e-STI service in Lambeth and Southwark	Binary	16+	✓	–
	Turner <i>et al</i> 2019 ³³	Observational and model generation	To establish cost-effectiveness of an OPSS service, and explore cost per diagnosis in different scenarios	–	–	–	–
	Wilson <i>et al</i> 2017 ⁴⁴	Experimental	To assess the effectiveness of an OPSS service compared with face-to-face services	Female, male, trans	16–30	✓	–
	Wilson <i>et al</i> 2019 ⁴⁵	Secondary data analysis of experimental study	To examine the effect of an e-STI service on testing uptake on people who had never previously tested (never-testers)	Female, male, trans	16–30	✓	–
TakeATestUK.com	Page <i>et al</i> 2021 ⁴¹	Observational	To ascertain how DBS HIV and syphilis kits compared with MT kits in this postal testing service	Female, male, trans	Mean 27	✓	–
Umbrella	Banerjee <i>et al</i> 2018 ³⁵	Observational	To evaluate the rates of uptake and return of OPSS kits and compare patient demographics and clinical outcomes in home and clinic testers	Female, male, trans	16+	✓	–
	Banerjee <i>et al</i> 2020 ³⁶	Observational	To evaluate the uptake, return rate and new diagnosis rates of home-based testing in comparison with clinic-based testing for HIV, syphilis and hepatitis B	Female, male, trans	16+	✓	–
	Manavi and Hodson 2017 ⁴⁶	Observational	To establish which factors influence return of OPSS kits	Female, male, trans	–	–	–

** Unstated, but reported as no difference between groups. ³⁹ Bracebridge *et al*. 2012 have labelled IMD quintile 1 as least deprived and IMD quintile 5 as most deprived in their paper. This may be an error and makes this data difficult to interpret. The corresponding author has been contacted for clarification.

DBS, dried blood sample; IMD, Index of Multiple Deprivation; MT, mini-test; OPSS, online postal self-sampling.

testing provider, and exploratory or observational (see online supplemental file 5 for the full MMAT results; for a summary of each individual service or intervention, see online supplemental file 6). We found only one randomised controlled trial, which was single blind and where the intervention was a Short Message Service (SMS) containing a link to an OPSS website and the control was a link to a webpage that contained information for clinics where the recruits aged 16–30 years old could access testing. Six studies explored solely chlamydia testing, 1 assessed a chlamydia and gonorrhoea testing service and 17 assessed services which tested for chlamydia, gonorrhoea, HIV and syphilis. Five articles compared demographic characteristics and outcomes of users of OPSS with clinic-based services.^{20 32–36}

As standardised definitions were not used across the included studies for terms such as ‘access’, ‘usage’ or ‘demand’, we have not attempted to define related terms in this scoping review.

Characteristics of those accessing OPSS services

Comprehensive demographic data were not consistently collected across studies, in terms of both type of data collected and what was collected (see table 1). Only two studies collected demographic data on all of gender, age, ethnicity, sexual orientation and the Index of Multiple Deprivation (IMD)^{32 37}; two collected none of these items.^{20 38} In addition to age and gender, 6 studies collected IMD data, 17 collected sexual orientation and 21 collected ethnicity, the majority of which were described in different ways using a variety of groupings. Gender types captured also varied between studies, with 2 that did not collect these data, and 10 only reporting binary types.

Those who accessed services tended to be majority women (56.7%–69.4% women, five studies reported statistical significance),^{5 20 32 34–36 39–41} were residents in less deprived areas compared with accessing testing in other settings ($p<0.001$),^{5 32 39 40} white or white British (53.3%–92% users, four studies reported statistical significance),^{5 32 34–36 39 41} and 20 years old or over (95.4% when compared with any age group,^{20 32} 32.0%–42.9% when c.f. people aged 20–25^{40 42}), with two studies reporting statistical significance.^{20 32}

In those studies that collected more comprehensive gender data, people who identified as gender diverse made up a small proportion of the overall population accessing the service (0.0%–0.4%).^{35 36 41 43–46}

There were limited and conflicting data on access according to sexual orientation; one study reported more MSM requesting access than heterosexual men,³² and one study found that a higher proportion of people identifying as non-heterosexual accessed online self-sampling compared with clinic-based testing (OR 0.44, 95% CI 0.27 to 0.72).³⁴ This is in contrast to findings from the Umbrella service, Birmingham.³⁶

Those accessing online services sometimes displayed higher risk behaviours,^{5 39} but often had a greater proportion of negative test results compared with clinic-based populations.^{32 35 36 43} Individuals were more likely to order OPSS kits if they had used STI testing services before.³⁹ Of those who were never-testers, a significant proportion was recruited face-to-face in communities.⁴⁵

Usage of OPSS services

The proportion of users returning self-sampling test kits varied by study (range 48.3%–78.4%).^{32 35 36 43} Women were more likely than men to access and return STI self-sampling kits in the majority of studies.^{20 32 35 36 39 40 46} One service evaluation found no difference between kit return rates between those identifying as gender diverse and those identifying as cisgender (OR 1.00, 95% CI 0.81 to 1.24),

although successful return (OR 1.6, 95% CI 1.06 to 2.36) and successful testing (OR 1.2, 95% CI 0.87 to 1.66) of blood samples were higher in those identifying as trans or non-binary/gender fluid.⁴³ Characteristics of those who returned test kits varied between studies for age^{32 36 39} and by level of deprivation.^{39 46} However, across several studies, people of white ethnicity were more likely to return the kit compared with other ethnicities.^{32 35 36}

A study that evaluated those accessing an OPSS spontaneously, compared with those who attended clinic and were triaged to testing online, found that the return rate was slightly lower in the triage and signpost group compared with the spontaneous online group (67.0% vs 70.5% by 6 weeks, respectively).²⁰

There are limited data on return rate of blood sampling kits, with one study finding only 54.4% (9033 of 16 611) of people returned a blood sample with a sufficient quantity of blood for testing.³⁶ Studies that examined different types of blood sampling kits found no difference between return rates for dried blood samples (DBS) versus mini-tests (MTs) (66.5% vs 68.7%),⁴⁷ but did find that the samples were significantly more likely to be successfully processed with DBS (94.6%–98.8%) compared with MT (55.7%–54.5%, $p<0.001$).^{41 47}

Impact of OPSS services on demand

In many areas, the introduction of OPSS services was not associated with a change in numbers of people attending clinics, but increased the overall demand for STI testing services.^{20 33 44}

Impact on clinical outcomes

Test positivity

Overall, test positivity for chlamydia and gonorrhoea was lower in OPSS services (4.4%–8.1%) than clinic-based services (10.3%–14.4%).^{32 35} Two studies found a low HIV prevalence in their OPSS testing population; 0.1% (144 of 148 257)⁴⁸ and 0.8% (75 of 16 611)³⁶ of users in the evaluation period had a reactive HIV result. Of these, 65.3%³⁶ and 91.6%⁴⁸ had confirmatory testing, and 1.3% (1 of 75)³⁶ and 23.6% (34 of 144) had a new diagnosis of HIV confirmed. When comparing DBS and MT for HIV self-sampling, MT was found to have a higher proportion of reactive tests (6.2% vs 0.5%),⁴¹ lower proportion of confirmed reactive tests ($n=1$ of 30 (3.3%) vs 1 of 11 (9.1%))⁴¹ and higher false positive tests (5.2%–5.4% vs 0.0%–0.4%).^{41 47} However, these were service evaluations and the blood sampling kit options were offered sequentially rather than in parallel, so the populations being compared are not directly comparable. In addition, the tests were not compared with the results of a gold standard test (HIV Ab/Ag test), and the authors were unable to provide sensitivity and specificity data.⁴⁷ These results should therefore be interpreted with caution.

Time to treatment

There were varied results regarding time to treatment; one paper reported that online patients took longer to receive treatment than clinic users,³⁵ and one study found that there was no statistically significant difference.⁴⁴ When an entire care pathway was trialled online and asymptomatic chlamydia-positive individuals could access an automated online clinical consultation which allowed people to collect their treatment at a community pharmacy, median time to treatment was 1 day (IQR 0–1).⁴⁹ A study comparing outcomes of asymptomatic service users testing positive for chlamydia via clinic-based services and online found that those diagnosed online were less likely to wait more than a week for treatment compared with those diagnosed in clinic (OR 9.94, 95% CI 2.87 to 34.42).³⁴

Reporting sexual assault and safeguarding outcomes

When evaluating outcomes of those people who reported online a recent sexual assault over a 6-month period in 2020, one service found that 0.5% (n=242 of 45 841) of users indicated they had been a victim of a recent sexual assault, which led to telephone intervention by a clinical healthcare professional. Of these, nearly 80% of people were contacted. However, 41.7% (n=101 of 242) of users stated that they had not intended to report recent sexual assault. Fifteen people had already reported the sexual assault and had been seen by the police or by a Sexual Assault Referral Centre (SARC). One person required a SARC referral, and eight people were referred to a clinic-based service.⁵⁰ The same service also evaluated their safeguarding outcomes in those aged 16–17 years old, finding that a high proportion of this population (42.5%) met the service criteria for a follow-up telephone call from a health advisor. The most frequent reason that a call was triggered was related to drug and alcohol use (27%). The outcome of 8.5% of calls was a discussion with the child protection team, with 7.0% requiring a referral or discussion with social services.⁴⁸ There was no evidence as to whether safeguarding opportunities were missed, or an in-depth understanding of the acceptability of providing this information in an online setting.

Acceptability of OPSS services

Qualitative research showed the importance of trust, confidentiality, discretion, reliability, convenience and improved patient choice in ensuring the successful use of OPSS,^{51 52} and between 71.1% and 98.0% of individuals surveyed expressed that they were pleased with and found these services acceptable.^{38 44 45}

Economics

Although this review did not specifically set out to evaluate the economic outcomes of OPSS services, only one study included any costing data.³³ This study, evaluating the impact of online testing across specialist SHS in two London boroughs found that, although there was an increase in the total annual cost of STI testing following the introduction of online testing, the average cost per test and diagnosis decreased.³³

DISCUSSION

Although evaluations of OPSS of variable quality were found, we did not identify any large-scale, multicentre robust studies. Available evidence suggests that OPSS services appear to be more likely to be used by, and acceptable to, asymptomatic individuals who are predominately women, over 20 years of age, residents in less deprived areas and of white ethnicities, when compared with clinic-based populations. There is preliminary evidence that people from groups experiencing a disproportionate burden of STIs use OPSS less than other groups. The heterogeneity of the included studies prevented full evaluation of clinical outcomes.

Online services tend to be targeted at asymptomatic individuals who do not have other sexual health needs. The ability for asymptomatic people to manage their care needs remotely is an important and useful contribution to detect symptomless STIs, in order to enable treatment of the index patient and partner notification, and reduce morbidity and onward transmission. However, asymptomatic users reported higher risk behaviours in some studies,^{5 39} and there were no data on the impact of using OPSS on future sexual behaviour. In addition, there was insufficient evidence to be able to establish the impact of OPSS on treatment and partner notification outcomes.

Women were more likely than men to access and return STI self-sampling kits in the majority of studies.^{20 32 35 39 40 46} For services that provided accessibility information by sexual orientation, MSM seemed to be successfully using OPSS services.^{32 46} This finding is consistent with those from an OPSS in Canada.⁵³ Certain minority ethnic groups such as black Caribbean, black African and mixed ethnicities, who are also key populations who are at higher risk of poor sexual health, were under-represented in OPSS users,¹¹ perhaps due to a preference for face-to-face care.⁵²

Some services appear to appropriately reach younger people, but other services were more popular with those aged over 20 years.³⁵ This could be because younger people are more likely to live at home and have concerns about parents finding a test kit delivered through the post.⁵⁴ Using chlamydia as an exemplar, chlamydia has formed 49% of new STI diagnoses in 2019, yet there has been a 13% reduction in tests completed by young people since 2015.¹¹ Chlamydia is the most commonly reported STI in the UK, and disproportionately affects young people from deprived areas,⁴² so it is crucial to ensure services are targeting these groups within their region. Despite this, recent research shows that both men (adjusted OR (aOR): 1.36 (95% CI: 1.35 to 1.39), $p < 0.001$) and women (aOR: 1.32 (95% CI: 1.31 to 1.33), $p < 0.001$) living in the least deprived quintile were more likely to use OPSS services for chlamydia screening than those from the most deprived quintile.⁵⁵

Understanding inequalities in access and usage of OPSS services requires services to collect comprehensive sociodemographic data. Of the 15 included studies, only 2 collected gender, age, ethnicity, sexual orientation and IMD data.^{32 37} Most studies included categories such as 'other' ethnicity or sexual orientation and though a few included trans participants, only one described people of non-binary, gender fluid or other genders.⁴³ This data gap results in not only a skewed understanding of the impact of STIs on minorities, but also 'facilitates the erasure of communities'.¹⁸ Further, the inter-relations between demographic groups have not been sufficiently examined in these studies despite reference in the literature^{20 42 56} (eg, 4, 11, 65).

Return rates of blood samples that were sufficient for testing were relatively low, and in keeping with findings from the national HIV self-sampling service.⁵⁷ Overall test positivity was lower in OPSS services compared with clinic-based services.^{32 36} This is in keeping with, but more marked than, findings from both selective and unselective national datasets.^{10 57} As highlighted within one study, the low positive predictive value (PPV) for home-based BBV testing is concerning³⁶ and requires further evaluation from both a cost-effectiveness and well-being perspective.

To our knowledge, this is the first review to explore the accessibility of OPSS services in the UK. The inclusion of qualitative as well as quantitative studies ensured that both acceptability and core themes regarding people's access to and use of services could be explored. The included studies were heterogeneous in design using a variety of methodologies which added value to the review. By excluding hypothetical studies, acceptability and barriers to service use are indicative of the real-life experience of online service users.

Fourteen of 23 studies took place in London and no studies were conducted in Wales, Scotland or Northern Ireland, so findings may not be generalisable to all of the UK. This review did not set out to evaluate partner notification or economic outcomes of OPSS services, but the authors observed that there was a dearth of information on these within the studies that were included in this review. This study only focused on the UK setting as it was focusing on access, and the infrastructure of SHS provision in the UK is different to other settings. However, the findings relating to acceptability and

convenience are similar to those reported in systematic review and synthesis of qualitative research on OPSS services.⁵⁴

OPSS services appear acceptable to current users and improve choice, but evaluation is limited. The existing evidence suggests that successful services achieve reliability, privacy, convenience, trust and are integrated with clinic-based services to provide ease of transition between modalities of care. Online services are successful in relieving pressure from clinics,⁵⁸ but clinic-based services remain essential for symptomatic individuals, people who have digital constraints and those who prefer face-to-face care and or require additional safeguarding, among others.¹⁸ Further research is required to understand impact on clinical outcomes, including safeguarding opportunities.

With the extensive expansion in provision of OPSS services in recent years, a large-scale, multicentre evaluation is needed to determine their cost-effectiveness and impact on access, clinical outcomes and service delivery. In addition to more targeted evaluations, it would be beneficial to conduct a holistic evaluation across all service modalities (including face-to-face services). Clinical outcomes are key to understanding the cost-effectiveness of these services and there is limited research into this important factor. Further research is required to understand why people aged under 20 years have lower uptake, and whether this is related to, for example, an individual's experience of autonomy, competence and relatedness⁵⁹ and how awareness and access can be improved for these individuals.⁶⁰

Handling editor Alec Miners

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Contributors KS conducted the original scoping review to fulfil requirements of KS' Masters dissertation, supervised by JG and KCL. JG, KCL, KS, CSE and FB conceived of the original idea. KS, JG and KCL contributed to the design of the study. KS led, and KCL and JG contributed to the establishment of the search strategy and method of analysis. The original article reviewing and data analysis were led by KS, with contribution from KCL and JG. The updated article review and data analysis were led by JG, with contribution from KCL and KS. All authors (KS, KCL, CSE, FB and JG) have made contributions to the drafting and revising of the article, and have approved the final version.

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Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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Supplementary File

Supplemental File 1: Search Strategy (where applicable limited to publications in English language, 2010-2020).

Database	Medical Subject Headings	Keywords
Medline	<p>exp Sexually Transmitted Diseases, exp Sexual Health, exp Telemedicine, exp Internet, exp Health Services Accessibility, exp Healthcare Disparities, exp Socioeconomic Factors, exp Minority Groups, exp Social Marginalization, exp United Kingdom</p> <p>NOT exp Africa, exp americas, exp antarctic regions, exp arctic regions, exp asia, exp oceania</p>	<p>"sexually transmitted disease*", "sexually transmitted infection*", sti, stis, std, stds, venereal, "sexual health*", chlamydia, gonorrhoea, gonorrhoea, syphilis, "herpes genitalis", hiv, "human immunodeficiency virus*", "acquired immunodeficiency syndrome*", aids, "acute retroviral syndrome*", ars, "hepatitis B", "hepatitis C" telemedicine*, telehealth*, "mobile health*", mhealth*, ehealth*, internet, "digital service*", "digital intervention*", "digital technolog*", "self sampl*", "self test*", "home test*", "test* kit*", "self collect*", "home base*", "web-base*", "self-swab*", "home swab*", "mobile technolog*", "mobile application*", app, apps, "social medi*", "cell phone*", cellphone*, "mobile phone*", "mobile telephone*", "cellular phone*", smartphone*, "smart phone*", "mobile device*", "text messag*", texting, texted, sms, mms, "multimedia messag*", "short messag*", "computers, handheld", "personal digital assistant", email*, "e-mail*", online, "digital health*", access*, disparit*, barrier*, availab*, inaccess*, unavailab*, socioeconomic*, minorit*, inequalit*, equalit*, inequit*, "equit", "marginaliz*", "marginalis*", "convenient*", "inconvenient*", "hard to reach", "national health service*", nhs*, gb, "g.b.", britain*, british*, uk, "u.k.", "united kingdom*", england*, "english", "northern ireland*", "northern irish*", scotland*, scottish*, wales, "south wales", welsh*</p> <p>NOT "british columbia", "new england", "new south wales", ((published or publication* or translat* or written or language* or speak* or literature or citation*) adj5 english)</p>
EMBASE	<p>exp sexually transmitted disease, exp sexual health, exp telemedicine, exp internet, exp health care access, exp health care disparity, exp socioeconomic, exp</p>	<p>"sexually transmitted disease*", "sexually transmitted infection*", sti, stis, std, stds, venereal, "sexual health*", chlamydia, gonorrhoea, gonorrhoea, syphilis, "herpes genitalis", hiv, "human immunodeficiency virus*", "acquired immunodeficiency syndrome*", aids, "acute retroviral syndrome*", ars, "hepatitis B", "hepatitis C" telemedicine*, telehealth*, "mobile health*", mhealth*, ehealth*, internet, "digital service*", "digital intervention*", "digital technolog*", "self sampl*", "self test*", "home test*", "test* kit*", "self collect*", "home base*", "web-base*", "self-swab*", "home swab*", "mobile technolog*", "mobile application*", app, apps, "social medi*", "cell phone*", cellphone*, "mobile phone*", "mobile telephone*", "cellular phone*",</p>

	<p>minority group, exp social exclusion, exp United Kingdom</p> <p>NOT exp africa, exp americas, exp antarctic regions, exp arctic regions, exp asia, exp oceania</p>	<p>smartphone*, "smart phone*", "mobile device*", "text messag*", texting, texted, sms, mms, "multimedia messag*", "short messag*", "computers, handheld", "personal digital assistant", email*, "e-mail*", online, "digital health*", access*, disparit*, barrier*, availab*, inaccess*, socioeconomic*, minorit*, inequalit*, equalit*, inequit*, "equit", "marginaliz*", "marginalis*", "convenien*", "inconvenien*", "hard to reach", "national health service*", nhs*, gb, "g.b.", britain*, british*, uk, "u.k.", "united kingdom*", england*, "english", "northern ireland*", "northern irish*", scotland*, scottish*, wales, "south wales", welsh*,</p> <p>NOT "british columbia", "new england", "new south wales", ((published or publication* or translat* or written or language* or speak* or literature or citation*) adj5 english)</p>
<p>PsycInfo</p> <p>HMIC</p>	<p>exp sexually transmitted diseases, exp sexual health, exp telemedicine, exp internet, exp health care access, exp health disparities, exp socioeconomic status, exp minority groups</p>	<p>"sexually transmitted disease*", "sexually transmitted infection*", sti, stis, std, stds, venereal, "sexual health*", chlamydia, gonorrhoea, gonorrhoea, syphilis, "herpes genitalis", hiv, "human immunodeficiency virus*", "acquired immunodeficiency syndrome*", aids, "acute retroviral syndrome*", ars, "hepatitis B", "hepatitis C" telemedicine*, telehealth*, "mobile health*", mhealth*, ehealth*, internet, "digital service*", "digital intervention*", "digital technolog*", "self sampl*", "self test*", "home test*", "test* kit*", "self collect*", "home base*", "web-base*", "self-swab*", "home swab*", "mobile technolog*", "mobile application*", app, apps, "social medi*", "cell phone*", cellphone*, "mobile phone*", "mobile telephone*", "cellular phone*", smartphone*, "smart phone*", "mobile device*", "text messag*", texting, texted, sms, mms, "multimedia messag*", "short messag*", "computers, handheld", "personal digital assistant", email*, "e-mail*", online, "digital health*", access*, disparit*, barrier*, availab*, inaccess*, unavailab*, socioeconomic*, minorit*, inequalit*, equalit*, inequit*, "equit", "marginaliz*", "marginalis*", "convenien*", "inconvenien*", "hard to reach", "national health service*", nhs*, gb, "g.b.", britain*, british*, uk, "u.k.", "united kingdom*", england*, "northern ireland*", "northern irish*", scotland*, scottish*, wales, "south wales", welsh*</p> <p>NOT "british columbia", "new england", "new south wales"</p>
<p>CINAHL Plus</p>	<p>(MH "Sexually Transmitted Diseases+"), (MM "Sexual Health"), (MH "Telemedicine+"), (MH "Internet+"), (MH "Health Services Accessibility+"), (MM "Healthcare Disparities"), (MH "Socioeconomic Factors+"),</p>	<p>"sexually transmitted disease*", "sexually transmitted infection*", sti, stis, std, stds, venereal, "sexual health*", chlamydia, gonorrhoea, gonorrhoea, syphilis, "herpes genitalis", hiv, "human immunodeficiency virus*", "acquired immunodeficiency syndrome*", aids, "acute retroviral syndrome*", ars, "hepatitis B", "hepatitis C" telemedicine*, telehealth*, "mobile health*", mhealth*, ehealth*, internet, "digital service*", "digital intervention*", "digital technolog*", "self sampl*", "self test*", "home test*", "test* kit*", "self collect*", "home base*", "web-base*", "self-swab*", "home swab*", "mobile technolog*", "mobile application*", app, apps, "social medi*", "cell phone*", cellphone*, "mobile phone*", "mobile telephone*", "cellular phone*", smartphone*, "smart phone*", "mobile device*", "text messag*", texting, texted, sms, mms, "multimedia messag*", "short messag*", "computers, handheld", "personal digital assistant", email*, "e-mail*", online,</p>

	(MM "Minority Groups"), (MH "United Kingdom")	"digital health*", access*, disparit*, barrier*, availab*, inaccess*, unavailab*, socioeconomic*, minorit*, inequalit*, equalit*, inequit*, "equit", "marginaliz*", "marginalis*", "convenien*", "inconvenien*", "hard to reach", "national health service*", nhs* , gb, "g.b.", britain*, british*, uk, "u.k.", "united kingdom*", england*, "northern ireland*", "northern irish*", scotland*, scottish*, wales, "south wales", welsh* NOT "british columbia", "new england", "new south wales"
Scopus Open Grey Web of Science	n/a	"sexually transmitted disease*", "sexually transmitted infection*", sti, stis, std, stds, venereal, "sexual health*", chlamydia, gonorrhoea, gonorrhoea, syphilis, "herpes genitalis", hiv, "human immunodeficiency virus*", "acquired immunodeficiency syndrome*", aids, "acute retroviral syndrome*", ars, "hepatitis B", "hepatitis C" telemedicine*, telehealth*, "mobile health*", mhealth*, ehealth*, internet, "digital service*", "digital intervention*", "digital technolog*", "self sampl*", "self test*", "home test*", "test* kit*", "self collect*", "home base*", "web-base*", "self-swab*", "home swab*", "mobile technolog*", "mobile application*", app, apps, "social medi*", "cell phone*", cellphone*, "mobile phone*", "mobile telephone*", "cellular phone*", smartphone*, "smart phone*", "mobile device*", "text messag*", texting, texted, sms, mms, "multimedia messag*", "short messag*", "computers, handheld", "personal digital assistant", email*, "e-mail*", online, "digital health*", access*, disparit*, barrier*, availab*, inaccess*, unavailab*, socioeconomic*, minorit*, inequalit*, equalit*, inequit*, "equit", "marginaliz*", "marginalis*", "convenien*", "inconvenien*", "hard to reach", "national health service*", nhs* , gb, "g.b.", britain*, british*, uk, "u.k.", "united kingdom*", england*, "northern ireland*", "northern irish*", scotland*, scottish*, wales, "south wales", welsh* NOT "british columbia", "new england", "new south wales"
Ethos	n/a	<ol style="list-style-type: none"> 1. "sexually transmitted infection" AND test 2. "sexually transmitted infection" AND online 3. "sexually transmitted infection" AND access 4. "sexually transmitted infection" AND UK 5. "sexually transmitted disease" AND test 6. "sexually transmitted disease" AND online 7. "sexually transmitted disease" AND access 8. "sexually transmitted disease" AND UK

Supplemental File 2: Systematic Review Data Extraction Form (blank)**Systematic Review Data Extraction Form**

Record no.	
Article citation	
Type:	
Completed by:	

Summary Notes

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Study Description

Study aims/research questions	
Rationale (why did the study author believe the study could benefit the study population in this context?)	
Participants (number and description)	
Setting (geographic location, institutional setting, other place/space-related features)	
Summary of intervention	

Data Collection

What types of data are collected/managed/shared?	
How is this data collected/managed/shared? (describe the tool, if there is one)	
Data collection and sharing context (who is collecting data and who is it being shared with, how?)	

Study Design

Description of study design	
Theoretical framework for development and/or evaluation (describe, if there is one)	
Eligibility (inclusion/exclusion criteria)	
Control/comparison group	
Analyses conducted	
Outcome measures	

Study Findings (add more rows to elaborate on findings as needed)

Key descriptive statistics	
Clinical outcomes	
Other self-reported outcomes	
Acceptability	

Assessment & Impacts

Strengths and Limitations (as noted by authors)	
MMAT Assessment Results	
Key impacts and lessons learned	

Key Quotes (for thematic analysis, add more rows as needed)

Notes	Quote

Supplemental File 3: Demographics of Study Participants

Service	Author	Study population & number of participants	Gender	Age	Ethnicity	Sexual orientation	Index of deprivation
eSexual Health Clinic (eSHC)	Aicken et al. 2018 (37)	Telephone interviews with patients who had used the eSHC N=36	Female - 20 Male - 16	18-24yrs – 18 25-35yrs - 18	Asian - 3 Black - 7 Mixed - 4 White - 22	Heterosexual – 34 Unstated - 2	Unstated
	Estcourt et al. 2017 (38)	Recruited from GUM clinic - 116	Female - 74 Male - 42	Median 25yrs	White British – 37 White other – 29 Black – 17 Asian, mixed or other – 21 Unstated - 12	Same-sex partner in last 6 months - 1	Unstated
		Recruited from NCSP Checkurself - 105	Female - 60 Male - 45	Median 22yrs	White British – 67 White other – 5 Black – 12 Asian, mixed or other – 10 Unstated - 11	Same-sex partner in last 6 months – 3	Unstated
	Gibbs et al. 2018 (39)	1) Patients completing telephone survey - 152 2) Interviews (see Aicken et al. 2018) 3) Online survey - 331	Unstated	Unstated	Unstated	Unstated	Unstated
Freetest.me	Dolan et al. 2014 (40)	2988	Male: 33.7 Female:66.3	(Mean) 16-19yrs – 30.7 20-24yrs – 66.4 Unstated – 2.9	(Mean) White – 86.5 Black – 1.4 Asian – 1.3 Other – 0.3 Mixed – 3.1	Unstated	(Mean) IMD Score (SD) – 20.2 (14.13)

					Unstated – 7.3		
Letstalkaboutit	Gasmelsid et al. 2021 (34)	Before online testing 2847	Female 1561 Male 1285	<25 1949 25+ 898	Black and Minority Ethnic: 209 White: 2099	Non-heterosexual 120 Heterosexual 1336	Unstated, but reported as no difference between groups
		After online testing 2066 clinic	Female 1007 Male 891	<25 1334 25+ 732	Black and Minority Ethnic: 227 White: 1540	Non-heterosexual 51 Heterosexual 875	
		After online testing 775 online	Female 437 Male 210	<25 520 25+ 255	Black and Minority Ethnic: 33 White: 366	Non-heterosexual 28 Heterosexual 213	
NCSP	Woodhall et al. 2012 (5)	Internet test kits requested (number of participants unstated) – 59719	Female: 38268	15yrs – 442 16-19yrs – 13099 20-24yrs – 24727	White – 32604 Black – 796 Asian – 747 Chinese – 74 Other – 91 Mixed – 1032 Unstated – 2924	Unstated	IMD quintile 1 (most deprived) – 6662 2 – 7965 3 – 7987 4 – 7341 5 – 7019 Unstated – 1294
			Male: 21451	15yrs – 237 16-19yrs – 6659 20-24yrs – 14555	White – 17925 Black – 499 Asian – 519 Chinese – 24 Other – 59 Mixed – 569 Unstated – 1855	Unstated	IMD quintile 1 (most deprived) – 3733 2 – 4276 3 – 4353 4 – 4093 5 – 4164 Unstated – 832
		GP tests (number of participants unstated) – 148619	Female: 109,187	15yrs – 3322 16-19yrs – 41698 20-24yrs – 64167	White – 67934 Black – 5851 Asian – 5464 Chinese – 721 Other – 540 Mixed – 2670 Unstated – 26007	Unstated	IMD quintile 1 (most deprived) – 26319 2 – 24489 3 – 18318 4 – 14620 5 – 15565 Unstated – 9876
			Male: 39432	15yrs – 901 16-19yrs – 14283 20-24yrs – 24248	White – 20976 Black – 2784 Asian – 4744 Chinese – 335	Unstated	IMD quintile 1 (most deprived) – 10837 2 – 9525 3 – 6186

					Other – 298 Mixed – 950 Unstated – 9345		4 – 4571 5 – 4495 Unstated – 3818
		SRH tests (number of participants unstated) – 202028	Female: 156,432	15yrs – 13463 16-19yrs – 82264 20-24yrs – 60705	White – 97153 Black – 11886 Asian – 4127 Chinese – 510 Other – 733 Mixed – 6139 Unstated – 35884	Unstated	IMD quintile 1 (most deprived) – 50020 2 – 35086 3 – 24394 4 – 19514 5 – 15441 Unstated – 11977
			Male: 45596	15yrs – 3215 16-19yrs – 24866 20-24yrs – 17515	White – 26261 Black – 4002 Asian – 1488 Chinese – 75 Other – 194 Mixed – 1703 Unstated – 11783	Unstated	IMD quintile 1 (most deprived) – 15331 2 – 10053 3 – 6395 4 – 5523 5 – 3952 Unstated – 4342
North East Essex PCT	Bracebridge et al. 2012 (41)	People offered screening - 29917	Female: 14773 Male: 15136 Unstated: 8	17-18yrs – 3773 19yrs – 4512 20yrs – 4532 21yrs – 4643 22yrs – 4220 23yrs – 4099 24-25yrs – 4128 Unstated – 10	Unstated	Unstated	IMD quintile 1 (least deprived)* – 5857 2 – 6048 3 – 6004 4 – 5992 5 (most deprived)* – 6002 Unstated – 14
		People who completed screening - 3431	Female: 1951 Male: 1480	17-18yrs – 466 19yrs – 564 20yrs – 569 21yrs – 466 22yrs – 444 23yrs – 434 24-25yrs – 486	White – 2967 Other – 216 Unstated – 248	Unstated	IMD quintile 1 (least deprived)* – 389 2 – 802 3 – 872 4 – 687 5 (most deprived)* – 676 Unstated – 5

		People who tested positive for chlamydia - 152	Female: 85 Male: 67	Unstated – 2 17-18yrs – 18 19yrs – 21 20yrs – 20 21yrs – 20 22yrs – 32 23yrs – 21 24-25yrs – 20	White – 135 Other – 6 Unstated – 11	Unstated	IMD quintile 1 (least deprived)* – 11 2 – 39 3 – 26 4 – 42 5 (most deprived)* – 34
Saving Lives	Page et al. 2019 (42)	Users of Mini-tube - 275	Female – 166 Male – 106 Trans – 2 Unspecified – 0	Median 26, IQR 22, 31 Mean 28, 95% CI 27, 29	Any other mixed background – 2 Any other white background – 7 Bangladeshi – 1 Black African – 0 Black Caribbean - 0 Chinese - 0 Indian – 1 Unknown/Not specified – 3 White & Asian – 4 White and black African – 2 White and black Caribbean - 3 White British - 242 White Irish - 10	Heterosexual Male – 86 Heterosexual Female – 152 MSM - 20 WSW - 16 Unknown/not spec - 1	Unstated
		Users of dried blood spot - 275	Female – 94 Male – 181 Trans – 0 Unspecified – 0	Median 25, IQR 22, 30 Mean 28, 95% CI 27, 29	Any other mixed background – 2 Any other white background – 5 Bangladeshi – 0 Black African – 1 Black Caribbean - 1 Chinese - 2 Indian – 0 Unknown/Not specified – 1 White & Asian – 3 White and black African – 0 White and black Caribbean - 1	Heterosexual Male – 66 Heterosexual Female – 167 MSM - 28 WSW - 14 Unknown/not spec - 0	Unstated

					White British - 253 White Irish - 6		
Sexual Health London	Day et al. 2020 (43)	250 reported recent sexual assault on online triage form	Female: 135 Male: 114 Trans or non- binary: 1	Mean 26 Range 18-55	African – 28 Asian – 24 Caribbean – 23 Other – 64 White – 111	Heterosexual men – 75 Heterosexual women – 105 MSM – 30 WSW – 2 Bisexual men – 9 Bisexual women – 28 Undetermined - 1	Unstated
	Day et al. 2021 (44)	118,825 registrants identifying as cisgender,	Cisgender F:66955 Cisgender M: 51870	Median age 27 Range 15-82	African – 5537 Asian – 5781 Caribbean – 6417 Other – 17,482 White – 39082	Unstated	Unstated
		504 registrants identifying as transgender, non- binary or ‘other’	Trans men 76 Trans women 78 Non- binary/gender -fluid 17 Other 33	Median age 27 Range 16-82	African – 14 Asian – 21 Caribbean – 12 Other - 100 White - 145	Unstated	Unstated
	Day et al. 2020 (45)	Call back group 193	Female: 133 Male: 57 Trans/non- binary: 3	16: 45 17: 148	White: 81 Caribbean: 45 African: 26 Asian: 14 Other ethnicity: 27	Heterosexual - 157 Homosexual – 15 Bisexual - 21	Unstated
		Non-call back group 261	Female: 179 Males: 90 Trans/non- binary: 1	16: 74 17: 187	White: 87 Caribbean: 90 African: 27 Asian: 15 Other ethnicity: 42	Heterosexual - 227 Homosexual – 9 Bisexual - 25	Unstated

	Day et al. 2021 (46)	34 confirmed new HIV results from 144 people with reactive HIV results.	Female: 2 Male: 32	Median 28 Range 21-50	White British or White Other: 20 Black, Asian and Minority Ethnic groups: 4 Other: 10	Gay and bisexual MSM – 30 Heterosexual men – 2 Heterosexual women - 2	Unstated
SH:24	Barnard et al. 2018 (32)	5747 (3198 clinic, 2549 online)	Female: 3258 Male: 2489	16-20yrs – 358 20-25yrs – 1516 25-30yrs – 1798 30-35yrs – 895 35+yrs - 1180	White British – 2233 White other – 829 Black African – 560 Black Caribbean – 480 Black other – 496 Mixed white black African or Caribbean’ – 225 South Asian – 90 Other – 600 Unstated - 229	Heterosexual – 4731 Homosexual – 651 Bisexual – 165 Unstated - 200	IMD quintile 1 (most deprived) – 2115 2 – 2394 3 – 974 4 – 219 5 (least deprived) – 29
	Barnard 2020 (Chapter 6) (47)	20	Female: 7 Male: 12 Trans: 1	16-19yrs – 1 20-24yrs – 10 25-30yrs - 9	White – 8 Mixed – 3 Asian – 2 Black – 6 Other - 1	Heterosexual – 13 Homosexual – 5 Bisexual - 2	Unstated
	Syred et al. 2019 (48)	Pre-intervention - 6253	Female: 4030 Male: 2223	16-24yrs – 3351	Black and Minority Ethnic – 642	Men who have sex with Men (MSM) – 367	IMD quintile 1 (most deprived) – 580 2 – 1364 3 – 1399 4 – 1614 5 (least deprived) - 1296
		Post- intervention - 7772	Female: 4968 Male: 2804	16-24yrs – 4120	Black and Minority Ethnic – 878	MSM – 530	IMD quintile 1 (most deprived) – 794 2 – 1705 3 – 1847 4 – 1886 5 (least deprived) - 1538

	Turner et al. 2018 (20)	Camberwell Sexual Health Clinic – 4172	Female: 1340 Male: 921	16-19yrs – 201 20-24yrs – 472 25-29yrs – 508 30-34yrs – 365 35+yrs – 715	White – 825 Mixed – 178 Asian – 59 Black or Black British – 939 Other – 208 Unstated - 52	MSM – 251	Unstated
		Spontaneous SH:24 – 5632	Female: 2746 Male: 1516	16-19yrs – 194 20-24yrs – 1282 25-29yrs – 1605 30-34yrs – 650 35+yrs – 531	White – 2850 Mixed – 353 Asian – 107 Black or Black British – 768 Other – 105 Unstated - 79	MSM – 505	Unstated
		Triage – 1266	Female: 416 Male: 474	16-19yrs – 55 20-24yrs – 205 25-29yrs – 262 30-34yrs – 146 35+yrs – 222	White – 461 Mixed – 93 Asian – 21 Black or Black British – 270 Other – 32 Unstated - 13	MSM – 94	Unstated
	Turner et al. 2019 (33)	Time period 1 – 43491 clinic visits Time period 2 – 51191 clinic visits, 11768 online orders	Unstated	Unstated	Unstated	Unstated	Unstated
	Wilson et al. 2017 (49)	Intervention group - 1031	Female: 604 Male: 424 Trans: 3	16-19yrs – 206 20-24yrs – 440 25-30yrs – 385	White – 779 Black/African/Caribbean/black British – 81 Asian/Asian British – 70 Mixed – 89 Other – 12	MSM – 129 Other – 890 Unstated – 12	Unstated
		Control group - 1032	Female: 609 Male: 422 Trans: 1	16-19yrs – 220 20-24yrs – 432 25-30yrs – 380	White – 749 Black/African/Caribbean/black British – 110	MSM – 133 Other – 888 Unstated – 11	Unstated

					Asian/Asian British – 57 Mixed – 99 Other – 17		
	Wilson et al. 2019 (50)	Intervention group - 244	Female: 130 Male: 113 Trans: 1	16-19yrs – 96 20-24yrs – 96 25-30yrs – 52	White/WB – 176 Black/black British – 18 Asian/Asian British – 33 Mixed – 14 Other – 3	MSM – 14 Other – 224 Unstated – 6	Unstated
		Control group - 284	Female: 142 Male: 141 Trans: 1	16-19yrs – 118 20-24yrs – 110 25-30yrs – 56	White/WB – 176 Black/black British – 25 Asian/Asian British – 34 Mixed – 26 Other – 5	MSM – 21 Other – 258 Unstated – 5	Unstated
TakeATestUK.com	Page et al. 2021 (51)	Mini tube - 1515	Female:1051 Male:460 Trans:0 Other:4	Mean (95% CI): 27.4 (27.1-27.8) Median (IQR): 26 (22-31)	Any other Asian – 2 Any other Black – 6 Any other mixed – 11 Any other white – 41 Bangladeshi – 6 Black African – 25 Black Caribbean – 81 Chinese – 1 Indian – 5 Pakistani – 13 Unknown/not specified – 26 White and Asian – 17 White and Black African – 2 White and Black Caribbean – 79 White British – 1147 White Irish - 7	Heterosexual man – 353 Heterosexual woman – 977 Bisexual man – 20 Bisexual woman – 18 MSM exclusive – 87 Women who have sex with women (WSW) exclusive – 56 Heterosexual trans woman - 0 Unknown/not specified – 4	Unstated
		Dried blood spot - 4155	Female: 2788 Male: 1357 Trans: 2	Mean (95% CI): 27.3 (27.1-27.5) Median (IQR): 26	Any other Asian – 2 Any other Black – 6 Any other mixed – 11	Heterosexual man – 1012 Heterosexual woman – 2617	Unstated

			Other: 8	(2-31)	Any other white – 41 Bangladeshi – 6 Black African – 25 Black Caribbean – 81 Chinese – 1 Indian – 5 Pakistani – 13 Unknown/not specified – 26 White and Asian – 17 White and Black African – 2 White and Black Caribbean – 79 White British – 1147 White Irish - 7	Bisexual man – 67 Bisexual woman – 95 MSM exclusive 278 WSW exclusive – 76 Heterosexual trans woman - 2 Unknown/not specified – 8	
Umbrella	Banerjee et al. 2018 (35)	Patients who requested home-based kits – 9258	Female: 5986 Male: 3258 Trans: 14	16-24yrs – 6033 25+yrs – 3225	White – 6648 Black/black British – 892 Asian/Asian British – 558 Other – 920 Unstated – 240	Heterosexual male – 2606 Heterosexual female – 5986 MSM – 652 Trans – 14	Unstated
		Patients who returned home-based kits - 4475	Femae: 3104 Male: 1367 Trans: 4	16-24yrs – 2868 25+yrs – 1607	White – 3375 Black/black British – 351 Asian/Asian British – 184 Other – 394 Unstated – 171	Heterosexual male – 1039 Heterosexual female – 3104 MSM – 328 Trans – 4	Unstated
		Patients tested in clinic - 19193	Female: 10861 Male: 8306 Trans: 26	16-24yrs – 9654 25+ yrs – 9539	White – 7996 Black/black British – 4026 Asian/Asian British – 2167 Other – 2160 Unstated – 2844	Heterosexual male – 6602 Heterosexual female – 10662 MSM – 1675 Trans – 24 Bisexual – 199 WSW – 31	Unstated
	Banerjee et al. 2020	Patients who requested home-	Female: 10686	16-24yrs – 8819 ≥25yrs – 7792	White – 11,519 Black – 1692	Heterosexual (M) – 5746 Heterosexual (F) – 10,667	Unstated

	(36)	based testing kit – 16,611	Male: 5889 Trans: 36		Asian – 1148 Other – 1770 Not stated - 482	Trans – 36 MSM – 138 Bisexual – 18 WSW - 6	
		Patients who returned home-based testing kits with sufficient quality of blood for testing – 9033	Female: 6004 Male: 3018 Trans: 11	16-24yrs – 4623 ≥25 years - 4419	White – 6588 Black – 803 Asian – 473 Other – 971 Not stated - 198	Heterosexual (M) – 2875 Heterosexual (F) – 5985 Heterosexual trans – 11 MSM – 138 Bisexual – 18 WSW - 6	Unstated
		Patients who had serological testing in clinic	Female: 8236 Male: 8422 Trans: 37	16-24yrs – 6616 ≥ 25 - 10079	White – 6331 Black – 3296 Asian – 1910 Other – 1796 Not stated - 3362	Heterosexual (M) – 6617 Heterosexual (F) – 8093 Heterosexual trans – 37 MSM – 1788 Bisexual – 95 WSW - 65	Unstated
	Manavi et al. 2017 (52)	Test kits requested – 5310 (number of participants unstated)	Female kits: 3513 Male kits: 1787 Trans kits: 10	Unstated	Unstated	Unstated	IMD rank <5000 – 1855 5000-14999 – 2095 15000+ - 1321

Table Key:

IMD: Index of Multiple Deprivation Unstated: unstated/refused/missing data SD: standard deviation

MSM: men who have sex with men WSW: women who have sex with women SRH: Sexual and Reproductive Health

**Bracebridge et al. 2012 have labelled IMD quintile 1 as least deprived and IMD quintile 5 as most deprived in their paper. This may be an error and makes this data difficult to interpret. The corresponding author has been contacted for clarification.*

Supplemental File 4: Study Summaries and Key Findings

Service Title	Authors (date)	Study type	Study aims	Description of study design	Inclusion/exclusion criteria	Key results
eSexual Health Clinic (eSHC)	Aicken et al. 2018 (37)	Qualitative interviews	To understand use and experience of the eSHC to inform future evaluation and refinement	<ul style="list-style-type: none">Telephone interviews with patients who had used the eSHCFramework analysis carried out with codes developed from the sSHC	Excluded: symptomatic or coinfecting patients, aged <16yrs, unable to read English, no phone number provided	<ul style="list-style-type: none">Key themes included rapidity, protecting privacy, choice and seeking peace of mindSubthemes included technology constraints, concerns with accessing results in public, simple and discreet treatment collection being positive and the trustworthiness conferred by the pathway being integrated within the NHS
	Estcourt et al. 2017 (38)	Non randomised, exploratory proof of concept study	To assess the safety and feasibility of eSHC	<ul style="list-style-type: none">Chlamydia positive patients contacted 2 weeks after receiving their diagnosisOutcomes included appropriate care management, time to treatment and proportion of partners treatedChlamydia-negative users sent a brief acceptability survey	Excluded: symptomatic or coinfecting patients, already receiving treatment for undiagnosed chlamydia, <16yrs, unable to read English	<ul style="list-style-type: none">~75% of users accessed the pathway of whom 60% managed solely online~25% users contacted the helplineMost patients collected treatment from their allocated pharmacyThe day after receiving diagnosis 76% of GUM patients and 67% of NCSP Checkyourself patients had collected treatment29% of GUM patients and 24% of NCSP Checkyourself patients accessed online health information

	Gibbs et al. 2018 (39)	Mixed methods evaluation	To evaluate the eSHC	<ul style="list-style-type: none"> Data collected on eSHC webpage interactions and a survey to establish acceptability for chlamydia positive patients Qualitative interviews with 36 users (see Aicken et al. 2018) Survey of chlamydia-negative users Acceptability analysed descriptively 	See Estcourt et al. 2017 and Aicken et al. 2018	<ul style="list-style-type: none"> 82-92% of patients accessed results within 5 days. Of these, 97% accessed their results on the day they received the text For key findings from qualitative interviews, see Aicken et al. 2018 91% of chlamydia positive patients surveyed were pleased with the service, 66% of previous testers preferred the eSHC, 99% felt they received sufficient health information Chlamydia negative users: 98% of first-time testers were pleased with the service, 90% of previous testers would use the eSHC again - 53% of those preferred the eSHC to alternative services
Freetest.me	Dolan et al. 2014 (40)	Randomised experiment	To explore the effect on chlamydia test return rates of non-cash financial incentives, and the influence of socioeconomic status	<ul style="list-style-type: none"> Test requests randomly allocated to intervention (incentive) or control (no incentive) Test kits sent identifiable bar codes for incentive Logistic regression was conducted using postcodes to identify socioeconomic status 	Included: individuals using site during the study period	<ul style="list-style-type: none"> Those requesting kits mostly female, white, displayed higher risk behaviours (e.g. 2+ partners in the last 12 months), less deprived, over 40% had completed a chlamydia test/over 30% had tested positive in the last year Return rate was 71%, only small differences between incentives, none statistically significant Individuals aged 15-19 and of lower socioeconomic position less likely to return tests

Letstalkab outit	Gasmelsid et al. 2021 (34)	Retrospecti ve service evaluation	To determine whether online screening is accessible by those patients most at need by comparing the demographics and number of asymptomatic chlamydial infections detected online and in clinic.	<ul style="list-style-type: none"> • Single service data • Comparison of the demographic characteristics and number of asymptomatic chlamydial infections detected via an online postal self-sampling service and in clinic • Two time periods: Time 1- pre-introduction of online postal self-sampling ((Sept 2014-March 2015); Time 2 and post-introduction of the online service (Sept 2017-March 2018) 	Included: People testing positive for chlamydia in Solent NHS Trust services (clinic-based and online) between September 2017-March 2018	<ul style="list-style-type: none"> • The demographic characteristics of individuals accessing services was similar in clinic and online services, and remained stable between Time 1 and Time 2. • The majority of patients diagnosed were <25 years old, of white ethnicity, heterosexual and women. • There were no differences in IMD before those diagnosed in Time 1 and Time 2 • There was a significantly higher proportion of service users who identified as gay, bisexual or other men who have sex with men in Time 2 compared to Time 1 • There was a significantly higher proportion of service users of Black, Asian and Minority ethnicity in Time 2 compared to Time 1 • Patients diagnosed in clinic were significantly more likely to wait more than a week for treatment than those diagnosed through online services.
NCSP	Woodhall et al. 2012(5)	Quantitative retrospectiv e data analysis; website evaluation	To describe and evaluate access to the NCSP's online chlamydia testing service	<ul style="list-style-type: none"> • Chlamydia testing data analysed to describe trends and proportion of internet tests, and describe online testing by area • Descriptive comparative analyses conducted of online vs face-to-face users • 90 websites evaluated on health promotion and clinical signposting information 	Included: had test codes for internet testing, aged 16-24	<ul style="list-style-type: none"> • 5.3% of tests ordered online 2006-2010 - <0.5% in 2006 to a maximum of 7.1% in 2009 (varied by area, some <1% and others <40%) • Online users more likely men, aged 20-24, of white ethnicity and less deprived • Women more likely to have had a new sexual partner in the 3 months before testing, or +1 in the previous year, than face-to-face users • A high proportion of online tests resulted in positive chlamydia diagnoses • Internet testers spread out in levels of deprivation, whereas face-to-face testers were more deprived

North East Essex PCT	Bracebridge et al. 2012 (41)	Cross-sectional study	To quantify uptake and test-positivity rates, identify factors associated with screening and compare costs of the intervention with the NCSP	<ul style="list-style-type: none"> • Associations examined between personal characteristics and study outcomes: test uptake, service registration and test positivity • Demographic data obtained through test registration 	Included: aged 18-24, residing within the boundaries of NE Essex PCT	<ul style="list-style-type: none"> • 82% requested online screening • Screening uptake less likely among men, less deprived and over 20's • Having 2+ partners in the previous year strongly associated to a positive diagnosis • 95.4% of chlamydia positive individuals and all notified partners requested postal treatment • Costs per screening test and positive diagnosis were 1.66 and 3.5 times more than the NCSP
Saving lives	Page et al. 2019 (42)	Observational study	To ascertain how DBS HIV kits compared with MT kits in this postal testing service.	<ul style="list-style-type: none"> • Single service dataset analysed to compare online requested MT and DBS HIV test kits • Analyses evaluated the online request, return and results of the two different bloods sampling techniques that were used sequentially by the service 	Included: All service users who ordered an HIV test kit during the study time period, and had consented to their anonymised data to be shared by a third-party organisation.	<ul style="list-style-type: none"> • Similar demographic characteristics of those accessing MT compared to those accessing DBS: 63% women, 90% white British, 86% heterosexual, median age 26) • No difference in return rates between MT and DBS. However statistically significant higher proportion of successful sample processing with DBS (98.8%) compared with MT (55.7%). • Higher proportion of false positives with MT (5.4%) <i>c.f.</i> DBS (0.0%)

Sexual Health London	Day et al. 2020 (43)	Retrospective service evaluation	To report the rate of recent sexual assault (SA) disclosure amongst users of SHL, and identify the outcomes of their call back discussions.	<ul style="list-style-type: none"> Single service dataset Service users reporting that they have been a victim of a recent sexual assault are contacted by the health advisor team Outcomes included successful phone contact with patient, referral to Sexual Assault Referral Centre, Intervention by SHL team, test kit return, diagnosis of STI 	Included: All patients using SHL between 01/01/2020 and 18/02/2020 who triggered a call back for sexual assault	<ul style="list-style-type: none"> 0.5% (242/45841) users triggered at least one call back for a SA Majority of users were female (54.0%), heterosexual (72%), of white ethnicity (44.4%) and 80.4% had attended a sexual health clinic previously. 79.3% (192/242) of call backs were successfully. Of those that were contactable, 45% (87/192) of confirmed a recent SA and 52.6% (101/192) stated that they had made an error on the triage. 76.2% (77/101) of the latter were male. 92.6% (224/242) kits were dispatched, and of these 73.7% (165/224) kits were returned and tested during the study period For 90% (78/87) of those reporting a SA, no onward referral was made.
	Day et al. 2021 (44)	Retrospective service evaluation	To assess the sexual health needs, sexual practices, STI/HIV positivity and satisfaction rates of trans and non-binary users of Sexual Health London	<ul style="list-style-type: none"> Single service dataset Demographic characteristics and outcomes of service users identifying as transgender, non-binary/gender fluid or 'other' (TNB) registering to use SHL. Outcomes included: sexual practices, sexual/reproductive healthcare needs and prior SHC attendance, service outcomes, STI test results and satisfaction scores. 	Included: All people identifying as TNB when registering for SHL between 20 th April 2019 and 31 st December 2019	<ul style="list-style-type: none"> 0.42% (540/119329) of registrants identified as transgender, non-binary/gender fluid or 'other'. 463 kits were placed, and 355 kits were returned from 302 unique users. No difference in kit return rate compared to cisgender individuals The odds of being of Black, Asian or Minority Ethnicity were 1.2 times higher compared with cisgender individuals. The odds of returning a blood sample were 1.6 times higher compared with cisgender individuals TNB service users were significantly more likely to engage in sex work, and reported similar rates of chemsex, group sex and fisting to that seen with MSM. 95% (50/51) of users would recommend SHL to friends/family 85.4% (70/82) gave a 5/5 star service rating

Day et al. 2020 (45)	Retrospective service evaluation	To report the safeguarding concerns and outcomes of 16-17 year olds accessing SHL	<ul style="list-style-type: none"> Single service data SHL uses questions adapted from the Spotting the Signs proforma Demographic characteristics and outcomes of those 16-17 year olds whose responses to the questions triggered a phone call (('call back' (CB)) from a health advisor, compared with those that didn't Outcomes included: type & number of safeguarding triggers, CB outcomes, safeguarding outcomes among CB cases, STI test kits ordered and returned, STI test results. 	Included: All 16 and 17 year olds who triggered a CB from a health advisor	<ul style="list-style-type: none"> 42.5% (193/454) service users triggered one CB, and 7 triggered 2 when ordering a second kit (i.e. they were 200 CBs triggered) The most common reasons for triggering a call back were related to drug and alcohol use (27%0. Partner's age imbalance (18% and involvement with social or mental health services (8%_ All users received at least one CB attempt, and 84.5% had a successful call back. 37.9% had a trigger downgraded (mainly because they had misread, misinterpreted or teicked the question in error. 6.5% disclosed additional or more serious concerns 35.5% were referred to or attend a sexual health clinic 8.5% were referred to the child protection team, mostly because they were not contactable or became uncontactable. 7% of cases involved a discussion/referral to social services.
Day et al. 2021 (46)	Retrospective service evaluation	To identify the characteristics and transfer to care rates of those who have a reactive HIV test result via SHL	<ul style="list-style-type: none"> Single service data Demographics and outcomes of those users with a reactive HIV test result 	Included: People with reactive HIV test results between 8 th January 2018-31 st December 2019	<ul style="list-style-type: none"> 0.097% (144/148,257) had a reactive HIV result 20.8% (30/144) were known to be living with HIV 29.8% (34/114) were confirmed HIV positive 59.6% (68/114) were found to be HIV negative (i.e. were false positives) In 10.5% (12/114) the result was unknown Of those confirmed as new HIV diagnoses, all service users transitioned to a HIV outpatient clinic. The majority were male (94.1%), men who have sex with men (88.2%), and of white ethnicity (58.8%).

SH:24	Barnard et al. 2018 (32)	Cross-sectional study	To compare the characteristics of e-STI service users with clinic users, and OPSS kit returners with non-returners	<ul style="list-style-type: none"> • Service activity data collected from sexual health clinics in Lambeth and Southwark • Complete case analysis carried out using logistic regression 	<p>Included: residents of Lambeth and Southwark</p> <p>Excluded: activity codes outside the remit, testing by prisoners</p>	<ul style="list-style-type: none"> • Online services most popular with users aged 20-30 years, women, white British ethnicity, homosexual or bisexual individuals, those who receive negative results, and are less deprived • Women who were 'mixed white black African or Caribbean' had lower odds of using online services compared to men in this group • Homosexual women were more likely to use online services than homosexual men • The most likely groups to return samples were >20 years (p<0.05) and white British
	Barnard 2020 (Chapter 6) (47)	Qualitative interviews	To describe the experiences, barriers and facilitators of SH:24 in Lambeth and Southwark	<ul style="list-style-type: none"> • Stratified purposive sampling of consenting trial participants (Wilson et al. 2017) • Thematic analysis 	See Wilson et al. 2017	<ul style="list-style-type: none"> • Key themes were trust, subjective norms, privacy, self-efficacy, convenience and perceived risk of infection • Subthemes included service reliability and confidentiality, comfort and control, concealing testing, improved trust and subjective norms over time, risk of infection, self-sampling and validity of results

Syred et al. 2019 (48)	Observational study	To describe user choice of OPSS orders and diagnoses in a 'choose to test' intervention	<ul style="list-style-type: none"> An online 'choose to test' intervention was piloted in Essex, UK Users given a personalized test package Users could add or remove tests Outcomes included test package edits, cost of tests and diagnoses 	n/a	<ul style="list-style-type: none"> Slight increase in MSM and more deprived groups occurred after the intervention 17.2% of MSM removed tests, 67.3% of BME users added a syphilis test, 59.8% of users in neither group added HIV and syphilis tests Orders from women and BME groups most likely to be modified, orders from 16-24s, MSM and symptomatic users least likely to be modified Number of positive chlamydia or gonorrhoea diagnoses did not significantly change Where users are given 'choice to test', most will choose chlamydia, gonorrhoea, HIV and syphilis Costs are saved through a reduction in HIV and syphilis tests ordered
Turner et al. 2018 (20)	Observational study	To investigate the effect of decision-making on resource allocation in a clinic after the introduction of an e-STI service in Lambeth and Southwark	<ul style="list-style-type: none"> Demographic data, type of STI test and area of residence were collected before and after the intervention Outcomes analysed included testing volume and complexity in clinic, and test positivity between pathways 	Included: residents of Lambeth and Southwark only Excluded: codes lacking from clinic visit, prisoners, <16yrs or >100yrs	<ul style="list-style-type: none"> Online testing increased the volume of testing, clinic visits were proportionally more complex The greatest proportion of 16-19s tested in clinic Women were most likely to use the online service but less likely to return tests, MSM were comparatively likely to use clinic or e-STI services Most online or triaged users were asymptomatic - reflective of the encouragement to use clinics if displaying symptoms More tests returned by spontaneous online users than triage patients (p=0.01)

Turner et al. 2019 (33)	Case study analysis and model generation	To establish cost-effectiveness of an OPSS service, and explore cost per diagnosis in different scenarios	<ul style="list-style-type: none"> Records of demographics, sexual orientation and clinical information from clinic visitations were captured Online service data collected Case study analysis conducted on cost-effectiveness of testing prior and post e-STI service 	Excluded: codes lacking from clinic visit, prisoners, <16yrs or >100yrs	<ul style="list-style-type: none"> Clinic testing rates remained stable after SH:24 was introduced, but online testing increased overall testing volume by 27% from 2014-16 37% of tests were ordered online by 2016 Average test positivity rates higher in clinic than online Average monthly diagnoses and annual cost of testing increased from 2014-16, but cost per test and per diagnosis decreased Return rates impact cost if they are below 60%; this study observed an over 75% return rate
Wilson et al. 2017 (49)	Single-blind randomised control trial (RCT)	To assess the effectiveness of an OPSS service compared with face-to-face services	<ul style="list-style-type: none"> Participants recruited from community settings, online and through clinics Participants randomly allocated to intervention (text message with e-STI service link) or control (text message with local clinic information) Staff were blinded to the allocation Outcomes included test completion, time to testing or treatment, positive tests and acceptability 	Included: aged 16-30, resident in Lambeth or Southwark, 1+ sexual partner in the 12 months prior, willing to complete a test, internet access Excluded: unable to read English or provide consent	<ul style="list-style-type: none"> STI testing at 6 weeks higher in the intervention group (50% vs 26.6%, $p<0.001$) with no evidence of heterogeneity across population groups so could be targeted to higher-risk groups Time to test shorter in the intervention group (28.8 days vs 36.5 days, $p<0.001$) Proportion of diagnoses or individuals treated, and time to treatment were not statistically significant (patients required to get treatment in clinic) 71% surveyed found the intervention acceptable

	Wilson et al. 2019 (50)	Secondary data analysis of an e-STI RCT in Lambeth and Southwark	To examine the effect of an e-STI service on testing uptake on people who had never previously tested (never-testers)	<ul style="list-style-type: none"> • Data analysed on never-testers • Outcomes included testing at 6 weeks, time to test, positive results, test completion by service, and acceptability • Interactions examined between demographics 	See Wilson et al. 2017	<ul style="list-style-type: none"> • Data available for 87% of the intervention and 79% of the control group • Return of STI test at 6 weeks was higher for the intervention group (~45% vs ~25%, $p < 0.001$) • Intervention reduced time to test at 42 days • Face-to-face community recruitment increased the effectiveness of the intervention • 74.6% surveyed found the intervention acceptable • There were greater proportions of men, 16-19 year old's, and Asian or Asian British ethnicities in the never-testers • Further barriers - around 54% did not test
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TakeATestUK.com	Page et al. 2021 (51)	Observational study	To ascertain how DBS HIV and syphilis kits compared with MT kits in this postal testing service	<ul style="list-style-type: none"> Single service dataset analysed to compare online requested MT and DBS HIV test kits Analyses evaluated the online request, return and results of the two different bloods sampling techniques that were used sequentially by the service. Secondary objectives were to describe the number of kit requests to obtain one successfully processed result, and the proportion of false-positive results for DBS and MT. 	Included: All service users who ordered an HIV/syphilis test kit during the study time period, and had consented to their anonymised data to be shared by a third-party organisation.	<ul style="list-style-type: none"> Similar demographic characteristics of those accessing MT compared to those accessing DBS (majority female (69.4% vs 67.1), white British (75.7% vs 73.2%) heterosexual (87.8% vs 87.3%), median age 26 (IQR 22-31) No difference in proportion of people who returned STI kit who also returned HIV/STS sample (88.2% for MT, 87% for DBS, $p=0.340$). Statistically significant higher proportion of successful sample processing with DBS (94.6%) compared with MT (54.4%), $p<0.001$. Higher proportion of MT samples were reactive for HIV compared with DBS (6.2% vs 1.1%, $p<0.001$). However, higher proportion of false positives with MT than DBS (5.2% of all successfully processed MT samples <i>c.f.</i> 0.4% of DBS) Lower proportion of STS samples were reactive (1.1% for MT samples <i>c.f.</i> 0.7% of DBS), with 0.4% of successfully processed MT samples being false positive <i>c.f.</i> 0.0% for DBS.)
Umbrella	Banerjee et al. 2018 (35)	Retrospective service evaluation	To evaluate the rates of uptake and return of OPSS kits and compare patient demographics and clinical outcomes in home and clinic testers	<ul style="list-style-type: none"> Retrospective data compared between home test users and clinic test users Outcomes included time before kit return, time to treatment, positivity and treatment rates 	Included: patients who took home or clinic based STI tests in the study period, >16yrs, residing in Birmingham/Solihull	<ul style="list-style-type: none"> A third of patients requested home tests, 48% returned kits Home sampling was more popular among those aged 16-24, of white ethnicity, heterosexual female and asymptomatic ($p<0.001$) Home sampling was less popular in black/black British and Asian/British Asian groups ($p<0.001$) Positivity rates higher in clinic Treatment rates lower in the home self-sampling group and time-to-treat longer than in clinic groups

Banerjee et al. 2020 (36)	Retrospective service evaluation	To evaluate the uptake, return rate and new diagnosis rates of home-based testing in comparison with clinic-based for HIV, STS, and hepatitis B	<ul style="list-style-type: none"> Retrospective data compared between home test users and clinic test users Outcomes included total number of patients in the two groups according to patient demographics, and presence of symptoms, number of patients returning home kit with sufficient quantity of blood compared to serological testing in clinic, overall return rate of home-based testing kits, number of patients with reactive results using home-based kits compared to clinic, outcomes of patients with reactive/equivocal tests in both groups. 	Included: Patients using home-based testing kits or attending clinics in the Birmingham & Solihull area between July-December 2017	<ul style="list-style-type: none"> Home sampling was more popular amongst those aged 16-24, white, female patients ($p < 0.001$). Home sampling was less popular in Black and Asian groups ($p < 0.001$) Only 54% (9033/16,611) of home-based test kits were returned with sufficient quantity of blood for testing. False positivity rate was significantly higher for HIV and Hepatitis B in the home based group. 26/75 of HIV, 71/146 of STS, and 12/15 Hep B reactive results from home-based sampling were unconfirmed. Only 1/75 of reactive HIV tests, 8/146 for STS, and 0/15 for Hepatitis B from home-based test kits were true-positives, new cases.
Manavi et al. 2017 (52)	Observational study	To establish which factors influence return of OPSS kits	<ul style="list-style-type: none"> Retrospective data collected including demographic information, sexual history and symptoms This data linked to the laboratory system to confirm which individuals returned requested kits 	Included: use of the service within the study period	<ul style="list-style-type: none"> 58.4% of kits were returned (61.2% of women vs 53.1% of men, $p < 0.001$, and 10% of transgender individuals). MSM had similar rates of kit return to women; heterosexual men were less likely to return kits Those who returned tests were less deprived Patients requesting home kits rather than pharmacy-collection were more likely to return them Symptomatic patients less likely to return kits, potentially due to clinic attendance

Supplemental File 5 – Mixed Methods Appraisal Tool (MMAT)

Author (date)	S1: Are there clear research questions ?	S2: Do the collected data allow to address the research questions ?	1.1. Is the qualitative approach appropriate to answer the research question?	1.2. Are the qualitative data collection methods adequate to address the research question?	1.3. Are the findings adequately derived from the data?	1.4. Is the interpretation of results sufficiently substantiated by data?	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	Comments
Aicken et al. 2018 (37)	YES	YES	1.1 YES	1.2 YES	1.3 YES	1.4 YES	1.5 YES	
Barnard 2020 (Chapter 6) (47)	YES	YES	1.1 YES	1.2 YES	1.3 YES	1.4 YES	1.5 YES	
			2.1. Is randomization appropriately performed?	2.2. Are the groups comparable at baseline?	2.3. Are there complete outcome data?	2.4. Are outcome assessors blinded to the intervention provided?	2.5. Did the participants adhere to the assigned intervention?	
Dolan 2014 (40)	YES	YES	2.1 YES	2.2 YES	2.3 YES	2.4 NO	2.5 YES	
Wilson 2017 (49)	YES	YES	2.1 YES	2.2 YES	2.3 YES	2.4 YES	2.5 YES	
Wilson 2019 (50)	YES	YES	2.1 YES	2.2 YES	2.3 YES	2.4 YES	2.5 YES	This was secondary analysis of RCT data. The MMAT has been completed

							based on the criteria of the original RCT (Wilson et al. 2017)
			3.1. Are the participants representative of the target population?	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?	3.3. Are there complete outcome data?	3.4. Are the confounders accounted for in the design and analysis?	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?
Banerjee 2018 (35)	YES	YES	3.1 YES	3.2 YES	3.3 YES	3.4 NO	3.5 YES
Banerjee 2020 (36)	YES	YES	3.1 YES	3.2 YES	3.3 YES	3.4 NO	3.5 YES
Barnard 2018 (32)	YES	YES	3.1 YES	3.2 YES	3.3 YES	3.4 YES	3.5 YES
Bracebridge 2012 (41)	YES	YES	3.1 YES	3.2 YES	3.3 YES	3.4 YES	3.5 YES
Day 2020 (43)	YES	YES	3.1 YES	3.2. YES	3.3. NO	3.4 NO	3.5. YES
Day 2021 (44)	YES	YES	3.1 CAN'T TELL	3.2. YES	3.3. NO	3.4. NO	3.5 YES
Day 2020 (45)	YES	YES	3.1. YES	3.2. YES	3.3. NO	3.4 NO	3.5 YES
Day 2021 (46)	YES	YES	3.1. YES	3.2 YES	3.3. NO	3.4 NO	3.5 YES
Estcourt 2017 (38)	YES	YES	3.1 YES	3.2 YES	3.3 YES	3.4 NO	3.5 YES
Gasmelsid 2021 (34)	YES	NO	3.1 NO	3.2. NO	3.3. NO	3.4 NO	3.5 YES

Page 2019 (42)	YES	NO	3.1 YES	3.2 YES	3.3. YES	3.4 NO	3.5 YES
Page 2021 (51)	YES	NO	3.1 YES	3.2 YES	3.3. YES	3.4 NO	3.5 YES
Syred 2019 (48)	YES	YES	3.1 YES	3.2 YES	3.3 YES	3.4 YES	3.5 YES
Turner 2018 (20)	YES	YES	3.1 YES	3.2 YES	3.3 YES	3.4 YES	3.5 YES
Turner 2019 (33)	YES	YES	3.1 YES	3.2 YES	3.3 YES	3.4 NO	3.5 YES
			4.1. Is the sampling strategy relevant to address the research question?	4.2. Is the sample representative of the target population?	4.3. Are the measurements appropriate?	4.4. Is the risk of nonresponse bias low?	4.5. Is the statistical analysis appropriate to answer the research question?
Manavi 2017 (52)	YES	YES	4.1 YES	4.2 YES	4.3 YES	4.4 YES	4.5 YES
Woodhall 2012 (5)	YES	YES	4.1 YES	4.2 YES	4.3 YES	4.4 YES	4.5 YES
			5.1. Is there an adequate rationale for using a mixed methods design to address the research question?	5.2. Are the different components of the study effectively integrated to answer the research question?	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?
Gibbs 2018 (39)	YES	YES	5.1 YES	5.2 YES	5.3 YES	5.4 YES	5.5 YES

Supplemental File 6: Summaries of the ten online postal STI services

Service	Setting	Summary of service or intervention
eSHC (37–39)	Greater London	<ul style="list-style-type: none"> • Individuals undergo STI testing at one of two included genitourinary (GUM) clinics or via an online postal self-sampling service provided by six NCSP areas in South London • All eligible patients receive an discreetly worded text message from the secure NHS SMS system stating that their results are available and can be viewed using an attached link for a password-protected online application • Patients log on with their date of birth and either their clinic or phone number • If the result is positive, patients are offered and may provide consent for their use of a remote, self-directed online chlamydia pathway. They complete an online consultation to provide routinely collected clinical and public health surveillance data, and they are provided with trusted links to access information about their condition. Patients can then nominate one of 30 participating pharmacies from which they can collect their treatment • If users receive a negative result, health promotion material is provided • If users opt out of the online care pathway, they redirected to traditional face-to-face care • A helpline staffed by research health advisors is accessible from 9:00am-5:00pm on weekdays • If users describe factors such as allergies, symptoms or drug use during their online consultation then they are directed to call the helpline whose staff will facilitate their access directly to face-to-face care • Treatment for sexual partners is recommended; sexual partners can be notified and linked to the record of their sexual partner
Freetest.me (40)	All areas of England except within the North East Strategic	<ul style="list-style-type: none"> • Preventx Limited provide an online and text service called Freetest.me • Individuals request a postal kit online; samples are returned by post using the prepaid return box • Individuals choose to be informed that their results are available for access by either text or email. They can opt in to being telephoned if results are positive

	Health Authority	<ul style="list-style-type: none"> • Results can be viewed online via an online tracking system • A reminder text is sent if samples have not been returned within 18 days, and samples not returned within 30 days of the request date are deemed invalid
Letstalkaboutit (34)	Hampshire	<ul style="list-style-type: none"> • OPSS service offered to residents of Hampshire, through Solent NHS Trust. • Introduced county-wide in 2015. • Local sexual health clinics sign post eligible service users to the Letstalkaboutit website. Service users request a kit online, the kit is posted to their home address, and they post the samples back to the laboratory. • Results via text or phone.
NCSP (5)	England	<ul style="list-style-type: none"> • The English National Chlamydia Screening Programme provides no-cost opportunistic testing for young people and easy access to treatment • Sexually active patients attending healthcare settings such as a general practice (GP), local pharmacies, and sexual health, abortion or reproductive health services are offered point-of-care tests • Patients can also access tests via the internet, and some may receive postal invitations to test
North East Essex PCT (41)	North East Essex	<ul style="list-style-type: none"> • Home self-sampling kits for chlamydia posted to all young people (18-24years) within the PCT boundary. Tests included uniquely numbered containers to collect urine samples, instructions, information about service registration, informative material on sexual health and a prepaid envelope for kit return • Individuals hoping to use the service were directed to sign up with their unique number through either a webpage or using a freephone number • Individuals were notified of available results by text or other means requested and could log into their account • If receiving a positive result, patients completed an online questionnaire and chose whether they would like to collect their treatment from a pharmacy or have it posted to them. A doctor remotely

		<p>reviewed this information and prescribed treatment if appropriate.</p> <ul style="list-style-type: none"> • If the doctor was concerned by information provided in the questionnaire, they would contact the patient directly to discuss treatment • If individuals did not have internet access they could use the freephone number to seek assistance • Sexual partners could receive notification from the service and could be linked to existing cases
Saving lives (42)	North-West of England sexual health clinic	<ul style="list-style-type: none"> • OPSS service provided by a charity (Saving Lives), their partners and Public Health England Birmingham Laboratories • Change of how self-samples are collected for HIV testing within this service occurred in August 2017 • Before August 2017, blood was collected using finger-prick capillary blood sampling into a 500µL mini-tube. From August 2017, blood was collecting using finger prick capillary blood sampling onto specialised filter paper (DBS). The volume of bloods required for DBS is much smaller than for MT.
Sexual Health London (43–46)	29 boroughs of London	<ul style="list-style-type: none"> • SHL is a consortium led by Preventx Limited, which provides the online testing service; the data controller is City of London; and the clinical governance lies with Chelsea and Westminster NHS Foundation Trust • SHL was launched in 2018, and is available to residents of the participating London boroughs who are aged 16 years or older. • Service users register for an account online, complete an online consultation and, if eligible, are either posted the test kit or are able to collect it from a local sexual health clinic (in some areas). Self-taken samples are posted back to the Preventx laboratory for testing. • Service users with symptoms, or other needs that mean they are unsuitable for remote testing, are signposted to their local sexual health service. • Local sexual health clinics refer suitable attendees to SHL. • Access results via online portal (or are phone reactive HIV results)
SH:24 (20,32,33,47–50)	Lambeth and Southwark, London;	<ul style="list-style-type: none"> • Individuals complete a short form on the SH:24 website to order a free postal self-sampling kit for chlamydia, gonorrhoea, HIV and syphilis; test kits for men who have sex with men (MSM) include

	Essex	<p>rectal and pharyngeal swabs. The kits include pictorial leaflets and links to the SH:24 website which has guidance and videos of how to collect blood samples</p> <ul style="list-style-type: none"> • Individuals reporting symptoms are advised to visit clinics but can use SH:24 postal kits if they prefer • Individuals reporting complex needs such as mental health conditions are spoken to by phone and are referred to relevant services but can still use SH:24 postal kits if they prefer • Users return kits in a prepaid envelope and are sent text messages to indicate the progress of their order. SH:24 contact information is provided in these messages for individuals who would like to discuss any concerns. • If SH:24 has not received the postal test within 2 weeks, a text reminder is sent and tests are resent if requested • STI test results for chlamydia, gonorrhoea and syphilis are sent by text and if they are positive then patients are signposted to clinics; HIV-reactive test results are provided by telephone call. • If results are positive, sexual partners can be notified
TakeATestUK (51)	Midlands based sexual health clinic	<ul style="list-style-type: none"> • OPSS service provided by a charity (Saving Lives), their partners and Public Health England Birmingham Laboratories • Change of how self-samples are collected for HIV/STS testing within this service occurred in August 2017 • From 6th December 2016- 1st November 2017, blood was collected using finger-prick capillary blood sampling into a 500µL mini-tube. From 3rd November 2017, blood was collected using finger prick capillary blood sampling onto specialised filter paper (DBS). The volume of bloods required for DBS is much smaller than for MT.
Umbrella (35,52)	Birmingham and Solihull	<ul style="list-style-type: none"> • Individuals self-register and fill out an online questionnaire. They are then issued a self-sampling kit, either to be posted to their chosen address or available from Umbrella pharmacies or clinics • Patients with symptoms are advised to attend a face-to-face clinic, but are able to order a test online if they prefer • Patients collect their samples and post the kit to a laboratory

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- Individuals are offered STI screening services if they choose to attend an Umbrella clinic
 - If patients receive positive test results, despite which method was used for screening, they are recalled for their treatment. They receive this invitation by SMS, followed by further telephone or written contact if consent was provided
-