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Contraception in Person-Contraception Online (CiP-CO) cohort study

Emma Rezel-Potts [ORCID],[1] Melissa J Palmer,[2] Caroline J Free,[2] Hannah McCulloch,[1] Paula Baraitser [ORCID] [1]

Correspondence to
Dr Emma Rezel-Potts, School of Population Health & Environmental Sciences, King's College London, London, UK; emma.rezel-potts@kcl.ac.uk

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ABSTRACT

Background Online contraception services increasingly provide information, clinical assessment and home-delivered oral contraceptives (OCs). Evidence is lacking on the effects of online contraceptive service use on short-term contraceptive continuation.

Methods Cohort study comparing contraceptive continuation between new users of a free-to-access online OC service in South East London with those from other, face-to-face services in the same area. Online questionnaires collected data on participants' sociodemographic characteristics, motivations for OC access, service ratings, OC knowledge and contraceptive use. Contraceptive use in the 4-month study period was measured using health service records. Unadjusted and multivariable logistic regression models compared outcomes between the online service group and those using other services.

Results Online service-users (n=138) were more likely to experience short-term continuation of OCs compared with participants using other services (n=98) after adjusting for sociodemographic and other characteristics (adjusted OR 2.94, 95% CI 1.52 to 5.70). Online service-users rated their service more highly (mean 25.22, SD 3.77) than the other services group (mean 22.70, SD 4.35; p<0.001), valuing convenience and speed of access. Among progestogen-only pill users, knowledge scores were higher for the online group (mean 4.83, SD 1.90) than the other services group (mean 3.87, SD 1.73; p=0.007). Among combined oral contraceptive users, knowledge scores were similar between groups.

Conclusions Free-to-access, online contraception has the potential to improve short-term continuation of OCs. Further research using a larger study population and analysis of longer-term outcomes are required to understand the impact of online services on unintended pregnancy.

Key messages

► New oral contraceptive (OC) users accessing a free, online contraception service were more likely to experience short-term contraceptive continuation than users of other, face-to-face services.

► The online group rated their OC service more highly than those using other services, particularly on convenience and speed of access.

► OC knowledge scores were similar between groups, but progestogen-only pill users from the online group had a higher mean score than those in the other services group.

INTRODUCTION

International and UK health policy suggest that digital healthcare could improve user experience and access.[1–4] Sexual and reproductive health (SRH) services have been early adopters of digital healthcare.[5] Online testing for sexually transmitted infections (STIs) is now routine in many public health systems[6–8] and there is an expanding market for online contraception within the private sector.[9] There is little research on the impact of online contraceptive services within public sector contexts.

In 2017, a pilot online contraception service including contraceptive information and a choice of combined oral contraception or progestogen-only pills (COC/POPs) was implemented in South East London. Service-users provide an online clinical history and self-reported height, weight and blood pressure for assessment by a UK-registered prescriber with a specialist qualification in SRH care (www.sh24.org.uk). The process is supported via text or telephone conversations to clarify

clinical history or answer questions. If the UK Medical Eligibility Criteria are met, a 3 or 6 months' supply of oral contraceptives (OCs) (ethinylestradiol 30 μg/ levonorgestrel 150 μg or desogestrel 75 μg) is posted home. The service meets the UK national standards for remote providers of SRH[10] and remote prescribing.[11]

In the UK, 29.5% of women of reproductive age using contraception use OCs,[12] and although contraception is available free-of-charge from primary care and specialist SRH services, 37.0% report difficulties with access.[13] Continuation rates for OCs are low, with one-third discontinuing within 3 months which could lead to unintended pregnancy.[14 15] The theory of change for this intervention hypothesised that home delivery of OCs might increase convenience and anonymity of service use and therefore improve access and continuation.[16] A cohort study analysed routine service use data for this intervention, exploring the sociodemographic factors associated with repeat OC ordering,[17] but the relationship between online service use and OC continuation and its acceptability compared with traditional, face-to-face providers has not been examined.

This cohort study investigated whether short-term OC continuation is associated with type of contraceptive service accessed by comparing continuation rates after a first supply of contraceptive pills between users of online and face-to-face services.

METHODS
Recruitment
Participants were recruited between 1 October 2016 and 31 October 2018 at face-to-face services or online by invitation from their health provider, promotional material in services, website promotion and text messages. Materials contained a link to the study website. Participants could enrol in the study with researchers immediately or via the website, up to 4 weeks after obtaining OCs.

Participants and Data Collection
Participants were new OC users, aged 16 years or above, resident in the study area with independent access to a mobile telephone. New OC users were defined as those who had been prescribed with their first 3 months' supply of any brand of COC or POP less than 4 weeks prior to enrolment. Participants were excluded if they were repeat users, had been prescribed OC while already using long-acting reversible contraception (LARC), were unable to read in English or unable to give informed consent.

Participants were texted links to questionnaires at 6 days and at 4 months after recruitment to be completed online. Questionnaires were developed using a combination of literature review and findings from the theory of change qualitative study which revealed assumptions about the online service, such as it being more likely to attract motivated and experienced OC users.[16] Participants received £5 cash in the post following completion of their first questionnaire and £10 cash following completion of their second questionnaire. Service use was followed up for 4 months after the first OC prescription and attendances verified through the clinical record. Those who did not obtain a new contraceptive prescription within 1 month after their 3 months' supply had run out were considered discontinuers.

Main measures
The exposure was the type of service accessed for the first 3 months' supply of OCs (online or other service). The primary outcome was the proportion of participants who continued to their second supply of OCs, confirmed by the service up to 4 months' post-recruitment. Secondary outcomes were continuation of any effective contraceptive (excluding condoms), self-reported use of male/female condoms, self-reported pregnancy risk during the study period, service rating scores and knowledge scores. Self-reported pregnancy risk was determined through responses to questions on experiences of unprotected sex or any potential risks of pregnancy during the study period. For service rating scores, participants provided responses to statements on six areas of service quality using a Likert scale. For knowledge scores, participants were asked a series of multiple-choice OC knowledge questions, differing according to whether they had accessed COCs or POPs. The questionnaires collected sociodemographic information including home postcode, age, ethnicity, highest level of education and employment status. Postcodes were used to assign level of socioeconomic deprivation, measured as Index of Multiple Deprivation (IMD). IMD ranks every Lower Layer Super Output Area (LSOA) (typically including around 650 households) in England from most to least deprived, thus participants were assigned an IMD from first (most deprived) to fifth (least deprived) according to their home postcode. Education level was classified according to the Regulated Qualifications Framework and Framework for Higher Education Qualifications.

Participants were removed from the analysis if objective data for their first attendance for OC could not be verified because there was no record of their attendance or the service did not provide this data. Background data collected at the first and second data collection points were presented regardless of availability of primary outcome data.

Sample size calculation
A minimum recruitment of 780 participants (390 per group) was estimated to obtain at least 80% power to detect an increase of 10% in OC continuation in the online group compared with the group using other services, based on a two-sided test with a 5% significance level. This was based on the assumption that OC

continuation in the other services group would be 65% and accounted for loss to follow-up (15%).

Patient and public involvement

The hypothesis for this work stems from an exploratory qualitative study which included interviews with potential service-users and patients of community clinics within the target population.[16] The study questionnaires were piloted with patients in the waiting room of one of the community clinics where recruitment took place. The online service was extensively tested with users during its development.

Analysis

Baseline sociodemographic characteristics and other background variables were described, with differences between exposure groups determined through bivariate analysis. Odds ratios (ORs) were calculated to identify differences between the exposure of type of service used and the primary outcome of OC continuation (verified through health records), and secondary outcomes at 4 months' follow-up.

A logistic regression analysis examined the strength of the association between type of service and OC continuation while adjusting for all sociodemographic variables (age, IMD quintile, employment status, and education). Additional baseline variables that were significantly associated with type of service used at the bivariate level ($p < 0.05$) were also adjusted for in a second multivariable analysis. A directed acyclic graph (DAG) (made using DAGitty version 3.0) depicting assumed relationships between the exposure and primary outcome and all variables included in the fully adjusted analysis model is available (online supplemental figure 1).

To compare service ratings between the exposure groups, overall scores were derived from the sum of Likert response options, with items reversed where necessary, and the mean difference in overall satisfaction calculated. We also calculated the proportion of users selecting each answer option for the individual service rating items, with a chi-squared test to assess differences between exposure groups. To compare knowledge scores between groups, each correct answer to a series of multiple-choice questions was awarded a numerical score which was then totalled and the means compared. We calculated the proportion of users selecting the correct answer for individual items, with a chi-squared test to assess differences between groups.

A sensitivity analysis used only self-reported data from questionnaires for the primary outcome of OC continuation due to concerns that losses to follow-up of objectively verified service use data were different between exposure groups. Unadjusted and adjusted ORs were calculated, adjusting for the same covariates as in the primary analysis. All analyses were conducted with Stata V.14.1 (StataCorp).

RESULTS

A total of 385 participants were recruited with 204 in the online group and 181 in the other services group. For the primary outcome of OC continuation, 149 (39%) were lost to follow-up overall, with 66 (32%) lost to follow-up in the online service group and 83 (46%) lost to follow-up in the other services group, resulting in 236 available for the primary outcome (figure 1). Participants in the online group were older, less likely to smoke, more likely to have used OCs before, less likely to have taken emergency contraception in the last year and rated themselves as more likely to use the OC prescribed (table 1).

Among those who obtained their first supply from online services, 69.6% continued onto a second supply of OCs compared with 38.8% in the other services group (unadjusted OR 3.61, 95% CI 2.09 to 6.22) (table 2). This association remained, although slightly attenuated, after adjustment for sociodemographic variables (OR 3.15, 95% CI 1.71 to 5.79), with a final fully adjusted OR of 2.94 (95% CI 1.52 to 5.70).

The unadjusted model showed higher odds of continuation of any effective method in the online compared with the other services group (OR 2.31, 95% CI 1.25 to 4.26), which attenuated slightly in the adjusted models (OR 2.31, 95% CI 1.09 to 4.26) and (OR 2.12, 95% CI 1.09 to 4.14). Fewer individuals in the online group reported switching to condoms; however, the results indicated no difference between groups in either the unadjusted (OR 0.40, 95% CI 0.14 to 1.14) or adjusted models (OR 0.63, 95% CI 0.18 to 2.28) and (OR 0.71, 95% CI 0.15 to 3.40). Fewer in the online group reported any pregnancy risks in the unadjusted analysis (OR 0.38, 95% CI 0.20 to 0.73) and model adjusted for sociodemographic variables (OR 0.41, 95% CI 0.20 to 0.83), although the confidence interval widened and encompassed the null in the fully adjusted model (OR 0.50, 95% CI 0.23 to 1.08).

There were 247 participants available for the sensitivity analysis of self-reported outcomes (table 3). In this, 77.2% of the online group continued OCs, compared with 61.3% of the other services group (unadjusted OR 2.14, 95% CI 1.23 to 3.73). After adjusting for sociodemographic variables, the association attenuated but the online group were still more likely to continue OCs than the other services group (OR 1.92, 95% CI 1.06 to 3.48). In the fully adjusted model, the association was further attenuated, with a CI encompassing the null (OR 1.74, 95% CI 0.92 to 3.29).

There was a significant difference between the mean service rating scores for the online group (mean 25.22, SD 3.77) versus the other services group (mean 22.70, SD 4.35; $p < 0.001$) indicating more positive service ratings for the online service. (online supplemental table 1) shows the proportions responding at each level of the scale and the areas where there were differences
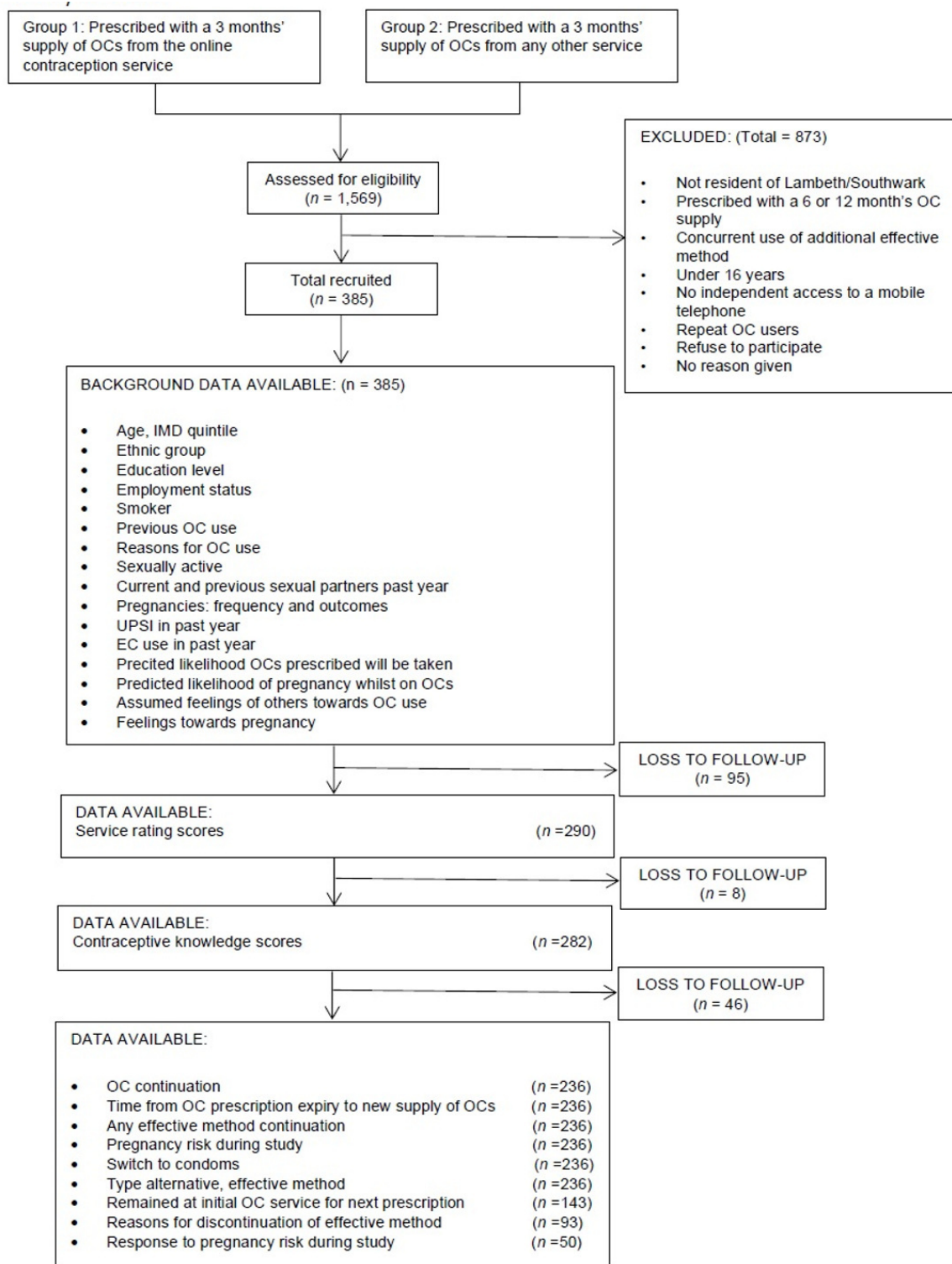
Figure 1 Study flow chart. EC, emergency contraception; IMD, Index of Multiple Deprivation; OC, oral contraceptive; UPSI, unprotected sexual intercourse.

between groups. The online group were more likely to consider their OC service convenient, easy to communicate with and speedy, but scored more poorly than the other services group on choice.

There was no difference observed between the means for COC knowledge scores for the online group (n=98; mean 5.09, SD 2.21) versus the other services group (n=82; mean 5.21, SD 1.84; p=0.707). The mean POP knowledge score was higher in the online group (n=54; mean 4.83, SD 1.90) versus the other services group (n=53; mean 3.87, SD 1.73; p=0.007). (online supplemental tables 2 and 3) show that both groups scored quite similarly across the different questions, although the online group that accessed POPs scored marginally better than the other services group, with higher odds of a correct answer for a question on

Table 1 Baseline characteristics by exposure group

Characteristic	Online contraception (SH:24) (n=204)	Other services (n=181)			P value (χ^2)
		%	95% CI	N	
Age group (years)					
16–19	6.4 (3.4–10.1)	20.4	(14.8 to 27.1)	50	<0.001*
20–24	36.8 (30.1–43.8)	38.7	(31.5 to 46.2)	145	
25–29	41.7 (34.8–48.8)	24.3	(18.3 to 31.2)	129	
30+	15.2 (10.6–20.9)	16.6	(11.5 to 22.8)	61	
Ethnic group					
White	50.5 (43.4–58.9)	39.8	(32.6 to 47.3)	175	0.151
Black	12.3 (8.1–17.6)	18.2	(12.9 to 24.6)	58	
Asian	5.9 (3.1–10.0)	6.1	(3.1 to 10.6)	23	
Mixed	6.4 (3.4–10.7)	8.8	(5.1 to 14.0)	29	
Other	2.0 (0.1–4.9)	5.0	(2.3 to 9.2)	13	
Missing	23.0 (17.4–29.4)	22.1	(16.3 to 28.9)	87	
IMD					
First quintile (most deprived)	35.3 (28.7–42.3)	34.8	(27.9 to 42.2)	135	0.211
Second quintile	37.3 (30.6–44.3)	44.8	(37.4 to 52.3)	157	
Third quintile	22.1 (16.6–28.4)	13.3	(8.7 to 19.0)	69	
Fourth quintile	4.9 (2.4–8.8)	5.5	(2.7 to 9.9)	20	
Fifth quintile (least deprived)	0.5 (0.0–2.7)	1.1	(0.1 to 3.9)	3	
Missing	0.0 (0.0–1.8)	0.6	(0.0 to 3.0)	1	
Education					
Entry level – Level 2	2.9 (1.1–6.3)	6.1	(3.1 to 10.6)	17	0.166
Level 3–5	15.2 (10.6–20.9)	21.0	(15.3 to 27.7)	69	
Level 6–8	58.8 (51.7–65.6)	50.8	(43.3 to 58.3)	212	
Missing	23.0 (17.4–29.4)	22.1	(16.3 to 28.9)	87	
Employment					
Employed	46.6 (40.0–53.7)	40.3	(33.1 to 47.9)	168	0.545
Studentand employed	3.9 (1.7–7.6)	3.3	(1.2 to 7.1)	14	
Student	20.1 (14.8–26.3)	27.1	(20.7 to 34.2)	90	
Unemployed	6.4 (3.4–10.7)	7.2	(3.9 to 12.0)	26	
Missing	23.0 (17.4–29.4)	22.1	(16.3 to 28.9)	87	
Smoker					
Yes	9.8 (6.1–14.7)	24.9	(18.7 to 31.8)	65	<0.001*
No	67.2 (60.3–73.6)	53.0	(45.5 to 60.5)	233	
Missing	23.0 (17.4–29.4)	22.1	(16.3 to 28.9)	87	
Previous OC use					
No previous OC use	11.3 (7.3–16.4)	21.0	(15.3 to 27.7)	61	0.003*
Previous OC use in past year	48.0 (41.0–55.1)	32.0	(25.3 to 39.4)	156	
Previous OC use more than a year ago	17.2 (12.3–23.0)	24.3	(18.3 to 31.2)	79	
Missing	23.5 (17.9–30.0)	22.7	(16.8 to 29.4)	89	
Reason for OC use					
Pregnancy prevention	64.7 (57.7–71.3)	68.0	(60.6 to 74.7)	255	0.708
Other	11.8 (7.7–17.0)	9.4	(5.6 to 14.6)	41	
Missing	23.5 (17.9–30.0)	22.7	(16.8 to 29.4)	89	
Sexually active					

Table 1 Continued

| Characteristic | Online contraception (SH:24) (n=204) | Other services (n=181) | | | P value (χ^2) |
		%	95% CI	N	
Yes	72.1 (65.4–78.1)	71.8	(64.7 to 78.2)	277	0.872
No	4.4 (2.0–8.2)	5.5	(2.7 to 9.9)	19	
Missing	23.5 (17.9–30.0)	22.7	(16.8 to 29.4)	89	
Sexual partners in past year					
0	3.9 (1.7–7.6)	1.7	(0.3 to 4.8)	11	0.606
1	32.4 (26.0–39.2)	34.3	(27.4 to 41.7)	128	
2+	40.2 (33.4–47.3)	40.9	(33.6 to 48.4)	156	
Missing	23.5 (17.9–30.0)	23.2	(17.3 to 30.0)	90	
Regular sexual partner					
Yes	54.9 (22.8–35.7)	56.4	(48.8 to 63.7)	154	0.952
No	21.6 (41.0–55.1)	20.4	(14.8 to 27.1)	141	
Missing	23.5 (17.4–29.4)	23.2	(17.3 to 30.0)	90	
Previous pregnancies					
0	61.8 (54.7–68.5)	54.1	(46.6 to 61.2)	224	0.196
1	7.8 (4.5–12.4)	11.6	(7.3 to 17.2)	37	
2+	5.9 (3.1–10.0)	8.8	(5.1 to 14.0)	28	
Prefer not to say	1.0 (0.1–3.5)	2.2	(0.6 to 5.6)	6	
Missing	23.5 (17.9–30.0)	23.2	(17.3 to 30.0)	90	
Children					
0	70.6 (63.8–76.7)	65.2	(57.8 to 72.1)	262	0.390
1	2.5 (0.8–5.6)	5.0	(2.3 to 9.2)	14	
2+	2.5 (0.8–5.6)	4.4	(1.9 to 8.5)	13	
Prefer not to say	1.0 (0.1–3.5)	2.2	(0.6 to 5.6)	6	
Missing	23.5 (17.9–30.0)	23.2	(17.3 to 30.0)	90	
Abortions					
0	64.2 (57.2–70.8)	59.7	(52.1 to 66.9)	239	0.654
1	8.3 (4.9–13.0)	10.5	(6.4 to 15.9)	36	
2+	2.5 (0.8–5.6)	3.3	(1.2 to 7.1)	11	
Prefer not to say	1.5 (0.3–4.2)	3.3	(1.2 to 7.1)	9	
Missing	23.5 (17.9–30.0)	23.2	(17.3 to 30.0)	90	
UPSI in past year					
Yes	37.3 (30.6–44.3)	43.7	(36.3 to 51.2)	155	0.330
No	37.3 (30.6–44.3)	30.4	(23.8 to 37.6)	131	
Unsure	2.0 (0.5–4.9)	1.7	(0.3 to 4.8)	7	
Prefer not to say	0.0 (0.0–1.8)	1.1	(0.1 to 3.9)	2	
Missing	23.5 (17.9–30.0)	23.2	(17.3 to 30.0)	90	
Taken EC in past year					
Yes	24.0 (18.3–30.5)	42.5	(35.2 to 50.1)	126	<0.001*
No	52.5 (45.4–59.5)	32.6	(25.8 to 39.9)	166	
Unsure	0.0 (0.00–1.8)	1.1	(0.1 to 3.9)	2	
Prefer not to say	0.0 (0.00–1.8)	0.6	(0.0 to 3.0)	1	
Missing	23.5 (17.9–30.0)	23.2	(17.3 to 30.0)	90	
Likelihood that OCs prescribed will be taken					

Continued

Table 1 Continued

Characteristic	Online contraception (SH:24) (n=204)	Other services (n=181)			P value (χ^2)
		%	95% CI	N	
Unlikely	0.5 (0.0–2.7)	7.2	(3.9 to 12.0)	14	<0.001*
Neutral	2.0 (0.5–4.9)	6.6	(3.5 to 11.3)	16	
Likely	74.0 (67.4–80.0)	63.0	(55.5 to 70.0)	265	
Missing	23.5 (17.9–30.0)	23.2	(17.3 to 30.0)	90	
Likelihood of pregnancy while on OCs					
Unlikely	70.1 (63.3–76.3)	65.8	(58.3 to 72.6)	262	0.362
Neutral	4.4 (2.0–8.2)	8.8	(5.1 to 14.0)	25	
Likely	2.0 (0.5–4.9)	2.2	(0.6 to 5.6)	8	
Missing	23.5 (17.9–30.0)	23.2	(17.3 to 30.0)	90	
Feelings of others† towards OC use					
Negative	5.9 (3.1–10.0)	10.5	(6.4 to 15.9)	31	0.408
Neutral	21.1 (15.7–27.3)	21.0	(15.3 to 27.7)	81	
Positive	49.5 (42.5–56.6)	45.3	(37.9 to 52.9)	183	
Missing	23.5 (17.9–30.0)	23.2	(17.3 to 30.0)	90	
Feelings towards pregnancy					
Negative	44.1 (37.2–51.2)	44.2	(36.8 to 51.8)	170	0.056
Neutral	26.0 (20.1–32.6)	18.8	(13.4 to 25.2)	87	
Positive	6.4 (3.4–10.7)	13.8	(9.1 to 19.7)	38	
Missing	23.5 (17.9–30.0)	23.2	(17.3 to 30.0)	90	

†Worded in the questionnare as "the people who are most important to you".
*Denotes statistical significance.
CI, confidence interval; EC, emergency contraception; IMD, Index of Multiple Deprivation; OC, oral contraceptive; UPSI, unprotected sexual intercourse.

whether OCs can trigger infertility (OR 2.87, 95% CI 1.01 to 8.17).

DISCUSSION
Summary
This cohort study explored the effects of a free-to-access, online contraception service on short-term OC continuation. The online group were more likely to continue their OCs, even after adjusting for covariates. Sensitivity analysis showed increased self-reported OC continuation in the online group compared with the other services group, but there were smaller differences between groups than in the primary analysis, with confidence intervals that did not cross the null in one adjusted model but encompassed no effect in the fully adjusted model. The online group found their OC service convenient, easy to communicate with and fast, but indicated that their choices were limited, likely due to a lack of contraceptive options. Among COC users, OC knowledge scores were similar between groups. Among POP users, the online group had a higher overall mean score than the other services group.

Comparison with existing literature
There is policy consensus that digital care increases access for some populations and enhances opportunities to make informed healthcare decisions.[24] However, the evidence to support these policy directions remains limited.[18] Recent randomised controlled trial evidence suggests that online services can increase uptake of STI tests,[6] but this study is the first to examine the impact of free, online contraceptive services on contraceptive continuation. Our findings support the theory of change underpinning the intervention tested in this study which suggests that the convenience of online care is important in increasing continuation.[16] This might be particularly important in contexts including the UK, where OCs require a prescription and where access is perceived as suboptimal.[13]

Strengths and limitations
This multisite cohort study recruited service-users from the online service, primary care and specialist SRH services and used objective data to determine eligibility and primary outcomes. While the sample size available for analysis was below target, it was sufficient for detecting a difference for the primary outcome with reasonable precision. Differences in objective data available for follow-up between groups are present because it was easier to access follow-up data from the online service where data were present within a single database than the other services group where barriers to accessing data from multiple services

Table 2 Proportions and logistic regression analysis for main outcomes showing unadjusted and adjusted odds ratios (95% confidence intervals) for the online contraception and other services group (n=236)

Parameter	Online contraception (SH:24) (n=138)		Other services (n=98)		Unadjusted analysis	Adjusted analysis*	Adjusted analysis†
	%	95% CI	%	95% CI	OR (95% CI)	OR (95% CI)	OR (95% CI)
Primary outcome							
OCs continued	69.6	(61.2 to 77.1)	38.8	(29.1 to 49.2)	3.61 (2.09 to 6.22)	3.15 (1.71 to 5.79)	2.94 (1.52 to 5.70)
Secondary outcomes							
Any effective method continued	70.3	(61.9 to 77.8)	46.9	(36.8 to 57.3)	2.67 (1.56 to 4.59)	2.31 (1.25 to 4.26)	2.12 (1.09 to 4.14)
Switch to condoms	4.4	(1.6 to 9.2)	10.2	(5.0 to 18.0)	0.40 (0.14 to 1.14)	0.63 (0.18 to 2.28)	0.71 (0.15 to 3.40)
Pregnancy risk during study	14.5	(9.1 to 21.5)	30.6	(21.7 to 40.7)	0.38 (0.20 to 0.73)	0.41 (0.20 to 0.83)	0.50 (0.23 to 1.08)

*Adjusted for age group; ethnic group; IMD quintile; employment status; education level
†Adjusted for age group; ethnic group; IMD quintile; employment status; education level; smoking status; likelihood that OCs prescribed will be taken; previous use of EC; history of OC use
CI, confidence interval; EC, emergency contraception; IMD, Index of Multiple Deprivation; OC, oral contraceptive; OR, odds ratio.

were greater. This could have led to overestimated positive associations between online provision and OC continuation when relying on objective data. Our sensitivity analysis using self-reported data suggests that more of those accessing other services may have continued OCs, resulting in an attenuation in the apparent association between service type and continuation. However, self-reported data are also prone to bias so it is not clear which approach to identifying continuation will be more reliable. Nonetheless, the results of all analyses were in the direction of increased OC continuation among those who obtained their first supply from the online service. In the fully adjusted model for the sensitivity analysis, confidence intervals encompassed no effect which may have been due to lack of power in these analyses when the apparent difference between groups in continuation of OC use was smaller. Our fully adjusted models included additional baseline variables that were significantly associated with type of service used at the bivariate level. For example, more individuals in the online group reported that they were likely to take their OCs (74% vs 63%), which may reflect that online service-users are likely to have specifically sought out OCs while clinic users might include those receiving OCs while attending for other reasons. We emphasise that the results from the adjusted models should be interpreted cautiously while there is limited understanding of the causal mechanisms between online or face-to-face service use and OC continuation, and it is therefore possible that one or more of these variables may not confound the association under study.

Implications for research and practice
From a person-centred perspective, online ordering of contraception may increase convenience and speed of access. From a system perspective, online options may be important elements of future contraceptive provision with face-to-face services continuing to provide LARC and complex care. Contraceptive services have developed rapidly in response to the COVID-19 pandemic with the face-to-face services studied here switching to telephone consultations and remote prescribing as a result of restrictions on movement and the infection risk associated with visiting clinics. As a result, face-to-face consultations may cease to be the default mode of contraceptive care. It will therefore be important to identify the quality standards for online services that deliver the increased access demonstrated in this study and to ensure equitable provision. Findings indicating similar OC knowledge scores between groups are reassuring that online provision of OC information may be adequate for safe and effective contraceptive use; however, our sample size likely prevented the detection of all but the largest differences and did not enable adjustment for confounders. While we have demonstrated benefits for short-term contraceptive continuation, further work is needed to

Table 3 Sensitivity analysis proportions and logistic regression analysis for primary outcome showing unadjusted and adjusted odds ratios (95% confidence intervals) for the online contraception and other services group (n=247)

Parameter	Online contraception (SH:24) (n=136)		Other services (n=111)		Unadjusted analysis	Adjusted analysis*	Adjusted analysis†
	%	95% CI	%	95% CI	OR (95% CI)	OR (95% CI)	OR (95% CI)
Primary outcome							
OCs continued	77.2	(69.2 to 84.0)	61.3	(51.5 to 70.4)	2.14 (1.23 to 3.73)	1.92 (1.06 to 3.48)	1.74 (0.92 to 3.29)

*Adjusted for age group; ethnic group; IMD quintile; employment status; education level
†Adjusted for age group; ethnic group; IMD quintile; employment status; education level; smoking status; likelihood that OCs prescribed will be taken; previous use of EC; history of OC use
CI, confidence interval; EC, emergency contraception; IMD, Index of Multiple Deprivation; OC, oral contraceptive; OR, odds ratio.

study the impact of online contraceptive services for longer-term continuation, contraceptive knowledge, choice of methods and unintended pregnancy.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not required.

ORCID iDs
Emma Rezel-Potts http://orcid.org/0000-0003-2986-792X
Paula Baraitser http://orcid.org/0000-0002-3354-6494

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