

1 Surveillance of mpox cases attending sexual health services in England (SOMASS): design,  
2 implementation, and initial findings from the SOMASS data collection tool, 2022

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25 **Abstract (297)**

26 Objectives

27 We aimed to design and implement a data collection tool to support the 2022 mpox outbreak,  
28 and to describe clinical and epidemiological data from individuals with mpox attending sexual  
29 health services (SHS) in England.

30 Methods

31 The UK Health Security Agency (UKHSA) and the British Association for Sexual Health and  
32 HIV (BASHH) established the Surveillance of Mpox Cases Attending Sexual Health Services  
33 in England (SOMASS) system.

34 Descriptive data were collected via a secure web-based data collection tool, completed by  
35 SHS clinicians following consultation with individuals with suspected mpox. Data were  
36 collected on patient demographics, clinical presentation and severity, exposures, and  
37 behavioural characteristics.

38 Results

39 As of 17<sup>th</sup> November 2022, 276 SOMASS responses were submitted from 31 SHSs in  
40 England.

41 Where recorded, most (245/261; 94%) individuals identified as gay, bisexual or men who have  
42 sex with men (GBMSM), of whom two thirds were HIV negative (170/257; 66%) and taking  
43 HIV pre-exposure prophylaxis (87/140; 62%), with a median age of 37 years [interquartile  
44 range: 30-43]. Thirty-nine percent (63/161) had a concurrent sexually transmitted infection at  
45 the time of their mpox diagnosis.

46 For 46% of individuals (127/276), dermatological lesions were the initial symptom. Lesions  
47 were mostly asymmetrical and polymorphic, predominately affecting the genital area and  
48 perianal areas.

49 Nine percent (24/276) of individuals were hospitalised. We report an association between  
50 receptive anal intercourse among GBMSM and proctitis (27/115; 24% vs. 7/130; 5%;  
51  $p < 0.0001$ ), and the presence of perianal lesions as the primary lesion site (46/115; 40% vs.  
52 25/130; 19%;  $p = 0.0003$ ).

### 53 Conclusions

54 We demonstrate multi-disciplinary and responsive working to develop a robust data collection  
55 tool, which improved surveillance and strengthened the knowledge base. The SOMASS tool  
56 will allow data collection if mpox resurges in England. The model for developing the tool can  
57 be adapted to facilitate the preparedness and response to future STI outbreaks.

58

### 59 What is already known on this topic?

60 Previous studies have highlighted that, in newly affected countries, the ongoing multi-country  
61 mpox outbreak has primarily affected gay, bisexual and other men who have sex with men  
62 (GBMSM), who present with atypical clinical presentations.

### 63 What this study adds

64 This study demonstrates multi-disciplinary, responsive and agile working between front-line  
65 sexual health services, clinical professional bodies and the national health protection agency,  
66 to design and implement a robust and adaptable data collection tool, to improve surveillance  
67 and strengthen the knowledge base.

### 68 How this study might affect research, practice or policy

69 The development of this data collection tool provided a detailed description of the clinical  
70 presentation of mpox in SHS, informing case definitions, and strengthened the evidence base  
71 for clinical assessment. This approach can facilitate the preparedness and response to future  
72 STI outbreaks.

73

### 74 Introduction

75 Mpox, previously monkeypox, is a zoonotic viral infection transmitted between humans by  
76 close contact (1). It can also be transmitted via respiratory droplets, or via contact with  
77 contaminated clothes, bedding or towels (2). Mpox is endemic in regions of Western and  
78 Central Africa, with historically only sporadic, travel-associated cases being identified outside

79 the region (3-7). In May 2022, an international outbreak of Clade IIb mpox virus, primarily  
80 affecting sexual networks of gay, bisexual and other men who have sex with men (GBMSM),  
81 was first identified in the United Kingdom (UK) (8), with over 86,000 cases spanning 110  
82 countries globally (9). Emerging evidence on the outbreak epidemiology suggested mpox can  
83 be effectively transmitted during sexual contact (10-12).

84 Historical descriptions of the clinical presentation of mpox document a systemic prodromal  
85 stage including fever, lymphadenopathy, and headache, followed by the presence of  
86 dermatological lesions (2). In a small case series in England between August 2015 and  
87 September 2021, most cases had a prodromal stage and lymphadenopathy prior to evident  
88 dermatological lesions, and transmission was thought to be related to travel, with subsequent  
89 transmission within nosocomial and household settings (13). However, since 16<sup>th</sup> May 2022,  
90 a rapid increase of cases with no epidemiological link to Western or Central Africa has been  
91 detected in the UK. Emerging insights from clinicians managing cases suggested the clinical  
92 presentation within this outbreak was different from reports of cases from West and Central  
93 African countries, including the predominance of anogenital lesions, the presence of lesions  
94 prior to a systemic prodrome and presence of proctitis (11, 14). Findings from these reports  
95 were integrated into updated outbreak case definitions in multiple settings (15-17).

96 Detailed descriptions of clinical presentation and severity of cases within this novel outbreak  
97 were lacking. Furthermore, the NHS advised affected individuals to seek clinical care from  
98 sexual health services (SHSs) in the UK, rather than non-specialist primary care providers  
99 (18), where management of a high consequence infectious disease was unprecedented. This  
100 evidence was urgently needed to inform triage decisions, clinical assessment, and  
101 management within SHSs. To understand the clinical presentation, clinical severity, and  
102 epidemiology of those affected by mpox who were attending SHSs in England, the UK Health  
103 Security Agency (UKHSA) and the British Association for Sexual Health and HIV (BASHH),  
104 with input from the British Association of Dermatologists (BAD), designed and implemented  
105 the Surveillance of Mpox Cases Attending Sexual Health Services (SOMASS) system.

106

## 107 **Methods**

108 In this case series of individuals with mpox attending SHSs in England, experts from the  
109 UKHSA, BASHH and BAD formed a multi-disciplinary working group to co-design and  
110 implement a secure web-based data collection tool between May and June 2022, hosted on  
111 Snap 11 Professional (<https://www.snapsurvey.com>), accessible from 5<sup>th</sup> July 2022. The  
112 design of this tool involved standardisation of clinical, epidemiological and sociodemographic  
113 variables relevant to the outbreak and validation against emerging clinical reports and

114 descriptors and classifiers of similar dermatological and infectious diseases. Three iterations  
115 of the data collection tool were designed and tested internally by the multi-disciplinary group  
116 with a focus on the relevance of the variables collected, clarity of language used and data  
117 quality. The implementation of this tool involved a piloting phase where data were collected  
118 from several volunteering SHSs to assess data quality and completeness of responses. Pilot  
119 feedback suggested minor restructuring of the content and order of questions to improve the  
120 data entry process. The finalised data collection tool was advertised through BASHH  
121 dissemination channels including mailing lists, newsletters and webinars. Submissions to  
122 SOMASS were not mandatory but encouraged, and interim findings were reported during  
123 professional meetings to highlight the value of the tool.

124 SOMASS responses were completed by genitourinary medicine (GUM) clinicians following  
125 consultations with suspected cases of mpox, using information captured during the  
126 consultation and entered into clinical records. Prompts were disseminated alongside the data  
127 collection tool for clinicians to use as an aide-memoire while assessing suspected mpox  
128 cases, to improve completion of data items.

129 The data collection tool captured the following:

- 130 (1) sexual health service attended by the case, date of patient's assessment
- 131 (2) patient demographics (age , region of birth, ethnicity, gender identity, assigned sex at birth,  
132 sexual orientation),
- 133 (3) relevant sexual health medical history (HIV status and treatment, history of sexually  
134 transmitted infections (STIs) in the previous 12 months, concurrent STIs and mpox status),
- 135 (4) pathway of care (attendance at a non-sexual health service prior to SHS attendance),
- 136 (5) clinical presentation (onset dates of symptoms, including dermatological vs. non-  
137 dermatological, determination of initial symptom, detailed description of dermatological signs  
138 and symptoms, including the location and frequency of lesions, and lesion morphology),
- 139 (6) clinical severity (severity of illness at attendance assessed by the GUM clinician, hospital  
140 admission following mpox diagnosis),
- 141 (7) exposures and behavioural characteristics (known mpox contact; within the three weeks  
142 prior to SHS attendance: chemsex, use of HIV pre-exposure prophylaxis (PrEP), group sex,  
143 attendance at sex-on-premises venues, type of sexual contact; within the three weeks before  
144 symptom onset: number and gender identity of sexual partners, international travel; number  
145 of sexual partners in the past three months).

146 Chemsex was defined as use of drugs such as GHB (gamma-hydroxybutyrate), crystal  
147 methamphetamine, or mephedrone during sex. Group sex was defined as sexual activity with  
148 >1 person at a time. Sex-on-premises venues were defined as commercial venues where  
149 sexual activity occurs. A concurrent STI was defined as a laboratory-confirmed diagnosis of  
150 herpes simplex virus (HSV), syphilis, chlamydia or gonorrhoea from a specimen taken at the  
151 SHS attendance.

152 A skin lesion (dermatological presentation) was defined as a single circumscribed area,  
153 including macule, papule, nodule, pustule, and vesicle presentations. Proctitis was defined as  
154 rectal bleeding or rectal discharge. The buttocks, perineum, anorectal, and perianal areas  
155 were combined into a single “perianal” category. The groin, mons pubis, glans penis, intra-  
156 meatal, sub-prepuce, penile shaft, and scrotum were combined into a single “genital” category.  
157 Clinical severity was assessed as “mild illness” if the mpox infection caused the patient no  
158 disability; “moderate illness” if the infection led to the patient being unable to perform most  
159 physical activities but not requiring nursing care (support with daily activities such as washing  
160 and dressing); and “severe illness” if the patient was unable to perform most physical activities  
161 and required nursing care. GBMSM included individuals identifying as male and gay or  
162 bisexual or identifying as male and reporting at least one male sexual partner in the past three  
163 weeks.

164 Data were extracted on 17<sup>th</sup> November 2022 by an epidemiologist at the UKHSA; cleaning  
165 and analysis was conducted using Stata 15. Data were analysed using descriptive statistics:  
166 proportions, median and interquartile range [IQR]; associations between type of sexual  
167 exposure and clinical presentation were tested using two-proportion Z-tests or  $\chi^2$  tests.  
168 Missing data for many variables resulted in different denominators; no imputation was  
169 undertaken for missing values.

170 Findings from SOMASS were compared to the characteristics of all mpox cases from England  
171 (19) to appraise generalisability.

## 172 Ethical considerations

173 This study was undertaken for health protection purposes under permissions granted to  
174 UKHSA to collect and process confidential patient data under Regulation 3 of The Health  
175 Service (Control of Patient Information) Regulations 2020 and Section 251 of the National  
176 Health Service Act 2006. Data was collected via a secure, web-based data collection form  
177 shared exclusively with SHSs in England. The data collected were pseudonymised and  
178 deidentified; only a clinic-specific patient identification code was captured.

179

180

## 181 **Results**

### 182 Demographic characteristics

183 As of 17<sup>th</sup> November 2022, 276 SOMASS responses were submitted from 31 SHSs from all  
184 nine UKHSA regions in England, representing 8% (95% CI 6.9% to 8.7%) of all confirmed  
185 mpox cases in England as of 14<sup>th</sup> November (20). The distribution of individuals within  
186 SOMASS by SHS attendance date is shown in Figure 1. Of these, 274 were subsequently  
187 laboratory-confirmed mpox positive; in two cases the laboratory result was unknown but  
188 assumed to be positive, and therefore these individuals were retained for analysis. Three  
189 clinics accounted for 78% of submissions: including two clinics in Greater London (n=174;  
190 63%), and one in Brighton (n=40; 15%). The median time between attendance date and  
191 submission of the SOMASS response by the clinician was 73 days [IQR: 37-127].

192 Most individuals (268/276; 97%) identified as a cis-gender man. Sexual orientation or  
193 behaviour was recorded for 95% (261/276) of individuals; of those, 94% (245/261) identified  
194 as GBMSM (Table 1). The median age of individuals was 37 years [IQR: 30-43; range: 17-68  
195 years]. Where ethnicity was known (188/276; 68%), the majority identified as White British  
196 (102/188; 54%) or other White ethnic background (33/188; 18%). Where region of birth was  
197 known (156/276; 57%), most individuals (109/156; 70%) were UK-born (Table 1).

198

### 199 Sexual history and lifestyle characteristics

200 Where HIV status was reported (257/276; 93%), 66% (170/257) of individuals were HIV  
201 negative, of whom and where known, 62% (87/140) reported taking PrEP in the previous three  
202 weeks. Of those living with HIV (87/257; 34%), the majority (81/87; 93%) were taking  
203 antiretroviral treatment.

204 Of those where STI testing at the SHS attendance was known (161/276; 58%), 39% (63/161)  
205 tested positive for a concurrent STI. Most of these concurrent STI diagnoses were gonorrhoea  
206 (30/63; 48%), followed by chlamydia (19/63; 30%), HSV (7/63; 11%) and syphilis (7/63; 11%),  
207 there were no new HIV diagnoses. The median number of sexual partners in the past three  
208 months was three [IQR: 1-5] and nearly half (87/179; 49%) of individuals, where this was  
209 known, reported being diagnosed with a STI in the previous year (Table 2).

210

211

212

213 Clinical presentation and severity

214 The clinical presentation of individuals was variable: 46% (127/276) described initial  
215 symptoms as dermatological, 34% (93/276) as non-dermatological and 20% (55/276) as both.  
216 Eighty percent (220/276) reported presenting with any non-dermatological symptom, 20%  
217 (54/276) reported presenting with dermatological symptoms only.

218 Of those reporting a dermatological presentation (268/276; 97%), the median number of body  
219 sites affected was two [IQR: 1-4]. We found that reporting a higher than median number of  
220 lesions was associated with presence of non-dermatological symptoms (P=0.006). Lesions  
221 were most frequently reported on the genital area (223/268; 83%), of which 47% (104/223)  
222 were on the penile shaft. Lesions were also reported on the perianal area (135/268; 50%), and  
223 face, head or neck (76/268; 28%). Lesions on the penile shaft, and face, head or neck were  
224 more likely to be polymorphic compared to monomorphic (23/35; 66% vs. 12/35; 34%; p=0.009  
225 and 16/20; 80% vs. 4/20; 20%; p=0.0001, respectively). For most individuals with complete  
226 data, the distribution of lesions was asymmetrical (211/224; 94%).

227 Of those who reported any non-dermatological symptoms (n=220), the most frequently  
228 reported symptoms were related to fever (n=141), lymphadenopathy (n=133), fatigue (n=75),  
229 malaise (n=66) and proctitis (n=47).

230 In terms of clinical severity at attendance, the clinician assessed most cases to be mild  
231 (195/276; 71%), moderate for 23% of cases (63/276) and severe for 5% of cases (14/276); for  
232 four individuals (2%) this information was unknown. Twenty-four individuals (9%) were  
233 admitted to hospital for medical intervention immediately or shortly after their mpox diagnosis;  
234 of those, 14/24 (58%) were assessed at attendance to be clinically severe, 6/24 (25%) were  
235 moderate and 4/24 (17%) were mild. A further two individuals were hospitalised as they were  
236 unable to isolate at home.

237

238 Exposure characteristics

239 Most individuals (230/276; 83%) reported no known contact with someone with mpox. Where  
240 known, 96% (111/116) of individuals reported condomless anal intercourse, 22% (34/158)  
241 reported group sex and 20% (27/135) reported attending sex-on-premises venues in the  
242 previous three weeks (Table 3).

243 Where this was known (194/276; 70%), 83% (161/194) of individuals reported either one or  
244 two sexual partners in the three weeks before symptom onset, and where known (215/276;

245 78%), 94% reported that this sexual contact occurred in the UK. Notably, eight male cases  
 246 reported having no sexual partners in that time (Table 3).

247 GBMSM reporting receptive anal intercourse (RAI) at least once in the past three weeks were  
 248 more likely to present with proctitis (27/115; 24% vs. 7/130; 5%;  $p < 0.0001$ ) and describe a  
 249 perianal lesion as their primary lesion (46/115; 40% vs. 25/130; 19%;  $p = 0.0003$ ), compared to  
 250 those who did not report RAI. We found no evidence that RAI or insertive anal intercourse  
 251 (IAI) was associated with reporting systemic symptoms prior to lesion development among  
 252 GBMSM ( $p = 0.14$  and  $p = 0.87$ , respectively). We found no evidence that reporting IAI, or giving  
 253 oral sex, was associated with increased likelihood of penile or oral lesions, respectively,  
 254 among GBMSM ( $p = 0.16$ ,  $p = 0.45$ ).

255

256 Pathway of care

257 Twenty-six percent (71/276) of individuals reported accessing another healthcare service  
 258 before attending a SHS for their mpox concerns, such as Emergency Departments (41/71,  
 259 58%), General Practice (12/71, 17%), urgent care/walk-in centre (10/71, 14%) or NHS 111  
 260 telephone service (9/71, 13%).

261

262 **Table 1:** Demographic characteristics of individuals within SOMASS

		N (% including missing data)	N (% excluding missing data) *
<b>Gender identity</b>	cis-gender man	268 (97)	
	cis-gender woman	5 (2)	
	transgender man	1 (0.4)	
	transgender woman	1 (0.4)	
	Unknown	1 (0.4)	
<b>Sexual orientation</b>	GBMSM	245 (89)	245 (94)
	Heterosexual man	11 (4)	11 (4)
	Heterosexual woman	4 (1)	4 (2)
	Bisexual woman	1 (0.4)	1 (0.4)
	Unknown	15 (5)	
<b>Age: median [IQR]</b>		37 [30-43]	
<b>Age: range</b>		17-68	
<b>Region of birth</b>	UK	109 (40)	109 (70)
	Europe (not inc. UK)	17 (6)	17 (11)
	Latin America & Caribbean	10 (4)	10 (6)
	Oceania	5 (2)	5 (3)
	Africa	7 (3)	7 (5)



	Asia	5 (2)	5 (3)
	Northern America	3 (1)	3 (2)
	Unknown	120 (44)	
<b>Ethnicity</b>	White British	102 (37)	102 (54)
	White other background	33 (12)	33 (18)
	Black African	10 (4)	10 (5)
	Black other background	6 (2)	6 (3)
	White Irish	5 (2)	5 (3)
	Black Caribbean	7 (3)	7 (4)
	Indian	4 (1)	4 (2)
	Asian other background	5 (2)	5 (3)
	Mixed ethnic background	13 (5)	13 (7)
	Other ethnic background	3 (1)	3 (2)
		Unknown	88 (32)

263 \* Missing data were excluded from the percentages if greater than 5% of all cases

264

265 **Table 2:** Characteristics of higher risk sexual networks among individuals within SOMASS

		<b>N (% including missing data)</b>	<b>N (% excluding missing data) *</b>
<b>HIV status</b>	Living with HIV	87 (32)	87 (34)
	Negative	170 (62)	170 (66)
	Unknown	19 (7)	
<b>PrEP use in previous 3 weeks † (among those HIV negative)</b>	Yes	87 (51)	87 (62)
	No	53 (31)	53 (38)
	Unknown	30 (18)	
<b>HIV treatment (among those living with HIV)</b>	Yes	81 (93)	
	No	2 (2)	
	Unknown	4 (5)	
<b>Concurrent STI</b>	Yes	63 (23)	63 (39)
	No	98 (36)	98 (61)
	Unknown	115 (42)	
<b>Median number of sexual partners in previous 3 months † [IQR]</b>		3 [1-5]	
<b>STI diagnosis in previous year †</b>	Yes	87 (32)	87 (49)
	No	92 (33)	92 (51)
	Unknown	97 (35)	

266 \* Missing data were excluded from the percentages if greater than 5% of all cases

267 † “previous” refers to period prior to attendance date

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269

270 **Table 3:** Exposure characteristics among individuals within SOMASS

		<b>N (% including missing data)</b>	<b>N (% excluding missing data) *</b>
<b>Known MPX contact</b>	Yes	38 (14)	
	No	230 (83)	
	Unknown	8 (3)	
<b>Group sex in previous 3 weeks †</b>	Yes	34 (12)	34 (22)
	No	124 (45)	124 (78)
	Unknown	118 (43)	
<b>Sex-on-premises venue attendance in previous 3 weeks †</b>	Yes	27 (10)	27 (20)
	No	108 (39)	108 (80)
	Unknown	141 (51)	
<b>Condomless anal intercourse in previous 3 weeks †</b>	Yes	111 (40)	111 (96)
	No	5 (2)	5 (4)
	Unknown	160 (58)	
<b>Known no. of sexual contacts in the 3 weeks before symptom onset</b>	0	8 (3)	8 (4)
	1	106 (38)	106 (55)
	2	55 (20)	55 (37)
	3	14 (5)	14 (5)
	4	2 (0.7)	2 (7)
	5	4 (1)	4 (2)
	6	1 (0.4)	1 (0.5)
	7	2 (0.7)	2 (2)
	10	2 (0.7)	2 (2)
	Unknown	82 (30)	
<b>Gender identity of sexual contacts in 3 weeks before symptom onset</b>	Male (including trans men)	204 (74)	204 (94)
	Female (including trans women)	12 (4)	12 (6)
	Unknown	60 (22)	
<b>Country where sexual contact occurred in the 3 weeks before symptom onset</b>	UK	202 (73)	202 (94)
	Spain	7 (3)	7 (3)
	USA	3 (1)	3 (1)
	Iceland	1 (0.4)	1 (0.5)
	Mexico	1 (0.4)	1 (0.5)
	Portugal	1 (0.4)	1 (0.5)
	Unknown	61 (22)	

271 \* Missing data were excluded from the percentages if greater than 5% of all cases

272 † “previous” refers to period prior to attendance date

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275

276 Discussion

277 In this study, we report the design, implementation, and initial findings of a bespoke data  
278 collection tool to support the response to the 2022 mpox outbreak, which collected clinical and  
279 epidemiological data from 276 individuals with mpox attending SHSs in England.

280 Our study showcases the role and value of multi-disciplinary collaborations between front-line  
281 SHSs, clinical professional bodies and the UKHSA when responding to outbreaks of emerging  
282 infections that transmit in sexual networks and outlines the public health approach to design  
283 and implement this data collection tool. Our analytical findings identify associations between  
284 sexual behaviour during the incubation period and clinical presentation of mpox, adding to the  
285 existing body of evidence indicating that mpox is transmitted sexually.

286 SOMASS provides detailed information on clinical presentation and the assessment of lesion  
287 morphology and distribution, where we present the largely asymmetrical distribution of lesions  
288 and polymorphic morphology. In SOMASS, almost all individuals (97%) presented with  
289 dermatological lesions, which is comparable to 95% described by Thornhill et al. (11) and  
290 Patel et al. (21). Nearly half of individuals reported their first identified symptom as  
291 dermatological, and 20% did not report any systemic symptoms at all, which is comparable to  
292 findings presented by Girometti et al., where 18% of individuals had no prodromal symptoms  
293 (14). SOMASS responses were not submitted from any London-based clinics included in the  
294 studies by Thornhill et al., Girometti et al. or Patel et al., affirming no case overlap with  
295 SOMASS.

296 Lesions were most frequently reported on the genital area (particularly on the penile shaft),  
297 but also on the perianal area. We report an association between RAI and proctitis, which was  
298 also reported by recent studies from Spain and Germany, respectively (22) (23), and an  
299 association between RAI and the presence of perianal lesions. These findings suggest that  
300 sexual contact is likely the primary route of transmission in this outbreak and that mpox is a  
301 sexually transmissible infection. This should continue to inform the content and audience of  
302 public health messaging, as well as the offer of control interventions in SHSs where people at  
303 risk of STIs are already linked.

304 The majority of individuals in this study were assessed as clinically mild. Nevertheless, 28%  
305 of individuals were moderate or severe, and 9% were admitted to hospital for further medical  
306 intervention at the time of data collection, which is comparable with findings from other studies  
307 (14, 24). This highlights that mpox causes substantial morbidity, and that SHSs and infectious  
308 disease units need to be adequately resourced to respond to resurgences in transmission,  
309 including having established pathways for referral of severe cases to hospital for management  
310 of complications. Of note, our assessment on the clinical severity of cases is cross-sectional  
311 at the time of data collection, and may be an underestimation of the true severity, given the  
312 possibility of clinical deterioration following SHS attendance.

313 Our findings suggest that among SHS attendees in England, mpox is circulating within high  
314 density sexual networks of GBMSM; 94% of individuals in this study identified as GBMSM,  
315 32% were living with HIV, 49% had a history of STI diagnosis in the previous year, and a  
316 median of three sexual partners in the last three months. These are consistent with findings  
317 from a study by Girometti et al. (14), where all cases identified as GBMSM, 24% were living  
318 with HIV and reported a median of five sexual partners in the last three months. As with  
319 findings reported by Girometti et al. (14), nearly 25% of people with mpox attending SHSs  
320 were diagnosed with a concurrent STI, also reporting condomless anal intercourse, group sex  
321 and attendance at sex-on-premises venues, indicating high risk sexual behaviour among  
322 those individuals. Whilst sexual contact is the likely route of transmission for most cases, we  
323 found that eight individuals did not report any sexual partners in the three weeks before  
324 symptom onset, the majority of whom had not travelled internationally. These findings suggest  
325 that, in a minority of cases, other routes of transmission may be contributing to the outbreak.

326 Our finding that 74% of individuals attended a SHS in the first instance, rather than attending  
327 another type of healthcare service, is not unexpected, given the guidance from the NHS that  
328 people with symptoms compatible with mpox should seek care at these services (18).  
329 However, this provides tangible evidence of the considerable additional pressure and costs  
330 for already stretched services still recovering from the impacts of the COVID-19 pandemic  
331 (25). Given the increased workload for SHSs, as well as the need for personal protective  
332 equipment (PPE) and enhanced environmental cleaning, further work is needed to quantify  
333 this increased pressure on SHSs nationally. There is also a need to understand the displaced  
334 prevention, testing, diagnosis and treatment of other STIs, including HIV, as well as impacts  
335 on reproductive health services such as contraception.

336 This study has some limitations. First, 78% of responses were submitted by a small number  
337 of SHSs in England, which does not include a number of high-throughput clinics at the centre  
338 of the outbreak which were likely unable to contribute to this study due to limited capacity.  
339 Second, cases in people who are not GBMSM are likely underrepresented in this study, as  
340 public health messaging at the time was focussed towards reaching GBMSM with perianal  
341 lesions and/or proctitis, meaning others may have been less likely to seek care at SHSs and  
342 undergo mpox testing. This makes findings from this study unlikely to be representative of all  
343 mpox cases in England. However, a number of demographic and behavioural characteristics  
344 of individuals within SOMASS, including sexual orientation and HIV status, were comparable  
345 to all mpox cases in England (19). Third, case data upload was done both contemporaneously  
346 to the patient being seen at the SHS, but also retrospectively, relying on required information  
347 being documented in clinical notes, which may affect data quality. This resulted in missing  
348 data for several demographic, exposure and behavioural variables, especially those not

349 routinely captured as part of standard history taking, which limits the inferences we can draw  
350 from these analyses. However, we found no evidence of a significant difference between those  
351 will complete and incomplete data for these variables, suggesting the risk of a biased sample  
352 is low. Finally, the presence of concurrent STIs among SOMASS cases may have influenced  
353 the clinical presentation, making it difficult to fully attribute to mpox virus infection.

354 We demonstrate multi-disciplinary and agile working between front-line sexual health services,  
355 clinical professional bodies and the national health protection agency, to design, implement  
356 and report the initial findings of a responsive data collection tool, which improved surveillance  
357 and strengthened the knowledge base during the 2022 mpox outbreak. This tool can be  
358 adapted to support preparedness and response to future STI outbreaks.

359

360 **Figure 1:** Distribution of SOMASS responses by sexual health service attendance date

361

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#### 371 Competing interests

372 NL is the Deputy Editor at *BMJ Sexually Transmitted Infections*

#### 373 Author contributions

374 JM, SSo, LH, KB, VP, NL, SC, RJ, TB, CD, MP and DP contributed to design of the data  
375 collection tool, and subsequent data collection. HC, MP, KT, MH and SSu were involved in  
376 operationalising the data collection tool and data validation. The UKHSA Sexual Health Liaison  
377 Group provided subject-matter expertise. HC led the data management and analysis and  
378 drafted the manuscript. All co-authors contributed to interpretation of the findings and to  
379 revision of the manuscript.

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