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Article (Published Version)

Wenlock, Rhys D, Shillingford, Chante, Mear, John, Churchill, Duncan, Vera, Jaime H and Dean, Gillian (2022) The impact of COVID-19 on HIV testing in the UK’s first Fast-Track HIV city. HIV Medicine. pp. 1-7. ISSN 1464-2662

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SHORT COMMUNICATION

The impact of COVID-19 on HIV testing in the UK’s first Fast-Track HIV city

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Abstract

Objectives: To describe the impact that the COVID-19 pandemic has had on HIV testing in Brighton and Hove, United Kingdom.

Methods: All HIV tests performed in Brighton and Hove from January 2016 to June 2021 were extracted, de-duplicated and anonymized. Analysis was performed to compare the monthly numbers of tests and diagnoses before and during the pandemic across different services.

Results: The number of patients having tests for HIV in sexual health services (SHS) decreased by 64% in April 2020, followed by a recovery to baseline levels by the start of 2021. Similarly, the monthly number of diagnoses decreased drastically after April 2020, with almost half of diagnoses made by SHS in 2020 occurring in the three pre-pandemic months of the year. ‘Self-sampling’, used more by women and younger patients, has contributed significantly to the recovery. The number of patients tested in secondary care was seemingly unaffected by the pandemic. However, testing numbers were reduced in specialist services, whereas in the emergency department (ED) testing increased four-fold (most notably in the elderly) without finding any cases. General practice saw decreases in both the number of HIV tests performed and the number of new diagnoses made, which had not returned to baseline by June 2021.

Discussion: The COVID-19 pandemic has had a large impact on the number of HIV tests performed in Brighton and Hove with sizeable decreases in the number of patients tested likely leading to ‘missed’ diagnoses. By June 2021 testing had still not returned to normal across the city.

KEYWORDS

COVID-19, HIV, services, testing
INTRODUCTION

The COVID-19 pandemic has caused more than 5.3 million deaths (as of 16 December 2021) and has threatened health systems globally. The UK went into a national lockdown on the 26 March 2020, with some social distancing regulations in place for the next 15 months until all restrictions were lifted on the 21 June 2021 [1]. Out of necessity, the UK’s National Health Service underwent significant adaptation, and its staff were redeployed to accommodate the enormous strain placed upon it. The collateral damage imposed on the UK’s health by the pandemic, and the response to it, is still coming to light.

Early during the pandemic, groups raised concerns of the potential direct and indirect impacts of COVID-19 on health [2]. Evidence is accumulating that in 2020 fewer patients attended emergency departments (EDs) [3–5], fewer presented with myocardial infarctions [6], fewer elective operations were performed [7] and avoidable deaths due to delays in diagnosing cancer are predicted [8]. Similarly, services providing care for sexually transmitted infections (STIs) have also been negatively impacted. [9–14]

There is literature suggesting a lower incidence of gonorrhoea, chlamydia and syphilis in cities around the world during 2020, with some reporting an 81% decrease [9–11]. This could be attributed to a decreased availability of testing leading to ‘missed diagnoses’ [12] or a decrease in transmission due to social distancing rules [13]. By contrast, other published work demonstrates a higher incidence of STIs in 2020, highlighting the importance of understanding local context and epidemiology [14,15].

However, no studies have reported in detail the impact of the COVID-19 pandemic on HIV testing in high-income countries. This has particular significance for HIV as delayed diagnosis can lead to onward transmission in the absence of obvious symptoms [16] and increased morbidity [17]. Hitherto, most of the studies investigating STIs either relied on national mandatory reporting of diagnoses, which may be unable to provide information on access to testing, or were based on single-centre sexual health services (SHS) studies. Understanding the potential impact on Brighton and Hove is important as it has the highest HIV prevalence in the UK outside of London, at 7.94/100 000 persons [18]. Here, we aim to use a unique dataset of all HIV tests processed at a city-wide laboratory to provide insights into the impact of the COVID-19 pandemic on HIV testing across a whole city.

METHODS

In Brighton and Hove, HIV testing is performed in a range of settings, including primary care (e.g. GP), secondary care (e.g. ED, specialist in-patient or outpatient services, antenatal clinics) or SHS. In the UK, SHS are community-based clinics focusing on genitourinary and reproductive health offering walk-in, referral and follow-up services for patients. HIV tests performed in Brighton and Hove are processed by the laboratory at the Royal Sussex County Hospital (RSC), University Hospitals Sussex NHS Foundation Trust.

Data pertaining to all HIV tests conducted at RSC between January 2016 and June 2021 were extracted from the Laboratory Information Management System (LIMS). Data related to ‘self-sampling’ tests (sample kits posted out to patients, who collect the sample themselves at home before posting to the laboratory) that were organized by local SHS but conducted at an alternative laboratory were also collected. Data were de-duplicated, and patient-specific codes were generated and anonymized. For each entry there was a corresponding date of birth and sex, but no other information. All patients with reactive HIV results had their clinical data reviewed to assess whether it was a new HIV infection.

All tests not processed (e.g. insufficient sample) were excluded. Testing numbers were reported either as number of tests (including patients retesting) or as unique patients. The number of unique patients tested was defined as follows: (i) each patient having a test was only included in counts once per month; (ii) if a patient underwent both ‘self-sampling’ and ‘clinic-based sampling’ tests during the same month, only the ‘clinic-based sampling’ test was included as that is the default mode of testing. Tests performed up to and including the 31 March 2020 were designated as ‘pre-pandemic’ (a total of 51 months from January 2016 to March 2020), and any performed after that were referred to as ‘during pandemic’ (15 months from April 2020 to June 2021). Data analysis was conducted in R Studio (v.1.2.5033), with visualization performed with the ggPlot2 package (v.3.3.3). The data were analysed using descriptive statistics with means ± SD reported.

RESULTS

Prior to the start of the pandemic in March 2020, the monthly number of unique patients tested in Brighton and Hove was 2321 ± 228 (January 2016 to March 2020). After the implementation of social distancing measures in April 2020, the numbers dropped to 1758 ± 281/month for the remainder of 2020 (total number of tests =16 458) before recovering somewhat to 2109 ± 189/month in the first 6 months of 2021 (total number of tests =13 005). The month of April 2020 recorded the lowest number of patients tested with 1385.

The number of new HIV diagnoses in Brighton and Hove decreased sharply from 63 in 2016 to 43 in 2017 before
stabilizing at 36 in 2018 and 34 in 2019. In the first 3 months of 2020 (pre-pandemic) nine diagnoses were made compared with 11 in the final 9 months of 2020. A further 11 were then detected in the first 6 months of 2021. Prior to the pandemic there were 3.6 new diagnoses/month compared with 1.2/month during the pandemic months of 2020 and 1.8/month in 2021 (reductions of 66% and 50%, respectively).

**Sexual health services**

Sexual health services conducted 54% of all HIV tests pre-pandemic (Table 1). During the pandemic, SHS contribution to testing decreased to 49% (14 484/29 463). Prior to April 2020, a mean of 1285 ± 129 unique patients were tested for HIV each month, whereas April 2020 saw a decrease, with only 428 patients tested (a 64% reduction). Monthly testing numbers remained below the 4-year average for the remainder of 2020, before returning to comparable levels in 2021 (Figure 1).

Thirteen new HIV diagnoses were recorded in SHS during 2020 compared with 37 in 2016, 22 in 2017, and 18 in both 2018 and 2019. Six of these diagnoses were from the three pre-pandemic months of 2020, with seven in the remaining 9 months of the year (2/month vs. 0.7/month).

By the end of June 2021, 7222 tests had been performed in SHS, demonstrating a return to pre-pandemic levels (Figure 1). However, the number of diagnoses per month remained below the pre-pandemic levels [1.2/month vs. either 2.3/month (January 2016 to March 2020) or 1.6/month (January 2018 to March 2020)].

‘Self-sampling’ became widely available in Brighton and Hove in March 2020 and accounted for 47% of tests during the pandemic in 2020 and 52% in 2021 (3378/7262 and 3787/7222, respectively; Table 1; Figure 2). Prior to the availability of ‘self-sampling’, virtually all HIV tests were conducted on samples taken in SHS clinics (‘clinic-based sampling’; Table 1). Since the introduction of self-sampling, three diagnoses have been made on the 7165 tests performed using this method, compared with 11 on the 7319 ‘clinic-based tests’ in the same time-frame. This represents a number needed to diagnose (NND, number of tests to diagnose one case) of 2388 for ‘self-sampling’ and 665 for ‘clinic-based sampling’. Patients opting for self-sampling were younger (mean = 28.9 ± 8.9 years) than those tested in clinics (31.2 ± 11.2 years) and more likely to be women (odds ratio = 2.01).

**Secondary care**

The monthly number of patients tested for HIV remained stable throughout the COVID-19 pandemic (835 ± 118/month pre-pandemic and 842 ± 133/month during it). However, despite that there were 50% fewer new diagnoses per month in secondary care (0.4/month) than pre-pandemic (0.92/month; Table 1). This corresponds to a 2.3-fold increase in the NND (2212 vs. 948).

The mean age of those testing in secondary care increased from 44.5 ± 18.7 years prior to the pandemic to 49.3 ± 20.7 years in 2020, before decreasing again to 45.3 ± 18.7 in 2021 (Table 1). Antenatal services make up the largest contribution to HIV testing in secondary care in Brighton and Hove, and 3298 patients were tested in 2020 compared with 3625 in 2019. On the other hand, several outpatient clinics saw modest decreases in testing (including haematology and digestive diseases) during 2020.

Testing in the ED saw large increases, as 1650 additional tests were performed in 2020 (a four-fold increase from 547 patients in 2019). That increase started in April 2020 with 340 patients tested compared with 37 in March 2020, with numbers persistently high until October 2020. However, despite the increase in testing, no cases were diagnosed in the ED during April–December 2020, as compared with two cases identified during January–March 2020 after only 130 tests.

There was a large increase in the mean age of patients tested in the ED, from 41 ± 16 years in January–March 2020 to 60 ± 21 years in April–December 2020. Similarly, during the last 9 months of 2020, 39% of all patients tested in the ED were over the age of 70, compared with 7% of those tested in January–March 2020. The year 2021 saw a return to a more normal distribution of ages, with a mean age of those tested of 37.6 ± 15.1 years.

**Primary care**

Forty-three general practices performed HIV tests between 2016 and 2021. Approximately 900 fewer patients were tested in general practice during 2020 than during 2019 (1294 vs. 2257). As with SHS, testing remained consistent for the first 3 months of 2020, with 25% of the year accounting for 37% of the tests performed in general practice during 2020 (476/1294). Similarly, testing had not returned to normal by June 2021, as only 759 patients had been tested (expected ~ 1100 patients). All but three practices saw decreases in testing and there was a median 46% decrease in the number of patients tested at each practice (range −88% to +27%).

The number of new diagnoses in primary care decreased from five/year in 2018 and 2019 to two/year in 2020 (with only one during the 9 months of the pandemic). The demographics of those testing in primary care were consistent before and during the pandemic (Table 1).
### TABLE 1  Demographic characteristics for all HIV tests conducted in Brighton and Hove divided into ‘pre-pandemic’ (January 2016 to March 2020), ‘during pandemic’ (April 2020 to December 2020) and ‘during pandemic’ (January 2021 to June 2021)

|                          | Pre-pandemic January 2016 to March 2020  | During pandemic April–December 2020  | During pandemic January–June 2021 |
|--------------------------|------------------------------------------|--------------------------------------|-----------------------------------|
| **Sexual health services** | n = 66 066                               | n = 7262                              | n = 7222                           |
| All patients             |                                          |                                      |                                   |
| Age (years) [mean (SD)]  | 31.6 (11.4)                              | 32.1 (11.2)                          | 30.9 (10.7)                       |
| Sex [n (%)]              |                                          |                                      |                                   |
| Male                     | 36 410 (55.1)                            | 3959 (54.5)                          | 3790 (52.5)                       |
| Female                   | 29 447 (44.6)                            | 3230 (44.5)                          | 3387 (46.9)                       |
| Missing                  | 209 (0.3)                                | 73 (1.0)                             | 45 (0.6)                          |
| Testing type [n (%)]     |                                          |                                      |                                   |
| Clinic                   | 65 834 (99.6)                            | 3884 (53.5)                          | 3435 (47.6)                       |
| Home                     | 232 (0.4)                                | 3378 (46.5)                          | 3787 (52.4)                       |
| Patients diagnosed HIV-positive |                                      |                                      |                                   |
| Age (years) [mean (SD)]  | 37.5 (11.1)                              | 40.2 (12.9)                          | 36.8 (10.3)                       |
| Sex [n (%)]              |                                          |                                      |                                   |
| Male                     | 111 (95.7)                               | 7 (100)                              | 7 (100)                           |
| Female                   | 4 (3.5)                                  | 0                                    | 0                                 |
| Missing                  | 1 (0.8)                                  | 0                                    | 0                                 |

**Secondary care**

|                          | 44 565                                   | 8333                                 | 4940                              |
|--------------------------|------------------------------------------|--------------------------------------|                                   |
| All patients             |                                          |                                      |                                   |
| Age (years) [mean (SD)]  | 44.5 (18.7)                              | 49.3 (20.7)                          | 45.5 (18.7)                       |
| Sex [n (%)]              |                                          |                                      |                                   |
| Male                     | 16 069 (36.1)                            | 3147 (37.8)                          | 1714 (34.7)                       |
| Female                   | 28 454 (63.8)                            | 5178 (62.1)                          | 3226 (65.3)                       |
| Missing                  | 42 (0.1)                                 | 8 (0.1)                              | 0                                 |
| Patients diagnosed HIV-positive |                                      |                                      |                                   |
| Age (years) [mean (SD)]  | 45.7 (12.4)                              | 47.5 (6.5)                           | 51.3 (23.7)                       |
| Sex [n (%)]              |                                          |                                      |                                   |
| Male                     | 36 (76.6)                                | 2 (66.7)                             | 3 (100)                           |
| Female                   | 11 (23.4)                                | 1 (33.3)                             | 0                                 |
| Missing                  | 0                                       | 0                                    | 0                                 |

**General practice**

|                          | 9887                                     | 818                                  | 776                               |
|--------------------------|------------------------------------------|--------------------------------------|                                   |
| All patients             |                                          |                                      |                                   |
| Age (years) [mean (SD)]  | 39.3 (14.1)                              | 40.3 (14.3)                          | 40.3 (14.3)                       |
| Sex [n (%)]              |                                          |                                      |                                   |
| Male                     | 4970 (50.3)                              | 400 (48.9)                           | 369 (47.6)                        |
| Female                   | 4915 (49.7)                              | 417 (51.0)                           | 407 (52.4)                        |
| Missing                  | 2 (< 0.1)                               | 1 (0.1)                              | 0                                 |
| Patients diagnosed HIV-positive |                                      |                                      |                                   |
| Age (years) [mean (SD)]  | 46.8 (11.3)                              | -                                   | -                                 |
DISCUSSION

The COVID-19 pandemic has caused significant disruption to health systems, including SHS globally. Understanding how services have changed in response to COVID-19 is vital in identifying unmet needs and planning for the future. HIV testing services may have been impacted in two potentially competing ways: (1) decreased access to healthcare services, meaning that patients were unable to test, leading to ‘missed diagnoses’; and (2) decreased population transmission risk as social distancing measures were in place, resulting in a lower incidence in the population. Disentangling these is difficult but is important for service planning and provision.

In Brighton and Hove, SHS have in recent years contributed the greatest number of patients to HIV testing. However, these data suggest that the COVID-19 pandemic has affected, and still is affecting, those services. The onset of ‘lockdown’ in April 2020 coincided with a steep decline in HIV testing in SHS which gradually recovered over the following year. We estimate a shortfall of approximately 3500 patients in 2020, with numbers appearing to return to normal in 2021. During the pandemic months of 2020, we observed fewer diagnoses than expected, coinciding with the fall in the number of patients undergoing HIV tests. Although the incidence of HIV infection is thought to be decreasing in Brighton and Hove (as seen by year-on-year

| TABLE 1 (Continued) | Pre-pandemic | During pandemic |
|----------------------|--------------|-----------------|
|                      | January 2016 to March 2020 | April–December 2020 | January–June 2021 |
|                      | (n = 120 909) | (n = 16 458) | (n = 13 005) |
| Sex [%]              |              |                 |                 |
| Male                 | 19 (86.4)    | 1 (100%)        | 1 (100%)        |
| Female               | 3 (13.6)     | 0               | 0               |
| Missing              | 0            | 0               | 0               |

Note: Standard deviations provided for continuous data. Ages are not provided for patients diagnosed in general practice during the pandemic owing to the small numbers of patients.

FIGURE 1 Number of patients tested per month in Brighton and Hove from January 2016 to June 2021 in general practice (GP), secondary care (e.g., emergency departments, specialist in-patient or outpatient services, antenatal clinics) or sexual health services (SHS)
decreases in new diagnoses) the precipitous change from March to April 2020 suggests that the fewer number of diagnoses are, at least in part, explained by decreased testing.

Even by June 2021, the number of ‘clinic-based’ tests performed by SHS remained below that of previous years, as much of the service recovery was led by the uptake of ‘self-sampling’ tests. Self-sampling tests now make up more than half of all HIV tests performed by Brighton and Hove SHS. However, early evidence presented here suggests that this sampling method may be testing a different population (more women and slightly younger) than conventional ‘clinic-based’ testing. Whether this explains the higher NND for ‘self-testing’ remains to be seen, but further research is needed to understand the differences between the populations testing. If patients who would previously test in the clinic pre-pandemic do not wish to perform self-sampling, is there sufficient access to and availability of testing in the clinic? If those patients are more ‘at risk’ of HIV, services need to find a way to effectively (re-)engage with them.

Secondary care appeared to maintain its testing numbers during 2020 but nevertheless saw a halving in the number of new cases diagnosed compared with recent years. Detailed inspection reveals that the pattern of testing did in fact change, with modest decreases across many specialities compensated for by increased testing in the ED. This probably arose from guidance produced in Brighton and Hove which recommended HIV tests for patients presenting with possible COVID-19 infection as part of their admission assessment [as per National Institute for Health and Care Excellence (NICE) guidance for areas of very-high HIV prevalence [19]]. As a result of this, the increased testing in the ED was predominantly in older patients, who are likely to be at lower risk of HIV infection [20]. This is consistent with the fact that two diagnoses were made after 130 tests in January–March 2020, but none after 2197 tests in April–December 2020. Although this practice is consistent with NICE guidelines, there has not been a rigorous analysis of ‘universal’ HIV testing in the EDs in the UK. However, the authors advise caution in interpreting these results because it is plausible that the population attending EDs during the pandemic was different from that beforehand, as the elderly were at greatest risk of COVID-19 infection, while younger people avoided socializing and travelling to work. As a separate point, given that many of these patients were routinely having blood tests, and that there is little to no additional work in adding an HIV test, these data demonstrate that it is feasible to increase the number of HIV tests done in the ED.

Primary care underwent large changes in practice during the COVID-19 pandemic, with a much greater reliance on telephone and virtual consultations. During 2020, fewer patients were tested for HIV in GP practices

![FIGURE 2 Number of patients tested in the clinic and through self-sampling (Self) in Brighton and Hove from January 2016 to June 2021](image-url)

- **FIGURE 2** Number of patients tested in the clinic and through self-sampling (Self) in Brighton and Hove from January 2016 to June 2021.
in Brighton and Hove, with a concurrent decrease in the number of new diagnoses.

This study has several limitations that are noteworthy. First, although we have attempted to include all tests conducted in Brighton and Hove, it is possible that rather than use tests processed in the laboratory some patients may have used home self-testing kits (e.g. acquired online or in pharmacies). Second, given the small numerators involved, even a single additional positive case is likely to alter interpretations. Third, given that this is a retrospective study we have limited information on the patients undergoing testing (e.g. no ethnicity data).

This study uniquely captures the effect of the COVID-19 pandemic on HIV testing across the whole city of Brighton and Hove and provides insights into the impact on different testing services.

ACKNOWLEDGEMENT

The authors would like to thank George Wilkinson for extracting the initial data.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

RDW, DC, GD and JHV conceived the study. RDW, CS and JM extracted and cleaned the data. RDW performed the data analysis and drafted the initial manuscript. All authors reviewed the final manuscript.

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How to cite this article: Wenlock RD, Shillingford C, Mear J, Churchill D, Vera JH, Dean G. The impact of COVID-19 on HIV testing in the UK’s first Fast-Track HIV city. HIV Med. 2022;00:1–7. doi:10.1111/hiv.13235