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CLINICAL ARTICLE

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Impact of approval of home use of misoprostol in England on access to medical abortion: An interrupted time series analysis

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Abstract

Objective: In 2018, the Department of Health and Social Care in England approved the use of misoprostol at home for early medical abortions, following administration of mifepristone at clinic. The objective of the present study was to assess the impact of the approval of home administration of misoprostol in England on access to medical abortion, assessed through proxy measures of the proportion of all abortions that were medical and gestational age.

Methods: This study uses the clinical data from the British Pregnancy Advisory Service on abortions in England in years 2018–2019, containing demographic and procedure characteristics of patients. We conducted an interrupted time series analysis to establish the differences before and after the approval in access to medical abortion, measured by the proportion of all abortions that were medical, and gestational age. The analysis also examined whether these changes were equitable, with focus on area-level deprivation.

Results: The analysis of the data (145 529 abortions) suggested that there was an increase in the proportion of medical abortions and decrease in gestational age of abortions after the approval. Compared with the situation if former trends had continued, the actual proportion of early medical abortions was 4.2% higher in December 2019, and the mean gestational age 3.4 days lower. We found that the acceleration of existing trends in increase in proportion of medical abortions and decrease in gestational age were larger in the most deprived quintiles and in those reporting a disability, but not equal across ethnic groups, with Black and Black British women experiencing little change in trajectories post-approval.

Conclusion: The approval of home use of misoprostol as part of an early medical abortion regimen in England was associated with material and equitable improvements in abortion access. Pre-approval trends toward greater uptake of medical abortion and declining gestational age were accelerated post-approval and were greatest in the most deprived areas of England, but not across all racial/ethnic groups. The present

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findings strongly support the continuation or introduction of home management of medical abortions.

KEYWORDS
abortion, medical abortion, self-care, self-management, sexual and reproductive health, telemedicine, women's health

1 | INTRODUCTION

Medical abortion involves the administration of mifepristone, followed 24–48 h later by misoprostol, resulting in loss of the pregnancy in a process similar to miscarriage.[1] The proportion of medical abortions in Britain has been increasing since the introduction of mifepristone in the early 1990s. In 2001, medical abortion accounted for only 12% of all abortions across England and Wales.[2,3] By 2011, this proportion had risen to 47%, and by 2019, to 73%.[4,5]

Early medical abortion refers to the use of mifepristone and misoprostol in the first 10–12 weeks of pregnancy. In many parts of the world, self-administration of misoprostol at home has been the standard model of care, in line with evidence demonstrating it to be safe, effective, and acceptable.[6,7] Until 2017, those seeking early medical abortion in Britain were legally required to attend an approved clinic or NHS hospital to have these medications administered.[8,9] In almost all cases, the patients would not remain in the clinical setting after receiving the medications but would return home to complete the abortion.

Home management of medical abortion in the early stages of pregnancy has been repeatedly proposed by clinicians and researchers as a means of improving access to care and mitigating psychological, financial, and logistical burdens. It has several advantages: it allows for increased privacy, affords opportunities for support from family and friends, and provides greater comfort.[10–13] The alternative—traveling home after administration of misoprostol in a clinical setting—increases travel time and associated expenses, can incur income loss, and carries the risk of causing distress in the event of onset of bleeding and pain during the journey.[3,8,10,13–15]

Increasing access to medical abortion can also result in abortions being provided earlier in pregnancy by mechanisms including both increased provider capacity and improved patient experience. While abortion is a very safe procedure overall, the risk of potential complications increases with every subsequent week of gestation.[1] Earlier abortions minimize the risk of adverse events, and more streamlined, efficient care can improve women's experience of abortion. There is also strong evidence that earlier abortions are more cost-effective for health systems: the savings a consequence of choosing medical over surgical abortions and preventing complications.[1,16,17]

In December 2018, the Secretary of State for Health in England approved "home" as a place where misoprostol as part of medical abortion regimen could lawfully be administered. This measure, conforming with WHO guidelines,[18] brought England in line with Wales, where home use had been approved in June 2018, and with Scotland, where it was approved in October 2017.[19] The approval of home use in England and Wales is limited to early medical abortions, defined as under 10 weeks of gestation. After the approval, patients were still required to come into the clinic for the administration of the first abortion pill, mifepristone—but the approval allowed them to avoid traveling twice. In 2019, 36% of medical abortions in England and Wales were carried out with misoprostol administered at home.[5]

In this study, we examined the impacts of the December 2018 ruling, permitting home administration of misoprostol in terms of access—as the safety of this regimen has been confirmed by prior research.[6,20,21] We use the proportion of all abortions that were early medical and gestational age at treatment as proxy measures of access. We analyzed these routinely collected data to explore changes in these measures after the approval of home use of misoprostol. We also examined whether any such changes varied by key population characteristics related to inequality, to understand effects by area-level deprivation, race or ethnicity, and disability.

1.1 | Terminology

The authors would like to note that abortions are experienced not only by cis-women, but also by trans, non-binary and intersex people, who should be recognized and treated as equal recipients of abortion care. Data on the gender identities of the patients was not routinely collected and so that remains a limitation of this study. The term "women" will be used in this project for simplicity and in acknowledgment of the fact that the majority of the patients identify as women.

2 | MATERIALS AND METHODS

2.1 | Data

Three-quarters of abortions in England and Wales are provided by independent-sector clinics working under NHS contracts.[5] We used data from one of these, the British Pregnancy Advisory Service (BPAS), which provides almost 33% of all abortions in Britain.[22] We extracted anonymized aggregate data from BPAS' Booking and Invoicing System (BIS) on all abortions provided between January 2015 and December 2019. The proportion of early medical abortions at BPAS has been increasing logarithmically since 2015 (see Figure S1). We therefore restricted our analysis to the time when the increase in this proportion was linear and stationary: from January 2018 to December 2019. We also restricted the sample to participants with postcodes from England to be able to study the impact of the approval in England only.

We asked whether the approval permitting home administration of misoprostol was associated with a change in the ratio of early medical abortions to late medical or surgical abortions, in gestational age at treatment, and whether any observed changes varied with patient characteristics.

We used the restricted sample from January 2018 to December 2019 and described it in terms of abortion method, gestational age, past experience of abortion, and distribution of demographic characteristics. In this paper, we use the term early medical abortion as under 10 weeks of gestation. Since whether the impacts of the approval on access to care vary in line with social inequities is of considerable public health interest, we conducted three further stratified analyses to examine differential effects by area-level deprivation, race/ethnicity, and disability. Deprivation was derived from the first three letters of patients' postcode linked to the Index of Multiple Deprivation in England (IMD). IMD ranks 32 844 small areas of England from the most deprived (first) to the least deprived (32 844th) based on measures of income, employment, education, health, crime, and other.[23] We derived a median IMD for every postcode district in the dataset and then grouped the entries into quintiles of area-level deprivation. Race and ethnicity were determined by self-report based on the NHS ethnic category code,[24] and disability was defined in accordance with the Equality Act 2010, as physical or mental impairment with a substantial, long-term negative effect on health.[25] Women with missing values of one of the outcomes or exposures (abortion method, gestational age, date of abortion, postcode) were removed from the analysis, while participants with missing values for other variables were maintained.

2.2 | Statistical analysis

We conducted a Mantel–Haenszel analysis to compare the prevalence of early medical abortion in the period before and after the approval, stratified by patient subgroups, and reported proportions and crude odds ratios (ORs). We also conducted a univariable linear regression to provide mean gestational age at abortion, stratified by patient characteristics, and the risk difference pre-post the approval.

We then conducted an interrupted time series analysis (ITS) using segmented linear regression analyses. We examined the slope of fitted regression lines that represent the expected increase or decrease in gestational age or proportion of early medical abortions for each additional month in time. Following Lopez Bernal et al.,[26] we modeled the time series as a "slope change following a lag". We specifically estimated the expected change in these slopes after the implementation of the new care model, anticipating an effect of the approval on the rate of change in our outcomes of interest. Given full implementation of the exposure was not achieved until approximately 6 months after the approval (see Figure 1), we include a 6-month transition period post-legislation as the lagged portion of the slope. Effect modification by social categories (deprivation, race or ethnicity, disability) was tested by introducing a three-way interaction term into the model to test the null hypothesis that the slope change post-approval was the same in each group. A Durbin–Watson test was conducted, and visual plots of autocorrelation functions were produced to examine whether the ITS assumption that each observation is not dependent on previous observations holds.

Change in slopes expected across the time period were plotted graphically. We also estimated average differences in outcome at the endpoint of December 2019 by comparing the observed outcomes to a counterfactual in the absence of intervention, that is, assuming that there was no slope change. All analyses presented in this paper were conducted in R v4.1.2 and the code is available post-publication at http://github.com/danieljcarter/bpas.

This study is reported as per the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Checklist S1).

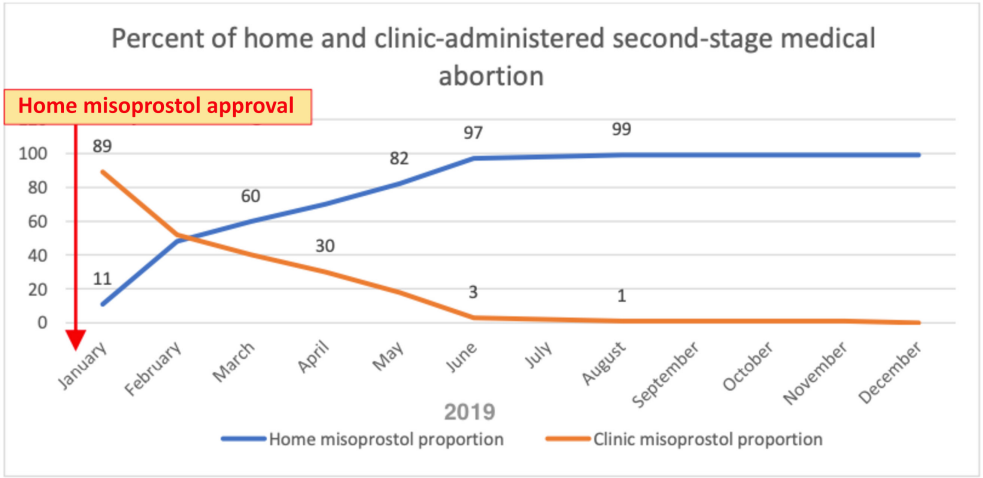

FIGURE 1 Proportion of early medical abortions with home and clinic administration of misoprostol at the British Pregnancy Advisory Service in 2019 ($N = 78\,178$).

2.3 | Ethical approvals

This project was approved by the BPAS Research and Ethics Committee (ref 2020/06/ML; June 11, 2020) and by the LSHTM MSc Research Ethics Committee (ref 28164; July 14, 2020). All the pre-existing data were delivered in a fully anonymized format and stored on an encrypted drive. This study was a quantitative data analysis of existing clinical data and patients were not directly involved in the research.

3 | RESULTS

3.1 | Study population characteristics

Between January 2018 and December 2019, 145 548 abortions were conducted by BPAS, of which 102 592/145 548 (70.5%) were early medical abortions. The gestational age at abortion ranged from 21 days (3 weeks) to 168 days (24 weeks), with a median of 52 days (7 weeks and 3 days), and a mean of 59 days, rounded to the nearest whole number. The characteristics of the study population are provided in Table 1. In terms of missing observations, 118 women with "unknown" method of abortion were removed from the analysis ($n = 118/145548$; 0.04%). Seven women had missing values for gestation, and were also dropped.

3.2 | Changes after the approval of home misoprostol

Following the approval and implementation of home misoprostol, early medical abortions as a proportion of all abortions carried out by BPAS increased from 69.8% to 72.0% (OR 1.12, 95% confidence interval [CI] 1.09–1.14) (Table 2). Notable increases were seen across patients of all ages except those under 18, among whom the proportion undergoing early medical abortion remained the lowest, and increased the least (pre, 63.0%; post, 64.5%; OR 1.07, 95% CI 0.95–1.20). Increases were seen across all quintiles of deprivation, and across all specified race/ethnicity and religious groups. The proportion undergoing an early medical abortion was lower among patients reporting a disability and the increase post-ruling was modest (pre, 62.5%; post, 64.5%; OR 1.09, 95% CI 0.96–1.23). The greatest change in odds of having an early medical abortion occurred in the group with previous experience of abortion (pre, 69.0%; post, 71.4%; OR 1.23, 95% CI 1.08–1.17). Across all strata, a decrease in the likelihood of early medical abortion was seen only among patients born in Northern Ireland [pre, 79.4%; post, 70.0%; OR 0.61, 95% CI 0.32–1.17).

The overall median gestational age dropped from 60 to 57 days following the approval (Table 3). The gestational age at early medical abortion decreased from 50.1 to 48.7 days (risk difference −1.40, 95% CI −1.62 to −1.17). We also saw a decrease in mean gestation for patients undergoing late medical and surgical abortions: from 82.6 to 77.6 days (−4.95, 95% CI −5.31 to −4.59). Significant decreases were seen across all but the oldest age group; and across all birth places except Wales, Scotland, and Northern Ireland. The decrease was more marked among non-white patients, among those of non-Christian religious affiliation, and among those who had previously had an abortion.

3.3 | Interrupted time series

Interrupted time series graphs of early medical abortion and gestational age are presented in Figure 2a,b. There was no evidence of autocorrelation. The "slope change" coefficients are interpreted as the change in slope of the relationship between the outcome (abortion method and gestational age) and time associated with the approval. After the approval, the rate of change of the mean proportion of early medical abortions each month accelerated by an additional 0.07% (95% CI −0.02, 0.15). This modeled change in trend suggests an extra 4.2% of abortions would be early medical abortions at the end of the study period, compared with if pre-approval trends had continued into December 2019. We found strong evidence that the existing decline in mean gestational age since 2015 at BPAS was accelerated post-approval each month by an additional −0.11 days (95% CI −0.18 to −0.03). This change in trend suggests that by the end of the study period, on average, abortions would be carried out 3.4 days earlier than if pre-approval trends had continued.

The estimated slope changes from the stratified time series analyses are presented in Table 4. We found some evidence that the change in slope post-approval differed by levels of race-ethnicity, and by levels of disability for both outcomes, and some weak evidence for difference by deprivation. The magnitude of the slope change post-implementation in the proportion of individuals having early medical abortions and in gestational age generally increased, going from the least to the most deprived. In terms of ethnicity, all groups demonstrated weak evidence of a slope change post-approval on either the early medical abortion measure or the gestational age measure except for Black or Black British women. The largest predicted accelerations in the decrease in gestational age post-approval were seen in Asian or Asian British and white women. Post-approval, the slope change in people with disabilities was faster than in those without disabilities. Figure 3 presents illustrative differences in early medical abortions by IMD, race or ethnicity, and disability.

4 | DISCUSSION

We found that access to early medical abortion improved after the approval of home misoprostol, as evidenced by the higher proportion of early medical abortions provided, lower gestational age at treatment, and higher odds of having an early medical abortion across almost all ethnic groups and socioeconomic groups. The only group that did not experience an increase in the odds of having an early medical abortion comprised those born in Northern Ireland. Even before to the approval for home use of misoprostol in England as part of an early medical abortion regimen, the proportion of abortions performed medically at BPAS was on the rise and gestational age at treatment was declining,

TABLE 1 Abortion method, gestational age, and patient characteristics at the British Pregnancy Advisory Service between January 2018 and December 2019 ($N = 145\,529$).

Characteristics		*n* (%) or median (IQR*)
Abortion method	Early medical abortion (<10 weeks)	102 592 (70.5%)
	Late medical (≥10 weeks) or surgical abortion	42 937 (29.5%)
Gestational age (days)		52 (IQR**: 45–63)
Age (years)	<18	5949 (4.1%)
	18–25	58 928 (40.5%)
	26–35	60 687 (41.7%)
	36–45	19 735 (13.6%)
	>45	230 (0.2%)
Place of birth	England	110 140 (75.7%)
	European Union	11 597 (8.0%)
	Northern Ireland	245 (0.2%)
	Outside of EU	21 906 (15.1%)
	Scotland	758 (0.5%)
	Wales	783 (0.5%)
	Missing	100 (<0.1%)
Disability	No/prefer not to say	140 597 (96.6%)
	Yes	4932 (3.4%)
First language	English	140 917 (96.8%)
	Other than English	4612 (3.2%)
Race/ethnicity	Asian or Asian British	12 571 (8.6%)
	Black or Black British	9180 (6.3%)
	White	113 153 (77.8%)
	Mixed	6502 (4.5%)
	Other/not stated	4123 (2.8%)
Religion	None	96 463 (66.3%)
	Christian	30 573 (21.0%)
	Muslim	7507 (5.2%)
	Prefer not to say	5236 (3.6%)
	Other	5750 (4.0%)
Previous abortions	No previous abortions	88 815 (61.0%)
	Previous abortions	56 689 (39%)
	Missing	25 (<0.1%)
Index of Multiple Deprivation	Least deprived	27 610 (19.0%)
	Less deprived	28 123 (19.3%)
	Middle quintile	29 094 (20.0%
	More deprived	29 320 (20.1%)
	Most Deprived	31 382 (21.6%)

Abbreviation: IQR, interquartile range.

but we found that these trends were accelerated. These accelerations were larger in the most deprived quintiles and in those reporting a disability, but not equal across ethnic groups, with Black and Black British women experiencing little change in trajectories post-approval.

The change in policy regarding home use of misoprostol may have had a positive effect on patients, by improving their experience of medical abortion through allowing them to carry it out from the comfort of their home, but it may also have played a part in improving clinics' capacity: it is possible that scrapping the requirement for a misoprostol visit allowed more patients to be seen faster.

A strength of the study was that it was a unique opportunity to assess the impact of the 2018 approval of home use of misoprostol prior to the COVID-19 pandemic, when medical abortion became

TABLE 2 Proportion of patients having an early medical abortion before and after full implementation of home use of misoprostol; stratum-specific odds ratios represent the change in odds of early medical abortion pre- and post-implementation ($N = 145\,529$).

Population	Pre-implementation period (January 2018 to May 2019) (*n* [%])	Post-implementation period (June 2019 to December 2019) (*n* [%])	Odds ratio[a] (95% CI)
Total	**99 008**	**46 521**	
Abortion method			
EMA	69 086 (69.8%)	33 506 (72.0%)	1.12 (1.09–1.14)
Age (years)			
<18	2625 (63.0%)	1148 (64.5%)	1.07 (0.95–1.20)
18–25	28 262 (69.9%)	13 440 (72.7%)	1.15 (1.10–1.19)
26–35	28 963 (70.7%)	14 311 (72.5%)	1.09 (1.05–1.13)
36–45	9139 (68.7%)	4553 (70.8%)	1.11 (1.04–1.18)
>45	97 (64.7%)	54 (67.5%)	1.13 (0.62–2.11)
Place of birth			
England	53 074 (70.7%)	25 493 (72.8%)	1.11 (1.08–1.14)
European Union	5103 (64.6%)	2474 (67.2%)	1.12 (1.03–1.22)
Northern Ireland	131 (79.4%)	56 (70.0%)	0.61 (0.32–1.17)
Outside of EU	9970 (67.7%)	5080 (70.8%)	1.16 (1.09–1.23)
Scotland	392 (75.5%)	181 (75.7%)	1.01 (0.70–1.47)
Wales	367 (69.5%)	186 (72.9%)	1.18 (0.84–1.68)
Disability			
No or not reported	67 093 (70.0%)	32 385 (72.3%)	1.12 (1.09–1.15)
Yes	1993 (62.5%)	1121 (64.4%)	1.09 (0.96–1.23)
First language			
English	67 225 (70.0%)	32 525 (72.3%)	1.12 (1.09–1.14)
Other than English	1861 (60.8%)	981 (62.3%)	1.11 (0.98–1.26)
Race/ethnicity			
Asian or Asian British	5935 (71.5%)	3166 (74.0%)	1.11 (1.08–1.14)
Black or Black British	3957 (65.8%)	2170 (68.6%)	1.13 (1.13–1.23)
White	54 513 (70.3%)	25 791 (72.4%)	1.13 (1.03–1.25)
Mixed	2795 (66.1%)	1585 (69.7%)	1.18 (1.06–1.32)
Other/not stated	1886 (64.5%)	794 (66.2%)	1.08 (0.93–1.25)
Religion			
None	46 288 (70.3%)	22 261 (72.3%)	1.10 (1.07–1.14)
Christian	14 334 (68.2%)	6837 (70.6%)	1.12 (1.06–1.18)
Muslim	3519 (70.6%)	1950 (74.5%)	1.21 (1.08–1.35)
Prefer not to say	2430 (67.3%)	1153 (71.0%)	1.19 (1.04–1.35)
Other	2512 (71.2%)	1302 (72.3%)	1.06 (0.93–1.20)
Previous abortions			
No previous abortion	42 728 (70.3%)	20 284 (72.4%)	1.11 (1.08–1.15)
Previous abortion	26 344 (69.0%)	13 218 (71.4%)	1.23 (1.08–1.17)
Index of Multiple Deprivation			
Least deprived	13 598 (70.4%)	5972 (72.0%)	1.08 (1.02–1.14)
Less deprived	19 360 (69.3%)	6244 (71.3%)	1.10 (1.04–1.16)
Middle quintile	13 623 (68.9%)	6647 (71.3%)	1.12 (1.06–1.18)
More deprived	13 627 (69.4%)	7012 (72.3%)	1.15 (1.09–1.22)
Most deprived	14 830 (70.8%)	7631 (73.1%)	1.12 (1.06–1.18)

Abbreviation: CI, confidence interval.

[a]Odds ratios derived from Mantel–Haenszel test.

TABLE 3 Mean gestational age at abortion before and after the full implementation of home use of misoprostol ($N = 145\,529$).

Population	Pre-implementation period (January 2018 to May 2019) (mean [SD])	Post-implementation period (June 2019 to December 2019) (mean [SD])	Mean difference (SD)
Total	59.9 (23.0)	56.8 (21.4)	−3.12 (−3.37 to −2.87)
Abortion method			
EMA	50.1 (8.4)	48.7 (8.6)	−1.40 (−1.62 to −1.17)
Late medical/surgical	82.6 (29.3)	77.63 (29.0)	−4.95 (−5.31 to −4.59)
Age (years)			
<18	65.7 (26.9)	62.7 (25.0)	−3.05 (−4.30 to −1.80)
18–25	60.9 (24.0)	57.5 (22.0)	−3.40 (−3.79 to −3.01)
26–35	58.7 (21.8)	55.8 (20.5)	−2.91 (−3.29 to −2.53)
36–45	58.6 (22.0)	56.0 (20.9)	−2.61 (−3.28 to −1.94)
>45	57.2 (22.7)	55.0 (21.2)	−2.18 (−8.28–3.92)
Place of birth			
England	59.8 (23.0)	56.8 (21.5)	−2.96 (−3.24 to −2.67)
European Union	61.3 (23.7)	57.7 (21.6)	−3.59 (−4.47 to −2.71)
Northern Ireland	58.9 (24.4)	55.5 (18.2)	−3.42 (−9.44–2.60)
Outside of EU	59.7 (22.9)	56.0 (20.8)	−3.68 (−4.31 to −3.04)
Scotland	59.3 (23.1)	56.8 (24.3)	−2.48 (−5.94–0.97)
Wales	61.3 (23.6)	58.7 (25.6)	−2.63 (−6.00–0.73)
Disability			
No or not reported	59.8 (23.0)	56.7 (21.4)	−3.16 (−3.41 to −2.91)
Yes	62.6 (24.0)	60.1 (22.8)	−2.53 (−3.85 to −1.22)
First language			
English	59.8 (23.0)	56.6 (21.4)	−3.13 (−3.38 to −2.88)
Other than English	64.0 (24.6)	60.9 (21.8)	−3.08 (−4.45 to −1.70)
Race/ethnicity			
Asian or Asian British	58.6 (22.6)	55.1 (20.2)	−3.48 (−4.31 to −2.65)
Black or Black British	61.4 (24.4)	57.1 (21.8)	−4.28 (−5.25 to −3.31)
White	59.8 (23.0)	56.8 (21.4)	−2.97 (−3.25 to −2.68)
Mixed	61.2 (23.3)	57.2 (21.3)	−3.96 (−5.11 to −2.82)
Other/not stated	61.2 (23.2)	59.2 (23.8)	−1.99 (−3.50 to −0.47)
Religion			
None	60.0 (23.1)	56.9 (21.5)	−3.03 (−3.33 to −2.72)
Christian	60.2 (23.1)	56.9 (21.4)	−3.25 (−3.80 to −2.71)
Muslim	59.0 (22.4)	55.3 (20.7)	−3.70 (−4.78 to −2.63)
Prefer not to say	60.4 (23.7)	57.1 (22.1)	−3.30 (−4.62 to −1.98)
Other	58.2 (22.1)	55.5 (20.5)	−2.74 (−3.98 to −1.50)
Previous abortions			
No previous abortion	60.3 (23.6)	57.1 (21.8)	−3.18 (−3.50 to −2.87)
Previous abortion	59.3 (22.2)	56.3 (20.8)	−2.99 (−3.39 to −2.60)
Index of Multiple Deprivation			
Least deprived	58.1 (21.1)	55.4 (20.1)	−2.70 (−3.28 to −2.70)
Less deprived	59.5 (22.6)	56.4 (21.0)	−3.12 (−3.69 to −3.12)
Middle quintile	60.1 (23.3)	57.1 (22.1)	−3.07 (−3.63 to −3.07)
More deprived	60.4 (23.6)	57.0 (21.6)	−3.39 (−3.94 to −3.39)
Most deprived	61.2 (24.3)	57.7 (22.0)	−3.50 (−4.03 to −2.97)

Abbreviations: EMA, early medical abortion; SD, standard deviation.

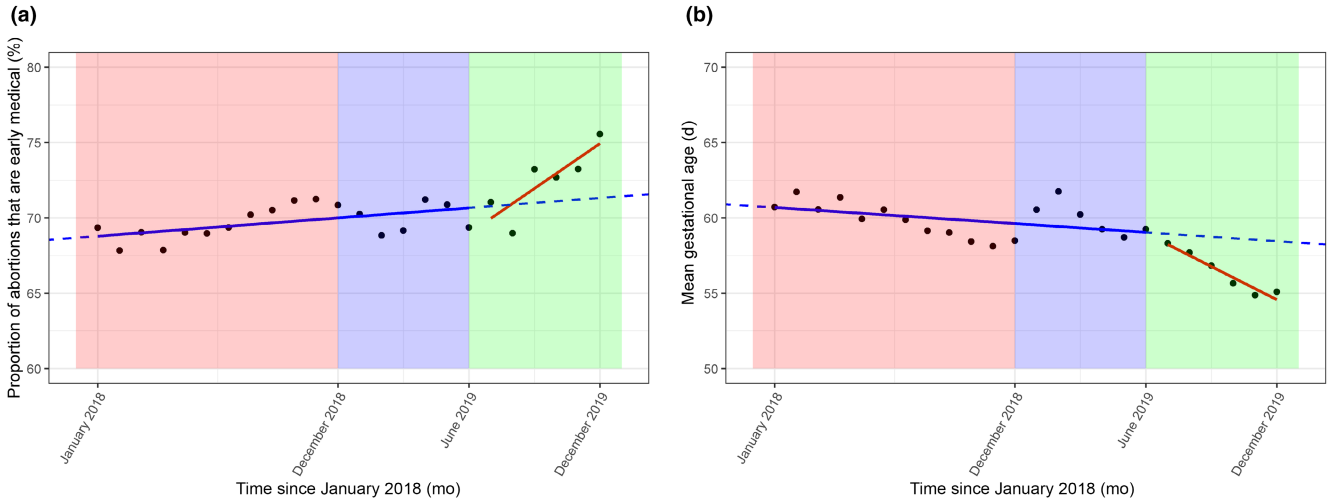

FIGURE 2 (a) Proportion of all abortions carried out by the British Pregnancy Advisory Service that were early medical abortions, between January 2018 and December 2019 ($N = 145\,529$). (b) Mean gestational age (days) at abortion carried out by the British Pregnancy Advisory Service between January 2018 and December 2019 ($N = 145\,529$). Red panel, time prior to the approval; blue, approval implementation period; green, full implementation period. In the time series analyses, the blue implementation period is included with the red pre-approval period.

TABLE 4 Interrupted time series analyses describing the change in slopes after the implementation (June 2019 to December 2019) compared with before (January 2018 to June 2019) of proportion of early medical abortions and gestational age.

	Early medical abortion		Gestational age	
	Change in slope[a] (95% CI)	*P*-value (LRT)	Change in slope (95% CI)	*P*-value (LRT)
Slope change				
Post-approval	0.07 (−0.02–0.15)		−0.11 (−0.18 to −0.03)	
IMD		0.23		0.1
Least deprived	0.04 (−0.06–0.15)		−0.08 (−0.15–0.00)	
Less deprived	0.00 (−0.14–0.14)		−0.05 (−0.14–0.03)	
Middle quintile	0.05 (−0.08–0.17)		−0.05 (−0.14–0.03)	
More deprived	0.09 (−0.03–0.21)		−0.10 (−0.18 to −0.01)	
Most deprived	0.13 (0.00–0.27)		−0.11 (−0.19 to −0.03)	
Race/ethnicity		0.01		0.01
Asian or Asian British	0.01 (−0.16–0.18)		−0.10 (−0.20 to −0.01)	
Black or Black British	−0.02 (−0.17–0.13)		−0.05 (−0.14–0.05)	
White	0.07 (−0.03–0.17)		−0.11 (−0.19 to −0.04)	
Mixed	0.17 (−0.09–0.43)		−0.07 (−0.20–0.07)	
Other	0.14 (−0.16–0.44)		−0.08 (−0.21–0.04)	
Disability		0.01		0.11
No disability	0.06 (−0.03–0.15)		−0.11 (−0.18 to −0.03)	
Disability	0.21 (−0.05–0.46)		−0.09 (−0.21–0.03)	

Abbreviations: CI, confidence interval; IMD, Index of Multiple Deprivation; LRT, likelihood ratio test (to compare model with and without a three-way interaction term).

[a]The "slope change" coefficients are interpreted as the change in slope of the relationship between the outcome (abortion method and gestational age) and time associated with the approval.

the default method in the first 10 weeks of pregnancy.[27] The study population was large, constituting 35.67% of all 407 992 abortions carried out in England and Wales between 2018 and 2019.[5,22,28] A wide range of age groups, ethnicities, religions, and national origins were represented.

A limitation of the analysis is that the comparator data collection period following the ruling was short, only 6 months, which may have resulted in an underestimate of eventual changes. The trends would likely have been stronger had there been more time points to analyze. Any extension of this period beyond March

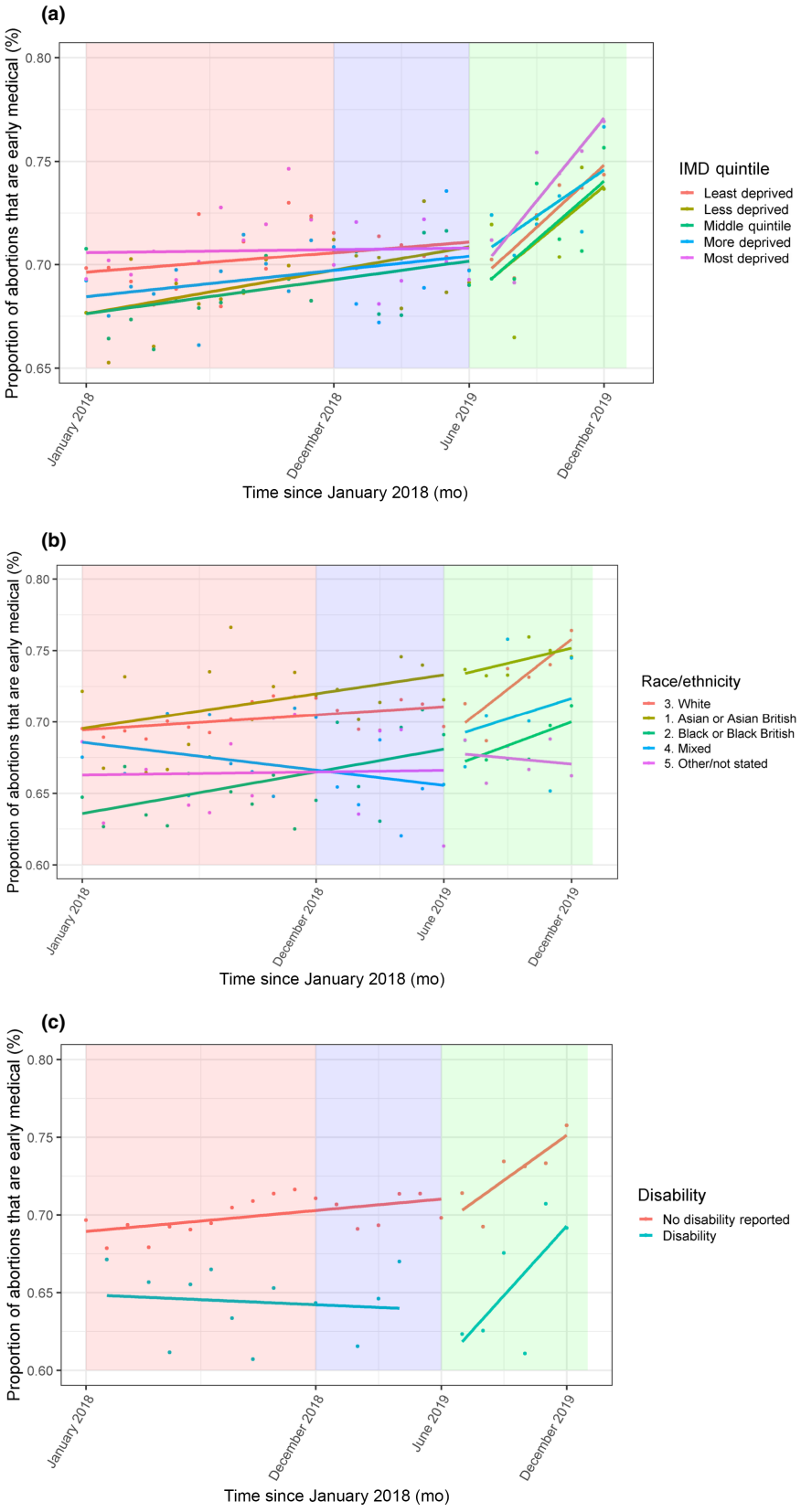

FIGURE 3 (a–c) Proportion of all abortions carried out by the British Pregnancy Advisory Service between January 2018 and December 2019 that were early medical abortions ($N = 145\,529$), stratified by: (a) deprivation quintile; (b) race/ethnicity; (c) disability status. Red panel, time prior to the approval; blue, approval implementation period; green, full implementation period. In the time series analyses, the blue implementation period is included with the red pre-approval period. IMD, Index of Multiple Deprivation.

2020, however, would have been confounded by the changes in abortion regulations contingent on the COVID-19 pandemic that were introduced in April 2020. We did not study the efficacy of the medical abortion regimen, as there is extensive evidence that it is highly effective and safe—consequently, we do not have data on how many patients required follow-up care.[6,20,21] Another limitation is that we have used data from only one independent abortion care provider (with multiple clinics across England). Later surgical abortions are more likely to take place in NHS facilities, rather than with independent providers such as BPAS, which could be the main source of selection bias in this study. However, even if the changes presented by us were to apply to BPAS only, our results would still have an important impact on access to abortion care in England, given that BPAS provides over a third of abortions in the country.

Our finding that the approval of home use of misoprostol was associated with an acceleration of existing trends in lower gestational age at treatment is important because it means more people in Britain can access early medical abortion at home. This facilitates abortions taking place under the upper gestational age limit imposed by law, and it can alleviate the distress caused by longer waiting times to abortion. In addition, the earlier in pregnancy that abortions take place, the safer and more acceptable they are.[1,16] The concomitant acceleration in trend toward more early medical abortions also has cost implications: early medical abortion is less expensive to provide than surgical abortion, and earlier abortions are associated with a reduction in the need for costly surgical management of complications such as incomplete abortion and continuing pregnancy.[17] The National Institute for Health and Care Excellence estimates that in England a reduction of 1 day in gestational age at abortion could save £1.6 million per year. Our findings that the approval of home use of misoprostol facilitated abortions happening over 3 days earlier show a significant economic potential of the change.[1,29]

At-home administration of misoprostol can particularly improve access to abortion in more deprived areas, for people with disabilities, and in some ethnic groups, as those populations can suffer from barriers to access, such as issues with travel, taking time off work, and arranging childcare, to a significantly greater extent. Home administration showed little evidence of improving access to abortion in Black and Black British women and further research should be conducted to understand this difference in uptake to better tailor abortion care services to reach marginalized populations.

There are other limitations to the Department of Health and Social Care's approval. First, the narrow definition of "home" means that patients can only take the pill where they are ordinarily resident. That might restrict access to some, for instance those staying with a family or partner away from their usual home; it also fails to account for people for whom carrying out a medical abortion at home might carry a risk from an abusive partner or family member.[13,29,30] Second, the arbitrary gestation cut-off of 9 + 6 weeks is not supported by literature, as studies have provided no evidence that home expulsion between 10 and 12 weeks is less effective, less acceptable, or less safe.[1,29,31,32]

Since the approval of home use of misoprostol, the COVID-19 pandemic impelled a sudden and rapid shift toward the telemedical model and the home management of the whole medical abortion process. There is accumulating evidence that, much like with misoprostol, home administration of mifepristone is also safe, effective, and preferred by women.[1,29,31,32] This swift move toward remote care resulted in further improvements in access: data from BPAS from March to June 2020 showed that waiting times for appointments halved, with an average of 4 days, and that average gestation fell by over 7 days, comparing the first half of 2019 with that of 2020.[33] The impact of this change on indices such as area-level deprivation, race/ethnicity, and disability is an area for further exploration.

In addition, it is essential to continue exploring patients' perspectives of those new models of care. In a qualitative study conducted in England during the COVID-19 pandemic, we found that women were overwhelmingly in favor of home self-management of medical abortion, but some stressed that the option of an in-person interaction with health practitioners should remain available.[34] Personal and informed choice pertaining to the abortion method and its location is crucial, and should remain available and accessible.[13,35,36]

5 | CONCLUSIONS

Our findings, that home administration of misoprostol was linked with earlier medical abortions, meant that more women could access care. This is more acceptable to women than the alternative of travelling back and forth to receive abortion medication, and it is less costly to the health system while allowing for more patients to be seen more quickly. By demonstrating that the benefits of home administration of misoprostol may be greater among disadvantaged populations, our study will help in decision making about which models of care to target and tailor to specific groups. The study adds to the growing number of studies assessing the impact of patient-centred approaches to health care on equity, access and quality of care.

AUTHOR CONTRIBUTIONS

ML, DC, PL, and KW conceptualized the study. ML and DC designed the statistical model. ML coordinated the ethical approvals, conducted the preliminary analyses and wrote the first draft. DC conducted the final analyses. AG provided additional guidance on the statistical model. ML and DC wrote the final draft. All authors contributed to the final manuscript.

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being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data reported in this analysis is not available as it is subject to an ethical permission restricted to the authors of the manuscript.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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