Improving the effectiveness and equity of contraceptive provision in general practice

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Abstract

Unplanned, unwanted pregnancies have adverse health and economic costs for the mother, child, and society, particularly for young women under 25 years. Reducing these and therapeutic abortions are major goals of reproductive health programmes globally. The UK have high abortion rates compared with other European countries and low prevalence of long-acting reversible contraception (LARC) use. Together, these suggest significant room for improvement in contraceptive programmes.

I used a feminist orientation and mixed-methods approach for this thesis. I conducted five studies for my PhD which examined what could be done to improve the contraceptive care in general practice; not only to address the unmet need for contraception, but also to improve the effectiveness, equity and experience of contraceptive care women receive when they attend general practice.

Using contraceptive prescriptions (including LARC) and abortion rates as outcomes, a pay-for-performance (P4P) scheme to give LARC advice to women attending for contraceptive care was associated with more LARC prescriptions, with greater impact for younger women and those from deprived backgrounds, but it had uncertain impact on abortion rates. A survey of contraceptive access during COVID-19 lockdown reported the struggles some women had to get the contraception they needed. A focus group study of young women's experiences of contraceptive care offered insight into what young women needed to make choices about contraceptives, and some of the barriers that made it difficult for them to exercise their choice, some of these included gender inequality and societal attitudes to young women. Women who attend primary care might have conditions and circumstances which made them more likely to have abortions. Improving access to effective contraception will not necessarily change the circumstances associated with abortions but managing some upstream factors might change women's lives and improve reproductive health outcomes.

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Richard Ma
29th January 2023

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3 Declaration of originality

I declare that the thesis presented here for examination for the degree of Doctor of Philosophy of Imperial College London is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it) and that the thesis has not been edited by a third party.

Richard Ma
28/1/2023

4 Funding sources

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5 Outputs from this PhD thesis

5.1 Original research articles in peer reviewed journals

BJGP Open

Ma R, Foley K, Saxena S. Access to and use of contraceptive care during the first COVID-19 lockdown in the UK: a web-based survey. BJGP Open. 2022;6(3):BJGPO.2021.0218 (1)

PLOS Medicine

Ma R, Cecil E, Bottle A, French R, Saxena S. Impact of a pay-for-performance scheme for long-acting reversible contraceptive (LARC) advice on contraceptive uptake and abortion in British primary care: An interrupted time series study. PLOS Medicine. 2020;17(9):e1003333.(2)

5.2 Media outputs

Based on PLOS Medicine publication.





5.3 Conference presentations – oral

Society for Academic Primary Care Annual Scientific Meeting (SAPC ASM) 2021 virtual conference

** NAPCRG/SAPC Junior Award - Best oral presentation by junior researcher **

Evaluation of contraceptive provision during SARS-CoV-2 lockdown in the United Kingdom: online survey using social media platforms

https://sapc.ac.uk/conference/2021/abstract/evaluation-of-contraceptive-provision-during-sars-cov-2-lockdown-united

European Public Health Association (EuPHA)16th World Congress on Public Health 2020– Virtual Conference - 30th June and 1st July 2021
Ma R, Cecil E, French R, Bottle A, Saxena S. Impact of financial incentives for primary care to give long acting reversible contraceptive advice. European Journal of Public Health. 2020;30(Supplement_5) (3)

Faculty of Sexual and Reproductive Healthcare (FSRH) Annual Scientific Meeting Edgbaston Birmingham 17th-18th May 2018
QOF indicator for GPs to give LARC advice – what is the impact?

Society for Academic Primary Care Annual Scientific Meeting (SAPC ASM) 2018 10-12 July 2018 Barbican Centre, London
What impact did financial incentives for long-acting reversible contraceptive (LARC) advice to women have on abortion rates?
https://sapc.ac.uk/conference/2018/abstract/what-impact-did-financial-incentives-long-acting-reversible-contraceptive

5.4 Conference presentations – poster

North American Primary Care Research Group (NAPCRG) 50th Annual Meeting November 18-22, 2022, Phoenix, Arizona.
What biopsychosocial factors are associated with abortions in primary care in Britain? A case control study comparing women aged 13 to 54 who had abortions compared with those who did not?

Faculty of Sexual and Reproductive Healthcare (FSRH) Annual Scientific Meeting (ASM) 16-17 May 2019 Royal College of Physicians, Edinburgh.
Impact of a pay-for-performance (P4P) scheme in UK general practice on long-acting reversible contraception (LARC): an interrupted time series study

5.5 Other presentations

Society for Academic Primary Care Annual Scientific Meeting (SAPC ASM) 2020 Conference in Leeds cancelled due to COVID-19 pandemic, but abstracts presented as tweets.

Rapid and cost-efficient recruitment of focus group participants using Instagram
https://sapc.ac.uk/conference/2020/abstract/rapid-and-cost-efficient-recruitment-of-focus-group-participants-using

Society for Academic Primary Care Annual Scientific Meeting (SAPC ASM) 2020 Conference in Leeds cancelled due to COVID-19 pandemic, but abstracts presented as tweets.

Shame, bluffs and drug mules – experiences of young women obtaining contraception
https://sapc.ac.uk/conference/2020/abstract/shame-bluffs-and-drug-mules-experiences-of-young-women-obtaining
https://twitter.com/Richard_GP/status/1284068273999446017?s=20&t=5x4nDk59hV_JYyvsFYaooA



Department of Primary Care and Population Health, UCL Infection Seminar 19.11.2018

What is the impact of offering financial incentives to give long-acting reversible contraception (LARC) advice in general practice? An interrupted time series study using electronic health records.

https://www.ucl.ac.uk/epidemiology-health-care/research/pcph/seminars/details/infection-seminar-191118

5.6 Wider dissemination and policy

Women's Reproductive Health Data Group/Reproductive Health Data Steering Group Health Improvement Directorate Public Health England – I was member of a steering committee advising on use of available data to improve women's health.

I submitted a report based on preliminary findings from the study on contraception access during COVID-19 lockdown to the All-Party Parliamentary Group on Sexual and Reproductive Health Inquiry into Access to Contraception in the UK. *Women's Lives, Women's Rights: Strengthening Access to Contraception Beyond the Pandemic*. The full report is available here: https://www.fsrh.org/policy-and-media/all-party-parliamentary-group-on-sexual-and-reproductive-health/ (4)

Society for Academic Primary Care (SAPC) Sexual and Reproductive Health Research – Special Interest Group

The Sexual and Reproductive Health group aims to promote research excellence and capacity in sexual and reproductive health in primary care. This blog aims to share articles that relate to sexual and reproductive health in primary care settings. Subject areas include (but not limited to): sexually transmitted infections, HIV, contraception, abortion, menopause, sexuality/sexual behaviour, sexual function, and LGBT issues

https://primarycaresexualhealth.wordpress.com/about/



5.7 Prizes and awards

1st Prize, NAPCRG/SAPC Junior Award

Evaluation of contraceptive provision during SARS-CoV-2 lockdown in the United Kingdom: online survey using social media platforms

Presenter: Richard Ma, Imperial College London. Best oral presentation prize awarded at SAPC ASM 2021

Heather Trickey Essay Prize "Highly Commended"

Why current sexual and reproductive health research, policy and practice are failing women – and what we can do about it?

A reflective essay from my PhD thesis now included as part of Discussion chapter

https://heathertrickeyprize.org/2022/01/30/why-current-sexual-and-reproductive-health-research-policy-and-practice-are-failing-women-and-what-we-can-do-about-it/

6 Abbreviations

ARMA	Auto-regressive moving average
ASD	United Nation's Agenda for Sustainable Development
BNF	British national formulary
CASH	Contraception and sexual health (clinic)
CHC	Combined hormonal contraception
COC	Combined oral contraception
COCP	Combined oral contraceptive pill
CPRD	Clinical practice research datalink
CRD	Current registration date
EHC	Emergency hormonal contraception
DOD	Date of death
EHR	Electronic health record
GP	General practitioner
GUM	Genito-urinary medicine
HCP	Healthcare professional
HES	Hospital episodes statistics
HIV	Human immunodeficiency virus
ICREC	Imperial College research ethics committee
IMD	Index of multiple deprivation
ISAC	Independent Scientific Advisory Committee

ITS	Interrupted time series
IUC	Intra-uterine contraception
IUD	Intra-uterine device
IUS	Intra-uterine system
LARC	Long-acting reversible contraception
MHRA	Medicines and Healthcare Products Regulatory Agency
MDG	United Nation’s Millennium Development Goal
NATSAL	National Survey of Sexual Attitudes and Lifestyle
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NIHR	National Institute for Health Research
NLHC	Non-LARC Hormonal Contraception
UK	United Kingdom (includes England, Scotland, Wales and Northern Ireland)
UN	United Nations
UNICEF	United Nations International Children's Emergency Fund
P4P	Pay-for-Performance
PAG	Project Advisory Group
POC	Progestogen Only Contraception
POP	Progestogen Only Pill
PPI	Patient and Public Involvement
QOF	Quality and Outcomes Framework

SDG	United Nation’s Sustainable Development Goal
SRHR	Sexual and Reproductive Health Rights
STI	Sexually Transmitted Infection
UK	United Kingdom
UTS	Up To Standard

7 Preface - my motivation for this thesis

I will begin the thesis with a story, about how I became interested in reproductive health research. It was the late 1990s and I was in my final year of vocational training for general practice when an issue came up with the final placement that was not going to be resolved in time for me to start. I decided to take a year out of the scheme and found a locum post as a senior house officer in a genitourinary medicine clinic. I also started training and later worked as a locum doctor in “family planning” clinics, as they were known then, to further improve my skills and practice in sexual and reproductive healthcare.

The work at family planning clinics seemed straightforward. Women, who were almost always healthy, would come to the clinic to discuss contraceptives they wanted, and I would prescribe or administer a contraceptive of their choice after a discussion about pros and cons. I would also see women requesting emergency contraception and abortions; working in a deprived part of Southeast London, this featured at almost every clinic session I worked in.

When I started my final year of GP training, I was grateful to have trained in sexual and reproductive healthcare as it was clear this comprised a significant workload in general practice. These knowledge and skills continued to be important as I became a GP principal in a small practice, and there were plenty of opportunities to practice my expertise in a deprived area of inner-city London.

At the time, reproductive health was a hot topic as the Labour Government’s Teenage Pregnancy Strategy was launched in 1998 by the Social Exclusion Unit (which it was known then).(5) The high rates of teenage conception rates and abortion rates of women of any age were often featured on the news media at the time.

While most consultations for contraceptive care were straightforward, I started to become more curious about some cases I was seeing as a practitioner. There were three typologies of patients that interested me in particular: women who were having condomless sex and would benefit from regular contraceptive methods but were ambivalent about using them; those who requested emergency contraception

frequently; and those who had more than one or two abortions. I often thought abortion referrals reflected failures: failure of a method such as condoms, regular contraception, or emergency contraception; failure of a woman to use chosen methods reliably and correctly (e.g., condom slipped or missed pills); failure of access or provision of suitable contraception. For women who requested emergency contraception frequently, used no methods at all, or requested more than one abortion, what was the reason for their choices? If modern contraceptives (LARC and more permanent methods) were safe and effective, how was it that as clinicians, we were not able to persuade women to use them especially those who might benefit the most?

My years in clinical practice made me reflect about these questions and these have become some of the motivations behind this thesis.

7.1 COVID-19

The pandemic happened in the middle of my part-time 5-year PhD. The lockdown measures meant all academic institutions in the UK were shut; staff and students were encouraged to work remotely, with many courses and lectures delivered online. Luckily, I was three quarters of the way through my research studies without much impact on my fieldwork and the rest of my PhD apart from some meetings, courses and conferences that had to be conducted online.

As a clinician working in general practice, I experienced first-hand how the pandemic had impacted public access to health services. As a GP researcher interested in sexual and reproductive health, on a funded doctoral fellowship examining contraceptive services in primary care, I felt there was a once in a lifetime opportunity to explore how the pandemic had impacted access to contraceptive care.

Even though it was an extra piece of work shoehorned into my fellowship programme and potentially cause delays with my PhD, I felt that this was not only an important question that needed answering, but it would also be topical, contemporary and help to further my understanding of contraceptive care in general practice.

8 Background

8.1 Reproductive healthcare – the global context

Unplanned, unwanted pregnancies in all ages have adverse health and economic costs for the mother, child and society but this is particularly true for girls and young women under 25 years.(6) While for some young women, having a child can be a positive experience, for many more teenagers, bringing up a child can be difficult and often results in poor outcomes for both teenage parents and child, including long-term poverty. Teenage pregnancy increases the risk of adverse birth outcomes regardless of economic status, prenatal care and weight gain during pregnancy.(7) They are also less likely to breast feed and more likely to suffer from postpartum depression than those mothers over 20 years.(8) Teenage mothers are also more likely to have children who frequently experience health and developmental problems.(9) Unintended pregnancies make up an estimated 44% of all pregnancies worldwide and nearly 60% of these end in abortion (10), and up to half of unintended pregnancies are due to incorrect or inconsistent use of contraception (11, 12).

8.1.1 Millennium Development Goals Reproductive health targets

Reducing unplanned, unwanted pregnancies and therapeutic abortions are major goals of reproductive health programmes globally.(13, 14) In 2000, the United Nations (UN) published the Millennium Declaration which identified fundamental values essential to international relations; the eight Millennium Development Goals (MDGs) were set up to realise these values (https://www.un.org/millenniumgoals/). However, it omitted sexual and reproductive health rights (SRHRs) when they were adopted in 2000 and a reproductive health target was only included in the MDGs seven years after their adoption in response to a sustained campaign by advocates.(15) The reason for the initial omission ironically explained why it was needed; the United Nations Secretariat conceded to the more conservative members of the G-77 countries and opted for a consensus which would not offend them.(16)
The targets for reproductive health were finally added in 2007 under *Target 5: Improving Maternal Health*, with a specific aim to achieve, by 2015, universal access to reproductive health. The following indicators were used to measure progress:

- 5.3 Contraceptive prevalence rate
- 5.4 Adolescent birth rate
- 5.5 Antenatal care coverage
- 5.6 Unmet need for family planning

A summary of the MDG gains reported contraceptive prevalence among women aged 15 to 49 years increased from 55 per cent in 1990 worldwide to 64 per cent in 2015.(17) However, three key reproductive health indicators—adolescent birth rates, contraceptive prevalence, and unmet need for family planning—had been at a virtual standstill in most places around the world. This was likely due to the lack of commitment from MDG in the first seven years of the millennium until the SRHR target were introduced. The stalling did not affect all the countries equally; the most advantaged have progressed, while the least advantaged have lost ground; thereby widening the inequalities among nations.

The United Nation's 2030 Agenda for Sustainable Development that followed sought to address what the MDGs did not, and that was to include among its targets gender equality and empowerment of all women and girls.(13) There are two targets in the Sustainable Development Goals (SDGs) that explicitly mentioned sexual and reproductive health:

- *to ensure universal access to sexual and reproductive healthcare services and the integration of reproductive health into national strategies and programmes; and*
- *to ensure universal access to sexual and reproductive health and reproductive rights.*

However, previous experience with the MDG have alerted reproductive health advocates to ensure sexual and reproductive health is taken seriously by the United Nations. For this reason, the Guttmacher Institute and The Lancet set up the *Lancet Commission for Reproductive Health*. Not only will it encompass all elements of sexual and reproductive health and rights, the Commission goes further to emphasise important concerns that were overlooked or neglected in the SDGs, such

as the availability of safe abortion and access to high-quality sexual and reproductive health information and services, including for adolescents, men, and sexual minorities, that respect sexual and reproductive rights and prioritise the needs of vulnerable and neglected populations.(14)

8.1.2 Access to abortion across the world

Women have abortions for many reasons, and they include socioeconomic and limiting childbearing. these reasons have not changed much over 20 years and are also similar among low-, middle- and high-income countries.(18, 19, 20) Access to abortions is therefore an important part of reproductive healthcare, particularly for whom regular contraception was not needed at the time, not an option for various reasons, or a safety net to limit childbearing if contraception failed. A study of abortions across 40 countries reported highest rates in women aged 20-29 years old, suggesting women in this age range might have higher unmet reproductive health needs than women of other age groups, difficulty in using effective contraception consistently, or higher than average need to limit childbearing.(21) While abortion rates can be a proxy indicator of any or a combination of these, its use as a way to evaluate reproductive health programmes could also be problematic; this is because not all unplanned pregnancies lead to an abortion and not all abortions are necessarily due to unplanned or unwanted pregnancies.

In one report, legal abortion incidence data were compiled from national statistical offices and nationally representative surveys of more than 40 countries where legal abortion was generally available. The findings suggested the proportion of abortions among 15 to 19-year-olds was higher in Africa (22%) than in any other major world region. The proportion of abortions among women in their 20s was highest in North America (57%), followed closely by Latin America (53%). The share of abortions in women in their 30s is highest was Europe (37%). This assessment was limited to the distribution of legal abortions, but nearly all abortions in North America and Europe were legal, thus the findings likely represented the overall patterns of abortion incidence in these regions. The majority of abortions were unsafe in the three major developing world regions—Africa, Asia and Latin America—and the estimated age

distributions of unsafe abortions for those regions have been published elsewhere.(22)

8.2 Reproductive healthcare – UK context

According to a UNICEF (United Nations International Children's Emergency Fund) report on teenage births among 28 rich nations using 1998 data, United States (US) topped the league table with 52 births per 1,000 teenage girls aged between 15 and 19 years, while the United Kingdom topped the list in Europe—and came second overall—with just over 30 births per 1,000 teenagers.(23) The report suggested teenage girls in US and UK were poorly prepared for life in a modern and sexualised society. Teenagers who kept their baby were also twice as likely to end up living in poverty than those who delayed motherhood.(24) The report added by tackling teenage births, governments had the chance to reduce poverty and its "perpetuation from one generation to the next". England and Wales had high abortion rates in women under 20 years and ranked second among women of all ages among countries in Western Europe (22 per 1,000 women aged 15 to 19 years, 2009 figures).(25) 20% of all legal abortions in England and Wales, and 24% in Scotland were in women under 20 years old.(25, 26). Together, these suggested significant room for improvement in contraceptive programmes in Britain and worldwide, particularly for teenage girls. (27)

8.2.1 The Teenage Pregnancy Strategy

At the beginning of the Labour Government in 1997, almost 90,000 teenagers became pregnant and three-fifths of them (or 56,000 in total) went on to give birth; almost 7,700 conceptions were to under 16s (about 70 per cent to 15-year-olds), resulting in 3,700 births. 2,200 conceptions were to girls aged 14 or under, and around 50 per cent of conceptions to under 16s ended in abortion. Teenage parents were a concern because they were more likely than their peers to live in poverty and unemployment and be trapped in it through lack of education, childcare and encouragement. To manage the high teenage pregnancy rates and associated problems, England's Teenage Pregnancy Strategy implemented in 1999 focused on reducing unplanned pregnancies and abortions through improvements in sexual health education and widening access to contraception for young women.(5) The

strategy was informed by an analysis from the Social Exclusion Unit which identified teenage pregnancy as a complex set of problems which were due to, among many factors: sex education that do not equip teenagers with skills to resist pressures, patchy access and knowledge of contraception, teenagers who lacked ambitions and saw no reason why not to become young parents; and not enough was done to encourage young parents back into employment. The policy response that followed included: a national campaign to mobilise communities, including local and central government to meet the goals; better prevention of the causes of teenage pregnancy through better education about sex and relationship and contraception, including at-risk groups and young men; and better support for pregnant teenagers and parents to ensure they finished education and learned parenting skills.

An interim report published ten years after the Strategy launch identified reductions in teenage pregnancies in some areas in England but also areas that needed strengthening and investments including: better information about contraceptive methods both at school and in the media, and better support for teenage mothers.(28, 29) The strategy was deemed a “success” as an observational study reported conception rates in women aged 18 years and younger declined from their peak in 1996 to 1998 and more rapidly from 2007 onwards; the estimated reduction was 11.4 conception per 1000 women aged 15 to 17 years for every £100 spent per head and a reduction of 8.2 conceptions per 1000 women after adjustments for socioeconomic deprivation and region. (30)

The Teenage Pregnancy Strategy succeeded in reducing teenage conceptions in ten years, from sustained, multifaceted policy intervention involving health and education agencies; the Strategy has been considered for implementation in low- and middle-income countries that also sought to reduce their teenage pregnancy rates.(31) Despite this success, England (and Wales) still ranked among the highest in teenage pregnancies and abortions compared with other European countries; for instance, English teenage birth rate in 2011 was 21 per 1,000 women aged 15 to 19 years and for Scotland it was 23 per 1,000 women.(32) The third National Survey of Sexual Attitudes and Lifestyle (NATSAL-3), which was a probability survey of sexual behaviours of adults in Britain, reported 21% of women aged 16 to 19 years had unplanned pregnancies, but so did 23% of women aged 20 to 24 years.(27) National

statistics from 2018 reported highest rates of abortion were for women aged 20 to 24 years, and abortion rates for 30-34 year olds increased from 15.1 per 1000 women in 2007 to 18.5 per 1000 women in 2017.(33) Over a third (39%) of all abortions were in women aged under 25 years and this had not changed for over a decade. (30, 34, 35). Although the rates of teenage conceptions have halved in England between 1999 and 2009, they are still relatively high when compared with other European countries. There is also another consideration: for women in early adulthood were no longer in education or training, reproductive healthcare policy needs to ensure that the impact of the Strategy is sustained well beyond the teenage years.(36)

8.3 Contraception provision in the UK[1] National Health Service (NHS)

As recognised in the Teenage Pregnancy Strategy, a major policy solution for reducing unplanned pregnancies and abortions is access to more effective methods of contraception. Before 1961, contraception was only available through family planning clinics run by charities such as Family Planning Association (FPA) and Marie Stopes. Contraception became available in the UK NHS from 4th December 1961. Enoch Powell, the Minster for Health at the time, confirmed in the House of Commons that “birth control pills” could be prescribed on the NHS but it was not until the reorganisation of the NHS in 1974 that incorporated family planning services into the NHS that all contraceptive advice and supplies would be provided free of charge, regardless of age or marital status.(37)

Most methods of contraception are currently provided free of charge in the UK NHS. There are over 15 different types of contraception, they can be classified into the following: (short-acting) hormonal methods, long-acting reversible contraception (LARC), barrier methods, permanent methods, and others (Table 1). LARC methods include progestogen-only contraceptive implant, depot progestogen-only injection,

[1] Although general practice and the provision of contraception might be similar across the UK, the devolved nations’ health policies might have different programmes and priorities; for example, the Teenage Pregnancy Strategy only applied to England. Additionally, routine statistics on reproductive healthcare are reported by country; abortion statistics, for example, are published separately for England and Wales and Scotland. Until recently, Northern Ireland had a different legislation to the rest of the UK, so abortion statistics cannot be used to evaluate reproductive healthcare outcomes. For these reasons, my thesis will mainly focus on Britain (i.e., England, Wales, and Scotland), unless otherwise stated.

intra-uterine system (releases progestogen hormone) and intra-uterine device (contains copper only). Contraception can be obtained from general practitioners (GPs) and contraception and sexual health (CASH) clinics. Pharmacies and emergency departments can also supply emergency hormonal contraception (EHC). Most CASH clinics provide LARC but only some GP practices offer this because not all of them have the skills to provide this. Referrals for abortions in Britain (i.e., Scotland, England, and Wales) can be done via GPs, CASH clinics and in some areas, women can self-refer to abortion services. Abortion services are run by third sector organisations (e.g., Marie Stopes International, British Pregnancy Advisory Service BPAS) and some local hospitals. Until recently, it was illegal to have an abortion in Northern Ireland and women who needed to have an abortion had to travel to Britain and pay privately to access.(38, 39)

Although contraception such as combined oral contraceptive pills (COCPs) might be efficacious in “perfect use”, they rely on users to take a pill regularly or use consistently (e.g. condoms and diaphragms), so “typical use” might be less efficacious (Table 1).(40) Contraceptive methods that are longer lasting and less reliant on the user could be more effective. The National Institute for Health and Care Excellence (NICE) guidance recommends long acting reversible contraception (LARC) methods because they are reliable, long lasting, and cost-effective.(41) The UK lags behind other European countries in terms of prevalent LARC use (UK 13% versus France 20%, Austria 20%, Norway 23%, and Estonia 22%).(42)

In addition to regular or routine contraception, emergency contraception can be used up to five days after sexual intercourse to prevent pregnancy. These include oral emergency hormonal contraception (EHC) or emergency IUD. Emergency hormonal contraception can be issued on prescription free of charge; some areas promote quick access to free EHC through pharmacies for young people under 25 years within a broader strategy of reducing teenage pregnancies; EHC can also be bought from community pharmacists without prescription for a charge. Emergency IUD needs a referral and fitting by trained clinicians; the IUD can be left in-situ to be used as a regular method thereafter.

Table 1 Contraceptives available in the UK and their effectiveness

Type	Method	Details (all methods are free on the NHS unless stated)	Effectiveness	
			Perfect use	Typical use
Short-acting hormonal methods	Combined oral contraceptive pill (COCP)	Contain both oestrogens and progestogens, taken once a day for three weeks followed by scheduled one week "break" for an artificial "period"	>99%	91%
	Contraceptive patch	As above, applied once a week, with a "patch free week" every fourth week	>99%	91%
	Vaginal ring	Same hormones as COCP, ring is put inside the vagina for three weeks, replaced with a new ring after a week break for scheduled period	>99%	91%
	Progestogen only pill (POP)	Progestogen hormone only, taken daily with no break	99%	91%
Long-acting reversible contraception (LARC)	Contraceptive injection	Lasts three months	>99%	94%
	Contraceptive implant	Lasts three years	>99%	NA
	Copper intrauterine device (IUD)	Lasts up to 10 years	>99%	NA
	Intrauterine system (IUS)	Lasts up to five years and slowly releases a progestogen hormone in the womb.	>99%	NA
Barrier methods	Cervical cap	Inserted by user before sex and covers the cervix	92-96%	71-88%
	Diaphragm	Inserted by user before sex and covers the cervix		
	Male condom	May need to be purchased	98%	82%
	Female condom	May need to be purchased	95%	79%
Permanent methods	Male sterilisation	Needs referral for this procedure		
	Female sterilisation	Needs referral for procedure	99%	
Others	"Natural" family planning - or "rhythm method	Using one's own menstrual cycle to calculate which days have the lowest risk of pregnancy to have sexual intercourse	99%	76%

Despite a 10-year strategy to reduce teenage pregnancy, and a wide variety of contraceptive methods available on the UK NHS, most of which are free and accessible without referral from any healthcare provider, abortion rates have not reduced outside the under-18 age group; overall rate increased by 4% since 2016 and highest level since 2008.(33) Some important policy questions include: what could be done in the UK NHS to improve access to contraception and reduce unplanned and unwanted pregnancies? What needs to be done for the impact of Teenage Pregnancy Strategy to be sustained, and for it to benefit women who are well beyond the teenage years?

8.4 Contribution of UK primary care in delivery of contraceptive services

Around 96% of the UK population are registered with a general practitioner and it is a common source of contraception for nearly a third of women.(43, 44) Optimising the use of general practice to deliver the most cost-effective contraception to their registered population could be one solution to some of the policy questions posed earlier.

In April 2004, the UK introduced the world's largest healthcare related pay-for-performance (P4P) scheme into primary care, the Quality and Outcomes Framework (QOF).(45) QOF is part of the General Medical Services (GMS) contract for general practices which rewards practices for the provision of 'quality care'. Generally, P4P schemes have increased implementation of care processes but evidence of a positive impact on health outcomes in ambulatory settings is lacking. (46, 47, 48)

In 2009 general practitioners (GPs) were further incentivised to give advice about LARC methods to women attending for contraceptive care.(49) The aim of this target was to reduce the number of unplanned pregnancies by offering women seeking contraception advice on more effective methods such as LARC. To satisfy the criteria for this indicator, the primary care practitioner did not need to discuss LARC methods in full, but a leaflet covering the methods, or in some cases a text message that signposted the patient to resources would suffice. It is unclear if this was adequate as an opportunity to discuss the best contraceptive method for the patient

or whether it might be as tokenistic. Also, by highlighting LARC as a preferred method, some have cautioned the ethics of “state-sponsored” prioritisation of a specific method rather than a genuine conversation about awareness and choice.(50)

There is some evidence that this might have had some impact on LARC prescribing, but the impact on clinical outcomes such as abortions, and who benefited from this policy remained unclear.(51) P4P is one population based intervention that could be optimised in general practice, but it needs to be considered with other interventions already tested or in place, as well as a good understanding of how contraceptive care is delivered in general practice to consider the levers for improvement.

8.5 Contraceptive care during COVID-19 and the Pandemic

My period of PhD study included the pandemic due to SARS-CoV-2, I explained how this affected me professionally and academically in the Preface. To contain the spread of SARS-CoV-2 infection and reduce the risk of deaths in the vulnerable population, many countries worldwide began a series of “lockdown” measures to ensure people stayed at home and worked from home where possible, except for essential workers and activities such as to buy groceries and to exercise for a limited time. The UK government introduced lockdown measures from 23rd March 2020 until it was lifted in June 2020.(52, 53) General practitioners in the UK were advised to use total triaging and remote consultation models to assess clinical need for face-to-face consultations.(54) These measures resulted in one third fewer appointments in general practices in April and May 2020 overall compared with the previous year.(55)

General practice is the preferred setting for women to obtain contraception according to national surveys.(56, 57) Before the pandemic, women who request contraceptive advice might consult a GP or practice nurse in person or by telephone. A clinical assessment including weight and blood pressure examinations might be necessary to assess safety of some methods of contraception.(58) A face-to-face appointment would be required to fit/remove/administer some long-acting reversible contraceptives (LARC) such as injections and implants.

The UK Royal College of General Practitioners (RCGP) and British Medical Association (BMA) advised GPs on reprioritisation of some services during the early phase of the pandemic; the advice included routine contraception could continue “if possible” and cessation of LARC provision such as injections and implants. (59) This advice might have adversely impacted on women’s reproductive health, not least because general practice had always been a significant provider of contraceptive services, it was also the preferred source of contraception according to a population-based survey.(44, 57) This concern was not unique to the UK as a global survey of health providers, researchers and policy makers also reported women’s health would suffer because of disruption of “non-essential” services such as contraception.(60)

I felt there was a once in a lifetime opportunity to explore how the pandemic had impacted access to contraceptive care. Not only was there an important question that needed answering, but it would also be topical, contemporary and help to further my understanding of contraceptive care in general practice for this thesis.

8.6 Summary of this thesis

In the Literature Review (Chapter 2), I shall present the currently available literature on contraceptive care in general practice in the UK and in other high-income countries. I shall use this to present the gaps in the literature and how I would address these in the proposed research questions.

The chapter on Methodology (Chapter 3) will explain my justifications for my research methods based on different philosophical beliefs about knowledge creation and ontologies. This will be followed by a short chapter outlining my aims and objectives of this thesis (Chapter 4). The chapter on methods (Chapter 5) gives details on the research methods used to conduct the research questions presented after the literature review. The results of each of the five original research studies will be presented in Chapters 6 to 10 respectively.

Finally in Chapter 11, I will summarise the findings of the studies in my thesis, the strengths, and limitations, how they impact on policy, practice, and recommendations

for further research. I will also reflect on the PhD journey and what I learnt from this experience and reconcile some of the questions I have presented in this and other chapters.

9 Literature review

In the previous chapter, I set out the current state of contraceptive care both globally and in the UK, and there appears to be a mismatch between contraceptive need and provision. The aim of this PhD, and for this literature review, was to find out what and how primary care in Britain could contribute to improving contraceptive care to reduce the rates of unplanned and unwanted pregnancies. To do this, I needed to understand if the current provision and access to effective contraceptive methods were adequate; what the barriers were; and if there were groups of women who experienced care differently.

9.1 Aim of literature review

The aim of this literature review was to better understand how contraceptive care could be improved in British[2] general practice. The specific objectives were:

- To describe the current provision and access to effective contraceptives in Britain
- To explore the barriers to contraceptive care in British primary care
- To explore the experiences of women receiving contraceptive care from primary care practitioners

9.2 Method

Using Ovid Medline database, I conducted a literature search using two concepts: contraception (including as key word, and other terms such as “contraceptive”, “family planning services”) and general practice (including synonyms such as “family practice” and “primary care”). These terms were chosen to reflect the different

[2] Although general practice and the provision of contraception might be similar across the UK, the devolved nations’ health policies might have different programmes and priorities; for example, the Teenage Pregnancy Strategy only applied to England. Additionally, routine statistics on reproductive healthcare are reported by country; abortion statistics, for example, are published separately for England and Wales and Scotland. Until recently, Northern Ireland had a different legislation to the rest of the UK, so abortion statistics cannot be used to evaluate reproductive healthcare outcomes. For these reasons, my thesis will mainly focus on Britain (i.e., England, Wales, and Scotland), unless otherwise stated.

terminologies used over the years and in different countries. I limited the outputs to those with abstracts, published in English (or at least an abstract in English) published between 2000 and 2019, and those based in high income countries (World Bank 2018 definition).(61)

I limited the search to high income countries only because low- and middle-income countries were less likely to have developed primary care systems, so limiting to high-income countries would allow better comparisons of contraceptive services delivered in primary care despite different healthcare systems. I chose to examine studies published after 2000 because they were more likely to include a full range of contraceptive methods including long-acting reversible contraception (LARC) as research topics. For example, the new generation of subdermal contraceptive implant, Implanon®, a single-rod implant, was not licensed for use in the UK until in September 1999 so it would not be expected to be used widely for a few years after that. In addition, the clinical guideline for LARC published from National Institute for Health and Care Excellence was not published until 2005, so LARC methods would not have been widely used or known until then.(62) The search strategy for this literature review is detailed in Appendix -1 Literature review Search Strategy.

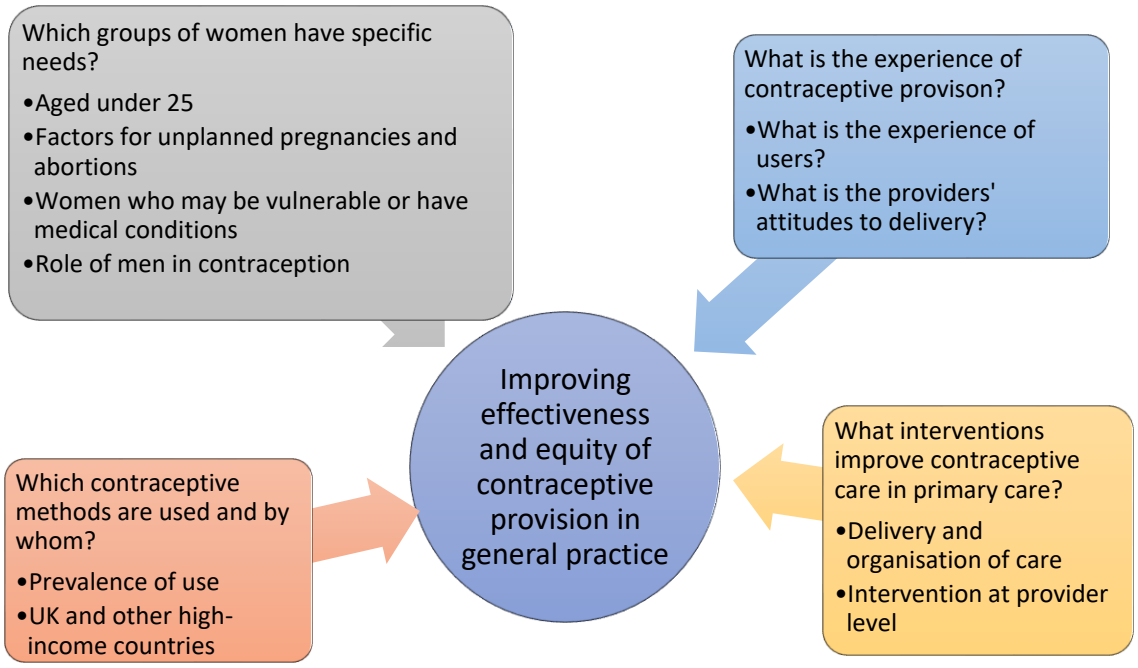
9.3 Results

A total of 848 publications were identified, of which 217 were relevant to the literature review. After screening the abstracts, I excluded review articles, study protocols and studies that focussed only on the use of contraceptives to manage conditions such as acne, and those whose focus was adverse effects such as venous thromboembolism. The remaining 83 studies examined contraceptive care with emphasis on primary care or delivery by primary care professionals.

I grouped the relevant studies into themes: descriptive studies of the prevalence of contraceptive use; the experiences and preferences of users; the contraceptive needs of specific groups; how healthcare is organised to deliver contraceptives; and experiences of users and attitudes of providers that hinder or facilitate effective contraceptive provision. These themes are summarised in Figure 1.

Although this was not a systematic review, I examined critically each of the studies' contribution to the scope of my thesis and validity of some of their findings.

Figure 1 A summary of literature review findings grouped into themes



9.4 Which contraceptive methods are used and by whom?

9.4.1 Prevalence of contraceptive use in the UK

To examine if contraceptive needs were met and what needed to be improved, I sought studies that reported on the prevalence of use of different types of contraception. There were very few sources that regularly reported prevalence of contraceptive use in the four UK countries (i.e., England, Scotland, Wales and Northern Ireland). The last representative survey of contraceptive use was from a household survey conducted by the Office for National Statistics (ONS – using random probability sample of 3,000 private households in Great Britain) in 2008. It reported oral contraceptive pills – particularly combined hormonal oral contraceptive pills were the most commonly used method.(63) ONS used to conduct this survey annually but this was discontinued. Despite not having regular surveys that used representative samples, other means of estimating population prevalence of

contraceptive use available in the literature used large database of electronic health records from general practices or data on prescriptions dispensed in community pharmacies.

Prevalence studies have been published that used electronic health records (EHR) from UK general practice. One such database is The Health Improvement Network (THIN) which is a medical research database of anonymised patient records and includes data from 3.7 million active patients. The data is recorded by primary care doctors in 562 participating general practices across the UK, covering 6.2% of the UK population. The data in THIN is representative of the UK population and has been validated for pharmaco-epidemiological research.(64) Studies using THIN database have suggested LARC use was relatively low compared with contraceptive pills and their use seemed to be more prevalent among older age groups. The prevalence of contraceptive use among women of reproductive age in 2008 was: COCs 16.2%, POPs 5.6%, IUD 4.5%, IUS 4.2%, progestogen-only implants 1.5%, progestogen-only injections 2.4%, contraceptive patches 0.1%. However, between 2004 and 2010, prevalence of progestogen-only implant use rose from 0.5 to 3.4%, and IUS from 3.1 to 5.2%. (65) LARC use, particularly the contraceptive implant, was increasing among in younger women but discontinuation rates were high.(66) A study using the same database found discontinuation rates of 7.5% for IUD, 10.6% for IUS, 13.2% for implants and 54.4% for contraceptive injections within the first year of use.(67)

The electronic health record database, IMS Disease Analyser (www.IMSHealth), contains anonymised computerised information systematically recorded by UK general practitioners. This database contains drug prescriptions, diagnoses and demographic data directly obtained from GP computer systems and has been validated for use in paediatric pharmaco-epidemiological studies.(68) A retrospective cohort study using IMS Disease Analyser database of adolescent females aged 12 to 18 years in the UK reported COC was the most prescribed contraceptive and this increased between 2002 and 2011. Although prescriptions of progestogen-only methods including the progestogen-only implant were lower than COCs, their use also increased during the study period; the authors were concerned however of the long-term safety of these methods on this age group.(69) Another study using a Scottish electronic prescribing data from primary care and sexual and reproductive

health clinics across Lothian reported relative proportion of 21.1% for all LARC and 15.3% for LARC excluding injections among contraceptive prescriptions of 90,000 women aged 16 to 49. Women in the most deprived quartile were significantly more likely to be prescribed LARC.(70)

9.4.2 Prevalence of contraceptive use in other countries

The relatively high prevalence of oral contraceptives and low prevalence of LARC seemed to be similar in other high-income countries such as USA, and Northern Europe. One study from Norway that used a database from mandatory reporting of prescriptions dispensed in community pharmacies reported a low and decreasing use of contraceptive injections among women aged 15 to 49 between 2006 and 2012.(71) Another study using the same database reported an increase in contraceptive implant prescriptions between 2006 and 2012 but it still only comprised 2.4% of all hormonal contraceptives sold in pharmacies.(72) Another Norwegian study of 359 young women aged 16 to 23 and 150 GPs reported COC (56%) and condoms (20%) were the most prevalent contraceptive and LARC use was low (12%).(73) A cross sectional study of over 400 women interviewed in Spain found similar proportions of contraceptive use among women aged 16 to 50 years; majority were using CHC (74%); it reported older women were more likely to use progestogen-only methods (14%) including the progestogen-only LARC. General practice was a frequent source of contraception as the family doctors prescribed 71% of the items.(74) In a study using electronic health records of 5,363 women aged 15-21 years receiving primary care within a large health system in Massachusetts, being older and having a primary care provider increased the odds of LARC use.(75)

The advantage of regular surveillance systems such as abortion data from National Statistics is that they produce detailed reports on abortions using statutory notification forms returned to the Chief Medical Officers of England, Wales, and Scotland. Apart from reporting the trends in abortions, other details in the statistics include: age groups, area of residence, ethnicity, by provider and previous abortions.(33, 76) There is not a similar reporting system for contraceptive use statistics; the data have been ad hoc and from different sources such as GP electronic records and prescriptions dispensed in the community. However,

contraceptive use reported from cross sectional studies in women of reproductive age – whether from surveys or electronic health records – might have some external validity at least in the UK because general practice has been reported as a preferred setting to obtain contraception so they might reflect contraceptive use in the general population.(63, 77)

9.5 Which groups of women have specific needs?

Most women of reproductive age in heterosexual relationships will be at risk of pregnancy during their reproductive life; typically 85% of women who do not use any method of contraception would have a pregnancy within a year.(78) However not all women experience the same risks throughout their life course, and some might have different risks compared with others due to different circumstances. While pregnancy is not necessarily an undesirable outcome, there will be those who want to delay childbearing and need contraception. Some women might have specific needs and difficulties in accessing the right contraceptive methods and might be underserved.

9.5.1 Young women under 25 years

General practice may have a role in reducing teenage conceptions. Young women attend for consultations in primary care, at least in high-income countries, but opportunities to prevent unwanted pregnancies might be missed if contraception and sexual health issues were not discussed. A case control study using GP records in the Trent region in UK noted missed opportunities for contraceptive counselling. Among 240 teenagers who became pregnant, over 90% consulted at least once and 50% over four times a year before getting pregnant. In addition, teenagers whose pregnancies ended in termination were more likely to have received emergency contraception before conception, suggesting the need for adequate follow-up.(79) A case-control study using the same cohort found half of those who had abortion had discussions about contraception and significantly more cases than controls had consulted for emergency contraception. The authors suggested there could be opportunistic interventions when seeing teenagers at high risk of unplanned pregnancies.(80)

Similar findings were reported from outside the UK. A retrospective audit of medical records using a random sample of 203 out of 829 eligible pregnant adolescent

women aged 15 to 19 years registered with a health maintenance organisation in Minnesota, USA, reported estimated average of 2.7 primary care visits in the previous 12 months before becoming pregnant. However, 57% did not have documentation of sexual activity and 47% did not have reproductive health counselling recorded; only 35% had any contraception prescribed in the 12 months prior to pregnancy which suggests some missed opportunities for contraceptive discussions. (81)

9.5.2 Factors associated with unplanned pregnancy and abortions

Young age is not the only risk factor for unplanned pregnancy as probability sample surveys have reported associations with medical conditions and lifestyle factors such as a history of depression and smoking respectively. The National Surveys of Sexual Attitudes and Lifestyles - Natsal - are among the largest surveys of sexual behaviour in the world; the surveys used a probability sample of the British population which meant that the results were broadly representative of the British population. The surveys have been conducted roughly once every 10 years from 1990 and the development of the newest wave, Natsal-4, has begun and the survey will be conducted in 2022/23. The third Natal survey - Natsal-3 - found depression, measured by reported treatment, was strongly associated with sexual risk behaviours, reduced sexual function, and increased use of sexual health services, with many people reporting help doing so from a family doctor.(82) Another study using Natsal-3 reported weekly binge drinking, early sexual debut, and younger age group being risk factors and knowing these help target STI testing and/or contraceptive advice and supply among women who have condomless sex.(83)

The findings from Natsal seemed consistent with literature from elsewhere. A systematic review of eleven papers reported unplanned pregnancy was associated with smoking, depression, being single and first sexual experience under 16 years.(84) Abortion was associated with lack of close parental relationship, leaving home at an early age, and relationship breakup. Non-use of contraception was associated with smoking, obesity, relationship status, sedentary lifestyles, fatalistic pregnancy attitudes and lower alcohol use. The authors concluded these psychosocial variables, particularly relationship status and smoking, might help identify women in primary care for STI testing and contraception advice and supply.

9.5.3 Women who might be vulnerable

Women with other conditions and risk factors not covered by these surveys and reviews might also have unmet contraceptive needs putting them at risk of unplanned pregnancies. For example, they might be more vulnerable and unable to express their reproductive health needs and for whom unplanned pregnancies might be troubling, or they might have conditions or treatments that put them at risk of foetal malformations and pregnancy complications. Examples of vulnerability may include women migrants or refugees who are socially isolated and/or do not speak English; women with mental health problems and learning disabilities who might be at risk of exploitation.

In a descriptive study of 104 women in five Dutch general practices, contraceptives were significantly less often discussed with and prescribed to refugees and other migrant women compared with native Dutch women.(85) A small retrospective study of contraceptive needs among 52 refugees in a primary care clinic in Canada reported 31% did not use any form of contraception and 12 had unwanted or mistimed pregnancy within the previous 12 months; the authors concluded there was a high unmet need for contraception among this population.(86)

Earlier, I mentioned a Natsal-3 study that depression was associated with sexual risk behaviours. An exploratory cross-sectional study of just over 200 women with enduring mental illnesses in Western Australia reported two thirds of the pregnancies were unplanned and of those who had a sexual encounter within previous 12 months, 28% were not using any contraception; however, over 90% were registered with a GP and nearly three quarters visited them within the last 6 months, which suggests potential for general practices to offer contraceptive support.(87) Another study from the US was a telephone survey conducted using a nationally representative, cross-sectional sample of 2,297 women veterans, aged 18 to 45 years, who used Veterans Affair Health Care system for primary care within 12 months prior to interview (survey completion rate 83%). Compared with women with no mental illness, women with any mental health disorder were more likely to report any unintended pregnancy than veterans without mental health disorders.(88)

Intellectual disabilities can put women at risk of unplanned pregnancies due to the risk of exploitation from non-volitional sex, and capacity to make informed choices

based on clear information among other reasons. A literature review examining the sexual and reproductive healthcare of people with intellectual disabilities recommended several practice recommendations to improve their care and experiences.(89) Among these recommendations included offering opportunities to discuss sex education, consensual sex, and use of contraceptives for menstrual hygiene as well as contraception.

Apart from vulnerability due to mental illness and intellectual disabilities, women with a history of drugs misuse may be further disadvantaged due to stigma around drug use. A retrospective cohort study of 376 women attending two primary care practices in North East England specialised in drugs misuse reported women opioid drug users had lower prevalence of regular contraception use, more abortions and higher annual incidence of chlamydia compared with aged-matched population.(90) The authors suggested some qualitative studies to explore underlying beliefs and attitudes about the low uptake of contraceptives.

9.5.4 Women with specific medical conditions

Some women of reproductive age with coexisting medical conditions such as HIV, heart problems and rheumatic diseases may be at risk of pregnancy complications and foetal abnormalities due to the condition and/or the treatment received. Just under 2,500 women of reproductive age (18 to 50) were studied using records from a probability sample of US HIV care providers who offered primary care, only 52% delivered comprehensive reproductive health counselling.(91) A cross-sectional analysis from the National Ambulatory Medical Care survey examined women with cardiovascular risk factors and found low rates of family planning visits.(92) A study of 2,455 women with rheumatological conditions from a large medical centre in Pennsylvania, US, reported a third (32.1%) received any prescription contraception, and only 7.9% of women used highly effective prescription methods (intrauterine devices, implants, and surgical sterilization.(93) This is especially concerning as 70% of women used at least one fetotoxic medication during the study which suggests potential to prevent foetal abnormalities from timely contraception advice.

9.5.5 Role of men in contraception

Lastly, there seems to be very little literature about how men are included in pregnancy prevention in primary care. A survey of 190 young men aged 15 to 24 seen in primary care in one US city reported 32% learned about pregnancy prevention, regardless of sexual activity.(94) Another survey of 427 men of same age range from another US city, 90% were sexually active and 71% had female partners but 23% were asked about family planning and only 32% offered with condoms and 35% were counselled about family planning.(95) Two studies from Malaysia also examined men's role in family planning. A cross sectional study of 443 men from a primary care clinic found use of modern contraception method was low and men who discussed it with their spouse and perceived family planning as a means of preserving their marital relationship were more likely to practice modern contraceptive method.(96) Another cross-sectional study at a primary care clinic of 167 participants found men who were older and from higher socio-economic class were more likely to take part in family planning roles.(97)

The probability sampling method of Natsal surveys meant their findings were likely to be representative of the British population. Most of these risk factors are usually documented in EHR in general practice so it might be possible to highlight women who might be at high risk for earlier intervention. Some could be identified easily from GP records and together with the risk profiling mentioned earlier, could be offered tailored intervention. Findings about specific groups apart from young age might be less generalisable from other smaller studies, nevertheless they might provide ideas for further research into reproductive health needs of specific population groups. Lastly, there is little in terms of intervention for men to be involved in reproductive care discussions with their heterosexual partners. Further research might be needed to explore how to involve men in this discussion and if there were any cultural differences.

9.6 What are users' knowledge, preferences, and experiences of contraception?

The literature has so far helped us to understand better about the pattern of use of different types of contraception and which women might benefit more than others from contraception. However, we also need to understand what and how some of these methods might suit their needs. Better understanding of user experiences and preferences might help to better match their contraceptive needs. We should also be interested in what happens at the interface between the user and their primary care professional as most of men and women obtain their contraception from primary care according to the surveys mentioned earlier.

9.6.1 Women's experiences of engagement with healthcare professionals

An internet survey of over 1,000 Belgian Facebook users aged 14 to 25 years old reported most were already using oral contraceptive pill and 80% obtained it from their GP; contrary to expectations, the sex of the GP did not influence likelihood of young women getting more information.(98) However although the sample was large, there were biases in the sampling as only Facebook users or those with online access could be surveyed, and over 75% of the sample was highly educated. These limited the external validity of the findings. Other factors also influence engagement with healthcare professionals (HCPs); a focus group study of Latin women aged 15 to 24 in the US reported effective communication and trusting relationship with a primary care professional facilitated contraception decision making.(99) The findings are also consistent with another study that examined 164 pregnant adolescents who stated positive communication with their primary are provider was associated with pregnancy prevention self-efficacy.(100)

9.6.2 What do women need to make informed contraceptive choices?

Some studies suggest women need basic information about contraceptive methods such as mode of action and unwanted effects. A questionnaire study of 145 women attending primary care in Atlanta reported discontinuing oral contraceptives due to side effects and most switched to less effective methods. (101) This suggested clinicians should discuss with them about making better informed choices. The

findings were consistent with another survey of women attending primary care centres in Pennsylvania who were prescribed contraception and non-contraceptive prescriptions. Those who were prescribed the former were more likely to seek further information about the methods later, suggesting contraceptive consultations were not adequate to provide enough information for decision making.(102)

Some primary care professionals might make assumptions about what women want to know during contraceptive discussions, but different women might have different preferences about how the chosen method could be suitable for them. A national telephone survey in the US of just over 2,300 women veterans aged 18-44 who received primary care at Veterans Administration reported contraceptive preferences, beliefs and self-efficacy varied by ethnicity and race. The authors suggested this might explain the observed disparities in contraceptive use and unintended pregnancies among different races and ethnicities.(103) A survey of just under 400 female students from three universities in Amsterdam reported young women also wanted discussions about delayed childbearing during contraceptive consultations. (104)

Having some understanding of user preferences might help to understand why some effective methods are not as popular in certain groups who are at higher risk of unpanned pregnancy. A focus group study with 27 young women aged 17 to 25 years from Australia reported barriers to LARC use included norms, misconceptions, bodily consequences, access and perceived lack of control over hormones.(105) Interviews with 30 adolescent women aged 14 to 18 years recruited from 2 urban school based primary care centres in Washington State, US, found five factors that influenced LARC choice among adolescents; these were: strong preferences about device specific characteristics, previous exposure to information from peers, family or healthcare professionals, knowledge gaps that affect informed decision making, circumstances or experiences that motivated a desire for effective /long acting contraception, and environmental constraints and supports that affect access to LARC.(106)

Other information that might be helpful to make choices about contraception and fertility control include awareness about one’s own fertility and the target of some contraceptive methods in terms of the fertilisation process. A cross sectional survey of women attending three different general practices in Australia found nearly a third

showed interest in fertility awareness, but only 2% correctly identified the fertile period in a menstrual cycle. 92% of the respondents believed women should receive fertility awareness education especially those using it for contraception.(107) One aspect of user attitudes not often discussed is some women's preferences for contraception that are affected by their belief that life begins at fertilisation, which means they might prefer to use contraceptive methods that have effects at pre-fertilisation stage. A survey of women from family practices and obstetrics/gynaecology clinics in two US states found up to 58% were unsure about mechanisms of oral contraceptives, IUDs, injections or natural family planning which meant their preferences might not be acknowledged.(108)

9.6.3 What are some of the barriers to accessing contraceptive care?

Qualitative studies have offered some insights into why some women found it difficult to access contraceptive care. For instance, some studies suggested young women felt stigmatised and shamed for requesting emergency contraception from healthcare settings such as general practice and emergency departments.(109, 110) One review that used a feminist perspective suggested whilst health care professionals felt it was appropriate to give emergency contraception to adolescent girls, they did not empower these young women enough because they felt ambivalent about adolescents being "irresponsible risk takers".(111)

Some studies also suggested internalised feelings of shame and stigma from women's own reproductive health choices which made it different for them to access care, whether it was related to menstrual health, contraception, or abortion.(112, 113)

A recent review of qualitative studies that used a feminist poststructuralist framework to examine women's contraceptive perceptions reported ways in which contraceptive beliefs and use were dependent on gender roles and power dynamics.(114) For example, power could manifest in contraceptive negotiations, where the male partner refuses to use contraception or condoms. In some cultures, it is normal for contraceptive decision making to default to men in the relationship; in addition, fertility preservation is essential to femininity in some discourses.

The literature in this section seems to be mainly surveys and studies from some US states and thus were limited in terms of methods and geography; there were few in-depth interviews and focus group studies especially in the UK. There are few studies that sought opinions of women on their experiences of obtaining contraception and how access and decision making could be made easier particularly for young women who are at high risk of unplanned pregnancies, as well as women with medical conditions who often have unmet needs. Nevertheless, the consistent message from these studies appears to be women's needs and preferences are different; they all need better information about different methods at are tailored to their circumstances. There appears to be a need to understand women's reproductive health needs from a feminist perspective.

9.7 What are contraceptive providers' knowledge, attitudes, and experiences?

9.7.1 Assumptions about patients' needs

I mentioned earlier that mismatch between service provision and need might be due to incorrect assumptions made about individuals' needs. A qualitative study using semi-structured interviews with 18 contraceptive users, 18 GPs and 9 pharmacists in Ireland found contrasting views between users and professionals. While users were more familiar with the oral contraceptive pill (OCP) and often started their contraception journeys with this method, they all admitted poor adherence throughout their reproductive life course. They also thought lack of information, misconceptions, lack of access and high cost to be barriers to using LARC. In contrast, GPs thought adherence to OCPs were good and were more likely to prescribe the methods that they were familiar with such as the OCP. Barriers to recommending LARC methods included time, cost to practice, training, and being deskilled in providing them. Pharmacists also thought adherence to the OCP was good and felt their role was limited to dispensing medication and providing information only when asked.(115)

9.7.2 Attitudes to LARC from UK HCPs

The assumptions made about a user's capacity to benefit, and preferences is highlighted particularly around the issue of LARC. In addition, misconceptions about unwanted effects of LARC were common, particularly intrauterine methods. A survey of 71 GPs in Hackney on London reported none would offer IUS as the first choice for nulligravid women under 25 years and instead would recommend OCP. 17% thought IUS was associated with an increased risk of pelvic inflammatory disease and 23% stated risk for ectopic pregnancy.(116) In a survey of just over 200 GPs from 69 practices in an English region, just under half of GPs and 8% of nurses reported being trained to fit intrauterine contraception (IUC), those not trained were more likely to state lack of knowledge of IUC as barrier to fitting and recommending IUC. Respondents were also less likely to recommend IUC to young nulliparous women, and women who had a history of ectopic pregnancy, recent STI or abnormal smear. The qualitative study reported much risk aversion, limited training, and HCPs' presumption that women were uninterested might lead to IUC being precluded as a suitable method.(117)

There were also those who knew LARCs were effective but felt ambivalent about recommending them. A survey of 486 GP principals in Avon, England reported just under half would fit IUD as an emergency contraception for under 16s and 72% would provide emergency contraception if requested by a 14 year old who had condomless sex the night before.(118) A survey of 321 healthcare professionals from general practice in UK cited a high proportion (80%) that endorsed LARC but half (50%) thought irregular bleeding deterred women from using LARC and a fifth (21%) were concerned about high discontinuation rates.(119) There were also misconceptions about the side effects of contraceptive methods.

9.7.3 Attitudes to LARC from HCPs in other countries

The misconceptions around LARC use especially in young women and ambivalence about promoting them is not unique to UK general practice. An online survey of 79 Flemish GPs' attitudes to LARC found almost a third did not discuss LARCs with adolescents and most recommend shorter acting contraceptives and stated uncertainty of their technical skills as main barrier. They also reported prejudices and traditions played a role in reluctance of GPs to recommend LARCs to

adolescents.(120) In a previously mentioned Norwegian study of young women aged 16 to 23 and GPs, women felt they didn't have enough knowledge about other methods and only 35% of GPs discussed LARC methods when counselling; the main determinant for GPs not discussing intrauterine methods was the woman's nulliparity.(73) The authors suggested the providers might need better awareness to improve choice for women. An interview study of 17 Australian GPs also found misconceptions, lack of GPs who fit IUCs and referral issues as main barriers to prescriptions and recommendation for IUCs.(121) A survey of 1,103 healthcare professionals which included 335 GPs, in 8 European countries and Canada reported many had gaps in their knowledge about IUC. The three main barriers reported included concerns about nulliparity (ranging from 25% to 83%), pelvic inflammatory disease (17% to 83%), insertion pain (7% to 60%) and infertility (6% to 55%) for nulliparous women; between 4% to 59% of healthcare professionals never proactively included IUC in contraceptive counselling for a nulliparous woman regardless of her age.(122) A retrospective cohort study of four general practices contributing to a continuous morbidity registration project in Nijmegen, the Netherlands, found GPs were more likely to fit IUDs in women who were married or cohabiting, around 30 years of age, with children but not if they were nulliparous.(123) A survey of 66 clinicians serving an urban, low-income community from adult primary care, women's health and adolescent practices in US reported that some of them were unlikely to recommend contraceptive implants who were nulliparous (8%), teenagers (22%), depressed (24%) or obese (22%). The authors concluded deficits in knowledge, restrictive practice and long waits might affect uptake of implants among a needy community.(124)

A US study using a "mystery shopper" approach to survey contraceptive providers in 199 clinics across 9 cities, reported that although the majority of primary care clinics (68%), family planning clinics (87%) and all obstetrics/gynaecology clinics offered the copper IUD, only 11%, 63% and 24% of these clinics offered it as emergency contraception respectively.(125) This was consistent with findings from a study using electronic healthcare records from 253 primary care practices in New York City which found although the number of IUD services increased, actual prescriptions of IUD remained low among practices.(126)

The above findings are consistent with a survey of over 100 researchers on reproductive health care including clinical and social science experts on LARC in US. It identified some barriers to its use including cost of device (63%), women's knowledge of safety, acceptability, and expectations, followed by a shortage of trained providers as a barrier especially in primary care providers.(127) A systematic review of barriers and myths surrounding intrauterine contraception identified the most widely explored barriers in published studies are those at the HCP level, although this finding did not specifically mention if barriers from primary care professionals were more prevalent.(128)

9.7.4 Quality of LARC provision in primary care

In contrast, there are studies that suggest intrauterine contraception in general practices in both UK and US were well received. A follow up study of 100 women aged between 18 to 38 years from a university general practice who opted for IUS, of whom 97 were nulliparous, reported 75 still had the IUS in-situ12 months after fitting, suggesting this was an acceptable method for this age group and among those who were nulliparous.(129) A retrospective study of 160 young women aged between 12 and 24 years who attended a primary care clinic in Maryland, USA reported a low 6-month discontinuation rate of LARC 11.3% and 12 month rate of 21.9%.(130) the authors suggested the results support the safety of LARC provision in adolescents and young women in primary care setting. Another prospective study that followed up the patients of 34 GPs who fitted 300 IUDs over four-year period reported that IUD was highly effective and acceptable and that the IUD fittings by GPs were safe and no different than by gynaecologists.(131)

In summary, many healthcare professionals such as GPs have misconceptions about suitability and acceptability of LARC use in young people and in women who have never been pregnant or had children, so women who might benefit from contraception such as LARC might miss out. Better awareness and access to training to fit LARC might improve access for more women. Likelihood of a primary care provider to give contraceptive advice include: their own knowledge and experience of the method, whether they were trained to provide LARC, gender, and their confidence about discussing the different methods. There is yet, no nationally

representative survey of primary care provider on their knowledge, attitudes, and practice on contraceptive care.

9.8 What interventions improve contraceptive care delivered in primary care?

In the previous section, I noted lack of awareness and training were cited as possible reasons why primary care professionals lacked confidence in promoting more effective contraception such as LARC in practice. Although education and training might appear to be solutions to improving awareness of contraceptive methods and LARCs, the impact on contraceptive use and delivery have been mixed.

9.8.1 Impact of interventions directed at the level of health care professionals

A complex intervention that included training in sexual health did not result in improved chlamydia testing and discussion of contraception among participating general practices.(132) However a qualitative study of the intervention highlighted how some young adults preferred general practice as a setting to deliver this programme compared to sexual health services which again highlighted the potential of primary care to deliver effective and person centred reproductive healthcare.(133)

Another way to improve contraceptive discussion to pre-empt inconsistencies in provider knowledge might include use of printed materials to give to patients, and to standardise contraceptive consultations. The use of standardised handouts to facilitate contraception counselling in primary care appeared to increase the rates of counselling from 0.8% to 5.2%.(134) However, a study in the North of England evaluated the use of a handout on IUC and implants to primary care and sexual health clinic attendees and they did not result in improved uptake.(135)

An audit conducted in an averaged sized inner-city general practice using electronic health records reported oral contraceptive prescribing could be improved by adherence to UK guidelines, and discussion about safer sex and LARC improved by using a template for consultations. (136) A randomised trial to improve quality of contraceptive care comparing empowering patients, computer decision support system and distribution of evidence based guidelines found that the first significantly improved GPs' performance during contraception consultation; whereas distributing

evidence-based guidelines and computer support did not make any difference to GPs' behaviour.(137)

Other provider level interventions such as the use of peer educators, expanding the role of nurses and pharmacists in contraceptive care, and pay-for-performance (P4P) schemes looked more promising. An online survey of over 100 GP educators reported they could be an untapped potential to increase training capacity for sexual and reproductive healthcare in general practice; 70% of those surveyed had these skills and experience and 40% were willing to train others in formal training programmes and LARC fittings.(138) A survey of 468 GPs and 1,142 practice nurses in Australia reported a majority (70%) agreed PNs could be involved in contraceptive counselling.(139) A reduction in the trend of emergency contraception consultations (including prescription of EHC) by general practitioners was observed in Australia when the EHC became available over the counter from pharmacies. However, the rate of unwanted pregnancy did not increase but stayed relatively stable suggesting women might be obtaining information and prescription elsewhere such as pharmacies.(140)

A more promising development was a pay-for-performance (P4P) to encourage general practitioners to give advice about LARC to women attending for contraception in primary care. An interrupted time-series study reported an increase in prescriptions of LARCs following the P4P policy, but the impact of this policy on adverse reproductive outcomes such as abortion and which women might have benefited from the policy was much less certain.(141)

9.8.2 Impact of interventions at the organisational level

Structural factors have been studied to examine how primary care could deliver better reproductive health care. An evaluation of contraceptive services in primary care in a London borough reported that practices did not often highlight confidential contraceptive services for young people in the waiting areas, therefore young people attending these practices might have lost out on accessing age-appropriate services.(142) This evaluation study highlighted a need to examine the quality of contraceptive care in general practices. Robust commissioning frameworks could be used to set high standards for delivery of LARC services from general practices, but

an evaluation of a range of commissioning contracts from London different boroughs showed wide variation in quality assurance and governance structures.(143)

Intervention at various points of contraceptive care delivery have been studied – on how to influence provider attitudes and consistency of care, provider behaviour and commissioning arrangements to improve quality of care. There might be further potential for these to improve behaviour and outcomes in contraceptive care in general practice but need further evaluation.

9.9 What was the impact of COVID-19 pandemic on access to contraception?

As mentioned in Section 7.1, the pandemic due to COVID-19 happened during the period of my PhD study and I had decided to use this opportunity to examine its impact on contraceptive care.

Widespread containment measures such as national lockdowns to control the COVID-19 pandemic resulted in reduced access to routine health services globally, including contraceptive care. In many countries including the United Kingdom (UK), much of primary care including contraception and long-term conditions management were deprioritised. A systematic review of over 20 countries reported healthcare use fell by about a third during the pandemic. (144, 145)

The United Kingdom government introduced lockdown measures from 23rd March 2020 until it was lifted in June 2020.(52, 53) General practitioners were advised to use total triaging and remote consultation models to assess clinical need for face-to-face consultations.(54) These measures resulted in one third fewer appointments in general practices in April and May 2020 overall compared with the previous year.(55) The advice also included routine contraception could continue “if possible” and cessation of LARC provision such as injections and implants. (59) This advice might have adversely impacted on women’s reproductive health, not least because general practice had always been a significant provider of contraceptive services, it was also the preferred source of contraception according to a population-based survey.(44, 57)

This concern was not unique to the UK as a global survey of health providers, researchers and policy makers also reported women's health would suffer because of disruption of "non-essential" services such as contraception.(60) Evaluation studies of contraceptive services have been conducted in the past, including during a period of social disruption such as a pandemic but there were not enough routine data collected prior to these to examine the impact of such disruptions. (142, 146, 147) A survey of women's access to female healthcare services in the UK conducted during the pandemic reported poor signposting about which contraception and sexual health (CASH) clinics were open and what was available in their area.(148) However, it did not specifically report access to LARC, and responses were limited to structured survey questions.

9.10 Summary of research gaps

National Statistics frequently report high abortion rates in women aged under 25 years and from deprived backgrounds. Assessment of contraceptive needs in general practice might be difficult as few studies report trends in contraceptive methods provided by UK primary care in different age groups and deprivation backgrounds, so it is difficult to target provision to women who have the greatest need.

Suboptimal knowledge and attitudes to LARC have been highlighted in HCPs but educational interventions to improve LARC provision have been disappointing; however, a financial incentive scheme appeared to be a promising intervention to improve promotion of LARC methods in general practice. There is yet no study that reports the impact of UK-wide P4P scheme on trends on reproductive health outcomes including contraceptive use and abortions, and its impact at the individual level, and differences between age groups and deprivation status.

Despite the contribution of general practice in contraceptive care, its high coverage of the population, and being the preferred source of contraceptive care for most women, there might be missed opportunities for earlier intervention to prevent unplanned pregnancies especially in women aged under 25. The literature consistently reported similar risk factors for unplanned pregnancies and some of these such as history of depression, previous history of abortion and smoking are routinely documented in electronic health records. This information could be used to

better identify women who might be at high risk of unplanned pregnancies for earlier intervention.

Lastly, reproductive health needs might vary through a woman's life course and according to individual preferences. A better understanding of their experiences might help to improve the provision of contraceptive care and advice to better match their needs.

The period of lockdown in the UK due to COVID-19 pandemic reduced access to contraception in general, but I speculated the curtailment of LARC and recommendations to use different methods such as condoms might have led to unmet contraception needs for some women during lockdown. Little is known about the impact of lockdown for women of reproductive age (16 to 54 years) and their experiences on contraceptive access, especially LARC. There was a need to examine the impact of the first wave of COVID-19 lockdown on access and experience of obtaining contraception from providers in the UK, especially primary care.

9.11 Proposed research questions

Based on the literature search and summary of research gaps, I proposed the following questions for this PhD:

1 *What is the impact of P4P scheme on LARC provision?*

2 *What are the factors for abortion in women attending primary care?*

3 *What are the experiences of women accessing contraceptive care?*

4 *What was the impact of lockdown due to COVID-19 pandemic on access to contraception in the UK?*

In the next chapter, I explore the research paradigms that underpinned the methods I used to answer the research questions.

10 Methodologies

In the last chapter, I reviewed the literature on sexual and reproductive healthcare that relate to primary care, published in the last 20 years to examine what the unmet needs and research gaps might be. I initially proposed three research questions for this PhD. To find the most appropriate way to answer these questions, I first needed to understand my own philosophical stance on how I seek to find answers. That is, how do I understand the natural world and explain the phenomena? What assumptions do I make about my search for answers and how I interpret them? Does universal "scientific truth" exist, or could there be more than one way of seeking answers and interpreting phenomena?

Methodology refers to the theoretical framework that guides data gathering, whereas methods are data gathering techniques. In this chapter, I shall explain the philosophical approaches to scientific methods and my justification for the choice of methods to answer the research questions and explain the caveats that are associated with each approach.

10.1 Paradigms in research

Different researchers and disciplines might subscribe to different paradigms, and these can affect how research questions are framed, how they are conducted and how findings are reported. In research, the term "paradigm" means the philosophical assumptions or the set of shared beliefs, values and generalisations that guide the world view of the researcher communities regarding the nature of reality and knowledge.(149) Traditionally, there are two diametrically opposing assumptions in which researchers can view the world and phenomena around them; these paradigms are broadly positivism and interpretivism and they reflect their ontological and epistemological positions on their views of the "reality".

In simple terms, ontology refers to the meaning of existence or reality and asks questions such as: what is reality, what does it mean to say something exists and how do you know what it is? Ontologically, realists will say there is only one truth or reality "out there" which is irrefutable and observed to be the same by everyone; whereas a relativist would argue that the world we know is only a representation in

our own consciousness and even that could have a different meaning to say, another animal being.

Epistemology refers to the theory and philosophy of knowledge and asks: how do you know something and how do we know what we know? Referring to similarly diametrically opposing thoughts: an objectivist's view of the world and truth is based on realism and positivism: knowledge exists and is independent of other conditions and that there is only one answer or way of seeing the world. Methods of investigation from a positivist's view would involve quantitative methods that aim to look for a single objective reality, and these methods would record the phenomena objectively, with no distortion due to value judgements of the observer.

In contrast, a subjectivist accepts knowledge and reality are constructed by individuals and the reality may be interpreted by different individuals under different conditions, i.e., they are *subjective*. Researchers such as social scientists reject the positivists' view that there is only one fact, and these "facts", when viewed from the philosophy of phenomenology, have different meanings to people from the same social world.(150) For phenomenologists, research setting needs to be unmanipulated (unlike the "test conditions" in clinical trials which do not bear resemblance to the real world), and the research subjects need to be studied in their "natural" world (quite unlike clinical trial participants who are usually healthy apart from the disease being studied). Their approach involves understanding and finding meanings of reality to individuals.

Despite apparently diametrically opposing ontological and epistemological positions, it is possible for researchers to shift between the two camps. This is particularly important in health service research where it is often difficult to say there is one irrefutable reality as medicine is full of uncertainties. There is thus a "third way" where some researcher communities believe reality needs to be constantly renegotiated and interpreted, so the best method to use is the one the solves the problem, which is the paradigm of pragmatism.

10.2 Pragmatism as the "third way"

Pragmatism rejects traditional philosophical dualism of objectivity and subjectivity and concepts such as truth and reality; rather than a philosophical position, it is open to different philosophical tools to solve practical problems in the real world, using methods of enquiry most appropriate for the question.(151) It allows the researcher to abandon the forced dichotomies which are positivism and constructivism (or interpretivism). As a research paradigm, its foundations derive from the philosophy of pragmatism and embraces a plurality of methods.(152) Some scholars have identified shared ideas about pragmatism as a paradigm; to summarise, no two people have the same experiences so their world view cannot be identical, but there may be overlaps in the shared experiences between them. Hence, their worldviews may be both individually unique and socially shared.(153) The pragmatist epistemology is that knowledge is always based on experience and an individual's worldview is influenced by their social experiences; therefore all knowledge is social knowledge.

The epistemological position of a pragmatist researcher sits between that of a positivist who acquires knowledge by examining empirical evidence and deduction, and constructivists who propose knowledge is relative, dependent on one's experience, and reality is too complex to observe and record. The pragmatist is situated in this paradigm continuum in terms of the mode of enquiry, rather than two diametrically opposite poles of either objectivity or subjectivity.(154)

10.3 Feminist research framework

As an extension of this philosophical discussion, research on women's health might involve studying the demographic and structural barriers that explain the processes and outcomes of care; naturally the focus is on gender, and this lends itself to application of a feminist framework. Despite an apparently natural and clear case for use of feminist research methodology for topics relating to women and women's health, there is no general agreement on what this means or what makes research "feminist".

Scholars have identified some common themes that share the values of feminism in research which help to distinguish “feminist research” from traditional social science research, such as those that study women or attend to gender but without an agenda for change.(155) One set of principles of feminist research include: dual objectives of construction of new knowledge and production of social change, the use of feminist principles in all stages of the research process, guided by the people involved in the research, and research that is characterised by diversity of disciplines and methodologies.(156)

Other scholars have attempted to define the key features of feminist research which include: rejection of positivism; the recognition of power differential in gender relations and experiences from women’s perspective; the recognition that research is not value-free and positivist influence on research paradigms serve to maintain the *status quo* in women’s oppression; and the use of “liberatory methodology” and the process of “conscientisation”, which involves study of the “oppressive reality by the subjects of oppression, where the [social science] researchers give their research resources to the oppressed so that they can formulate and come to understand their own problems”.(157, 158)

Feminist research paradigm differs because of the methodologies and purpose as part of the research process. Although definitions of this paradigm might differ among scholars, they have a common root of being informed by women’s struggles against different forms of oppression, while recognising that research is often conducted within institutions that are patriarchal. I will explain later and in the discussion chapter how a feminist approach has influenced the work of this PhD.

10.4 Research questions in relation to the paradigms

I shall first give a general overview of the research paradigms that I adopted for this thesis and then detail how there were used to frame the proposed research questions.

10.4.1 Pragmatist paradigm

I employed a variety of methods in this PhD to answer the research questions that I proposed. Together they offered empirical evidence to test out theories and hypotheses, and inductive approaches to generate hypotheses and theories. The quantitative methods were employed to examine the impact of the P4P scheme on outcomes such as LARC prescriptions and abortions; and determine if the P4P scheme had been effective or not. Quantitative methods also examined the presence and the strength of associations between abortion and pre-defined factors, which might help to explain which women attending primary care might be at risk.

A qualitative method was used to explore the experiences of young women in contraceptive care. Lastly, I used questionnaire tool with free text option to examine the access and explore experiences of women accessing contraceptive care during the first wave of COVID-19 lockdown in the UK; it was a mixed method questionnaire to meet the aims. A summary of the studies and how they fit the epistemological and ontological perspectives is presented in Figure 2.

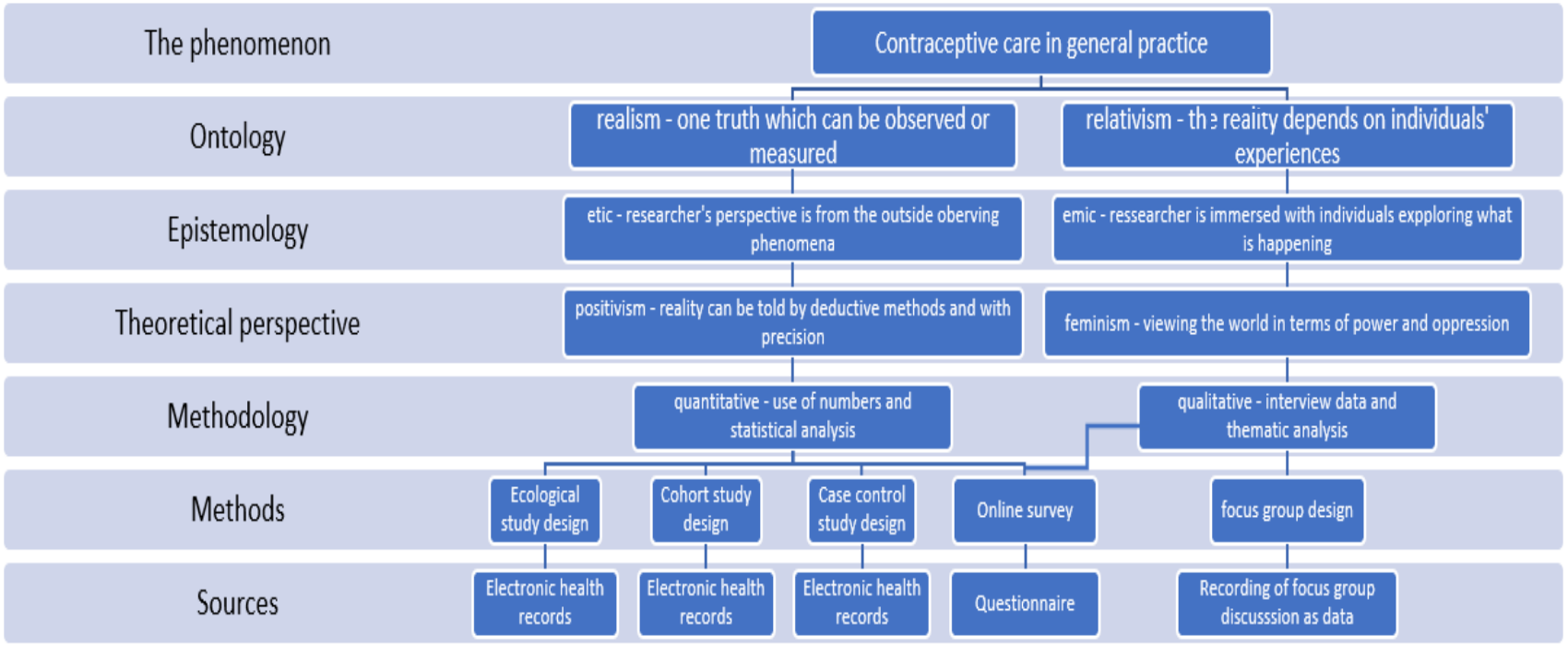
10.4.2 A feminist approach to research

Earlier, I discussed the different approaches of the “feminist” methodology and despite their differences, there is a common theme of recognising and exploring the power relationships that serve to oppress the marginalised groups. I have applied this approach for the research for my PhD. Not only have I sought a plurality of methods to answer the research questions, but I have also approached it in a way that flattened the hierarchy between the researcher and the research subjects, and for potential end-users of my research findings to have meaningful involvement in the production of the research.

Firstly, I consulted with my Project Advisory Group (PAG - which included individual women and those representing young people, sexual health and abortion charities) from planning, recruitment and discussing of the findings. The PAG wasn’t just involved in this study, they were involved with the PhD throughout and contributed to the design, interpretation, reporting and dissemination of the studies. I shall explain later in the discussion chapter why this approach was important. Further details

about this group are explained in the Methods chapter and Appendix 7 Project Advisory Group. Secondly, I decided to use a focus group method rather than one to one interview; the former lent itself to minimising the hierarchical relationships between researchers and the subjects. Thirdly, during the focus group discussion, I as a cisgender male doctor and researcher, was able to literally take a back seat so that I was physically as far away as possible from the group discussion. I also used a cisgender female facilitator again to redress the gender balance. One of the members of the PAG was a co-author and she was involved in analysing the focus group data. The other co-authors were also women, which meant the views of women were represented in the analysis and reporting of this study.

Figure 2 Summary of the research questions, working backwards to their methodology, epistemology and ontology



10.4.3 What was the impact of a pay-for-performance scheme to give LARC advice to women attending British primary care on contraceptive prescriptions and abortions?

I framed this question with a realist approach: I was aware of a financial incentive scheme that encouraged GPs to give LARC advice to women attending for contraceptive advice, and its aim was to improve awareness of more effective LARC methods and eventually see a reduction in unplanned pregnancies and abortions. This approach assumed a linear, biomedical process where women at risk of pregnancy, when given advice and chose to use LARC, might prevent an unplanned pregnancy (as measured by abortions), for as long as she used LARC. We want to know if X (LARC advice) caused Y and Z (increase in LARC prescriptions and reductions in abortions respectively) and by how much. This question would yield an answer which tells us if the intervention worked or not (one objective reality) and by how much (quantifiable reality that could be measured).

A randomised controlled trial would be the “gold standard” design for an experimental study to find out if an intervention had the intended outcome. As the intervention was a financial incentive policy delivered nationally, an experimental study would need to assign areas that had the incentive, compared with areas that did not. These areas would need to be as similar as possible so that any changes to outcomes are likely to be due to the intervention alone. However, as the financial incentive had already been implemented, it would not have been possible to conduct a trial. A trial that involved incentives and participation of enough practices from all over the country to give adequate power would have been very costly; hence, an ecological study would be a better alternative. This is an observational method to look for associations between disease and exposure; the unit of observation is the population, or the community and the disease rates and exposures are measured using readily available data, so it does not require resource intensive data collection.(159) In addition, my interest is the ecologic effects, i.e., the impact of an intervention or policy at a population level, as opposed to the biological effects at the level of the individual.(160) I chose a time-trend study using an ecological design to examine the trends in contraceptive prescriptions and abortions over a period,

comparing the rates before and after the financial incentive was introduced. I used electronic health records from general practices to extract prescription and abortion data over this period. Using an interrupted-time series (ITS) analysis, I was able to infer association between the outcomes and the intervention. ITS analysis is a strong quasi-experimental research design often used to evaluate impact of natural experiments such as health policy changes at a population level. (161)

The major limitation of ecological designs is “ecological fallacy” of making a causal inference from ecological effect estimates to reflect biological estimate at the individual level. For example, a number of ecological studies found association between consumption of fatty foods at the population level and breast cancer.(162) However, when examined at the individual level, this association disappeared.(163) The authors suggested a low-fat diet may be correlated with health-conscious behaviours, such as participation in mammographic screening, which may detect cancers earlier and thus artificially increase the incidence of breast cancer among women with low-fat diets. Further details about the strengths and limitations will be given in the Discussions chapter.

10.4.4 What is the impact of LARC advice on LARC prescriptions and abortions at the individual level?

As mentioned, the previous ecological study cannot make inferences at the individual level, so this study examines the impact of LARC advice at the individual level. I used a cohort design which followed up a group of eligible women from an electronic database of health records. I examined the association between LARC advice given and the prescription for LARC products and abortion events a year or two later. I compared eligible women who were given LARC advice with those who did not get the advice.

The philosophical perspective has not changed – that I am framing the question in a realist point of view and used positivist methods of enquiry such as quantifying the strength of association between intervention (LARC advice) and outcomes (LARC prescription and abortion events). Neither have I changed the biomedical assumption that women at risk of pregnancy, when given advice about LARC, would probably

have a much-reduced risk of unplanned pregnancies (measured by abortions) because they are generally more effective at preventing pregnancies.

There are limitations to using this method particularly for rare events as large numbers of both exposed and unexposed subjects are needed. In addition, there might be a delay before an exposure/intervention and an outcome so a long lead time may be needed for a meaningful measure. In this study, women who received LARC advice in year 1 may not receive LARC prescription until year 2 and longer; on the other hand, women who were eligible for LARC advice but did not receive it might take time to accrue risk of unplanned pregnancy, particularly if they were using another method of contraception.

10.4.5 What are the biopsychosocial risk factors associated with abortion in a British primary care population?

The question presumes a relationship between various factors and abortion, that these factors are observable, and the strength of such relationships could be measured objectively. Again, this question is framed ontologically from a realist perspective with an objectivist approach to its epistemology. I chose a case-control design as it enabled me to examine and compare the exposure histories of cases and controls, which are then compared to examine the association between the exposure and outcome. The main differences between this design and the previous are it does not require follow up over time, and it reduces the number of people without the outcome of interest that need to be studied. One main disadvantage is potential of selection bias if cases and controls are not comparable.

From an ontological point, all three questions frame the phenomenon of contraceptive care in general practice in a certain way, leading to hypotheses such as – LARC advice improves LARC use and reduce unplanned pregnancies as measured by reductions in abortions; women at risk of abortions have certain characteristics which can be identified using primary care data.

However, the underlying assumptions of these studies reflect only one reality, and the findings might not necessarily explain what is in the “black box”. There is also an assumption that women of reproductive age in heterosexual relationship want to

control their fertility, have volitional control, make rational and predictable decisions to prevent pregnancies and abortions are usually the outcomes of unplanned and unwanted pregnancies. There is an assumption that there is a causal pathway – notwithstanding confounders – which can be observed, measured, and represented by an algebraic equation which can then be used to predict this phenomenon in the "real world". We see later that ecological study and individual cohort study give slightly different results. We might speculate why this might be but designing a study using a different ontological perspective might offer us some insights and help us triangulate the findings to explain the phenomena.

10.4.6 What are the experiences of young women's contraceptive care?

For this last study, I deliberately chose a different ontological orientation. Discrepancies between expected and actual outcomes due to the intervention being studied are not unusual in experimental studies. Quantitative methods such as regression analysis can be used to understand which groups of subjects are more likely to have certain outcomes. However, not all explanatory variables can be measured, and other methods need to be considered to make sense of the phenomena. Human beings make sense of the world in their own way which might be complex and unpredictable. Therefore, methods used in natural sciences such as experimental studies using quantitative methods are unlikely to be useful to understand this. Questions such as: "What is going on here?", "Why do unplanned pregnancies happen?", and "What levers influence contraceptive access behaviour?", are not easily answered through quantitative methods because there are no effects being investigated or measured, and because they are processes that can only be explored using qualitative methods.(164) I therefore used a relativist approach and qualitative methodology to explain the phenomenon of the "black box". In other words, we need to have insight into the "black box" and a qualitative design is one way of doing so.(164, 165)

I wanted to explore the experiences of young women aged between 16 and 24 negotiating contraceptive care. This age group is often overrepresented in abortion figures and target of interventions such as the Teenage Pregnancy Strategy. Rather than interviewing them individually, I chose a focus group method instead. A key

advantage of a focus group is it allows for interaction between research participants which helps to generate the data.

10.4.7 What are the experiences of women accessing contraception during COVID-19 lockdown?

This study is a good example of pragmatic research: there was an opportunity to examine if women were able to access contraceptive care during lockdown and to explore what their experiences were like. However, the window of opportunity for research was short (due to a defined lockdown period) and due to lockdown measures, it was not possible to meet in person. The most pragmatic design was use of online surveys. There was little time to organise a well powered study such as a probability sample, so a convenient sample of women accessing the survey from various online platforms had to be used instead; this method of rapid data collection using online survey during COVID-19 pandemic was not uncommon.(166) Interview studies would have been difficult to organise, again, due to the lockdown and the short window; instead, free text option was used to explore individual experiences which were not captured by the survey questions.(167) Online surveys can be problematic due to the risk of biased sampling, poor response rates, use of unvalidated questionnaire instruments, among others.(168) Nevertheless, this design was useful to examine the extent of access to contraceptives during the lockdown using quantitative data from the questionnaire, and the free text analysis was useful to give another dimension to explore access and offered some explanations as to why it was problematic for some.

10.5 Summary

In this chapter I discussed the ontology and epistemology of knowledge and how different research paradigms could be used to answer the research questions, and the different approaches to research methods that corresponded to the different philosophies. Having some understanding of the philosophical stance behind methodologies helped me to justify the different approaches, understand the assumptions I made and appreciate the limitations of each approach. Further details of each study design are given in the Methods chapter.

11 Hypotheses, Aims, and Objectives

In the Literature Review chapter, I explored over 200 studies that examined contraceptive services in primary care from high-income countries. I reported that there is a need for good contraceptive care not just in the UK but worldwide. Although there is a range of effective modern contraceptive methods, many studies from different countries consistently reported a low prevalence of use of LARC (long-acting reversible contraception) methods which are more effective and longer lasting.

Apart from a handful of large probability sample surveys and a systematic review, the main weakness of the included studies is the external validation of the findings as many were small samples from a few cities in US, Australia, and other European countries. Although many have a primary care system, some of the organisation and delivery of contraceptive care might not apply to the UK context. Despite these weaknesses, there seem to be consistent findings about the prevalent use of different types of contraception among different age groups, as well as the attitudes and experiences of providers and users respectively on some contraceptive methods especially LARC. For qualitative studies, a meta-ethnographic synthesis might be helpful to contribute to the theoretical and conceptual insights for evidence based policy making.(169)

Low prevalence of effective contraceptive methods does not affect everyone equally. Young women under 25 years were overrepresented among low users of LARC and they were often also overrepresented in abortion statistics, suggesting possible mismatch between need and use. Some studies also suggested that LARC might not be the contraception of choice among healthcare professionals especially for young nulliparous women; this and the myths and misconceptions about LARC and other methods, and lack of capacity to deliver LARC could account for the rates of unplanned pregnancies and abortions.

Finding ways to ensure women with different needs and preferences who might be at risk of unplanned, unwanted pregnancies are matched with the most effect methods that suit them, might be key to improving reproductive health.

11.1 A conceptual model of contraceptive journeys

Not every woman has the same contraceptive need at any one time and throughout their life course. To understand the contraceptive needs of women better, I suggest a conceptual model to explain the typical “contraceptive journeys” of heterosexual women throughout their life course as outlined in Figure 3. This conceptual model is important to help us contextualise the hypotheses that underpin the research questions.

Firstly, not every woman aged between 13 and 54 are fertile as some may have early menopause, ovarian insufficiency or other conditions like polycystic ovarian syndrome which can impair fertility. Even if they were fertile, they might have different attitudes to pregnancy; some may not want to get pregnant, others might feel ambivalent about it, whereas others might be actively trying to conceive.

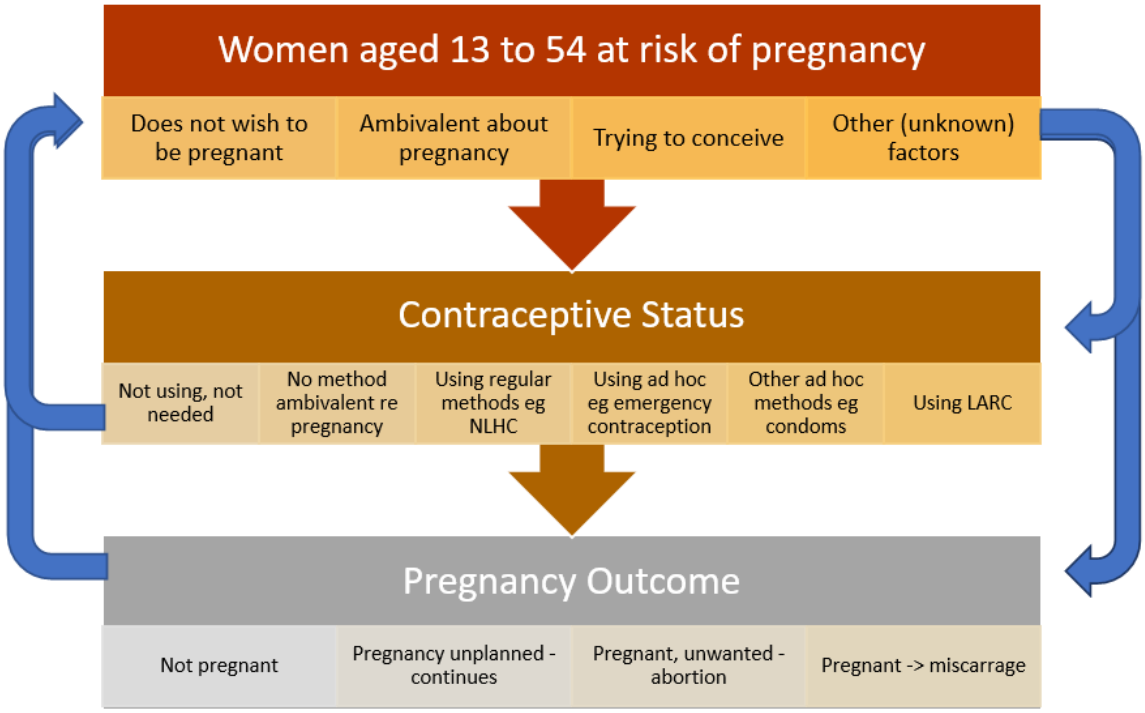
Women’s choice of contraceptives may or may not depend on their attitudes to pregnancy. It may also depend on whether they are in a (heterosexual) relationship and waiting for optimal time to conceive; or not in relationship and therefore do not want to use any regular methods. Therefore, although there might be effective and long-lasting contraceptive methods available, not everyone might feel they need it.

Lastly, when women become pregnant, it is possible for this to be received with mixed feelings. For example, it might not have been planned but it might be wanted. Also, whether this pregnancy would proceed might change with the woman’s circumstance; for example, a relationship beak-up might mean she is no longer able to support the child and she might opt for an abortion. Hence, not all abortions are avoidable or preventable; and not all women take contraception to “prevent an abortion”.

I have also added a couple of pathways outside of this linear conceptual model. One is that we cannot assume there aren’t other factors that operate outside this linear model of contraception journey. This will be explored further in the Discussion chapter. Additionally, women who have had experiences of contraception and pregnancy outcomes might take a different path in their contraceptive journey as their behaviour changed from experience.

Since it would be impossible and impractical to have a record of attitudes to conception and pregnancy for every woman who is fertile and at risk of pregnancy, I will assume that most women aged between 13 to 54 are at risk of pregnancy and each one is as fecund as the other. In addition, I will assume that the use of regular hormonal contraception suggests an active decision to avert a pregnancy. As unplanned, unwanted pregnancies cannot be measured, we shall use abortion as a proxy indicator.

Figure 3 Contraceptive journeys of heterosexual women throughout their life course



11.2 Scope of this PhD

This PhD will examine the role of general practice in delivery of contraceptive care for women aged 13 to 54. The setting will be UK-based but at times, it will apply only to Britain (England, Scotland and Wales); the rationale for this will be made clear in each of the individual studies. The studies in this PhD will not cover contraceptive care delivered in other settings such as private clinics, community pharmacies, sexual health clinics or secondary care settings.

11.3 Hypotheses

The hypotheses, based on the conceptual model in Figure 3, is that women who are using regular contraception (such as the oral contraceptive pill), might benefit from discussions about a more effective method (LARC). Offering advice on LARC may persuade some women to switch and therefore avert a potential unplanned pregnancy (resulting in an abortion). Furthermore, because of the nature of EHRs, it would be possible identify women who might be at risk of unplanned and unwanted pregnancies (as measured by abortions) for earlier intervention.

I speculated the restrictions in the first wave of lockdown because of COVID-19 pandemic led some women to use less suitable or reliable methods and suffered unwanted effects, or not used any contraception at all, with risk of unplanned, unwanted pregnancies.

Lastly, it would be possible to identify some women such as young women under 25 years to interview them about their experiences of contraceptive care and how primary care professionals could better meet their needs. As this is a qualitative study, it is usually regarded as hypothesis generating.

Having considered all the above, I propose the following aims, objectives and research questions for my PhD.

11.4 Aims

To examine the effectiveness and equity of contraceptive provision in general practice, explore where the unmet needs might be and how best to support women to make informed choices for their fertility control.

11.5 Research questions

1 Did financial incentives in general practice to offer LARC advice increase LARC use and reduce abortion rates in the British population?

2 Did offering LARC advice in general practice improve uptake of LARC and reduce risk of abortion in women of reproductive age at the individual level in Britain?

3 Which women registered in British general practices are at a higher risk of abortion?

4 What was the impact of lockdown due to COVID-19 pandemic on access to and experience of contraceptive care?

5 How can primary care professionals improve women decision making for contraception?

11.6 Objectives

1 Examine the equity and impact of P4P policy on reproductive health outcomes in women attending general practice including LARC prescriptions and abortions at a population level.

2 Examine the effectiveness of LARC advice policy to increase use of LARC and reduce abortions at the individual level.

3 Identity women who might be at risk of abortions in primary care and who might benefit from earlier intervention for contraceptive care.

4 Examine the impact of lockdown on women's access to contraception and explore their experiences

5 Explore women's experiences of getting contraception from healthcare providers and what would help them make the right choice for fertility control.

6 Make recommendations for policy, practice, education, and further research to improve effectiveness and equity of contraceptive care.

The next chapter will give details on the methods used to answer these research questions.

12 Methods

In the previous chapters, I explained the rationale for the various methodological approaches to answer the research questions and the hypotheses, aims and objectives of this thesis. This chapter describes each of the methods for the five study questions in detail.

12.1 Project Advisory Group (PAG)

One of the principles of feminist research is the recognition of power relationships and the experiences from a woman's perspective. The "feminist praxis" is a feminist belief system which advocates equal relationship between researchers and the research subjects, i.e. people whose lives are being researched. (170)

Although I have almost two decades of experience in delivering sexual health care and understand some of the issues, I will never be able to experience the reproductive health care from a user's point of view. For this reason, I set up a Project Advisory Group (PAG) for my PhD and the NIHR Doctoral Fellowship (Appendix 7 – Project Advisory Group). The group comprised of contraception users, sexual health care professionals, representatives from sexual health and abortion services charities, and peer education organisations. The aim of this group was to ensure that the research programme was relevant to the end users, i.e., women who need to use contraception.

It was also important for me that the members of the group had meaningful participation in my research programme. I felt strongly that a research programme on contraceptive care should include and hear from service users. In addition, the potential research outputs should be meaningful to and make a difference for users. One example of a 'meaningful' participation was the use of criminalised women in the coproduction of research in which research participation and involvement went beyond the process of research management and towards an understanding of how participation in the created research helped to respond to a group who faced oppression, and used their lived experience to coproduce knowledge.(171)

Initially, the PAG was involved in giving feedback about the Fellowship application; since the fellowship award, it has helped me in all parts of the research process. This included framing of research questions, advice on study design, recruitment of study participants for the focus group, interpretation of analyses and research outputs, pilot the Covid survey, help with press release and one member with research experience was involved in analysis and co-authored the focus group study. Further reflection about the PAG is detailed in the Discussions chapter.

12.2 Study 1 – What is the impact of P4P on LARC prescriptions and abortions in Britain?

The aim of the first study was to examine the impact of a pay-for-performance scheme to give LARC advice to women aged 13 to 54 years attending for contraception care in general practice on LARC prescriptions and abortions. I used an ecological study design to study the trends in rates of LARC prescriptions and abortions in Britain over a ten-year period; this included five years before and five years after the P4P scheme was introduced; in other words, a natural experiment to examine this P4P scheme. Using an interrupted time series analysis, I used the trend before the intervention to predict what would have happened if the intervention had not taken place (the “counterfactual”) and compared that with the actual trend after the intervention.

12.2.1 Ethical approval

In general, the Clinical Practice Research Datalink (CPRD) has broad National Research Ethics Service Committee (NRES) ethics approval for purely observational research using the primary care data and established data linkages so there was no need to apply separately for ethics approval. The study protocol was approved by the Independent Scientific Advisory Committee (ISAC) for Medicines and Healthcare Products Regulatory Agency (MHRA) database research (protocol number 15/076_R2 Appendix 2 – Supplementary materials for study 1).

12.2.2 Data source

I used CPRD “GOLD” database of anonymised electronic health records extracted from over 600 primary care practices in Britain (i.e., England, Scotland, and Wales) that were using Vision® GP software. It has a coverage of over 17 million registered patients broadly representative of age, sex and ethnicity of approximately 7% of the British population (172).

In October 2017, CPRD launched their “Aurum” database, which collects records from practices that use EMIS Web GP software. This database contains records of 19 million patients from 738 practices (10% of English practices).(173) There are some differences in structure and clinical coding in these two systems so the data are provided as two separate primary care databases at present. Although the Aurum database has a slightly better coverage of the British population, particularly in London, it was still new and needed some validation work at the time, so this and the next couple of studies were conducted using the GOLD database.

Clinicians use “Read codes” to codify some aspects of consultations in electronic health records; Read codes are a hierarchical clinical classification system containing over 96,000 codes, ranging from clinical symptoms and signs, diagnoses, referrals, investigations and processes of care.(174) The database structure broadly separates information into clinical, referral, immunisation, test and therapy. The variables in each folder include the Read code, the medical term used in CPRD, date of recording, and values (for investigations). In the CPRD, prescriptions are automatically recorded with a product name and code based on the British National Formulary (BNF). Prescriptions are recorded under the “Therapy” folder, which includes variables such as drug brand name, generic name, classification, quantity and date of issue.

As the EHR contains records of various prescriptions including a range of contraceptive methods that could be prescribed in general practice, it would allow examination of the trends in the use of different contraceptive methods prescribed in UK primary care over a defined study period. In the two previous chapters (Background and Literature Review), I mentioned a pay-for-performance (P4P) scheme introduced in general practice that incentivised primary care professionals to

give LARC advice to women attending for contraceptive care. As an intervention to improve uptake of more effective methods like LARC, instead of a prospective trial, it was possible to evaluate this recent intervention in UK general practice, as a “natural experiment”, using contraceptive prescriptions including LARC and abortions as outcomes to be measured.

12.2.3 Population

I created an open cohort within a study period spanning ten years from financial years 2004/05 to 2013/14, so women became eligible or censored at any time throughout the period of study. This was necessary due to the mobile nature of general practice populations; usually, patients may register and stay for a short period before moving to another area and register with a different practice. Those who move and join another CPRD practice are assigned a new patient ID, although their records move with them.

For individuals to be eligible for the study and included in the cohort, they must be coded as female, be at least 13 years old, and registered with a practice (current registration date, CRD) that was “up to standard” (UTS, when practice met data quality and completeness criteria). Using the dates of these events, individuals were included in the denominator count for each financial year, using the latest of registration date, UTS, start of study (2004) and year of reaching age 13. Individuals were censored from a denominator count using the earliest out of transferred out date (TOD, when patients left the practice), last collection date (LCD, date after CPRD extraction ceased), death (date of death DOD), end of study (2014) and year they reached 54 years old.

12.2.4 An example to illustrate the open cohort

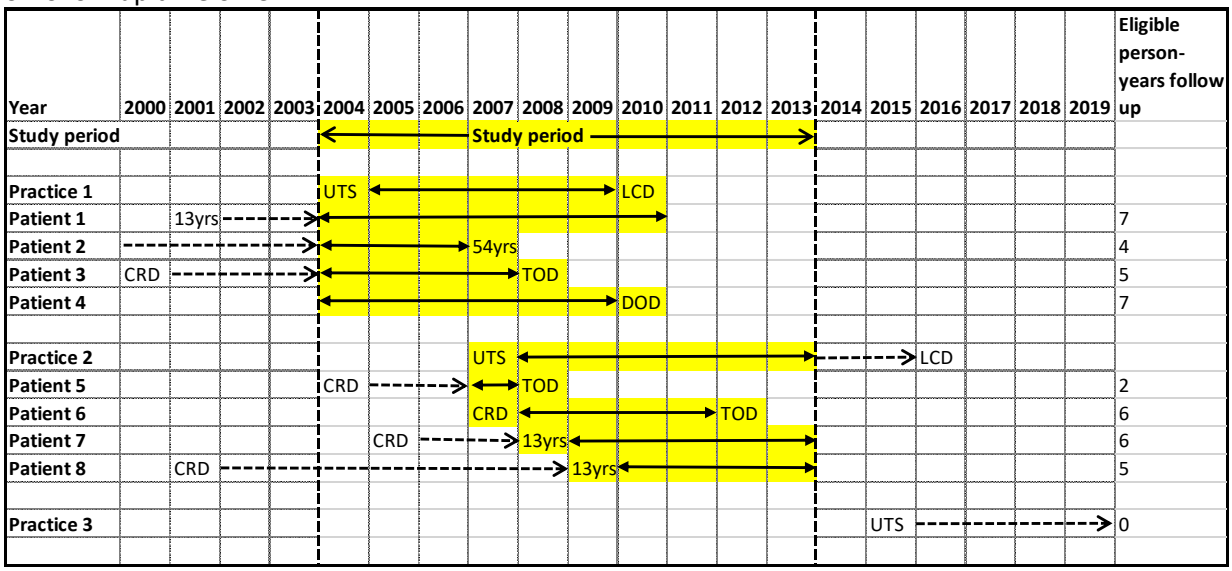
Figure 4 illustrates how individuals are included and censored in the open cohort using a hypothetical example of eight patients and three practices. The study period is 10 years between 2004 and 2013 inclusive.

Practice 1 became up to standard (UTS) in 2004, and the last collection date (LCD, date after which data ceased to be extracted to CPRD) was 2010. This practice

offers a maximum follow up time of seven years for all the patients registered. Patient 1 turned 13 years old before the study started in 2004 and remained in the cohort since the practice become UTS in 2004 until its LCD in 2010, giving a total of seven person years of follow up. Patient 2 turned 54 years old in 2007 so was censored after that, giving a total follow up time of four years. Patient 3 left the practice in 2008 so had total follow up time of five years. Patient 4 died in 2010 so contributed to seven years of follow up.

Practice 2 was not UTS until 2007; this meant patient 5 could not enter the cohort until that same year in 2007, but they left the practice in 2008, giving a follow up time of two years. Patient 6 stayed with the practice for six years, during which time they contributed to the follow up time. Patient 7 did not turn 13 until 2008 but contributed to the cohort follow up until the end of the study in 2013, giving a total of six years. Similarly, Patient 8 registered in 2001 but did not turn 13 until 2009; they contributed five years of follow up until end of study in 2013. All the patients from Practice 3 were not eligible because their UTS date was after the study period.

Figure 4 Illustration of how individuals are included and censored in the open cohort and calculation of follow-up time on CPRD



12.2.5 Outcome measures

The main outcome was annual LARC uptake, calculated by summing the total number of women who chose any LARC method, divided by the number of women in the denominator count for that financial year, expressed as per 1,000 women aged 13-54 years. I hypothesised LARC uptake would increase after introduction of the P4P scheme to offer LARC advice to women coming for contraceptive care in general practice. The same method was used to calculate annual non-LARC hormonal contraception (NLHC) uptake. I reported both NLHC and LARC prescriptions to examine overall contraceptive uptake and changes in method preference over the years.

The secondary outcome measure was annual abortion rates, defined as the number of abortions divided by the denominator count, expressed as per 1,000 women aged 13-54 years. I used abortion as a proxy measure of unplanned and unwanted pregnancy; notwithstanding the limitations, I hypothesised this would be reduced if more women chose to use LARC methods.

I calculated annual rates for LARC, NLHC and abortion and performed subgroup analyses by age, deprivation, and region.

12.2.6 Data management – patient and practice files

I extracted patient, practice, consultation, referral and therapy files and associated variables from CPRD. Due to the number of patients and the files associated with each person, the key technical challenge was to minimise the size of the files to allow for efficient running of commands and analyses on Stata.

The key variables I used included gender (coded as female only), year of birth and date of death from patient files; practice region, registration date, transferred out date (date patient left practice) and up to standard (UTS) date (when practice met data quality and completeness criteria) from practice files; Read term, event date from consultation files; and prescription item, quantity and prescription date from therapy files.

I minimised the patient files to only include those codes as female; using the year of birth, I excluded those who were older than 54 years old in 2004 and those who would not have reached 13 years old by 2013. For the practice files, I excluded practices whose UTS date was later than 2013 or if the LCD was before 2004. The merged patient/practice folder thus contained only practices that were UTS before or during the study period and were contributing to CPRD within the defined study period.

The UK is divided into 13 regions in the CPRD: North East, North West, Yorkshire & The Humber, East Midlands, West Midlands, East of England, South West, South Central, London, South East Coast, Northern Ireland, Scotland and Wales. My study focused on Britain (i.e., England, Scotland and Wales) rather than the whole of UK as access to abortion was restricted in Northern Ireland during the study period. Women often travelled to Britain to have abortion privately, which rendered Northern Ireland's abortion figures unreliable.

I assigned women to one of four age groups: 13 to 19, 20 to 24, 25 to 34 and 35 to 54 years. These groups represented policy focus on teenage pregnancy (aged 19 years or younger), sexual health services for young people (aged 25 years or younger) as well as different experiences across the life course such as in education and training, early adulthood, parenthood etc. Women were assigned to one of five population-weighted deprivation groups based on their residential postcode using English Indices of Multiple Deprivation (IMD) quintiles that range from IMD 1 (least deprived) to IMD 5 (most deprived). The IMD is a weighted combination measure of deprivation using 38 separate indicators across seven distinct domains identified in the English Indices of Deprivation: deprivation, employment deprivation, health deprivation and disability, education skills and training deprivation, barriers to housing and services, living environment deprivation, and crime; IMD data are available for the English population only (175).

12.2.7 Data management - abortion

Abortion events may be recorded in a few ways in the CPRD. Typically, a patient who is diagnosed with a condition and/or referred to another service for advice or treatment would be documented in the electronic health records with a Read code

representing a diagnosis or referral respectively; any interaction with the service would also be recorded (Appendix 2 – Supplementary materials for Study 1). A woman who needs to be referred for an abortion would usually have a problem or diagnosis code and/or a referral code to indicate an unplanned pregnancy and/or referral respectively (e.g., “referral for termination of pregnancy”, “referral for abortion counselling”). After the procedure, there may be correspondence from the abortion provider to indicate what type of abortion and when it took place among other details; again, this is usually documented in the electronic health records as “Termination of Pregnancy”, “legally induced abortion” etc. Abortion event was treated as a binary variable; in other words, a woman either had an abortion that year or they did not.

Women in Britain are usually referred for an abortion through their GP, hospital, or sexual health clinic. In some areas, they could also self-refer so this meant they could bypass a consultation with GPs without a record of a referral. Women could also withhold consent for information to be sent back to their GP after the procedure, so again, the abortion procedure might not be documented in the records. For these reasons and to minimise missing data, I compiled a list of codes that suggested both referrals for abortion and elective abortion procedures. Not all “referral” codes for abortion were in the Referrals folder, and not all procedure codes were in the Consultations folder – and these codes were often filed interchangeably between these folders. Therefore, I used these codes to look for events in both consultation and referral folders in the CPRD.

It is possible but rare for some women to have more than one abortion each year. During one episode of abortion care, a woman might also have both a referral code and procedure code recorded for the same event, which might make it appear she had two abortions in succession. Therefore, I counted only the earliest event in any year if there were two or more recorded within six weeks of another to be biologically plausible. This would help to minimise duplicate events for the same person each year.

For the purposes of this study, I treated all women aged between 13 and 54 years as equally fecund and at risk of pregnancy in any year regardless of pregnancy status, contraceptive use, and medical condition that might impair fertility.

12.2.8 Data management – prescriptions

I defined LARC as any branded or generic prescriptions of contraceptive injections, implants, IUS and IUD (Appendix 2). All other branded or generic prescriptions of CHCs (including pills, vaginal rings and patches) and POPs were grouped as non-LARC hormonal contraception (NLHC). The prescription of LARC and NLHC were treated as binary variables for analyses, i.e., they were either prescribed or not prescribed.

Given that the main aim was to evaluate impact of P4P on LARC uptake, I noted only whether LARC was prescribed at all for each woman in any given year, rather than quantifying the number of such prescriptions. LARC methods such as implants and IUD last from three to ten years, so were prescribed infrequently, whereas injections and NLHC were often prescribed several times a year. Therefore, for fairer comparison, I counted only the incident prescription of either a LARC or NLHC per woman per year, whichever was prescribed first. If women were prescribed more than one LARC product, I counted only the first product that was issued that year. LARC was treated as a binary variable: women were either prescribed a LARC method or they weren't that year.

For NLHC, any issue of an oral contraceptive pill, contraceptive patch, or vaginal ring counted as one issue of NLHC for that year regardless of which method was issued first. It was therefore treated as a binary variable. Contraceptive prescriptions are usually issued in multiples of 3 months or more; I included prescriptions only if they were of three months or more as any issues that were of shorter duration might not have been for contraception so were excluded.

12.2.9 Statistical analysis

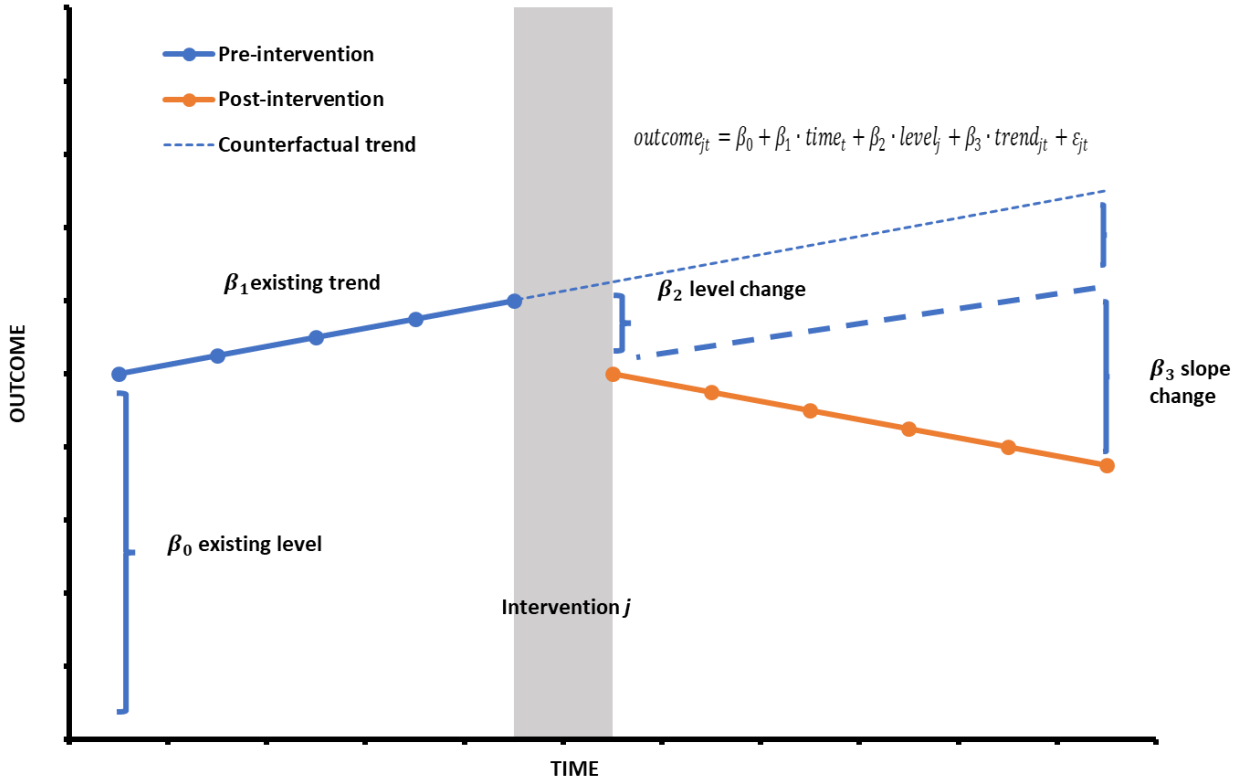
I examined outcomes using interrupted time series (ITS) analysis to compare trends in annual contraceptive uptake and abortion rates before and after the introduction of P4P in financial year 2009/10. ITS analysis is a strong quasi-experimental research design often used to evaluate impact of natural experiments such as health policy changes at a population level (161).

I used a segmented time series regression model for analysis. The regression is represented by Figure 5 and the formula:

$$〚outcome〛_jt = \beta_0 + \beta_1 \cdot 〚time〛_t + \beta_2 \cdot 〚level〛_j + \beta_3 \cdot 〚trend〛_jt + \varepsilon_jt$$.

Any outcome of intervention status *j* at time *t* is a product of four variables: the existing level β_0 at time *0;* β_1 represents the trend at time *t;* β_2 is the step change in level for intervention *j*; β_3 represents the trend line at time *t* for intervention *j*; with additional error terms for that time and intervention.

Figure 5 Time series analysis



I used annual time series of LARC, NLHC and abortion rates across the study period to establish the underlying trend (slope) prior to the introduction of the P4P scheme. I compared the observed post-intervention trend line with the continuation of the pre-intervention trend that would have been expected in the absence of an intervention (the counterfactual), in terms of the change in the trend post-intervention and the change in the level at the intercept (when the P4P was introduced in 2009/10).

The data were ‘time stratified’ by year, which permitted adjustment for confounding by “seasonality”. I excluded data for 2009/10 in the analysis to allowed for a one year “phase-in period” for the scheme to take effect. To account for auto-correlated data, I used autoregressive moving average (ARMA) models (176). The order of the moving average and the autoregressive model parameters were determined using multiple methods including scatter plots of the deviance residuals versus time, the Durbin–Watson test and the autocorrelation and partial autocorrelation functions (161, 177, 178). I used the maximum likelihood ratio test to assess the fit of the model parameters. I used the Generalised Least Squares (GLS) approach to run the final model, which is like a linear regression but allowed autoregressive and moving average processes.

I used the final model to estimate the absolute and relative changes 5 years after the P4P scheme was introduced.

12.2.10 Sample size

I estimated the lowest prevalence of LARC use was 1 per 1,000 for IUD in women of reproductive age from population surveys (179, 180); assuming an anticipated increase of LARC use by 15% when comparing the crude proportions before and after P4P, the sample size needed would be 174,644 women. An increase of 15% is both clinically significant and likely, given that previous studies reported a range of 6-20% (141). A sample size of 170,000 women would have been likely to detect a change of this magnitude before and after the scheme in 2009/10.

12.2.11 Sensitivity analysis

Although the incentive was introduced in financial year 2009/10, I allowed one full financial year for it to be fully implemented (“phase-in period”); this gave women time to respond to advice and start or switch to LARC. I compared the trends in crude contraceptive prescription and abortion rates with and without phase-in periods. To demonstrate the time it took to fully implement the P4P scheme, I calculated the proportion of eligible women based on the P4P scheme (those prescribed NLHC) given LARC advice per financial year from 2004/05 to 2013/14.

As mentioned earlier, women had been able to self-refer for abortions without having to see their general practitioner; they could also withhold consent for the clinic to inform their GP of the abortion procedure. Both scenarios could lead to missing abortion events on CPRD. To examine the impact of possible missing abortion events, I conducted a sensitivity analysis to examine the effect of artificially inflating the number of abortions after the P4P scheme by 20%, 40%, and 50%.

I used STATA version 14 (STATA Corp, College Station, TX, USA) to perform the data management. I used R Studio (Version 1.1.456 – © 2009-2018 RStudio, Inc. http://www.r-project.org) for modelling and statistical tests.

12.3 Study 2 – impact of LARC advice on LARC prescriptions and abortions at individual level

This was a cohort study comparing the outcomes of eligible women given LARC advice compared with those who did not.

12.3.1 Ethical approval

As for study 1. The study protocol was approved by the Independent Scientific Advisory Committee (ISAC) for Medicines and Healthcare Products Regulatory Agency (MHRA) database research (protocol number 15/076_R2 Appendix 1).

12.3.2 Population

As a starting point, I used the same cohort of women for the denominator population constructed for Study 1. However, there are two important differences in the denominator populations between this study and Study 1. As I was examining the impact of LARC advice intervention, which was not implemented until financial year 2019/10, the study period was shorter, a total of five financial years from 2009/10 to 2013/14 compared with 10 years in Study 1. The second difference is that the QOF business rules stipulated which women were eligible for LARC advice. This included women who were prescribed non-LARC hormonal contraception (NLHC) or emergency hormonal contraception (EHC) only. Therefore, the denominator population for LARC advice is much smaller than the denominator for Study 1 and only includes women who were using these methods in any one year.

With Study 1, I included women who were prescribed NLHC as anyone given at least a three-month supply of contraception (contraceptive pills, contraceptive patches and vaginal rings) or oral emergency hormonal contraception (EHC). As women might have had more than one prescription or each type or different method, I only counted the incident method of either NLHC or EHC. As the woman became eligible for LARC advice with either method of NLHC or EHC for any financial year, it did not matter how many times they were prescribed in a year.

12.3.3 Intervention

The P4P scheme was introduced in financial year 2009/10. For each woman who was prescribed either a NLHC or EHC, I looked for a LARC advice code for that year. A list of LARC advice codes (Appendix 3 – Supplementary material for Study 2) are available, and they were used and recorded on CPRD before 2009/10 but much more so after to achieve a 90% target for practices.

As mentioned, only women prescribed NLHC and EHC were eligible for LARC advice within a set period from the date of prescription. A woman might have different contraceptive needs in her lifetime so she might be eligible in some years and not in others. For each eligible woman, the advice given might be documented once or more than once or not at all in any given financial year. For analysis, LARC advice was recorded as a binary variable and women were deemed to have had advice if it was coded at any time in that year.

12.3.4 Comparison

The comparison groups were women who were eligible for LARC advice but did not receive it in the year they were prescribed NLHC or EHC. These groups included women who we could reasonably assume were fecund and at risk of pregnancy – hence the prescription for regular or emergency contraception.

I did not need to include women who did not use either NLHC or EHC but could have been at risk of pregnancy as they would not have been eligible for LARC advice and therefore their reproductive outcomes were not relevant in terms of the impact of the P4P scheme.

12.3.5 Outcomes

The primary objective of the P4P scheme was to offer the choice of more effective method of contraception, so I used the prescription of any type of LARC products within a single year as primary outcome measure.

Abortion events, which was a proxy for unplanned, unwanted pregnancy, were examined as a secondary outcome measure. The underlying assumption was that abortions were preventable by access to and use of LARC. Data from codes for abortion referrals and procedures were used in the same way as Study 1. For this study, I was interested only in any abortion event per person each year, rather than multiple events per person per year; in other words, I was interested in the proportion of women affected rather than how often they had an abortion.

Women given LARC advice might or might not have responded to the advice. If they did, it might have taken time for them to find out more about LARC, and in the case of implants and IUC, might take time to arrange. I assumed a reasonable time lag between advice and action. Therefore, I examined outcome measures such as LARC prescription and abortion events one year after the initial LARC advice.

12.3.6 Analysis

Using multinomial logistic regression, which extends binary logistic regression to an outcome with more than two categories, I reported the odds of categorial events (prescription of LARC and abortion) among the four groups of women (women using NLHC and given/not given LARC advice, women issued EHC given/not give LARC advice) stratified by age group and IMD. I used model fit statistics to check the outputs. To look for outliers or influential data points, I ran separate logistic models and used the diagnostics tools on each model.

To account for confounding, I conducted stratified analysis for women in both groups for age and IMD.

I used STATA version 14 (STATA Corp, College Station, TX, USA) to perform the data management and analysis.

12.3.7 Sample size

If 2% of those on contraceptives started taking LARC and 1% of those who received emergency contraceptives start taking LARC, then ignoring any clustering effect, I needed 3,300 patients per group for 90% power at 5% significance level. CPRD data extract contained more than 5 million unique patients (females aged between 13 and 54), and over 160,000 episodes of abortion between 2004 and 2014 so this study was feasible. The same would apply for comparing emergency contraceptive group and regular contraceptive group with abortion rates.

12.3.8 Sensitivity analysis

To account for the time taken for women to respond to LARC advice and for the risks of unplanned pregnancies to accrue, I examined and compared the outcomes one and two years after LARC advice was given.

12.4 Study 3 – What are the biopsychosocial correlates of abortion in women attending primary care?

This study used a case-control design to examine the differences between women who had abortions compared with women who did not, using biopsychosocial correlates such as history of mental health issues, substance use, deprivation among others. In the Methodology chapter, I discussed randomised controlled trials are the “gold standard” method for establishing a causal link between a disease and its predictors. This is because randomisation process allows enough “exposed” and “unexposed” groups to be as similar as possible regarding other potential risk factors both measured and unmeasured. Matching cases with comparison groups is another way of trying to ensure both groups are as similar as possible and to control for available confounding factors.

The risk factors such as age, deprivation index, risk taking behaviour (such as smoking and alcohol consumption), and vulnerability due to medical diagnosed or other conditions (e.g., mental health problems, domestic violence) might be recorded in the EHR and it would allow me to examine the associations with abortions. An important consideration here is that access to abortions was not similar in all UK countries; Northern Ireland had restrictive access to abortions and many women had

to travel to Britain to have an abortion procedure. This would make abortion figures for Northern Ireland unreliable and difficult to compare with the rest of the UK. For this reason, the study will focus on Britain only (i.e., England, Scotland, and Wales).

12.4.1 Ethical approval

The ISAC process was replaced by Research Data Governance (RDG) process from 1 June 2021. The RDG process includes an independent scientific review and patient advice provided by Expert Review Committees (ERCs) and the Central Advisory Committee (CAC) respectively. The study protocol was approved by the by the RDG process (protocol number #21_000543 Appendix 3).

12.4.2 Data source

I used the CPRD database of anonymised electronic health records extracted from over 600 primary care practices in Britain. As this was a different study to Study 1 & Study 2 with a different research question, I submitted a new request for data extraction from CPRD (protocol ID 21_000543, Appendix 3).

12.4.3 Population

I extracted records for women aged 13 to 54 years registered with a practice contributing to CPRD between 2004 and 2013. Every woman between the ages of 13 and 54 registered with a practice for any part of the financial year were considered potentially “at risk” of unplanned pregnancy.

For the purposes of establishing an association between abortion and predictor variables, I defined “cases” as women aged between 13 and 54 years old who had ever had an abortion event between 2004 and 2013. For each case, I selected two women as controls who were the same age (using year of birth) and from the same practice as the case. Matching by age reduces the confounding effects it has on abortions as women under 25 years are overrepresented in abortion statistics. It also means cases and controls are comparable in terms of life stages and their associations with abortions. In addition, matching by practice ensures the samples were taken from a very similar population reflected in the catchment area of the practice.

The memory capacity of the server I was using to run Stata limited the number of patients I could use in the sample to run smoothly without crashing. After several attempts, I used a random sample of 2.5% of the population to look for cases and performed a 1:2 matching by age and practice.

I examined variables that have been reported in the literature which are correlated with abortion, including documented risk-taking behaviour (alcohol, smoking and drug use), psychosocial factors (depression, anxiety, domestic violence). I used the same code list for abortion and contraception as for previous studies and created a code list for the predictor variables (Appendix 4). The most time-sensitive variable would be smoking as people could change their status throughout their life course. Only the most recent documentation was used, as this was considered the most relevant regarding the woman's smoking behaviour.

As I was examining the association between abortion and associated factors, the timing of documentation of the predictor variables relative to the date of abortion would not affect the analysis. The timing might be relevant for example in a cohort study to examine the risk of various outcomes after an abortion, or the "hazards" of an abortion event after the predictor variables were recorded. For the purposes of this study and except for smoking status, a recording of the predictor variable at any time relative to the abortion date would suffice.

12.4.4 Sample size

A sample size of 10,000 women who had with abortions compared with up to 100,000 who did not would give a power estimate of 90% power at 5% significance level to find very small effect size of only 3.5% of the standard deviation. There are enough episodes of abortions and many more unique patient records in the CPRD cohort for a well powered study.

12.4.5 Analysis

I used unadjusted and multiple logistic regression to analyse the data and present as odds ratios with 95% confidence intervals to compare postulated risk factors between cases and controls.

Age and deprivation were the main confounder for abortions; the incidence of abortions is highest in women aged 20-24 compared with other age groups. As I had already used age (as year of birth) to match cases with controls, I used deprivation measures to stratify the analysis. Women were assigned to one of 5 population-weighted deprivation groups based on their residential post code using English Indices of Multiple Deprivation (IMD) quintiles that range from IMD 1 (least deprived) to IMD 5 (most deprived).

I used STATA version 14 (STATA Corp, College Station, TX, USA) to perform the data management and analysis.

12.4.6 Missing data

I noted there were missing smoking records in this dataset, and a disproportionate number of those who did not have an abortion had missing smoking data compared with those with a history of abortion (47.4% vs 3.6%); more detail is given in the Results chapter. Therefore, using a complete case analysis (CC – a simple approach of excluding all individuals with missing data) would likely introduce bias to the analysis. It was also not appropriate to use last observation carried forward (LOCF) method as the analysis only needed the latest documented record of smoking status in the study period and missing data suggests none was documented during this time.

Imputation was performed using covariates (age, depression, anxiety, severe mental illness, drug misuse and alcohol misuses) judged to be most likely to be associated with smoking consumption. One analysis used 20 imputations, and another was repeated using 100 imputations to examine if it offered a better estimate of missing smoking data.

12.4.7 Sensitivity Analysis

For all the variables, I assumed a documented coding with associated event date meant the condition was present; conversely, I assumed an absence of the code and event date meant the condition was not present. For example, I assumed that patient had no history of alcohol dependency if there were no codes that suggested that.

However, this was more difficult to assume for health status codes such as smoking, as missing smoking information may suggest any of the smoking status.

Not everyone had their smoking status recorded in CPRD, and the data might be missing completely at random (MCAR, where the “missingness” was completely due to chance and not associated with any of the observations) or missing at random (MAR, where the missing data may be related to certain observations, for example, women not using contraception might not have their smoking status recorded, but women with drug or alcohol use might be just as likely to have their smoking status recorded). The missingness, however, was unlikely to be “missing not at random” (MNAR, where missing data is systematically associated with an observation).

As missing data were imputed based on the assumption that data were either missing completely at random (MCAR) or missing at random (MAR), and if missing at random, could be associated with certain variables. I carried out a sensitive analysis to test if these assumptions were correct.(181) Firstly, to test the distribution of imputed smoking variables, I repeated the analyses using four scenarios: replacing all missing smoking data to “non-smokers”, substituting missing smoking data with “ex-smokers”, substituting with “smokers”, and finally allocating al missing data across randomly but equally among the three smoking categories. I then compared these estimates with those of smoking prevalence among females aged 30 to 100 years were reported as 55%, 20% and 22% of non-smokers, ex-smokers and smokers respectively in one study using the CPRD.(182)

Secondly, I tested the assumption that the imputed variable might be associated with certain variables by re-running the analysis without such associations. Lastly, I tested if the number of imputations made any difference to the outcome.

12.5 Study 4 – what are the experiences of young women of contraceptive care?

The first study helped to understand the impact of LARC advice given by GPs on contraceptive prescriptions and abortions at the population level; this was explained further at the individual level in Study 2. Study 3 offered some insight into some of the factors for unplanned pregnancies using abortion as a proxy measure. However,

none of this helped to understand why and how women access contraception and what other contextual factors help to understand their use. For this reason, I needed to do a qualitative study, which would help to interpret the findings from the previous three studies.

12.5.1 Ethical approval

I sought ethical approval for this study and was granted. This study was approved by Imperial College Research Ethics Committee (ICREC reference 19IC5086 Appendix 5 – Supplementary material for Study 4 Focus Group Study).

12.5.2 Design

Young women might find it intimidating to undergo a one-to-one interview with a researcher but might find it easier to discuss certain issues among peers instead. Therefore, I conducted a qualitative study using focus groups. Compared with individual interviews, focus groups might be less resource intensive, but they can limit the amount of time each person contributes to the discussion. On the other hand, this method allowed for interactions, discussions, and sharing of experiences among group members. The interactive dynamic also allows group members to sound out their own experiences and explore meanings with others.(183)

12.5.3 Research Team

It is important to be aware of how the research team might affect the behaviour and responses of focus group members. Recognition of these factors help to reflect on our findings and how to interpret them. Our research team comprised of me (RM) and 4 women (Dr Lorna Hobbs, Ms Rebecca Blaylock, Professor Sonia Saxena, Professor Helen Ward). I have over 20 years' experience of working in sexual and reproductive health services and general practice. LH has experience of conducting interviews on sensitive topics. RB is a researcher at an abortion provider. All researchers, including SS and HW have experience of qualitative research on sexual health and vulnerable groups.

12.5.4 Recruitment and data collection

I aimed to recruit between 8 and 12 people for the 16-19 and 20-24 age groups. I used convenience sampling via social media to recruit into two focus groups: one group aged 16 to 19 years ("younger group") and another 20 to 24 years ("older group"). These age groups reflected women in different life stages and experiences; the former group likely to be in education, and the latter group likely out of education and some in relationships/and or have children.

I used social media platforms to recruit because it had a wide reach potentially and the promotion targeted to the demographics needed for the study. Following advice from the PAG, I designed a poster for social media format (including a £50 Amazon voucher) and posted on Twitter. Following poor response, I chose another platform – Instagram – and used their promotions feature. There are guidelines for promoting content on Instagram (owned by Facebook) and Facebook. This includes subtle differences in wording that do not inadvertently disclose personal information for anyone who interacted with the advertisement.

The Instagram promotion feature also allowed targeted promotion according to gender, age, location and content. The cost of promotion was a product of the number of days of promotion and the intensity of exposure each day, i.e., the same budget could pay for a longer, less intense promotion or vice versa.

The recruitment ran for two weeks in July 2019 on social media (adverts shown in Appendix 5). Potential participants contacted me through social media and were sent study information and consent forms (Appendix 5).

The focus group discussions were led by an experienced facilitator (LH), lasted 1.5 hours each and took place in a central London venue. Participants were made aware of my background and of LH's during introductions. I was present as an observer, made field notes, and answered any technical queries about contraception. Discussion topics included experiences of obtaining contraception and what changes they would like to see to make it easier (Appendix 5); participants were able to discuss any issue relevant to contraception.

I recorded the discussions digitally and sent the files to a professional transcription service (www.transcriptdivas.co.uk). Apart from one minor transcription error due to muffled speech on the recording, which was corrected, participants verified the transcripts were an accurate reflection of the focus group discussion.

12.5.5 Analysis

I used a process of "reflexive thematic analysis" as described by Braun and Clarke, which identifies themes or patterns of meaning in qualitative data but with a flexible theoretical orientation.(184) There are differences between usual thematic analysis and reflexive thematic analysis (RTA). In the latter, there is no assumption of reliability of the coding framework among the researchers, as each interpretation of the coding is considered a reflection of the researcher's interpretive analysis of the data conducted. The difference in interpretation depends on everyone's theoretical assumptions of the analysis, and their analytical skills. RTA therefore does not naturally assume one (right) way of interpreting the data but instead, it is important to be explicit about the process, and being cognizant of researchers' theoretical assumptions.

The coding framework was developed inductively as I analysed the transcripts. Three of the co-authors (RM, LH, RB) met to discuss initial interpretation of the data. I then conducted a thematic analysis – I read the transcripts to familiarise myself with the data, coded the data, and reviewed initial themes. The co-authors went through an iterative process of re-reading the transcripts, comparing our coding scheme to discuss emergent themes, divergence and their interpretation, until no new themes could be developed.(184) The iterations of the coding scheme is shown in Appendix 5.

We discussed different theoretical frameworks to interpret the data. I developed an understanding of the feminist approach during our discussions, and this lead me to adopt it as a framework to explain how societal attitudes, norms and assumptions about gender roles, gender inequality and power that are grounded in institutions might have impact on contraceptive care and access. I used NVivo ((NVivo 12, 2019 QSR International) to organise the data for thematic analysis.

12.6 Study 5 - What was the impact of lockdown due to COVID-19 on access and experience of contraceptive care?

12.6.1 Ethical approval

This survey was deemed to be a service evaluation by the UK Health Research Authority so did not require ethics approval.

12.6.2 Design

Evaluation studies of contraceptive services have been conducted in the past, including during a period of social disruption such as a pandemic but there were not enough routine data collected prior to these to examine the impact of such disruptions. (142, 146, 147) Although direct observation was not possible during lockdown, patient experiences could be assessed using online questionnaires.

12.6.3 Method

I developed an online questionnaire to ask women's experiences of accessing contraceptive care during the lockdown period (Appendix 6). Participants from a convenience sample were divided into those who were not using contraception at the time and were seeking to start; and those who were considering changing methods or repeat supplies.

12.6.4 Survey development

I developed a questionnaire using an evaluation framework encompassing, acceptability, relevance, and equity; this was based on Maxwell's dimensions of quality which has been used to evaluate contraceptive services previously. (142, 185) The questionnaire aimed to address these dimensions by using fixed and free text responses as shown in Table 2; participants were also invited to make free text comments not covered by the questions at the end of the survey.

I speculated three scenarios when women would need contraceptive care from providers during the pandemic: those not using a regular contraceptive method at the time of the survey but were looking for advice or a prescription; those who

obtained contraception before the lockdown and needed a change or repeat prescription; and those who obtained contraception during the lockdown. Respondents were streamed to one of these three groups according to their contraceptive use at the time of the survey to ensure the questions were relevant. For those who had obtained or were seeking contraception during lockdown, they were asked if they anticipated or experienced difficulties obtaining contraception respectively. These are examples of a "skip patterns" or "adaptive questioning" where irrelevant questions are "skipped" depending on the response given to the previous question (Appendix 6).

Table 2 Maxwell's evaluation dimensions and related sources of data from survey

Dimension	Survey questions	Responses
Access	"Where did you get your method of contraception?" "Do you expect any problems getting future supplies?" "Were you able to obtain contraception that you wanted (before/after lockdown)?"	Drop down options Yes/No – drop down menu and free text if "yes" Yes/No – drop down menu and free text if "no"
Acceptability	"Did you have any problems getting your supply?" "Were you happy with the alternative method?"	Yes/No – drop down menu and free text if "yes" Yes/No – drop down menu and free text if "no"
Relevance/ appropriateness	Survey question: "Did you get the method you wanted/needed?	Yes/No – drop down menu and free text if "no"
Equity	Demographic data e.g., age, sex, location and if this was the usual place of residence during lockdown.	Drop down menu Free text comments

The survey title page included information on study aims, eligibility, and consent procedure. The survey was designed to be completed online anonymously; no incentives were given for completion, participation was voluntary; participants could review their responses and withdraw at any time. I designed the survey (Appendix 6) using Qualtrics software (version May 2020, copyright © 2020 Qualtrics, Provo, UT, USA https://www.qualtrics.com). There were 27 questions over 17 pages including demographic questions and consent page; the rest was divided among participants who were / were not using contraception, and whether they obtained contraception before or after lockdown. The title page included participant information, eligibility (cisgender women, over 16 years and living in UK) and consent (

Figure 6). Participation was voluntary, no incentives were given for completion. There were links to information on contraception and abortion, and contacts for study authors at the end of the survey.

I obtained data on gender identity, age and location; the last to ascertain if participant was at usual place of residence or elsewhere during lockdown. I did not obtain any other sensitive data. Survey responses were kept on Imperial College London's password protected Qualtrics server. The data were downloaded to a password protected folder in a secure server at Imperial College London. No identifiable data were stored.

12.6.5 Piloting

The PAG piloted a draft version and commented on readability, skip patterns based on conditional responses and completion time. After feedback I made changes including addition of lactational amenorrhoea method (LAM) and correction of a skip pattern. I separated the depot progestogen contraceptives "Depo Provera" and "Sayana Press" because the latter could be self-administered, so did not require a face-to-face appointment with a healthcare professional. The survey was designed to be used on laptop, desktop, or a mobile device; the responses were stored on a password-protected secured server and no identifiable data were collected or stored.

12.6.6 Publication

The survey was published via a link on Twitter, Facebook, and Instagram targeting women between ages of 16 and 54 in UK (Figure *7* and Figure *8*). The survey went live for two weeks from 27th May 2020 until 9th June 2020. I reviewed the responses after a week and boosted the promotion to improve responses from specific age ranges and regions. Qualtrics generated specific links for social media platforms such as Facebook, Twitter, and LinkedIn; a link to survey was generated separately to be posted on Instagram. I reviewed the range of participants after a week and selected specific age ranges and areas for promotion to boost the sampling to ensure I had participants from each of the age ranges and regions.

Figure 6 Survey appearance on web browser and mobile device



Figure 7 Survey promotion on Twitter platform

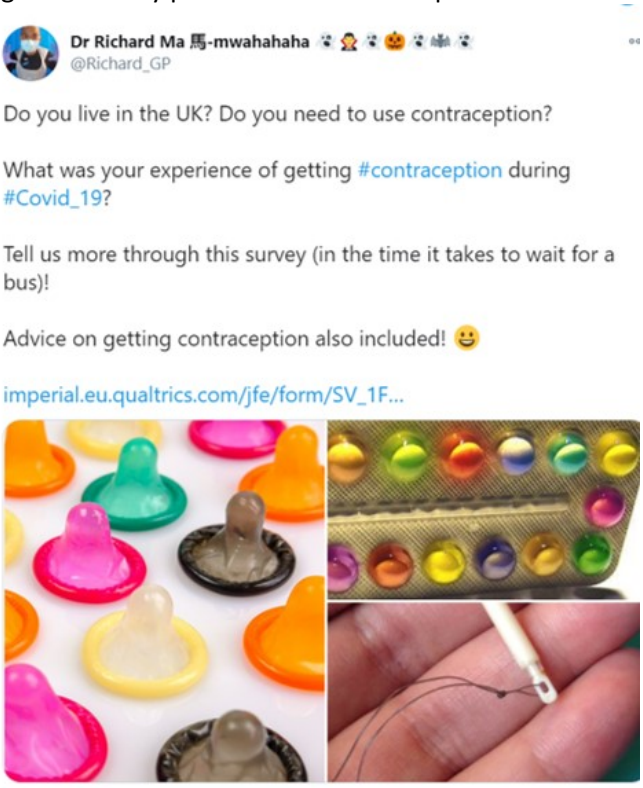
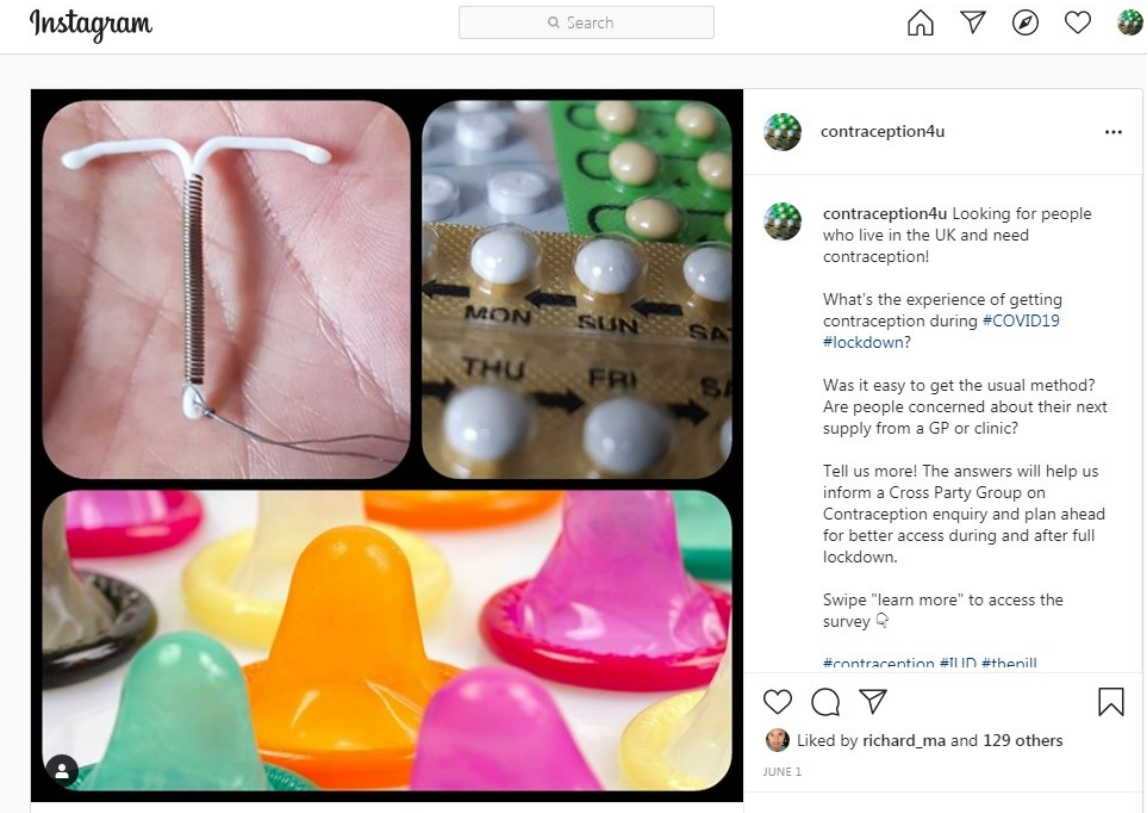


Figure 8 Survey appearance on Instagram platform



12.6.7 Analysis

I used Microsoft Excel for descriptive analyses of quantitative data and NVivo (NVivo 12, 2019 QSR International) to organise free text data for thematic analysis. I initially analysed the free text data independently, then compared the findings noting any convergence, complementarity or discrepancy.(186) The study was written up using reporting frameworks – CHERRIES (Checklist for Reporting Results of Internet E-Surveys) and STROBE (Strengthening the Reporting of Observational Studies in Epidemiology Appendix 6).(187, 188).

I used an online data visualisation software to present the survey respondent demographics and initial findings (https://flourish.studio/) and NVivo to produce a word cloud to summarise the free text data.

For pragmatic reasons, this survey was conducted in a short time frame of two weeks to submit to a UK Cross-Party Parliamentary Inquiry into contraceptive care during the pandemic,(4) therefore I did not expect our survey to be representative of the UK population of women but nevertheless would provide valuable insight into experiences during the first lockdown of this pandemic.

12.7 Feminist approach to research

I mentioned in the Methodology section that I used a feminist perspective to the work undertaken in this PhD. Initially, I adopted a pragmatist approach to the research, but it was not until I started working more with the PAG on the qualitative study and the case control study on the biopsychosocial correlates of abortion that the feminist perspective became clearer to me. The feminist orientation was developed through many discussions with the members of PAG during the PhD. This approach also helped me to reflect on the current literature and policies on sexual and reproductive healthcare. Further reflection on this approach is detailed in the Discussions chapter.

12.8 Summary

I have described five different designs to answer each of the research question: an ecological study using interrupted time-series analysis, a cohort study using logistic regression analysis, a matched case-control study using multinomial regression, a

focus group study using thematic analysis, and an online survey to examine the impact of the pandemic on contraceptive care. In the following chapters, I will report the findings of each study.

13 Results - What was the impact of a pay-for-performance (P4P) scheme to give long-acting reversible contraception (LARC) advice in British primary care on LARC prescriptions and abortions?

13.1 Publication

The published version of this study is available from PLoS Medicine(2):

Ma R, Cecil E, Bottle A, French R, Saxena S. Impact of a pay-for-performance scheme for long-acting reversible contraceptive (LARC) advice on contraceptive uptake and abortion in British primary care: An interrupted time series study. PLOS Medicine. 2020;17(9):e1003333.

13.2 Descriptive analysis

The study population included 3,281,667 women aged 13 to 54 years from over 600 practices across Britain who were followed up from 2004/05 to 2013/14. The proportions of women in each age group and deprivation quintiles per year were similar across the 10-year period (Appendix 2). There were just over one million women in the denominator count every year except for the last couple of years; there was a 12.9% attrition in the annual denominator population from 1,117,648 in 2004/05 to 973,473 in 2013/14. Practice populations in the South of England and more affluent postcodes were overrepresented while attrition was greatest in the North East and East Midlands regions of Britain.

The basic demographics of the study's sample is summarised in Table 3 across three time points represented by financial years: 2003/04 (beginning of the study period), 2009/10 (when the financial incentive was introduced) and 2013/14 (end of study period). I compared the proportion of women across 5-year age bands at two time points (2004 and 2013) between UK Census data and CRPD population and found no significant differences (Appendix 2).

LARC advice was offered to 43.4% of eligible women in 2004/5, rising to 78.3% in 2008/09 and then 95.3% when P4P was introduced in 2009/10; this proportion was sustained between 96.5% and 97.9% by the end of the study period which supported the use of a phase-in period in 2009/10 (Table 4).

13.3 Trends in LARC uptake

Between 2004/5 and 2013/14, crude LARC uptake rates increased by 32.0% from 29.6 to 39.0 per 1000 women, compared with a smaller increase (18.0%) from 172 to 203 per 1,000 women in NLHC uptake in the same period (Table 3). Crude LARC uptake increased in all age groups from 2004/05 to 2013/14 but the relative change was greatest in women aged 35 to 54 years (48.1%), followed by 13 to 19 years (32.1%), 20 to 24 years (19.1%) and 24 to 34 years (18.6%). Crude LARC uptake was higher in women from most deprived than least deprived group throughout the study period but relative increase in uptake was larger in least deprived (43.6%) compared with the most deprived (13.9%) group.

Table 3 Crude rates per 1000 women for Long-Acting Reversible Contraception (LARC), Non-LARC Hormonal Contraception (NLHC) uptake and abortion by age and deprivation groups at three time points: study baseline (2004/05), introduction of pay-for-performance (P4P 2009/10) and end of study period (2013/14)

Denominator & rate per 1,000 women	***Long-Acting Reversible Contraception (LARC)***			***Non-LARC Hormonal Contraception (NLHC)***			***Abortions***		
Year	***2004/05***	***2009/10***	***2013/14***	***2004/05***	***2009/10***	***2013/14***	***2004/05***	***2009/10***	***2013/14***
All ages	*1,117,648*	*1,156,125*	*973,473*	*1,117,648*	*1,156,125*	*973,473*	*1,117,648*	*1,156,125*	*973,473*
	29.6	**33.9**	**39.0**	**172**	**208**	**203**	**16.9**	**13.9**	**8.59**
Age group (years) 13-19	159,368	163,444	139,621	150,646	163,444	139,621	150,646	163,444	139,621
	20.9	**24.0**	**27.6**	**197**	**223**	**205**	**26.6**	**18.1**	**7.66**
20-24	107,921	113,168	97,039	103,018	113,168	97,039	103,018	113,168	97,039
	52.9	**52.4**	**63.0**	**393**	**434**	**396**	**57.5**	**44.4**	**23.8**
25-34	252,564	253,811	222,146	253,424	253,811	222,146	253,424	253,811	222,146
	45.7	**47.8**	**54.2**	**291**	**343**	**323**	**25.2**	**22.7**	**15.8**
35-54	629,744	625,702	514,667	610,560	625,702	514,667	610,560	625,702	514,667
	21.0	**27.4**	**31.1**	**79.1**	**108**	**114**	**4.17**	**3.63**	**2.85**
Deprivation* Least deprived	161,781	177,608	141,254	161,781	177,608	141,254	161,781	177,608	141,254
	22.0	**25.9**	**31.6**	**166**	**210**	**207**	**12.1**	**9.12**	**4.96**
Most deprived	106,615	120,866	98,300	106,615	120,866	98,300	106,615	120,866	98,300
	42.4	**44.4**	**48.3**	**161**	**192**	**172**	**26.5**	**20.6**	**12.9**

*Deprivation data available for England only

Figure 9 Trends in Long-Acting Reversible Contraception (LARC) prescriptions between 2004/5 and 2013/14

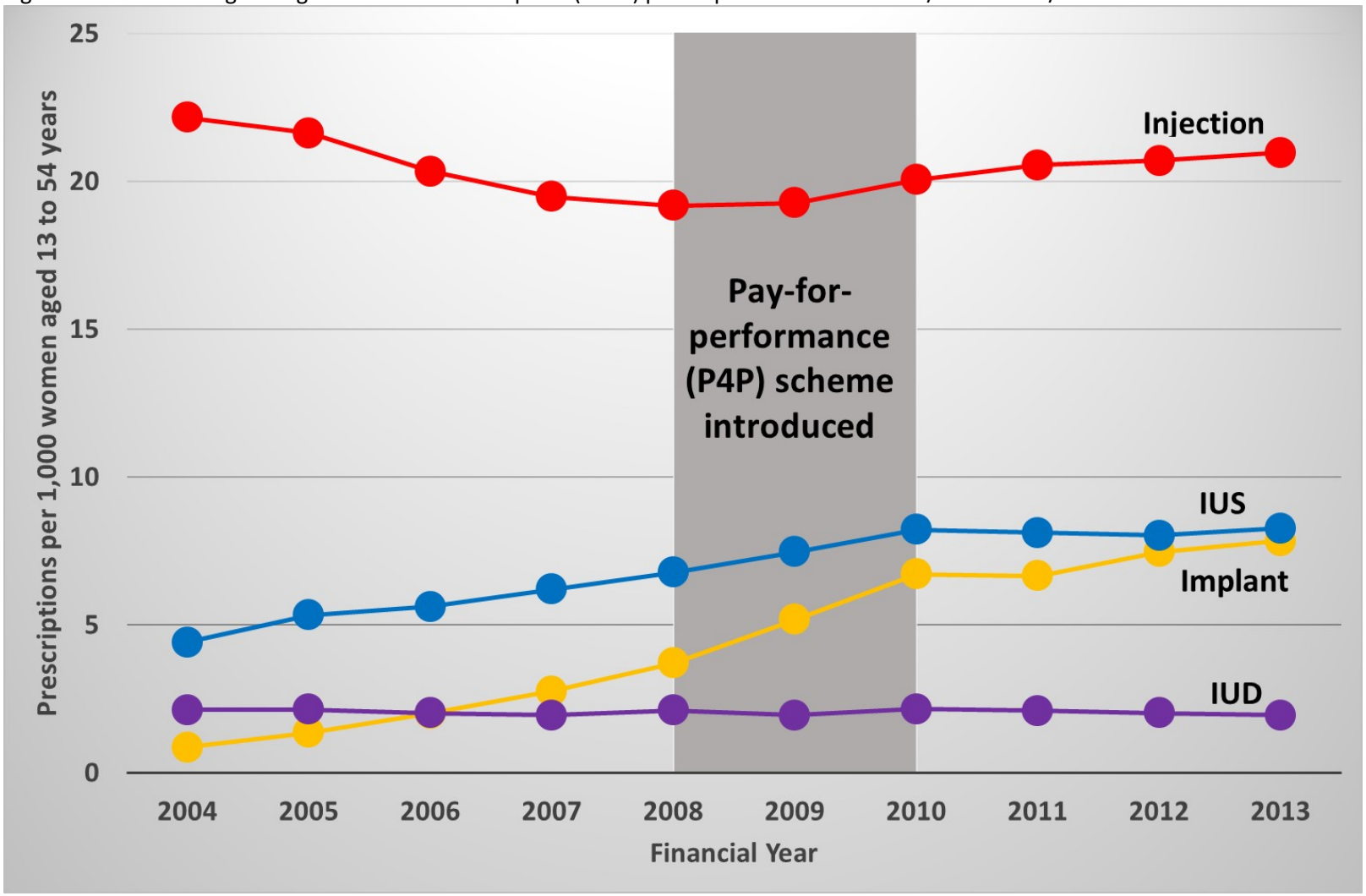


Table 4 LARC advice given as a percentage of eligible women aged 13 to 54 using a non-LARC hormonal contraception

Year	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*
% Denominator population given LARC advice	43.4	49.5	56.8	66.6	78.3	95.3	97.6	97.9	97.7	96.5

Table 5 Uptake per 1,000 women aged 13 to 54 years by method of contraception 2004/05 to 2013/14

Contraceptive uptake	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*
*POP**	29.6	34.9	40.5	44.9	49.0	52.9	56.7	61.3	65.0	69.1
*CHC**	142	146	156	160	160	155	147	142	138	134
Injection	22.2	21.6	20.3	19.5	19.2	19.3	20.1	20.6	20.7	21.0
Implant	0.85	1.35	2.00	2.76	3.70	5.19	6.71	6.65	7.47	7.84
*IUD**	2.13	2.14	2.02	1.95	2.11	1.94	2.16	2.10	2.02	1.95
*IUS**	4.42	5.32	5.62	6.20	6.77	7.47	8.22	8.11	8.03	8.26

*POP: Progestogen-Only Pill; CHC: Combined Hormonal Contraception; IUD: Intra-Uterine Device; IUS: Intra-Uterine System

Table 5 shows the uptake of different contraceptive methods across the study period. Among the LARC methods, the contraceptive injection consistently had the greatest uptake across 2004 to 2013, but crude rates fell by 5.4% from 22.2 items per 1,000 women in 2004/05 to 21.0 per 1,000 women in 2013/14 (Figure 9). There was also a fall in IUD uptake by 8.5%. In contrast, there was an 8-fold increase in crude uptake of contraceptive implants and a smaller rise in IUS uptake (86.0%).

ITS analysis (Table 6 and Figure 10) showed a small increase in trend (increase of 0.56 per 1,000 women per year, 95% CI 0.54 to 0.59) in overall LARC uptake before P4P, then a large increase immediately after P4P was introduced (5.36, 5.26 to 5.45), followed by a small but sustained decrease in trend following P4P (-0.35, -0.42 to -0.28). All LARC methods had statistically significant and positive step changes in uptake immediately after P4P; among these methods, the greatest step changes occurred in injection (1.68, 1.67 to 1.70) and implant (1.64, 1.67 to 1.70). There was an apparent reversal in contraceptive injection uptake from an initial decline pre-P4P (-0.86, -0.86 to -0.85), followed by a sustained increase post-P4P (1.25, 1.24 to 1.27).

There were statistically significant step increases in LARC uptake across all ages. The greatest rise occurred among women aged 20-24 years (8.40, 8.34 to 8.47), with sustained increase in uptake in the five years after the introduction of P4P (3.14, 3.08 to 3.19). There was a small increase in the trend in LARC uptake in women from least deprived quintile before the P4P was introduced (0.10, 0.10 to 0.10); whereas the trend pre-P4P was decreasing in least deprived quintile (-0.03, -0.06 to -0.01). However, the step change in uptake following P4P was greater in the least deprived quintile (5.71, 5.70 to 5.71) compared with the most deprived quintile (3.72, 3.61 to 3.83).

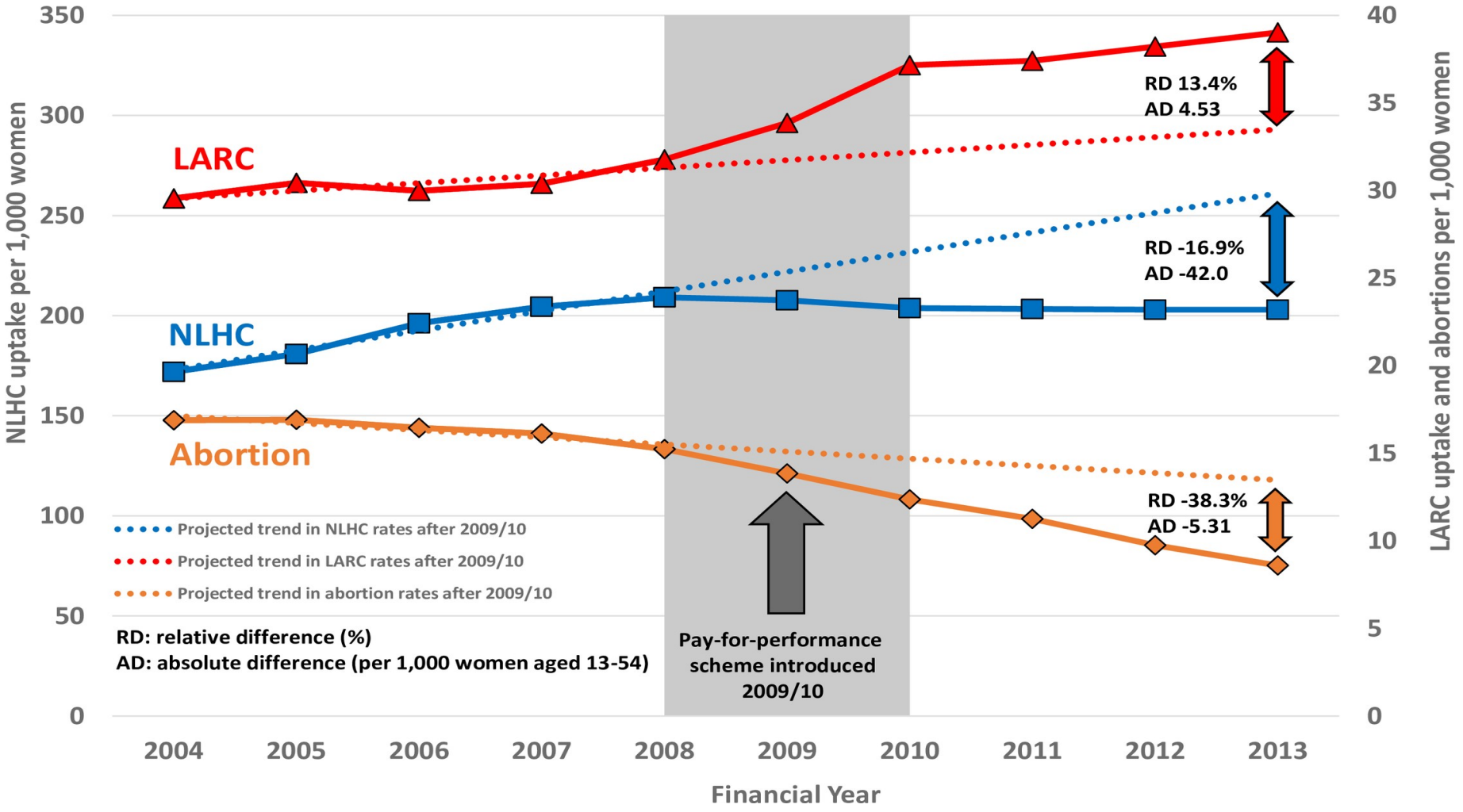
The modelling predicted an extra 4.53 LARC prescriptions per 1,000 women more than what would have been expected had the P4P scheme not been introduced, or relative increase of 13.4% four years following the P4P scheme by 2013/14 (Table 6). If extrapolated to British population, this was equivalent to additional 81,190 LARC prescriptions.

Table 6 Interrupted time series analysis of trends in contraceptive uptake rate per 1,000 women in primary care in Britain before and after introduction of pay-for-performance (P4P) scheme in 2009/10

Contraceptive method	*Age / deprivation group*	***Pre-P4P trend****	***Step change ****	***Post-P4P trend****	***Absolute change 4 years after P4P***	***% change 4 years after P4P***
All LARC methods	All ages	0.56 (0.54 to 0.59)	5.36 (5.26 to 5.45)	-0.35 (-0.42 to -0.28)	4.53	13.4%
Injection	All ages	-0.86 (-0.86 to 0.85)	1.68 (1.67 to 1.70)	1.25 (1.24 to 1.27)	5.83	38.0%
Implant	All ages	0.71 (0.71 to 0.71)	1.64 (1.63 to 1.65)	-0.20 (-0.21 to -0.18)	1.57	24.8%
IUD	All ages	-0.04 (-0.04 to -0.04)	0.21 (0.20 to 0.22)	0.00 (0.00 to 0.01)[1]	0.18	10.1%
IUS	All ages	0.51 (0.51 to 0.52)	0.95 (0.95 to 0.96)	-0.54 (-0.55 to -0.54)	-0.70	-8.03%
All LARC methods	13-19	0.15 (0.09 to 0.22)	4.51 (4.18 to 4.83)	1.04 (1.00 to 1.08)	8.83	42.3%
	20-24	-0.90 (-0.91 to -0.88)	8.40 (8.34 to 8.47)	3.14 (3.08 to 3.19)	20.1	45.1%
	25-34	-0.50 (-0.50 to -0.49)	6.31 (6.28 to 6.34)	1.40 (1.37 to 1.42)	11.4	26.9%
	35-54	0.99 (0.99 to 1.00)	2.27 (2.25 to 2.29)	-0.52 (-0.54 to -0.50)	1.19	4.01%
	Least deprived	0.10 (0.10 to 0.10)	5.71 (5.70 to 5.71)	0.48 (0.48 to 0.48)	7.73	33.0%
	Most deprived	-0.03 (-0.06 to -0.01)	3.72 (3.61 to 3.83)	0.67 (0.58 to 0.76)	6.37	15.2%
NLHC	All ages	9.25 (8.98 to 9.52)	-22.9 (-24.5 to -21.2)	-7.10 (-7.88 to 6.33)	-42.0	-16.9%
CHC	All ages	5.24 (5.13 to 5.35)	-15.0 (-15.5 to -14.5)	-10.8 (-11.2 to -10.5)	-53.1	-28.7%
POP	All ages	4.83 (4.81 to 4.85)	-2.60 (-2.69 to -2.51)	-0.33 (-0.37 to -0.30)	0.89	1.30%
NLHC	13-19	8.45 (7.81 to 9.09)	-30.8 (-34.1 to -27.5)	-10.2 (-11.1 to -9.26)	-63.1	-23.4%
	20-24	12.7 (11.9 to 13.4)	-42.7 (-46.8 to -38.7)	-17.6 (-19.2 to -16.1)	-101	-20.2%
	25-34	14.7 (14.4 to 15.1)	-41.9 (-44.1 to -39.6)	-14.4 (-15.4 to -13.4)	-84.6	-20.5%
	35-54	6.61 (6.51 to 6.70)	-10.3 (-10.8 to -9.80)	-3.48 (-3.75 to -3.21)	-17.6	-13.2%
	Least deprived	11.5 (11.1 to 11.8)	-27.7 (-29.4 to -26.0)	-8.11 (-9.13 to -7.08)	-48.7	-18.7%
	Most deprived	8.88 (8.42 to 9.34)	-30.6 (-33.0 to -28.3)	-9.77 (-11.2 to -8.35)	-60.8	-25.6%

*p<0.001 unless otherwise stated [1]p=0.25 LARC: Long-Acting Reversible Contraception; NLHC: Non-LARC Hormonal Contraception; POP: Progestogen-Only Pill; CHC: Combined Hormonal Contraception; IUD: Intra-Uterine Device; IUS: Intra-Uterine System

Figure 10 Summary figure - Trends in crude LARC and NLHC uptake and abortion rates between 2004/2005 and 2013/2014 in women aged 13–54 years in British primary care before and after introduction of P4P scheme for LARC advice. AD, absolute difference; LARC, long-acting reversible contraception; NLHC, non-LARC hormonal contraception; P4P, pay for performance; RD, relative difference.



13.4 Trends in NLHC uptake

There was comparatively more NLHC uptake than LARC methods among women of all age groups and deprivation quintiles (Table 3 and Appendix 2); there was an overall increase of 18.0% in NLHC uptake from 172 in 2004/05 to 203 in 2013/14. The uptake of NLHC varied among different age groups; the magnitude of NLHC uptake at baseline was several folds that of LARC, ranging from just under four-fold difference in 35-54 years (79.1 vs 21.0), to nine-fold difference in 13-19 years (197 vs 20.9). More NLHC was prescribed to women aged 20 to 24 years compared with other age groups and women from the least deprived quintile. The relative increase in uptake was greatest in women aged 35 to 54 (44.1%) and those from the least deprived quintile (24.7%).

The ITS analysis showed trend increases in NLHC uptake overall of 9.25 prescriptions per 1,000 per year (95% CI 8.98 to 9.52) and across all age and deprivation groups before the P4P scheme was introduced (Table 6 and Figure 10). There were negative step changes in all age and deprivation groups immediately following P4P, which meant there was a change from increasing to decreasing rates of NLHC prescribed soon after the scheme was introduced. The negative step change was followed by a sustained reduction in trends for the remaining period. Out of the NLHC, uptake was higher for CHC than POP initially, but there was a larger drop in CHC compared with POP immediately following the introduction of P4P scheme (-15.0, -15.5 to -14.5 vs -2.60, -2.69 to -2.51); and a larger sustained decrease in uptake of CHC in the remaining period (-10.8, -11.2 to -10.5 vs -0.33, -0.37 to -0.30) in all age groups.

By the end of the study period in 2013/14, the modelling predicted a relative reduction in NLHC for all women of -16.9% or absolute reduction of 42.0 per 1,000 women compared to what would have been expected if the P4P were not introduced; most reductions were due to decreases in uptake of CHC.

13.5 Trends in abortion

Crude abortion rates fell by 49.2% from 16.9 to 8.59 across the study period (Table 3 and Appendix 2); the magnitude of relative reduction also decreased with age, from -71.2% in 13 to 19 years to -31.7% in 35 to 54 age group. There was a larger relative reduction in women from least deprived compared with most deprived quintile (-59.0% vs -51.3%).

Before the P4P scheme was introduced, there was an annual reduction in trend in abortion rates in all ages (Table 7 and Figure 10) of -0.41 per 1,000 women (95% CI -0.55 to -0.27); with a step change of -2.28 (-2.99 to -1.57) immediately after P4P was introduced, followed by a sustained reduction in trend (-0.88, -1.12 to -0.63). There was an absolute reduction of -5.31 abortions per 1,000 women or a relative reduction of -38.3% compared with what would have been expected without the P4P scheme; this is equivalent to 95,170 additional abortions averted by 2013/14 if extrapolated to the British population.

Although reductions in abortions were seen across the board, the greatest impact was seen in women aged 20 to 24 years with both a large step change of -4.52 (-7.48 to -1.57) immediately after P4P, and the greatest sustained rate reduction out of all age groups following P4P scheme (-2.84, -3.84 to -1.84). By 2013/14, there was an absolute reduction of -18.0 abortions per 1,000 women or a relative reduction of -42.6% in this age group. Women in the 13-19 age group had the largest step change (-5.04, -7.56 to -2.51) and relative reduction of -57.0%. Women from the most deprived group had a greater step change than those from the least deprived group (-4.40 vs -1.36). Trends in abortion rates post-P4P did not differ much between these groups; predicted change in the absolute abortion rate was greater in women from most deprived than least deprived group (-7.46 vs -3.96), whereas women from least deprived quintile had a greater relative reduction (-44.0% vs -37.5%).

13.6 Sensitivity analysis

I added a “phase-in period” of one year which coincided with the introduction of the P4P scheme to consider the time it took for a new policy to be implemented into practice. I performed a sensitivity analysis to see if it would have made any

difference to the outcomes. Phase-in periods did not alter the trends of LARC uptake and abortion rates, but the effect was greater with than without (Table 8). For LARC uptake, the step change was 5.36 (5.26 to 5.45) with phase-in period and 3.34 (3.17 to 3.52) without. The effect on NLHC was greater; step change in NLHC was -22.9 (-24.5 to -21.2) with phase-in and -8.01 (-9.09 to -6.92) without phase-in. The step change in abortion rates associated with P4P was greater with phase-in (-2.28, -2.99 to -1.57) than without (-1.49, -1.62 to -1.35).

I mentioned in the methods section that there might be missing abortion events due to a couple of reasons: women who self-referred for abortions would bypass GPs so the referral would not be documented, and some might not give consent for the abortion clinic to notify the GP of the procedure. In the sensitivity analysis (Table 9), I found a sustained reduction in abortion rates post-P4P under all 3 scenarios of missing data on abortion: 20%, 40%, or 50%, all of which were statistically significant ($p < 0.001$). Even if 50% additional abortion events were included in the analysis after the P4P, the trend post-P4P would have been −1.52 (1.78 to −1.26, $p < 0001$). These suggested the risk of bias from missing abortion data was small.

13.7 Conclusions

This interrupted-time series study suggests increase in LARC uptake increased and reductions in abortions were associated with introduction of a P4P scheme in British primary care, with additional impact for young women aged 20-24 years and those from deprived backgrounds.

The study strengths and limitations will be discussed later in the Discussion chapter, in addition to what this might mean for policy and practice, and how it fits in with the other studies in this PhD.

Table 7 Summary of Interrupted Time Series (ITS) analysis of trends in abortion rates before and after introduction of pay-for-performance (P4P) scheme in 2009/10 in primary cares in Britain

*Abortion rates per 1,000 women**	*Pre-P4P trend*	*Change in level*	*Post-P4P trend*	*Absolute change 4 years after P4P*	*Relative change 4 years after P4P*
All ages	-0.41 (-0.55 to -0.27)	-2.28 (-2.99 to -1.57)	-0.88 (-1.12 to -0.63)	-5.31	-38.3%
Age group (years)					
13-19	-1.26 (-1.77 to -0.76)	-5.04 (-7.56 to -2.51)	-1.19 (-2.07 to -0.32)	-9.87	-57.0%
20-24	-2.07 (-2.65 to -1.49)	-4.52 (-7.48 to -1.57)	-2.84 (-3.84 to -1.84)	-18.0	-42.6%
25-34	-0.16 (-0.39 to 0.07)	-2.15 (-3.34 to -0.97)	-1.54 (-1.95 to -1.14)	-8.49	-35.1%
35-54	-0.09 (-0.14 to 0.04)	-0.17 (-0.42 to 0.07)[1]	-0.13 (-0.22 to -0.04)	-0.66	-19.2%
Least deprived	-0.40 (-0.47 to -0.32)	-1.36 (-1.72 to -1.01)	-0.73 (-0.86 to -0.61)	-3.96	-44.0%
Most deprived	-0.85 (-1.35 to -0.35)	-4.40 (-6.89 to -1.91)	-0.74 (-1.60 to 0.13)[2]	-7.46	-37.5%

*P<0.001 unless otherwise stated [1]P=0.23 [2]P=0.16

Table 8 Sensitivity analysis of outcomes with and without phase-in period

Outcome (per 1,000 women)	*Pre-P4P trend*	*Change in level*	*Post-P4P trend*	*Absolute 4 years after P4P*	*Relative change 4 years after P4P*
LARC all ages- with phase-in	0.56 (0.54 to 0.59)	5.36 (5.26 to 5.45)	-0.35 (-0.42 to -0.28)	4.53	13.4%
LARC all ages - no phase-in	0.24 (0.20 to 0.28)	3.34 (3.17 to 3.52)	0.84 (0.81 to 0.86)	7.54	23.6%
NLHC all ages- with phase-in	9.25 (8.98 to 9.52)	-22.9 (-24.5 to -21.2)	-7.10 (-7.88 to -6.33)	-42.0	-16.9%
NLHC all ages - no phase-in	9.90 (9.65 to 10.2)	-8.01 (-9.09 to -6.92)	-10.4 (-10.6 to -10.2)	-60.0	-22.8%
Abortion all ages- with phase-in	-0.41 (-0.55 to -0.27)	-2.28 (-2.99 to -1.57)	-0.88 (-1.12 to -0.63)	-5.31	-38.3%
Abortion all ages- no phase-in	-0.41 (-0.45 to -0.38)	-1.49 (-1.62 to-1.35)	-0.85 (-0.86 to -0.83)	-4.87	-36.1%

Table 9 Sensitivity analysis of additional abortions due to missing data

Abortion rate (per 1,000 women)	*Pre-P4P trend*	*Change in level*	*Post-P4P trend*	*Absolute 4 years after P4P*	*Relative change 4 years after P4P*
Additional 20%	-0.41 (-0.55 to -0.26)[1]	0.21 (-0.52 to 0.93)[2]	-1.13 (-1.38 to -0.88)	-3.60	-25.9%
Additional 40%	-0.41 (-0.55 to -0.26)[3]	2.69 (1.95 to 3.43)	-1.39 (-1.65 to -1.13)	-1.88	-13.6%
Additional 50%	-0.41 (-0.55 to -0.26)[4]	3.93 (3.18 to 4.68)	-1.52 (-1.78 to -1.26)	-1.03	-7.39%

All values p<0.001 unless stated. [1]p=0.003, [2]p=0.599, [3]p=0.003, [4]p=0.003

14 Results - What is the impact of LARC advice on LARC prescriptions and abortions at the individual level?

This chapter reports on the results of the second study, which examined the impact of a pay-for-performance (P4P) scheme to incentivise primary care practitioners to give LARC advice at the individual level. In Study 1, I examined the trends in outcomes (LARC prescriptions and abortion rates) associated with the introduction of a P4P scheme in general practice where women who requested either a non-LARC hormonal contraception (NLHC) or emergency hormonal contraception (EHC) were offered advice about LARC methods.

Using interrupted time series analysis, I demonstrated the P4P scheme was associated with increased LARC prescriptions and reduced abortion rates. However, as an ecological study, it was not possible to attribute the outcomes to individuals and doing so could lead to the "ecological fallacy". Therefore, this study aimed to examine the impact of LARC advice on LARC prescriptions and abortion events at the individual level.

I used the same cohort of women from the dataset I used in Study 1. I followed up everyone who was eligible for LARC advice, i.e., either they were issued NLHC or EHC that year, and I examined if the LARC advice given was associated with a prescription for LARC and abortion event the following year. I also examined the same outcomes two and three years after the initial LARC advice as part of a sensitivity analysis to determine if the impact took time to accrue.

14.1 Demographics

There were 3,200,856 individuals in the cohort, with roughly one million in each financial year denominator population (Table 10). Similar trends in the total denominator population were noted between Study 1 and this study, particularly the attrition in numbers among several regions – North East. Yorkshire and Humber and East Midlands; for instance, there was a reduction in the population in East Midlands

from 36,288 in 2009 to 2,231 in 2013. As the scheme to give LARC advice was not introduced until financial year 2009/10, I only examined the outcomes associated with this cohort from that year onwards, which meant the study period was five years between financial years 2009/10 and 2013/14. As the same cohort of women were used for both studies, the total denominator population for each year, the distribution among regions, age groups were the same.

Data for Index of Multiple Deprivation (IMD) quintiles were available for England only; the discrepancies in the yearly denominator populations between the population for Britain and the subpopulation used for analysis of IMD were attributable to loss of two regions (Scotland and Wales) and missing IMD data. Across the English regions, missing IMD data comprised between 17% (London) to 44% (East Midlands) of the regional populations, averaging 22% (593,151/2,711,803) of this subset of the total cohort. Despite this, there were roughly 100,000 individuals per IMD quintile per year for analysis (Table 11). The demographic information in Table 11 relates to those without missing information.

One major difference between this and Study 1 was how the data panels were set up. Data for Study 1 was in the “long” format, where each row contained details of one event such as abortion or prescription for contraception; each patient had more than one row of data. For this study, the data panel was set up in the “wide” format to allow for easier analysis. This meant each row had data associated with one unique individual. As the data were set up to allow for one episode of LARC advice per person per year, it also meant I used only the incident prescription of either NLHC or EHC, which determined everyone’s eligibility for LARC advice; I also only used the incident prescription of LARC and no more than one abortion event per person per year. So, if an individual were prescribed both EHC and NLHC at different times in one financial year, I counted the earlier prescription for the eligibility for LARC advice and followed through for the outcome measures based on that method of contraception.

As only women who were issued either NLHC or EHC were followed up to examine the outcomes, the total number of LARC and abortions per year were less than the numbers calculated for the previous study. This was because the aim was to examine if LARC advice was associated with any prescription of a LARC product

and if this was associated with abortion event averted; the data were not set up to calculate the rate.

For each financial year, roughly 80% of women were issued with a NLHC and between 76% and 86% of them had LARC advice. Fewer women were issued with EHC each year and ranged from 0.7% to 0.9%; proportionally more were given LARC advice than those who had NLHC (ranging from 91% to 95%). The trend in LARC prescription was increasing from 4.1% in 2009 to 4.6% while abortions were decreasing from 0.7% to 0.6% of the cohort between 2009 and 2013. These figures are not true “rates” because unlike Study 1, only incident prescriptions and abortion events were counted.

14.2 LARC advice and outcomes – LARC prescriptions

Unadjusted and multiple logistic regression outputs are presented in four tables: LARC prescriptions (Table 12), abortions (Table 13), and sensitivity analyses (Table 14 and Table 15). Each table shows the regression output for an outcome measure (LARC prescription or abortion) a year after LARC advice was given for each method that was prescribed, either NLHC or EHC.

Unadjusted logistic regression analyses (Table 12 and Figure 11) suggest a significantly increased likelihood of LARC being prescribed a year following LARC advice in 2009 (unadjusted OR 1.29, 95% CI 1.22 to 1.36, $p<0.001$). This effect did not change after adjusting for age groups and IMD quintiles (adjusted OR 1.32, 1.25 to 1.39, $p<0.001$ and 1.37, 1.28 to 1.46, $p<0.001$ respectively). This association was consistent and significant throughout the study period from 2009 and 2012 (latter the latest year for advice for outcome following year used for analysis) whenever LARC advice was given at the time of NLHC prescription.

The differential impact on age groups and deprivation quintiles seemed mixed. LARC prescriptions were significantly less likely to be issued for all age groups following LARC advice; this effect was consistent for LARC advice given between 2009 and 2012. However, likelihood of LARC being prescribed was greater for more deprived quintiles (IMD 5) compared with the least deprived quintiles (IMD 1, used as the

reference); the impact was consistently and significantly greater for women from the deprived quintile (IMD 5) throughout the study period.

For those using EHC and given LARC advice in 2009, they were more likely to be prescribed LARC the following year (unadjusted OR 1.54, 1.17 to 2.03, p=0.002); this effect remained after adjusting for age groups and deprivation quintiles (adjusted ORs 1.54, 1.16 to 2.03, p=0.003 and 1.48, 1.03 to 2.11, p=0.032 respectively). There were no associations between LARC advice and LARC prescriptions after that year. LARC prescription was significantly less likely following advice for some age groups who were using EHC, but this effect was not consistent throughout the study period. There were no consistent associations with deprivation quintiles.

Post estimation likelihood ratio tests using nested models all ranged from p<0.02 to p<0.001 which suggests the model was a better fit using age groups and IMD quintiles (Appendix 3). The exception was for LARC prescriptions in 2013 and advice after EHC in 2012 where the estimates made little difference (p=0.026).

14.3 LARC advice and outcomes - abortions

There were no associations between LARC advice given to those using NLCH or EHC in any year and abortions the following year; this did not change after adjusting for age groups and deprivation (Table 13 and Figure 11).

For those on NLHC and given LARC advice, despite no overall effect, there was a reduced likelihood of abortions particularly in the older age groups compared with those aged 13 to 19 (reference group). This association persisted when adjusted for deprivation and was consistent across the study period. There was also a significant increase in the odds or abortion especially among those from the most deprived quintile; this was the case throughout the study period.

For those given LARC advice following EHC use, there was also a decreased likelihood of abortions among the older age group (35 to 54) even after adjusting for deprivation, but this only persisted until 2011. There was an increased risk of abortion among the most deprived compared with the least deprived quintile, but this effect was observed for LARC advice given in 2012 and abortion events in 2013; there were no association in the other years.

Post estimation likelihood ratio tests using nested models ranged from p=0.003 to p<0.001, suggesting the addition of age group and IMD quintiles into the models gave a better fit (Appendix 3).

14.4 LARC advice and outcomes – sensitivity analyses

To determine if the impact of LARC advice might manifest in later years, I performed sensitivity analyses two years and three years after the initial LARC advice was given; the latter was possible for advice given in 2009 and 2010 only as the outcomes were not examined beyond 2013. This was performed using age-adjusted regression analyses (for the British population) and again using age and deprivation quintile adjusted analyses (for English regions only).

For those on NLHC given LARC advice in 2009 (Table 14), there was a significant increase in LARC prescriptions two years after in 2011 observed from age group adjusted analyses (1.18, 1.11 to 1.24, p<0.001) and three years after in 2012 (1.20, 1.13 to 1.26, p<0.001). This effect was observed for LARC advice given in 2010 and LARC prescriptions in 2012 (1.17, 1.11 to 1.23, p<0.001) and in 2013 (1.17, 1.11 to 1.24, p<0.001).

For those on EHC and given LARC advice in 2009, it was associated with increased LARC prescriptions in 2011 (1.47, 1.07 to 2.01, p=0.017) and in 2012 (1.69, 1.19 to 2.40, p=0.003). LARC advice in 2010 was associated with significant increase in LARC prescriptions three years later in 2013 (2.04, 1.26 to 3.32, p=0.004).

There were no significant effects on abortions two or more years after LARC advice.

For age group and deprivation quintile adjusted analyses (for England only Table 15 and Figure 11), the likelihood of LARC prescriptions issued two years following LARC advice while taking NLHC was significantly increased for advice given in 2009 and LARC issued in 2011 (1.19, 1.11 to 1.27, <0.001), and for advice in 2010 and LARC issued in 2012 (1.15, 1.08 to 1.22, p<0.001). For those taking EHC and given LARC advice, the increased likelihood of LARC prescription was only observed for advice given in 2009 (1.59, 1.04 to 2.44, p=0.031).

There were no associations between LARC advice given for either of the contraceptive methods and abortion as the outcome two or three years after the initial advice. No associations were observed after adjustments for age and deprivation

14.5 Conclusions

Women given LARC advice given at the time of NLHC prescriptions were significantly more likely to be prescribed LARC the following year. This association did not change after adjusting for age and deprivation and was consistent throughout the study period. Women from the most deprived quintile were most likely to have been issued with a LARC, and this association was seen throughout the study period. Those given EHC in 2009 were more likely to have LARC prescribed in 2010.

Overall, there were no associations between women given LARC advice taking either NLHC or EHC with abortions the following year. However, women from more deprived quintiles using NLHC were significantly less likely to have an abortion the following LARC advice the year before.

P4P for LARC advice was associated with increased LARC prescriptions, particularly for those from more deprived quintiles. The reduction in the likelihood for abortion was observed for women from more deprived quintiles.

The interpretation of the findings, strengths and limitations and policy implications of this study will be examined in the Discussions chapter. The next chapter will report on the findings of a study that looked at the determinants of abortions using electronic health records from general practice.

Table 10 Demographic information for cohort of women between 2009 and 2013 in Britain

Year		***2009***	***%***	***2010***	***%***	***2011***	***%***	***2012***	***%***	***2013***	***%***
Region	North East	21,414	1.9	21,452	1.9	19,747	1.8	17,048	1.6	7,769	0.8
	North West	140,796	12.2	135,409	12.0	130,993	11.8	124,151	11.6	116,939	12.0
	Yorkshire & Humber	30,001	2.1	27,371	2.4	19,301	1.7	11,853	1.1	9,565	1.0
	East Midlands	36,288	3.1	26,166	2.3	19,904	1.8	7,728	0.7	2,231	0.2
	West Midlands	100,717	8.7	99,792	8.9	100,708	9.1	99,139	9.3	85,171	8.8
	East of England	100,882	8.7	92,111	8.2	86,381	7.8	76,279	7.1	66,286	6.8
	South West	102,750	8.9	102,177	9.1	106,421	9.6	103,768	9.7	80,209	8.2
	South Central	139,492	12.1	140,709	12.5	135,733	12.2	132,948	12.4	127,378	13.1
	London	134,820	11.7	131,832	11.7	140,045	12.6	150,505	14.1	134,758	13.8
	South East Coast	120,650	10.4	121,161	10.8	120,801	10.9	118,877	11.1	111,555	11.5
	Scotland	127,111	11.0	127,173	11.3	128,885	11.6	129,271	12.1	129,911	13.4
	Wales	101,204	8.8	101,666	9.0	102,247	9.2	98,776	9.2	101,701	10.5
	Total	1,156,125	100.0	1,127,019	100.0	1,111,166	100.0	1,070,343	100.0	973,473	100.0
Age group	13-19	163,444	14.1	160,550	14.3	159,218	14.3	153,454	14.3	139,621	14.3
	20-24	113,168	9.8	111,238	9.9	110,451	20.0	107,298	10.0	97,039	10.0
	25-34	253,811	22.0	247,786	22.0	248,754	22.4	244,210	22.8	222,146	22.8
	35-54	625,702	54.1	607,445	53.9	592,743	53.3	565,381	52.8	514,667	52.9
NLHC	No NLHC	925,377	80.0	905,208	80.3	893,357	80.4	860,686	80.4	782,563	80.4
	NLHC prescribed	230,748	20.0	221,811	19.7	217,809	19.6	209,657	19.6	190,910	19.6
	LARC advice	187,066	81.1	168,010	75.7	174,336	80.0	167,163	79.7	161,778	84.7
EHC	No EHC	1,145,406	99.1	1,117,010	99.1	1,101,829	99.2	1,061,898	99.2	966,233	99.3
	EHC	10,719	0.9	10,009	0.9	9,337	0.8	8,445	0.8	7,240	0.7
	LARC advice	9,749	91.0	9,448	94.4	8,830	94.6	7,947	94.1	6,746	93..2
LARC	No LARC prescribed	1,108,753	95.9	1,076,968	95.6	1,061,994	95.6	1,022,192	95.5	928,814	95.4
	LARC prescribed	47,372	4.1	50,051	4.4	49,172	4.4	48,151	4.5	44,659	4.6
Abortion	No abortion	1,147,790	99.3	1,119,396	99.3	1,103,590	99.3	1,063,640	99.4	967,758	99.4
	Abortion	8,335	0.7	7,623	0.7	7,576	0.7	6,703	0.6	5,715	0.6

Table 11 Demographic information for population used for age and deprivation quintile analysis (English regions only)

England Only	***Year***	***2009***	***%***	***2010***	***%***	***2011***	***%***	***2012***	***%***	***2013***	***%***
Region	North East	18,229	2.4	18,240	2.5	16,531	2.3	13,801	2.0	7,682	1.3
	North West	117,331	15.6	114,219	15.7	109,728	15.4	102,989	15.1	96,438	16.2
	Yorks & Humber	27,067	3.6	25,806	3.5	19,150	2.7	11,806	1.7	9,534	1.6
	East Midlands	24,094	3.2	14,035	1.9	10,572	1.5	5,745	0.8	2,224	0.4
	West Midlands	82,703	11.0	81,665	11.2	82,256	11.5	81,324	11.9	70,196	11.8
	East of England	87,191	11.6	79,938	11.0	74,145	10.4	65,901	9.6	55,912	9.4
	South West	86,611	11.5	85,718	11.8	89,705	12.6	86,617	12.7	63,967	10.8
	South Central	101,723	13.5	102,820	14.1	97,627	13.7	94,186	13.8	88,687	14.9
	London	112,043	14.9	109,244	15.0	117,286	16.5	127,492	18.7	113,421	19.1
	South East Coast	95,065	12.6	96,319	13.2	95,864	13.5	93,861	13.7	86,702	14.6
	Total	**752,057**	**100.0**	**728,004**	**100.0**	**712,864**	**100.0**	**683,722**	**100.0**	**594,763**	**100.0**
Age group	13-19	105,640	14.1	103,021	14.2	101,586	14.3	97,578	14.3	85,070	14.3
	20-24	71,722	9.5	69,733	9.6	68,497	9.6	65,922	9.6	56,765	9.5
	25-34	166,632	22.2	161,500	22.2	161,298	22.6	157,912	23.1	137,033	23.0
	35-54	408,063	54.3	393,750	54.1	381,483	53.5	362,310	53.0	315,895	53.1
IMD quintile	1 Least deprived	177,608	23.6	172,988	23.8	163,967	23.0	153,470	22.5	141,254	23.8
	2	163,330	21.7	155,867	21.4	149,715	21.0	140,813	20.6	123,997	20.9
	3	150,549	20.0	145,499	20.0	141,519	19.9	137,900	20.2	118,854	20.0
	4	139,704	18.6	135,314	18.6	135,083	19.0	132,320	19.4	112,358	18.9
	5 Most deprived	120,866	16.1	118,336	16.3	122,580	17.2	119,219	17.4	98,300	16.5
NLHC	No NLHC	599,173	79.7	582,257	80.0	572,477	80.3	550,309	80.5	479,125	80.6
	NLHC prescribed	152,884	20.3	145,747	20.0	140,387	19.7	133,413	19.5	115,638	19.4
	LARC advice	124,296	81.3	110,823	76.0	112,525	80.2	106,687	80.0	99,398	86.0
EHC	No EHC	744,990	99.1	721,534	99.1	706,783	99.2	678,162	99.2	590,135	99.2
	EHC	7,067	0.9	6,470	0.9	6,081	0.9	5,560	0.8	4,628	0.8
	LARC advice	6,463	91.4	6,128	94.7	5,769	94.9	5,232	94.1	4,331	93.6
LARC	No LARC prescribed	721,031	95.9	695,418	95.5	680,973	95.5	652,843	95.5	567,422	95.4
	LARC prescribed	31,026	4.1	32,586	4.5	31,891	4.5	30,879	4.5	27,341	4.6
Abortion	No abortion	746,563	99.3	723,080	99.3	708,002	99.3	679,493	99.4	591,326	99.4
	Abortion	5,494	0.7	4,924	0.7	4,862	0.7	4,229	0.6	3,437	0.6

Table 12 Regression analysis for effect of LARC advice on outcome (LARC prescriptions) the following year, unadjusted, adjusted for age group and adjusted for age group and deprivation quintiles (England only)

LARC Advice	*Method*	*Outcome (year)*	*Unadjusted OR (95% CI)*	*p*	*Adjusted OR (95% CI)*	*p*	*Adjusted OR (95% CI)*	*p*
2009	NLHC	LARC 2010	1.29 (1.22 to 1.36)	<0.001	1.32 (1.25 to 1.39)	<0.001	1.37 (1.28 to 1.46)	<0.001
		13-19			REF		REF	
		20-24			0.62 (0.59 to 0.66)	<0.001	0.62 (0.57 to 0.66)	<0.001
		25-34			0.55 (0.52 to 0.58)	<0.001	0.54 (0.51 to 0.58)	<0.001
		35-54			0.52 (0.49 to 0.55)	<0.001	0.54 (0.51 to 0.58)	<0.001
		IMD 1 Least deprived					REF	
		IMD 2					1.07 (0.99 to 1.15)	0.092
		IMD 3					1.19 (1.10 to 1.28)	<0.001
		IMD 4					1.28 (1.19 to 1.38)	<0.001
		IMD 5 Most deprived					1.43 (1.32 to 1.55)	<0.001
	EHC	LARC 2010	1.54 (1.17 to 2.03)	0.002	1.54 (1.16 to 2.03)	0.003	1.48 (1.03 to 2.11)	0.032
		13-19			REF		REF	
		20-24			1.01 (0.78 to 1.32)	0.920	0.92 (0.66 to 1.28)	0.627
		25-34			0.80 (0.63 to1.01)	0.055	0.72 (0.53 to 0.96)	0.025
		35-54			0.64 (0.50 to 0.82)	<0.001	0.62 (0.45 to 0.85)	0.003
		IMD 1 Least deprived					REF	
		IMD 2					0.82 (0.57 to 1.17)	0.264
		IMD 3					0.86 (0.61 to 1.21)	0.386
		IMD 4					1.06 (0.76 to1.48)	0.741
		IMD 5 Most deprived					1.11 (0.80 to 1.55)	0.530
2010	NLHC	LARC 2011	1.22 (1.16 to 1.29)	<0.001	1.23 (1.17 to 1.29)	<0.001	1.26 (1.18 to 1.34)	<0.001
		13-19			REF		REF	
		20-24			0.69 (0.65 to 0.73)	<0.001	0.68 (0.63 to 0.74)	<0.001
		25-34			0.56 (0.53 to 0.59	<0.001	0.57 (0.53 to 0.61)	<0.001
		35-54			0.48 (0.45 to 0.51)	<0.001	0.51 (0.48 to 0.55)	<0.001
		IMD 1 Least deprived					REF	

		IMD 2					1.08 (1.00 to 1.17)	0.047
		IMD 3					1.14 (1.05 to 1.24)	0.001
		IMD 4					1.36 (1.25 to 1.47)	<0.001
		IMD 5 Most deprived					1.58 (1.46 to 1.72)	<0.001
	EHC	LARC 2011	1.34 (0.96 to 1.87)	0.088	1.31 (0.93 to 1.83)	0.118	1.48 (0.95 to 2.31)	0.081
		13-19			REF		REF	
		20-24			1.06 (0.81 to 1.40)	0.656	0.92 (0.65 to 1.31)	0.640
		25-34			0.98 (0.77 to 1.26)	0.899	0.91 (0.67 to 1.23)	0.526
		35-54			0.60 (0.46 to 0.79)	<0.001	0.53 (0.37 to 0.74)	<0.001
		IMD 1 Least deprived					REF	
		IMD 2					1.06 (0.73 to 1.54)	0.762
		IMD 3					0.94 (0.65 to 1.36)	0.739
		IMD 4					1.18 (0.83 to 1.68)	0.349
		IMD 5 Most deprived					1.34 (0.95 to 1.88)	0.098
2011	NLHC	LARC 2012	1.07 (1.02 to 1.13)	0.008	1.09 (1.04 to 1.15)	0.001	1.12 (1.05 to 1.20)	0.001
		13-19			REF		REF	
		20-24			0.68 (0.64 to 0.72)	<0.001	0.70 (0.64 to 0.75)	<0.001
		25-34			0.55 (0.52 to 0.58)	<0.001	0.55 (0.52 to 0.60)	<0.001
		35-54			0.44 (0.42 to 0.47)	<0.001	0.47 (0.43 to 0.51)	<0.001
		IMD 1 Least deprived					REF	
		IMD 2					1.06 (0.97 to 1.15)	0.184
		IMD 3					1.23 (1.13 to 1.33)	<0.001
		IMD 4					1.35 (1.25 to 1.47)	<0.001
		IMD 5 Most deprived					1.60 (1.47 to 1.74)	<0.001
	EHC	LARC 2012	1.29 (0.91 to 1.83)	0.148	1.30 (0.92 to 1.84)	0.142	1.24 (0.81 to 1.90)	0.319
		13-19			REF		REF	
		20-24			1.42 (1.08 to 1.87)	0.013	1.33 (0.94 to 1.88)	0.103
		25-34			0.75 (0.58 to 0.97)	0.026	0.68 (0.49 to 0.93)	0.018
		35-54			0.62 (0.47 to 0.82)	0.001	0.64 (0.45 to 0.90)	0.010
		IMD 1 Least deprived					REF	
		IMD 2					1.17 (0.78 to 1.74)	0.446

		IMD 3					1.34 (0.91 to 1.97)	0.134
		IMD 4					1.32 (0.90 to1.93)	0.160
		IMD 5 Most deprived					1.53 (1.06 to 2.21)	0.024
2012	NLHC	LARC 2013	1.12 (1.06 to 1.19)	<0.001	1.14 (1.08 to 1.21)	<0.001	1.17 (1.09 to 1.25)	<0.001
		13-19			REF		REF	
		20-24			0.65 (0.61 to 0.69)	<0.001	0.63 (0.58 to 0.69)	<0.001
		25-34			0.54 (0.51 to 0.57)	<0.001	0.53 (0.49 to 0.57)	<0.001
		35-54			0.44 (0.41 to 0.47)	<0.001	0.45 (0.42 to 0.49)	<0.001
		IMD 1 Least deprived					REF	
		IMD 2					0.96 (0.88 to 1.04)	0.316
		IMD 3					1.09 (1.00 to 1.19)	0.039
		IMD 4					1.22 (1.12 to1.32)	<0.001
		IMD 5 Most deprived					1.37 (1.25 to 1.49)	<0.001
	EHC	LARC 2013	1.13 (0.80 to1.58)	0.483	1.09 (0.78 to 1.53)	0.618	1.09 (0.72 to 1.65)	0.696
		13-19			REF		REF	
		20-24			1.23 (0.90 to1.67)	0.186	1.09 (0.74 to1.60)	0.677
		25-34			0.96 (0.73 to 1.27)	0.774	0.90 (0.64 to1.27)	0.555
		35-54			0.68 (0.50 to 0.92)	0.013	0.63 (0.43 to 0.92)	0.016
		IMD 1 Least deprived					REF	
		IMD 2					0.93 (0.60 to 1.44)	0.742
		IMD 3					0.99 (0.66 to1.50)	0.978
		IMD 4					1.32 (0.90 to1.95)	0.161
		IMD 5 Most deprived					1.19 (0.81 to 1.76)	0.382

Table 13 Regression analysis for effect of LARC advice on outcome (abortions) the following year, unadjusted, adjusted for age group and adjusted for age group and deprivation quintiles (England only)

LARC advice	*Method*	*Outcome year*	*Unadjusted OR (95% CI)*	*p*	*Adjusted OR (95% CI)*	*p*	*Adjusted OR (95% CI)*	*p*
2009	NLHC	Abortion 2010	0.92 (0.83 to 1.02)	0.100	0.94 (0.85 to 1.04)	0.254	0.91 (0.80 to 1.03)	0.150
		13-19			REF		REF	
		20-24			0.86 (0.77 to 0.96)	0.009	0.83 (0.72 to 0.95)	0.008
		25-34			0.57 (0.51 to 0.63)	<0.001	0.55 (0.48 to 0.63)	<0.001
		35-54			0.22 (0.19 to 0.26)	<0.001	0.22 (0.18 to 0.27)	<0.001
		IMD 1 Least deprived					REF	
		IMD 2					1.11 (0.93 to 1.31)	0.237
		IMD 3					1.28 (1.09 to 1.52)	0.003
		IMD 4					1.52 (1.29 to 1.79)	<0.001
		IMD 5 Most deprived					1.77 (1.50 to 2.09)	<0.001
	EHC	Abortion 2010	1.07 (0.68 to 1.68)	0.784	1.04 (0.66 to 1.64)	0.854	1.12 (0.62 to 2.02)	0.703
		13-19			REF		REF	
		20-24			1.61 (1.03 to 2.51)	0.038	1.77 (1.01 to 3.10)	0.047
		25-34			0.90 (0.58 to 1.38)	0.620	0.95 (0.56 to 1.63)	0.863
		35-54			0.50 (0.30 to 0.83)	0.007	0.47 (0.25 to 0.90)	0.022
		IMD 1 Least deprived					REF	
		IMD 2					1.09 (0.58 to 2.03)	0.794
		IMD 3					0.95 (0.51 to 1.78)	0.878
		IMD 4					0.99 (0.53 to 1.83)	0.963
		IMD 5 Most deprived					0.97 (0.52 to 1.79)	0.917
2010	NLHC	Abortion 2011	1.00 (0.90 to 1.10)	0.962	0.99 (0.89 to 1.09)	0.779	0.93 (0.82 to 1.05)	0.253
		13-19			REF		REF	
		20-24			0.90 (0.80 to 1.01)	0.072	0.89 (0.77 to 1.03)	0.123
		25-34			0.60 (0.54 to 0.68)	<0.001	0.58 (0.50 to 0.66)	<0.001
		35-54			0.21 (0.18 to 0.24)	<0.001	0.19 (0.15 to 0.23)	<0.001
		IMD 1 Least deprived					REF	
		IMD 2					1.11 (0.93 to 1.32)	0.261
		IMD 3					1.36 (1.14 to 1.61)	0.001

		IMD 4					1.53 (1.29 to 1.82)	<0.001
		IMD 5 Most deprived					1.90 (1.60 to 2.26)	<0.001
	EHC	Abortion 2011	0.90 (0.52 to 1.54)	0.696	0.86 (0.50 to 1.48)	0.587	1.29 (0.59 to 2.80)	0.527
		13-19			REF		REF	
		20-24			1.12 (0.69 to 1.82)	0.645	1.19 (0.63 to 2.25)	0.588
		25-34			0.94 (0.61 to 1.45)	0.778	1.23 (0.71 to 2.15)	0.463
		35-54			0.39 (0.22 to 0.68)	0.001	0.48 (0.24 to 0.97)	0.040
		IMD 1 Least deprived					REF	
		IMD 2					1.49 (0.73 to 3.00)	0.271
		IMD 3					1.26 (0.62 to 2.54)	0.522
		IMD 4					1.30 (0.65 to 2.59)	0.463
		IMD 5 Most deprived					1.70 (0.88 to 3.28)	0.116
2011	NLHC	Abortion 2012	1.04 (0.93 to 1.17)	0.479	1.04 (0.93 to 1.17)	0.456	1.03 (0.89 to 1.19)	0.673
		13-19			REF		REF	
		20-24			1.04 (0.92 to 1.18)	0.541	1.11 (0.94 to 1.30)	0.205
		25-34			0.69 (0.61 to 0.78)	<0.001	0.73 (0.63 to 0.85)	<0.001
		35-54			0.25 (0.21 to 0.29)	<0.001	0.25 (0.20 to 0.31)	<0.001
		IMD 1 Least deprived					REF	
		IMD 2					1.30 (1.08 to 1.57)	0.006
		IMD 3					1.54 (1.28 to 1.85)	<0.001
		IMD 4					1.48 (1.48 to 1.78)	<0.001
		IMD 5 Most deprived					1.87 (1.55 to 2.25)	<0.001
	EHC	Abortion 2012	0.67 (0.38 to 1.18)	0.168	0.65 (0.37 to 1.16)	0.144	0.80 (0.38 to 1.70)	0.568
		13-19			REF		REF	
		20-24			1.50 (0.85 to 2.62)	0.161	1.41 (0.70 to 2.83)	0.336
		25-34			0.98 (0.58 to 1.66)	0.942	0.90 (0.47 to 1.72)	0.745
		35-54			0.46 (0.24 to 0.87)	0.016	0.44 (0.20 to 0.97)	0.042
		IMD 1 Least deprived					REF	
		IMD 2					4.15 (1.19 to 14.44)	0.026
		IMD 3					3.73 (1.07 to 12.99)	0.039
		IMD 4					4.84 (1.43 to 16.36)	0.011

		IMD 5 Most deprived					5.53 (1.67 to 18.39)	0.005
2012	NLCH	Abortion 2013	1.01 (0.90 to 1.14)	0.823	1.00 (0.89 to 1.13)	0.944	0.99 (0.85 to 1.15)	0.853
		13-19			REF		REF	
		20-24			1.07 (0.93 to 1.22)	0.339	1.16 (0.97 to 1.39)	0.095
		25-34			0.76 (0.67 to 0.86)	<0.001	0.82 (0.69 to 0.97)	0.018
		35-54			0.23 (0.19 to 0.28)	<0.001	0.25 (0.20 to 0.32)	<0.001
		IMD 1 Least deprived					REF	
		IMD 2					1.26 (1.02 to 1.55)	0.034
		IMD 3					1.47 (1.19 to 1.80)	<0.001
		IMD 4					1.64 (1.34 to 2.01)	<0.001
		IMD 5 Most deprived					2.26 (1.85 to 2.76)	<0.001
	EHC	Abortion 2013	1.62 (0.71 to 3.72)	0.254	1.53 (0.66 to 3.52)	0.319	1.42 (0.51 to 3.95)	0.502
		13-19			REF		REF	
		20-24			1.27 (0.70 to 2.33)	0.430	1.96 (0.84 to 4.57)	0.118
		25-34			0.93 (0.53 to 1.62)	0.797	1.43 (0.65 to 3.14)	0.372
		35-54			0.41 (0.21 to 0.82)	0.012	0.51 (0.19 to 1.38)	0.188
		IMD 1 Least deprived					REF	
		IMD 2					0.75 (0.30 to 1.88)	0.546
		IMD 3					0.75 (0.31 to 1.78)	0.507
		IMD 4					0.93 (0.41 to 2.09)	0.857
		IMD 5 Most deprived					1.08 (0.50 to 2.35)	0.843

Table 14 Age-adjusted sensitivity analyses of LARC advice given and outcomes (LARC prescriptions and abortions) two and three years later

Britain overall			***Outcome Year***			
Outcome	Contraception	LARC advice	2010	2011	2012	2013
LARC prescription	NLHC	2009	1.32 (1.25 to 1.38)	1.18 (1.11 to 1.24)	1.20 (1.13 to 1.26)	
		2010		1.23 (1.17 to 1.29)	1.17 (1.11 to 1.23)	1.17 (1.11 to 1.24)
		2011			1.09 (1.04 to 1.15)	1.05 (0.99 to 1.11)
		2012				1.14 (1.08 to 1.21)
	EHC	2009	1.53 (1.16 to 2.03)	1.47 (1.07 to 2.01)	1.69 (1.19 to 2.40)	
		2010		1.31 (0.93 to 1.83)	1.31 (0.89 to 1.94)	2.04 (1.26 to 3.32)
		2011			1.30 (0.92 to 1.84)	0.97 (0.67 to 1.42)
		2012				1.09 (0.78 to 1.53)
Abortion	NLHC	2009	0.94 (0.85 to 1.04)	1.06 (0.95 to 1.19)	0.97 (0.85 to 1.09)	
		2010		0.99 (0.89 to 1.09)	1.03 (0.92 to 1.15)	1.00 (0.88 to 1.13)
		2011			1.04 (0.93 to 1.17)	1.12 (0.99 to 1.27)
		2012				1.00 (0.89 to 1.13)
	EHC	2009	1.04 (0.66 to 1.64)	0.86 (0.50 to 1.48)	0.64 (0.36 to 1.13)	
		2010		0.86 (0.50 to 1.48)	1.08 (0.52 to 2.23)	0.50 (0.26 to 0.97)
		2011			0.65 (0.37 to 1.16)	1.65 (0.60 to 4.55)
		2012				1.53 (0.66 to 3.52)

Table 15 Age and deprivation quintile adjusted sensitivity analyses of LARC advice given and outcomes (LARC prescriptions and abortions) two and three years later (English regions only)

England only			***Outcome Year***			
Outcome	**Contraception**	**LARC advice**	**2010**	**2011**	**2012**	**2013**
LARC prescription	NLHC	2009	1.37 (1.28 to 1.46)	1.19 (1.11 to 1.27)	1.24 (1.15 to 1.33)	
		2010		1.26 (1.18 to 1.34)	1.15 (1.08 to 1.22)	1.19 (1.12 to 1.28)
		2011			1.12 (1.05 to 1.20)	1.04 (0.97 to 1.11)
		2012				1.17 (1.09 to 1.25)
	EHC	2009	1.48 (1.03 to 2.11)	1.59 (1.04 to 2.44)	2.42 (1.44 to 4.06)	
		2010		1.48 (0.95 to 2.31)	1.62 (0.95 to 2.78)	3.86 (1.70 to 8.78)
		2011			1.24 (0.81 to 1.90)	0.89 (0.56 to 1.42)
		2012				1.09 (0.72 to 1.65)
Abortion	NLHC	2009	0.91 (0.80 to 1.03)	1.04 (0.91 to 1.20)	0.98 (0.84 to 1.15)	
		2010		0.93 (0.82 to 1.05)	0.97 (0.85 to 1.12)	1.02 (0.87 to 1.20)
		2011			1.03 (0.89 to 1.19)	1.19 (1.00 to 1.40)
		2012				0.99 (0.85 to 1.15)
	EHC	2009	1.12 (0.62 to 2.02)	1.04 (0.51 to 2.11)	0.89 (0.40 to 1.99)	
		2010		1.29 (0.59 to 2.80)	0.85 (0.36 to 1.99)	0.59 (0.25 to 1.41)
		2011			0.80 (0.38 to 1.70)	2.34 (0.56 to 9.69)
		2012				1.42 (0.51 to 4.00)

Figure 11 Odds ratios of outcome measures (LARC prescriptions and abortions) in those who had LARC advice vs those how didn't by method of contraception, adjusted for age groups

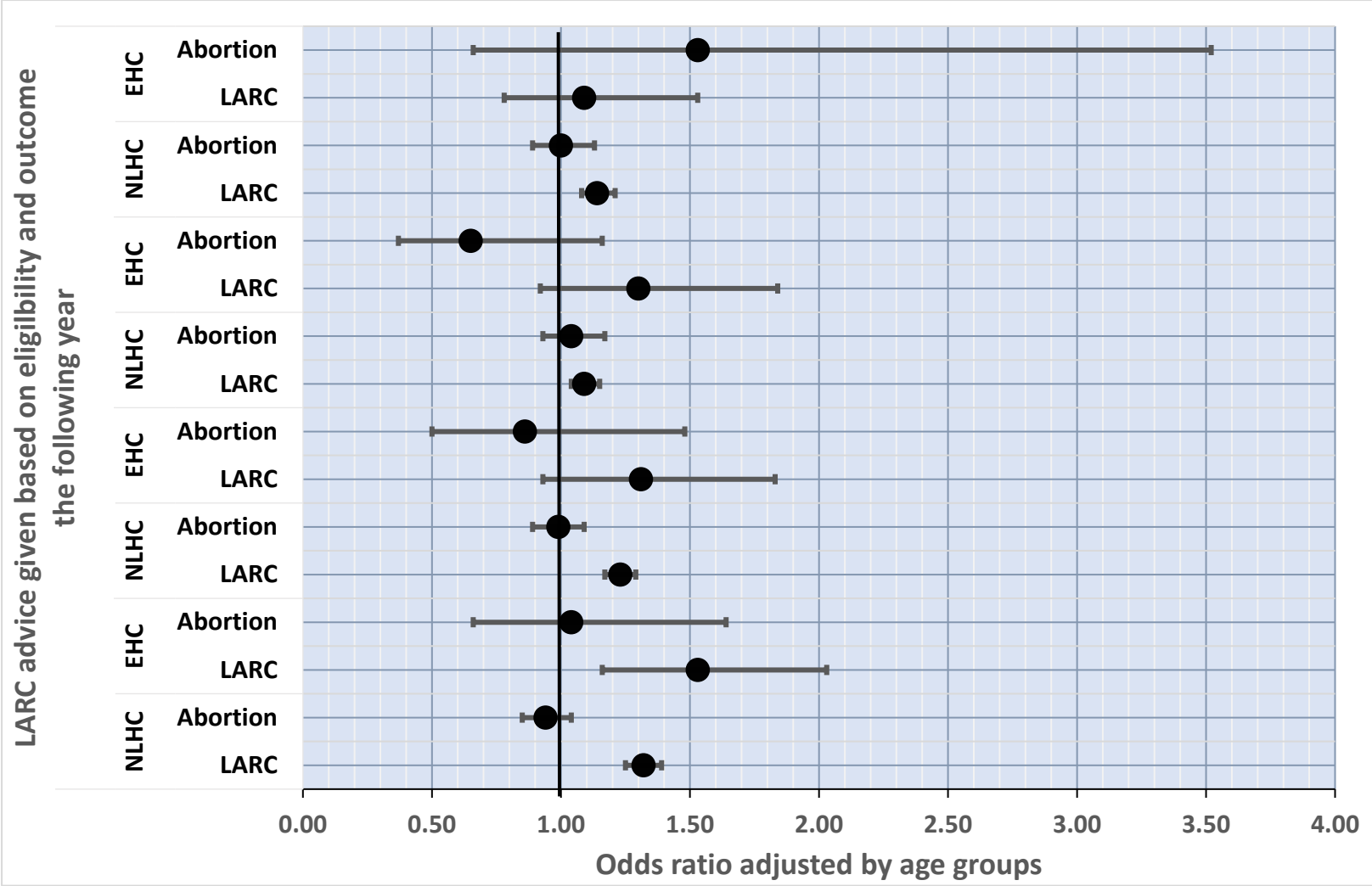
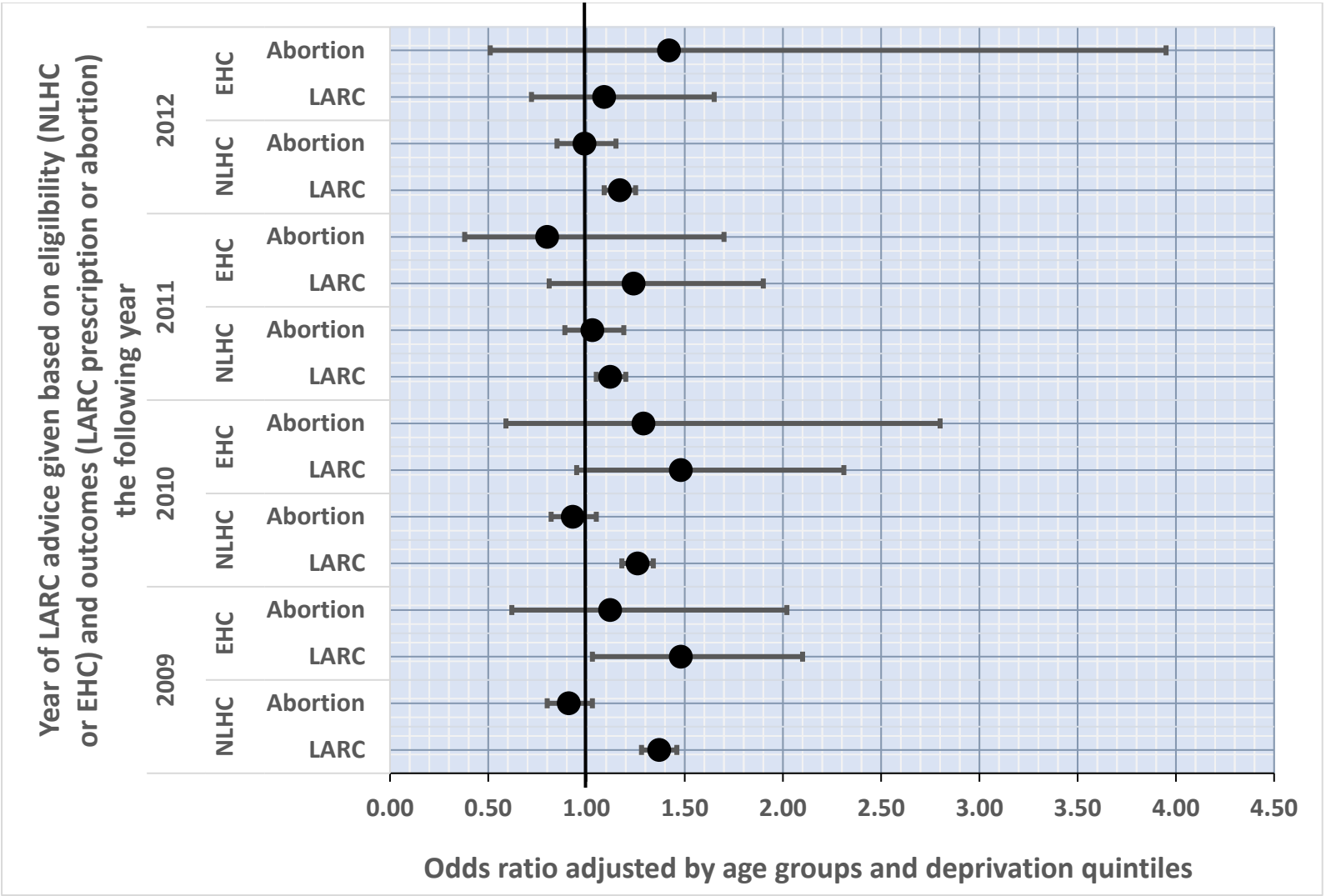


Figure 12 Odds ratios of outcome measures (LARC prescriptions and abortions) associated with LARC advice by method of contraception adjusted for age groups and deprivation quintiles (English regions only)



15 Results Study 3 – What are the biopsychosocial correlates of abortion in British primary care?

In this chapter, I will report the results of Study 3 – what are the biopsychosocial correlates of abortion? This was a case-control study of women who had ever had an abortion, comparing a selection of biopsychosocial determinants with women who did not have an abortion in the same period. An abstract of this study was presented as a poster at the 50th Annual Meeting of North American Primary Care Research Group (NAPCRG) on November 18-22, 2022 in Phoenix, Arizona (U.S.).

15.1 Descriptive analysis

The original cohort contained 5,899,484 women aged 13 to 54 across a ten-year study period between 2004 and 2013 with 193,686 women who ever had an abortion. However, as mentioned in the Methods chapter, this caused problems with the matching programme because this large number of patients in the cohort consumed too much memory and it was impossible to do any matching. I found a compromise of 1:2 matching using a random 2.5% subset of the original cohort. The final sample was 294,974, with a total of 9,787 women who had abortions; out of that, 8,789 were matched to 2 controls who had the same year of birth and who were from the same practice. Although this was slightly less than the sample size calculation of 10,000 cases against 100,000 controls, the results suggest this sample offered good precision for the analysis.

Abortions were not distributed evenly across the regions in Britain in this sample (Table 16). The highest number of women who had abortions were in Wales (15.8%) and the lowest from North East (1.1%). The case-control pairs from each region comprised roughly 10% of the sample population from each region, but Scotland had a much lower proportion of case-control pairs drawn (5.3%) compared with other regions. Otherwise, cases and controls were comparable in terms of mean and standard deviation and median age and interquartile range. The latter is likely to be more meaningful as the age range of abortions tend to be skewed with a peak between 20 to 24 years according to literature.

Table 16 Demographics of sample

Region	*Sub population*	*Cases*	*Mean age in 2013 (range, SD)*	*Matched Controls*	*Mean age n 2013 (range, SD)*	*Distance between matches*	*Total*	*Proportion of region (%)*	*Proportion of sample (%)*
North East	3,348	100	29.5 (17 to 49, 6.7)	200	29.5 (17 to 49, 6.6)	4	300	9.0%	1.14
North West	25,925	897	30.8 (13 to 51, 7.4)	1,794	30.8 (12 to 51, 7.4)	77	2,691	10.4%	10.21
Yorkshire and Humber	7,918	197	31.8 (17 to 53, 7.3)	394	31.8 (17 to 53, 7.3)	14	591	7.5%	2.24
East Midlands	8,554	246	31.3 (16 to 50, 7.1)	492	31.3 (16 to 50, 7.1)	13	738	8.6%	2.80
West Midlands	21,557	750	30.5 (15 to 55, 7.1)	1,500	30.5 (15 to 55, 7.1)	76	2,250	10.4%	8.53
East of England	21,317	633	32.1 (15 to 55, 7.3)	1,266	32.1 (15 to 55, 7.3)	21	1,899	8.9%	7.20
South West	22,202	693	31.1 (16 to 52, 7.5)	1,386	31.1 (16 to 52, 7.5	43	2,079	9.4%	7.88
South Central	26,565	810	31.1 (15 to 56, 7.5)	1,620	31.1 (15 to 56, 7.5)	21	2,430	9.1%	9.22
London	38,814	1,181	32.5 (14 to 60, 7.5)	2,362	32.5 (14 to 60, 7.5)	65	3,543	9.1%	13.44
South East Coast	25,051	902	31.1 (15 to 63, 7.5)	1,804	311. (15 to 63, 7.6)	67	2,706	10.8%	10.26
Scotland	56,025	996	30.3 (15 to 56, 7.5)	1,992	30.3 (15 to 56, 7.5)	440	2,988	5.3%	11.33
Wales	37,698	1,384	30.3 (14 to 61, 7.6)	2,768	30.2 (14 to 61, 7.6)	143	4,152	11.0%	15.75
Total	294,974	8,789	31.1 (13 to 63, 7.5)	17,578	31.1 (12 to 63, 7.5)	984	26,367	8.9%	100

Table 17 Distribution of covariates among cases (abortion) and controls (no abortion)

Covariate	Total	Cases	Proportion (%)	Controls	Proportion (%)
Depression	4,477	2,597	58.0	1,880	42.0
Anxiety	1,195	667	55.8	528	44.2
Severe Mental Illness SMI	168	95	56.5	73	43.5
Abuse	259	192	74.1	67	25.9
Deliberate Self Harm DSH	204	112	54.9	92	45.1
Drug misuse	246	165	67.1	81	32.9
Overdose	777	499	64.2	278	35.8
Alcohol misuse	416	262	63.0	154	37.0
Non-smoker	9,171	3,655	39.9	5,516	60.1
Ex-smoker	3,159	1,614	51.1	1,545	48.9
Smoker	5,384	3,204	59.5	2,180	40.5
Missing smoking data	8,653	316	3.7	8,337	96.3

Table 18 Distribution of missing smoking data according to outcome variable (abortion)

Abortion	Non-smoker	Ex-smoker	Smoker	Missing	Total
No abortion	5,516	1,545	2,180	8,337	12,578
Abortion	3,655	1,614	3,204	316	8,789
Total	9,171	3,159	5,384	8,653	26,367

Table 19 Summary of logistic regression analyses of associations between abortion and biopsychosocial factors, with outputs that are unadjusted, adjusted for smoking only and no multiple imputations (MI), adjusted for smoking only with multiple imputations), and adjusted for smoking and IMD quintiles with multiple imputations (England data only)

Covariate	*Unadj OR (95% CI)*	*p value*	*Adj OR no MI (95% CI)*	*p value*	*Adj OR + MI (95% CI)*	*p value*	*Adj OR + MI (95% CI)*	*p value*
Depression	3.50 (3.28 to 3.74)	<0.001	1.46(1.36 to 1.57)	<0.001	2.46 (2.23 to 2.64)	<0.001	2.44 (2.22 to 2.70)	<0.001
Anxiety	2.65 (2.36 to 2.98)	<0.001	1.14 (1.01 to 1.29)	0.034	1.57 (1.39 to 1.80)	<0.001	1.49 (1.25 to 1.77)	<0.001
Severe Mental Illness	2.62 (1.93 to 3.56)	<0.001	0.96 (0.69 to 1.32)	0.783	1.02 (0.73 to 1.43)	0.891	0.93 (0.61 to 1.43)	0.744
Abuse	5.84 (4.41 to 7.72)	<0.001	2.27 (1.70 to 3.03)	0.001	3.00 (2.22 to 4.04)	<0.001	2.83 (1.91 to 4.19)	<0.001
Deliberate Self Harm	2.45 (1.86 to 3.24)	<0.001	0.78 (0.58 to 1.05)	0.101	0.79 (0.58 to 1.08)	0.137	0.87 (0.57 to 1.33)	0.527
Drugs misuse	4.13 (3.16 to 5.40)	<0.001	1.20 (0.90 to 1.59)	0.211	1.25 (0.93 to 1.68)	0.131	1.14 (0.74 to 1.76)	0.548
Overdose	3.75 (3.23 to 4.35)	<0.001	1.44 (1.23 to 1.69)	<0.001	1.71 (1.44 to 2.02)	<0.001	1.79 (1.43 to 2.25)	<0.001
Alcohol	3.48 (2.84 to 4.25)	<0.001	1.35 (1.09 to 1.67)	0.005	1.73 (1.38 to 2.15)	<0.001	2.19 (1.57 to 3.05)	<0.001
Non-smoker	1.00 (REF)		1.00 (REF)		1.00 (REF)		1.00 (REF)	
Ex-smoker	1.58 (1.45 to 1.71)	<0.001	1.49 (1.37 to 1.62)	<0.001	0.80 (0.74 to 0.86)	<0.001	0.83 (0.75 to 0.91)	<0.001
Smoker	2.22 (2.07 to 2.38)	<0.001	2.01 (1.87 to 2.16)	<0.001	3.01 (2.81 to 3.23)	<0.001	3.04 (2.77 to 3.35)	<0.001
IMD1 (Least deprived)	1.00 (REF)						1.00 (REF)	
IMD 2	1.17 (1.04 to 1.32)	<0.001					1.09 (0.97 to 1.24)	0.161
IMD 3	1.35 (1.20 to 1.51)	<0.001					1.22 (1.08 to 1.38)	0.001
IMD 4	1.40 (1.25 to 1.57)	<0.001					1.18 (1.05 to 1.34)	0.006
IMD 5 (Most deprived)	1.46 (1.30 to 1.63)	<0.001					1.16 (1.03 to 1.30)	0.017

Table 17 summarises the distribution of cases and controls for each covariate. Compared with women who did not have an abortion, women who had abortions were more likely to have a history of depression (58.0% vs 42.0%), anxiety (55.8% vs 44.2%), severe mental illness (56.6% vs 43.5%), abuse (74.1% vs 25.9%), deliberate self-harm (54.9% vs 45.1%), drug misuse (67.1% vs 32.9%), overdose (64.2% vs 35.8%), and alcohol misuse (63.0% vs 37.0%). Compared with women who did not have an abortion, those who had abortions were more likely to be smokers (59.5% vs 40.5%), less likely to be ex-smokers (51.1% vs 48.9%) and non-smokers (39.9% vs 60.2%).

Out of 26,367 patients, there were 8,653 missing smoking records, which comprised 32.8% of the total sample (Table 18). Out of the 12,578 who did not have an abortion, there was a disproportionate number who had missing smoking data compared with those who had a history of abortion (47.4% vs 3.6%); among the 8,653 with missing smoking data, there were disproportionally more among those who did not have abortion (96.4%) compared with those with a history of abortion (3.7%).

15.2 Regression analysis

The results of the logistic regression analyses are summarised in Table 19, Figure 13 and Figure 14. Before adjustment, all determinants appeared to have significant associations with abortions as all unadjusted odds ratios (ORs) were over 1.00, with 95% confidence intervals greater than 1.00 and all $p<0.001$. The associations became weaker and less significant for only three of the predictor variables (Severe Mental Illness, Deliberate Self Harm, and drugs misuse) and for one of the variables (ex-smoker), the association was reversed.

The first multivariate regression model used the imputed smoking data and all covariates to adjust the outcomes (Table 19 and Figure 13). Among the mental health diagnoses, abortion was strongly associated with a history of depression (OR 2.46, 2.29 to 2.64, $p<0.001$), anxiety (1.58, 1.39 to 1.80, $p<0.001$) but not associated with having severe mental illness such as psychosis (1.03, 0.73 to 1.43, $p=0.885$).

There was strong association with overdose (1.71, 1.44 to 2.02, p<0.001) but not deliberate self-harm (0.79, 0.58 to 1.08, p=0.790).

The relationship with addiction was mixed: there was not a strong association with drugs misuse (1.26, 0.94 to 1.69, p=0.128), whereas the association alcohol dependency was stronger (1.72, 1.38 to 2.16, p<0.001).

Using non-smoker as the reference value, being a smoker was strongly associated with abortion (3.03, 2.83 to 3.25, p<0.001) but the association seemed protective for ex-smokers (0.82, 0.76 to 0.88, p<0.001). The strongest predictor of abortion among the chosen variables was a history of domestic or sexual abuse (3.0, 2.22 to 4.05, p<0.001).

Another modelling was conducted in the same way but with additional adjustment for deprivation quintiles (Table 19 and Figure 14). Unadjusted analysis showed greater likelihood of abortion the higher the deprivation quintile (i.e., more deprived) and this association was significant for all deprivation quintiles compared with IMD 1 (lease deprived). After adjustment, the association was still present for all but IMD 2. The adjusted odds ratios for all other covariates remained largely unchanged.

15.3 Sensitivity analysis

I described in the Methods chapter that missing data were imputed based on the assumption that data were either missing completely at random (MCAR) or missing at random (MAR), and if missing at random, could be associated with certain variables. I carried out a sensitive analysis to test if these assumptions were correct.(181)

Firstly, to test the distribution of imputed smoking variables, I repeated the analyses using four scenarios: substituting all missing smoking data with “non-smokers”, substituting with “ex-smokers”, substituting with “smokers” and finally randomly assigning any of these three smoking categories to the missing data. The distribution of missing smoking data is presented in Table 18, and the impact on the regression analysis is shown in Table 20, Table *21*, Table *22* and Table 23.

It is important to note there were more missing data among women who did not have an abortion when interpreting the sensitivity analyses. Compared with imputed analysis, when missing smoking data were substituted with being “non-smokers” (Table 20), the direction of association, confidence level and p values did not change; the only exception was that ex-smokers had become associated with increased risk of abortion (adjusted OR 3.09, 2.85 to 3.35 p<0.001) and history of DSH less (0.71, 0.52 to 0.97, p<0.029).

When missing values were allocated to “ex-smokers” (Table 21), that status became significantly less likely to be associated with abortion (adj OR 0.32, 0.30 to 0.34, p<0.001), drug misuse became strongly associated (adj OR 1.38, 1.03 to 1.86, p=0.033) while associations with other covariates remained unchanged. When missing data were substituted with “smoker” (Table 22), drug misuse became stronger in its association with abortion (adj OR 2.58, 1.92 to 3.46, p<0.001), as was being an ex-smoker (adj OR 1.39, 1.27 to 1.51, p<0.001) and being a smoker became significantly less likely to be associated with abortion (adj OR 0.50, 0.47 to 0.53, p<0.001).

Table 20 Regression analysis using missing data substituted with "non-smokers"

Covariate	***adj OR (95% CI)***	***p value***
Depression	2.15 (2.00 to 2.32)	<0.001
Anxiety	1.45 (1.27 to 1.65)	<0.001
SMI	1.09 (0.78 to 1.53)	0.615
Abuse	2.96 (2.19 to 4.01)	<0.001
DSH	0.71 (0.52 to 0.97)	0.029
Drug use	1.17 (0.87 to 1.56)	0.294
Overdose	1.60 (1.35 to 1.89)	<0.001
Alcohol dependence	1.60 (1.28 to 2.00)	<0.001
Non-smoker	REF	
Ex-smoker	3.09 (2.85 to 3.35)	<0.001
Smoker	4.09 (3.82 to 4.38)	<0.001

Table 21 Regression analysis using missing data substituted with "ex-smokers"

Covariate	***adj OR (95% CI)***	***p value***
Depression	2.20 (2.04 to 2.37)	<0.001
Anxiety	1.45 (1.27 to 1.65)	<0.001
SMI	0.96 (0.69 to 1.33)	0.796
Abuse	2.87 (2.12 to 3.88)	<0.001
DSH	0.84 (0.61 to 1.15)	0.272
Drug use	1.38 (1.03 to 1.86)	0.033
Overdose	1.72 (1.46 to 2.04)	<0.001
Alcohol dependence	1.67 (1.34 to 2.08)	<0.001
Non-smoker	REF	

Ex-smoker	0.32 (0.30 to 0.34)	<0.001
Smoker	1.87 (1.74 to 2.01)	<0.001

Table 22 Regression analysis using missing data substituted with "smokers"

Covariate	***adj OR (95% CI)***	***p value***
Depression	2.73 (2.54 to 2.93)	<0.001
Anxiety	1.52 (1.34 to 1.72)	<0.001
SMI	1.17 (0.84 to 1.64)	0.354
Abuse	3.80 (2.83 to 5.11)	<0.001
DSH	0.94 (0.69 to 1.29)	0.707
Drug use	2.58 (1.92 to 3.46)	<0.001
Overdose	2.13 (1.80 to 2.51)	<0.001
Alcohol dependence	2.14 (1.73 to 2.66)	<0.001
Non-smoker	REF	
Ex-smoker	1.39 (1.27 to 1.51)	<0.001
Smoker	0.50 (0.47 to 0.53)	<0.001

Table 23 Regression analysis using missing data substituted with randomly assigned smoking status

Covariate	***adj OR (95% CI)***	***p value***
Depression	2.89 (2.69 to 3.10)	<0.001
Anxiety	1.67 (1.48 to 1.90)	<0.001
SMI	1.10 (0.79 to 1.54)	0.564
Abuse	3.44 (2.56 to 4.61)	<0.001
DSH	0.89 (0.66 to 1.21)	0.467
Drug use	1.80 (1.34 to 2.40)	<0.001
Overdose	1.95 (1.66 to 2.30)	<0.001
Alcohol dependence	2.02 (1.63 to 2.51)	<0.001
Non-smoker	REF	
Ex-smoker	0.82 (0.76 to 0.88)	<0.001
Smoker	1.27 (1.20 to 1.35)	<0.001

Table 24 Regression analysis using multiple imputations with no associated variables

Covariate	***adj OR (95% CI)***	***p value***
Depression	2.46 (2.29 to 2.64)	<0.001
Anxiety	1.58 (1.39 to 1.80)	<0.001
SMI	1.02 (0.73 to 1.43)	0.891
Abuse	3.00 (2.22 to 4.05)	<0.001
DSH	0.79 (0.58 to 1.08)	0.137
Drug use	1.25 (0.93 to 1.68)	0.131
Overdose	1.71 (1.44 to 2.02)	<0.001
Alcohol dependence	1.73 (1.38 to 2.15)	<0.001
Non-smoker	REF	
Ex-smoker	0.80 (0.74 to 0.86)	<0.001
Smoker	3.01 (2.81 to 3.23)	<0.001

Estimates of smoking prevalence among females aged 30 to 100 years were reported as 55%, 20% and 22% of non-smokers, ex-smokers and smokers respectively in one study using the CPRD.(182) Distributing the missing smoking data randomly to the three smoking statuses seem to produce a smoking prevalence that compared well those reported even taking into account the difference in age range: this scenario produced prevalence of 46%, 23.% and 31% respectively. It was not surprising, therefore, that this produced an output that was closest the imputed output (Table 23); the only difference was a strong association between abortion and history of drug misuse (adj OR 1.80, 1.34 to 2.40, p<0.001).

There were no differences in the outputs in terms of direction, strength and significance of the associations in other scenarios with the imputed outputs: using 20 to 100 imputations or reducing the associated variables to include alcohol and drug misuse only and no associations at all (Table 24).

15.4 Summary

This study aimed to examine the biopsychosocial correlates of abortion among women aged 13 to 54 in British general practices. The original dataset comprised just under 6 million women, but due to the large amount of memory that would have been needed to run the matching and subsequent analysis, a random subset of 2.5% was used, which gave me just under 300,000 patient records that could be used for a 1:2 matched case control study.

The analysis showed that an abortion event was strongly associated with a history of abuse (domestic or sexual), followed by depression, anxiety, overdose and alcohol misuse. The strength of association was much less for severe mental illness, deliberate self-harm, and drugs misuse. Using non-smoker status as a reference, being a smoker was strongly associated with abortion; the direction of association was reversed for ex-smokers where it was significantly less likely to be associated with abortion.

I will discuss this study's strengths, limitations and the implications for policy and practice in the Discussion chapter.

Figure 13 Summary plot of odds ratios (adjusted for smoking) of biopsychosocial factors associated with abortion

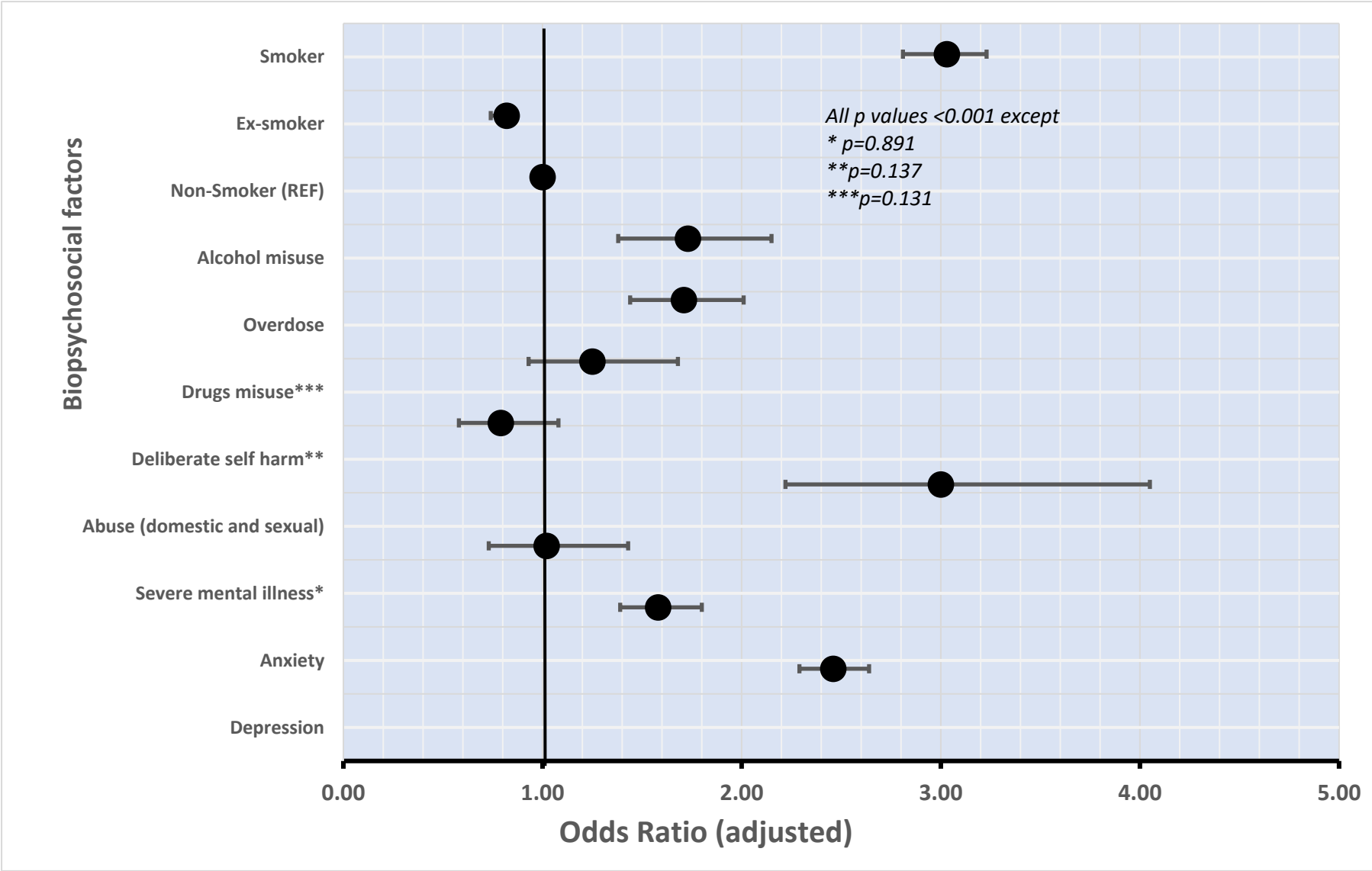
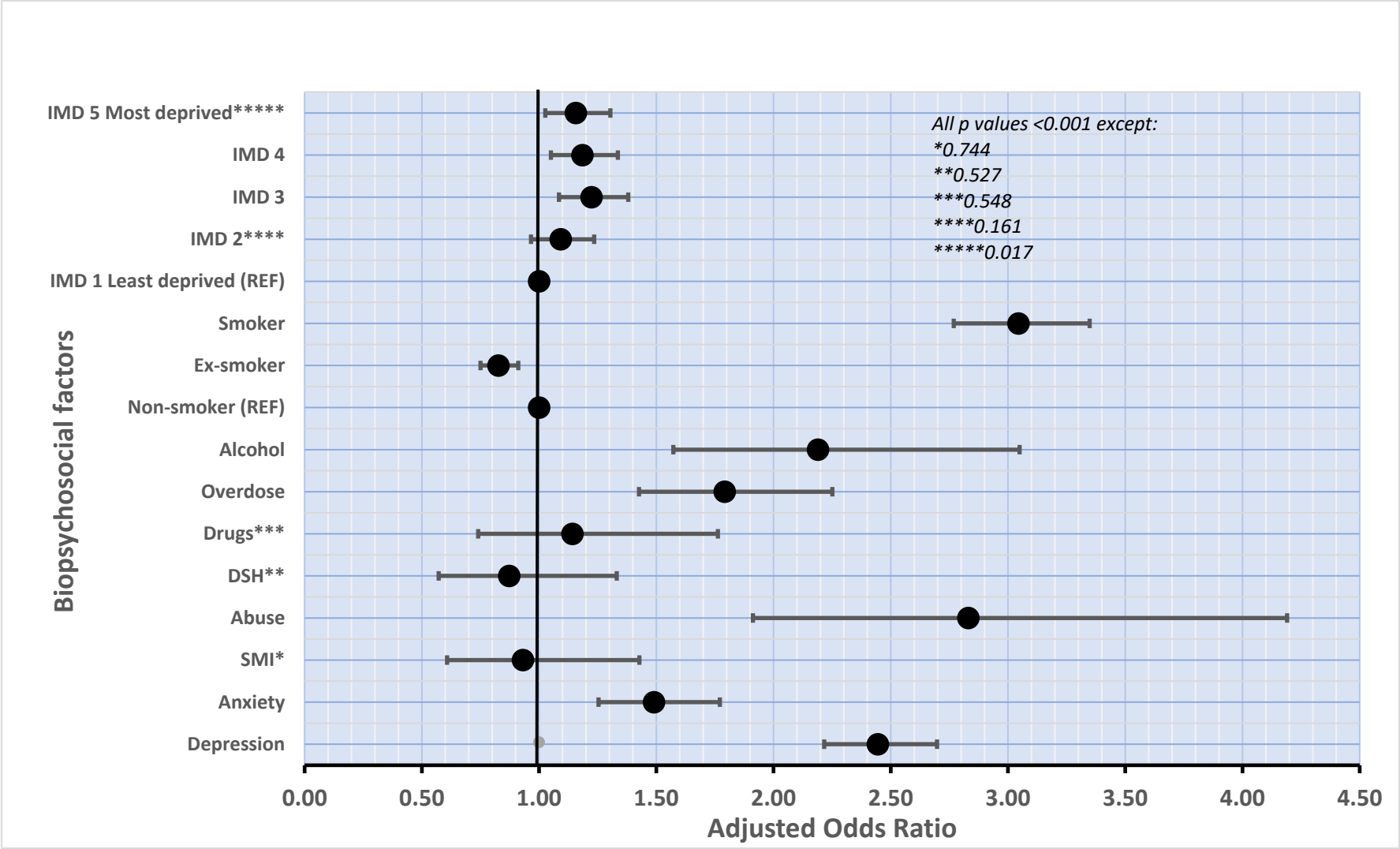


Figure 14 Summary plot of odd ratios (adjusted for smoking and deprivation quintiles) of biopsychosocial factors of abortion



16 Results Study 4 - What are young women's experiences of contraceptive care? A focus group study

This chapter reports the findings of the focus group study of young women about their experiences of accessing contraception. As previously mentioned, the first few studies that examined the impact of LARC advice and the risk factors for abortion do not help to understand why and how women access contraception and what other contextual factors help to understand their use. For this reason, I needed to do a qualitative study which would help to interpret the findings from the previous studies.

This was a qualitative study of two groups of young women: 16- to 19-year-old and 20- to 25-year-old. These age groups reflected women in different life stages and experiences; former group likely to be in education and latter group likely out of education and some in relationships/and or have children.

The focus group discussions were recorded digitally and together with some co-authors, we used a process of reflexive thematic analysis to examine the data. I used a feminist framework to frame the data which helped to explain how societal attitudes, norms and assumptions about gender roles, gender inequality and power that are grounded in institutions might have impact on contraceptive care and access.

16.1 Demographics

There were 8 participants in the younger group and 9 in the older group. The age range in the younger group was 16 to 18 and in the older group it was 20 to 23. Half of the former gave their ethnicity information which included: White British, Black Caribbean and Other; five in the latter also gave their ethnicity and included: White & Asian mixed, White British, Irish, Other and Mixed Other.

16.2 Thematic analysis

We organised the data into the following major and minor themes (Figure 15): sources of information and contraception (people, places, online, method specific), and structural factors (access, supportive environments, gender inequality, shaming of female sexuality, and power and oppression).

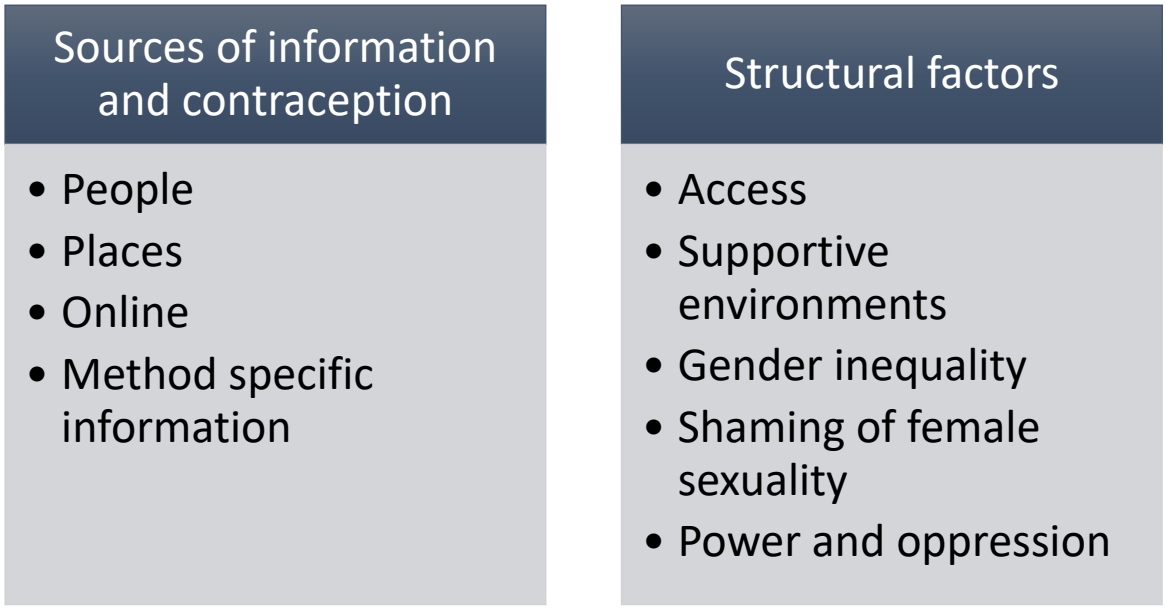
I was present at both discussions as an observer and to give any clinical information if needed. I was also there to observe the group dynamics. As a ice-breaker, the participants were invited to choose a range of contraceptive methods that were displayed on the table and talk about why they chose them.

Among the 16- to 19-year-old group, many picked the methods they were currently using such as the oral contraceptive pill, the condom and contraceptive implant; one picked the IUD which was what she was recommended after looking at her options on a website and she was curious about what it looked like. There was a short discussion about their experiences with each to begin with and the conversation flowed about their experiences of using them, including unwanted effects, and accessing them. Compared with the older group, the participants needed a little more prompting from the facilitator to invite everyone to contribute. Due to their age and experiences, they tended to discuss more about schools, friends and how they were judged about their sexual behaviour.

In the older group, one picked up the IUS because that was what her GP recommended and the discussions started with some concerns regarding the hormones and where the device was located, until one of the group members talked about her positive experiences of using the IUD. The discussions in the older group were more spontaneous than the younger group, and everyone felt at ease to share many personal experiences about their use of contraception and sexual partnerships. The older group were more sexually experienced, most had at least one sexual partner in the past and one also had children. As they were more experienced, they were also able to discuss other themes not covered in the younger group such as the dynamics in a heterosexual relationship, reflecting on their experiences as young adults navigating through the health system. The facilitator needed very little prompting.

Although we had a topic guide, the discussions were flowing spontaneously and the topics that they covered I felt were far more relevant about their experiences, we did not feel we needed adhere strictly to it.

Figure 15 Major and minor themes from qualitative data



16.2.1 Sources of information and contraception - People

Not all participants felt comfortable talking to their parents about sex and contraception as they felt that their parents did not make them feel at ease without judgement. Some participants said that they did not approach their fathers, whom they thought were indifferent. Parental advice mainly involved abstention or condom use. Some thought their parents were either in denial or chastised them about their sexual activity. Both age groups wanted advice on how to feel empowered to negotiate a mutually respectful relationship and look after themselves. One woman reported not having any role models to discuss options with, which made her feel isolated.

> *I would be able to have conversations about contraception with my sister and my brother, but I would never be able to have that kind of conversation with either of my parents and I think that's purely because of it's kind of frowned upon almost until you get to like a certain age. (16-19)*

Some participants obtained hormonal contraceptives from GPs, initially for conditions like acne and painful periods which they thought were less stigmatising reasons for their use, but then felt dismissed by their GP when they started to use them for contraception. Others felt GPs did not have the expertise nor time to discuss contraception effectively and preferred sexual health clinics.

> *Well, I was put on the pill when I was really young for like medical reasons because I got my period when I was like nine, … I wanted to speak to the GP about it being for contraception and I was like dismissed and like ushered to the local sexual health clinic. (20-24)*

Sex and contraception were often topics of conversation among peers at schools and colleges. Participants from both age groups remembered their school nurse as a trustworthy, female figure with whom they could discuss in confidence. A few from the older group also felt able to recommend methods they were using to their friends. Both groups discussed sharing advice with peers and sometimes supporting one another by accompanying friends to sexual health clinics.

> *So, I've taken like loads of my friends to clinic, and I've told them 'look, it's fine. There's literally nothing to worry about' and it's just that thought of just like going to the clinic by yourself and I think that's what scares people. (16-19)*

16.2.2 Sources of information and contraception- Places

Participants from both groups discussed their experiences of personal, social, health, and economic education (PSHE) classes at school. Older group participants reported feeling disinterested in discussing sex because they were not curious or sexually active at that time, so it was difficult to engage.

> *I feel like when we initially talked about this kind of stuff, you're at school, you're kind of mid-teens, it's a bit like 'oh, you know, it's all about sex' it's awkward, it's scary … But actually, now it's like, you know, this is important … I don't care, I'm not embarrassed, it's my health, I want to protect it. (20-24)*

Most felt sexual health clinics were better placed to discuss a full range of contraception choices in confidence. A few from the older group felt it was reassuring to be asked about their welfare and safeguarding issues. Although sexual health clinics were confidential, it is self-evident what the purpose of someone's visit is

whereas it is difficult to make assumptions about attendance at a GP surgery. One participant attended a clinic in a different area to where she lived to avoid seeing people she might know. Pharmacies were used, particularly for emergency contraception, as it was easier than attending hospital emergency departments, but the provision was inconsistent and depended on the local funding arrangements for free prescriptions.

> *At the GP they don't, nobody else in the waiting room knows what you're there for ... but I use a family GP so my mum goes there, my nan goes there, … whereas when you go to a sexual health clinic your parents don't go to that sexual health clinic and you might bump into a friend or two but that friend is unlikely to go to your mum and be like 'oh yeah, I saw your daughter' … [but] everybody knows you're going there because of sex. (20-24)*

16.2.3 Sources of information and contraception – Online forum

Online sources were convenient but problematic as some thought comments posted online could be biased towards negative experiences of contraceptive methods; participants from both age groups thought it would be better to follow this up with a healthcare professional in person.

> *A lot of people write online because they're angry … if you're absolutely fine with your contraception you're not going to write about it on Mumsnet or whatever. You're just going to write about it if you're angry. (16-19)*

16.2.4 Sources of information and contraception - Method specific information

Participants discussed their experiences of using contraceptive methods to treat conditions like acne, or heavy and painful periods. Participants had varied experiences of hormonal methods and accepted trade-offs among effectiveness, reliability, and unwanted effects. They valued information about hormones and their effects, rather than how they worked, to make the right choices. Discreet methods were important for those from the younger group, who want to conceal their sexual activity from parents.

16.2.5 Structural factors – access

Structural factors refer to the broader political, economic, social and environmental conditions and institutions. Some participants reported difficulties booking appointments in various healthcare settings. While walk-in clinics might overcome this issue, the trade-off could be long waiting times and taking time off work or school/university. Being able to be “anonymous” was also an advantage. One reported a lack of a confidential space for consultation at a pharmacy which left her with a poor first impression. While another was made to feel ashamed and to wait for long time in A&E. Regardless of setting, participants felt it was important to for them to feel validated rather than judged for looking after their sexual and reproductive health.

> *The clinic I went to was in Hackney and I think they’re very good but for that one you cannot book in advance. So, basically, I have to take the whole day off to go there as early as possible and sit there in the queue like for hours. (20-24)*

> *You don’t want to feel punished and judged for doing a sensible thing because like I said it does take quite a lot of, like somewhat courage to go to a clinic to go and get the emergency pill. (16-19)*

16.2.6 Structural factors – supportive environments

Participants thought boys and girls should learn about the other’s experiences and sexual development at school rather than having segregated classes; discussing sex and relationships without shame could be educational and liberating for both sexes. One thought PSHE classes should be voluntary as some young people might not be ready to have such conversations at that age.

> *I think they split the sex in our school so the boys would go and do theirs and the girls would do theirs, but I think maybe it would be better if it was voluntary and everybody wasn’t forced to do it because there were certain people in my group that were just too childish to actually have those conversations at that age. (20-24)*

Participants from the older group found the focus group itself offered a safe and non-judgemental environment to learn more about reproductive choices, share experiences and learn from them.

16.2.7 Structural factors - gender inequality

Both groups reported they assumed the responsibility for contraception in a heterosexual relationship; some male partners refused to use condoms and only one reported that her boyfriend accompanied her to obtain emergency contraception. One felt surprised to learn in the focus group how prevalent this attitude was among men as she thought it only happened to her. To test their partner's attitudes to their sexual wellbeing, a couple of the older participants bluffed about not using contraception to test their partner's attitudes and willingness to use a condom and discovered their indifference and complacency about sexual health.

> *I gave it to him [the condom], he's like 'we've already started, what's the point?' I was like 'okay' and then the next morning I was like 'okay, so are you happy to split the cost of the morning after pill and he was like 'oh, I just assumed you're on something' and I was like 'you can't assume that. I gave you a condom for a reason'. (20-24)*

Older participants thought one way to educate men about sharing responsibility for sexual health might begin at school, with both boys and girls learning together.

16.2.8 Structural factors - shaming of female sexuality

Societal attitudes to young women's sexuality were noted by some participants, who felt that as young women they were judged and shamed for their sexuality while young men appeared to be congratulated and even encouraged. This reaction could come from both parents and peers. Oppressive environments made it difficult for some to discuss contraception, and some were so embarrassed to the extent that one mentioned they had to smuggle contraception for their friend.

> *I used to go and get the morning after pill for her [friend] … I remember the first time that I went for her they [pharmacist] were like 'okay, can you take it now' and I was like 'shit'. .., so I just kind of put it in my braces and she's like 'yeah, yeah, bye' and I've left and I'm like 'oh shit' get it out of my mouth…. And then I've gone to my friend and I was like 'sorry, there's a bit missing but it should be fine'. (20-24)*

Some participants reported differential experiences due to their ethnic and cultural backgrounds, with some reporting that judgement came from their own communities.

… the boys could go around and say everything as a [particular ethnic or religious background] and it would be fine for them and they would get like ratings for that. … But if a girl so much as started to speak about anything like that they would be like 'oh, but that's wrong'. (16-18)

Basically my parents are very religious and if you know [one specific] culture they're very sort of fixated on the idea no sex before marriage. You have one partner all your life. So, I could never even dream of speaking about sex with my mum. (20-24)

16.2.9 Structural factors – power and oppression

Some participants described scenarios where they felt powerless as young women. Power inequalities manifest in different ways: parents withholding their consent for sex education at school; being denied contraception from healthcare providers and asked to attend elsewhere; feeling responsible for contraception within a partnership; and being put at risk of unplanned pregnancy and STIs because their partners would not use condoms.

My parents are really religious … were very vehement in making sure that she [my sister] was not going to sign a consent form for sex education. (20-24)

A couple of participants reported how they reversed the power dynamics by threatening to withhold sex unless their partner agreed to use a condom.

One time I said to him 'do you have a condom?' and he was like 'oh, no' and I was like 'oh, I guess we're not having sex then' and he was like 'oh wait, yeah, I do'. (20-24)

16.3 Summary of findings

This focus group study of young women between 16 to 24 years offered some insight into how they sought information and accessed contraceptive care, and what barriers they faced.

Participants sought contraceptive information from people around them (including parents, siblings and friends), online and professional sources; school nurses were highlighted as someone they could discuss in confidence. They were cognizant of the trade-offs among discretion, effectiveness, unwanted effects, and non-contraceptive benefits. Information from various sources was used to have further

discussions with a health care professional (HCP) whom they trusted, which would usually be in a sexual health clinic. Each venue had pros and cons; it was important they could discuss at ease with someone who was competent, non-judgemental, looked after their welfare, made them feel validated for their maturity and responsibility.

Multiple structural factors made it difficult for young women to exercise their reproductive rights. Some were made to feel their sexuality was shameful, particularly in some communities and cultures. Participants felt the burden of contraceptive responsibility in heterosexual encounters; some reversed the power dynamics by withholding consent for sex unless the male partner was willing to use a condom.

The strengths and limitations of this study, as well as the implications of the findings will be considered in the Discussion chapter.

17 Results Study 5 – Access to and experience of contraceptive care during COVID lockdown – a web-based survey

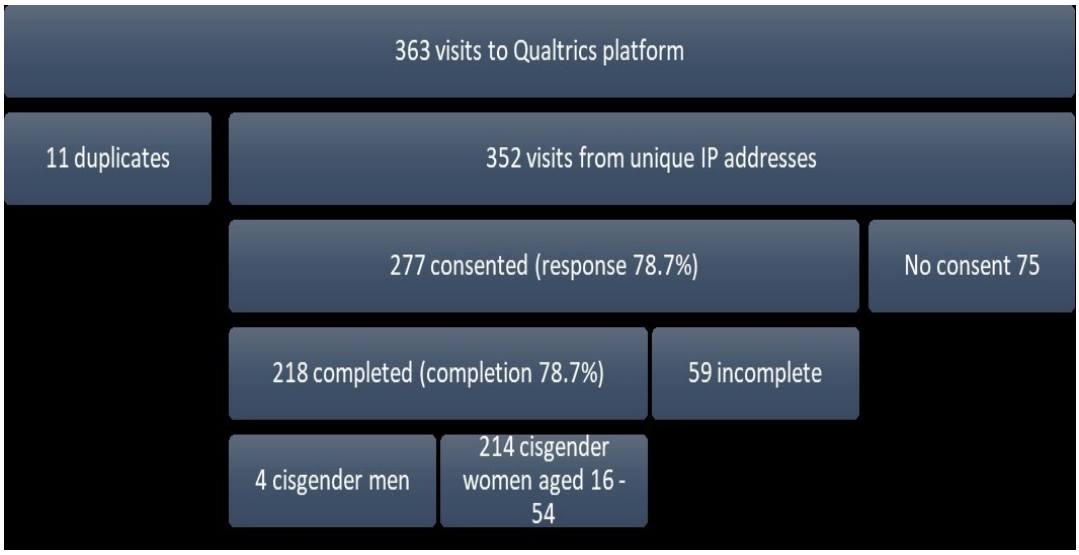
This chapter presents the findings from the Contraception during Covid survey. I submitted a report based on preliminary findings from this to the All-Party Parliamentary Group on Sexual and Reproductive Health Inquiry into Access to Contraception in the UK. *Women's Lives, Women's Rights: Strengthening Access to Contraception Beyond the Pandemic*. The full report is available here: https://www.fsrh.org/policy-and-media/all-party-parliamentary-group-on-sexual-and-reproductive-health/ (4) The survey has also been published in British Journal of General Practice Open (BJGP Open):

Ma R, Foley K, Saxena S. Access to and use of contraceptive care during the first COVID-19 lockdown in the UK: a web-based survey. BJGP Open. 2022;6(3):BJGPO.2021.0218 (1)

17.1 Survey metadata

The metadata provided by Qualtrics were useful to examine who were accessing the survey and how, as well as to calculate response rates. There were 363 visits to the survey site between 27th May 2020 and 9th June 2020 of which 352 were from unique IP addresses; 214 were eligible and completed the survey. A flowchart representing the respondents is summarised in Figure 16; the response rate was 78.7% (277/352) and completion rate also 78.7% (218/277). These metrics suggested the right people were targeted by the promotions and the survey was felt to be relevant for them. In cases of multiple IP addresses, the most complete response was used.

Figure 16 Flowchart of survey respondents



It was possible to determine which platform respondents were recruited from based on the links they responded to; 144 were recruited from Facebook and 70 from Instagram promotions. Instagram promotion was more likely to attract younger respondents; 94.3% (66/70) of all women recruited from Instagram were younger than 24 years old, 58.4% (66/113) of this age group were recruited from Instagram.

The median time to complete was 183 seconds (3 minutes 3 seconds). Of 277 respondents who consented and agreed to participate, 59 did not answer the demographic questions, resulting in completion rate of 78.7% (218/ 277); I excluded 4 cisgender men from this sample to make 214 eligible respondents.

17.2 Respondents' demographics

Respondents were aged between 16 to 54 years and the age group distribution of respondents are shown in Figure 17; the largest age group was 16 to 18 years (n=70, 32.7%), smallest was 45 to 54 years (8, 3.7%). All UK regions were represented and is summarised in

Figure 18; the largest proportions were from South East (30, 14%), South West (39, 14%) and London (28,13%); the smallest was Northern Ireland (6, 3%).

I analysed responses based on three groups of respondents as described in the Methods chapter, which were:

- those not using any method at the time but were looking to start contraception during lockdown,
- those who were already using a method of contraception but needed a repeat supply or change of methods during lockdown, and
- those who obtained contraception during lockdown.

The contraception methods sought or used by these three groups are summarised in a “tree diagram” in Figure 19 where the size of each box corresponds to the number of women using or seeking that method. LARC methods were already being used by some women before the lockdown began; these methods were being sought by two groups of women during lockdown: those who wished to continue or change methods, and those who were not using a method but were considering these.

Over half of the respondents (55.1%, 118/214) anticipated or experienced difficulties with contraceptive supplies during the lockdown; irrespective of whether they were using contraception or not at the time of survey, and whether they obtained contraception before or during the lockdown (Figure 20 and Table 25).

Figure 17 Age distribution of respondents

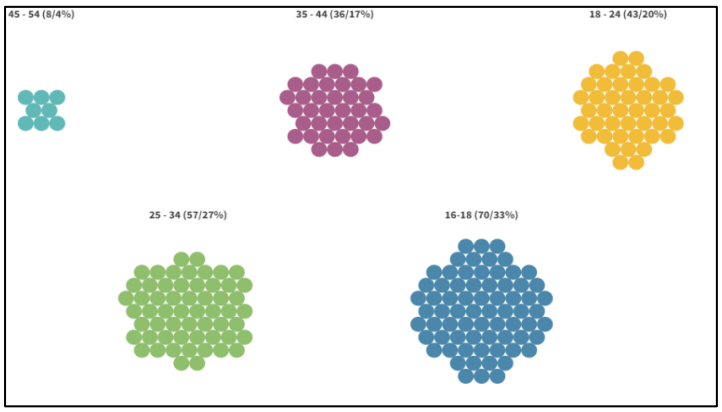


Figure 18 Distribution of UK regions of respondents

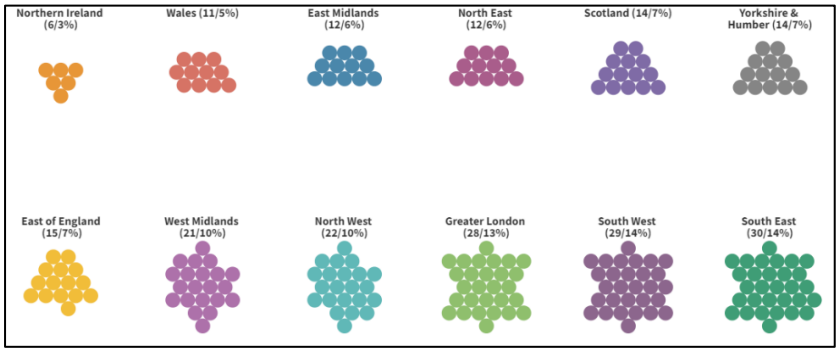


Figure 19 Tree diagram summarising contraception used or sought by responders. Size of each box corresponds to the number of women using or seeking that method. Long-acting reversible contraceptive (LARC) methods: implant, IUD, IUS, Depo-Provera, and Sayana Press. COCP = combined oral contraceptive pill. EHC = emergency hormonal contraception. IUD = intrauterine device. IUS = intrauterine system. LAM = lactational amenorrhoea method. NFP = natural family planning. POP = progestogen-only pill.

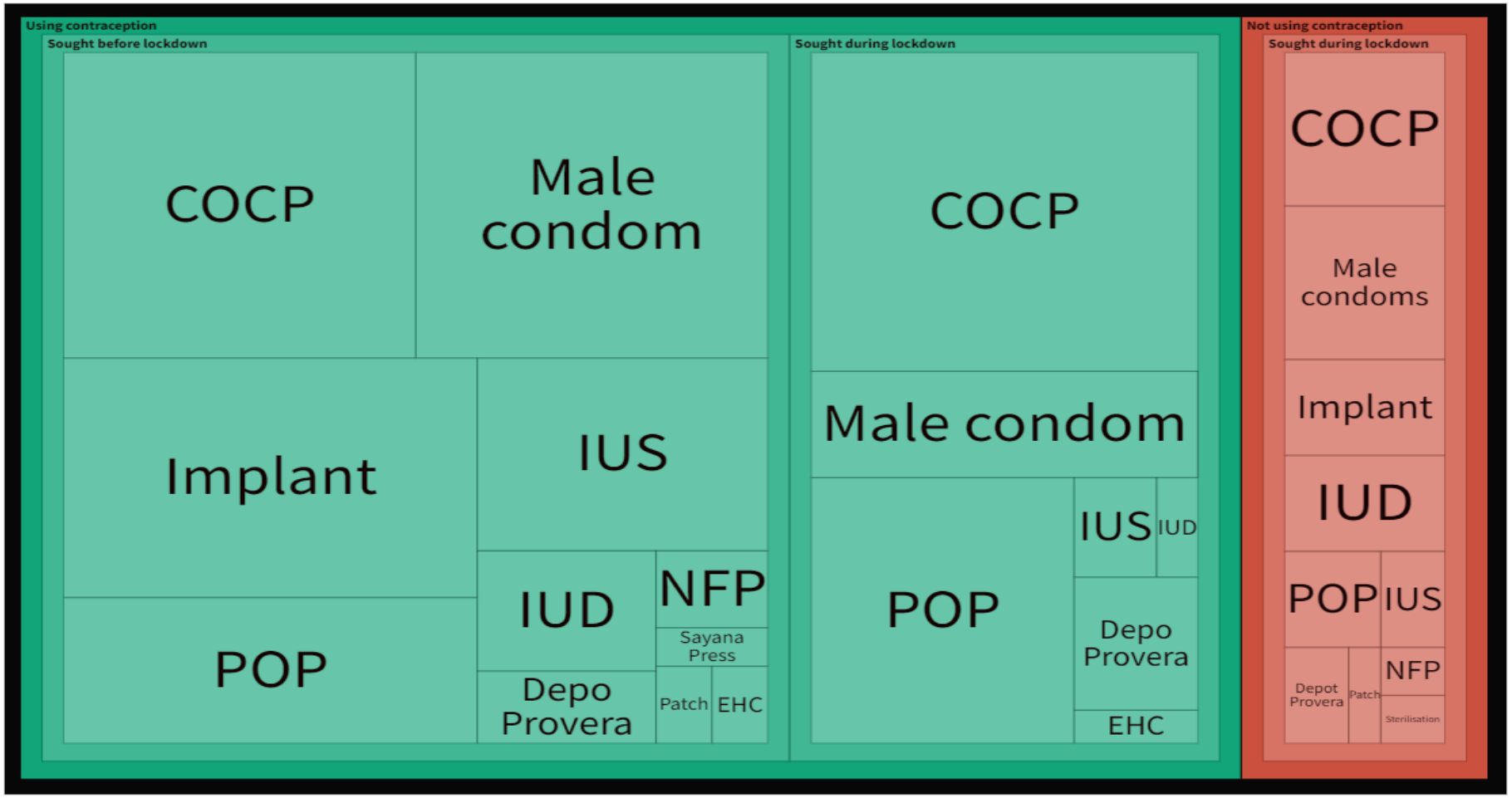


Figure 20 Sankey diagram summarising concerns about contraceptive supplies among the three groups of responders: those using contraception obtained before or during lockdown, and those not using but were seeking a method

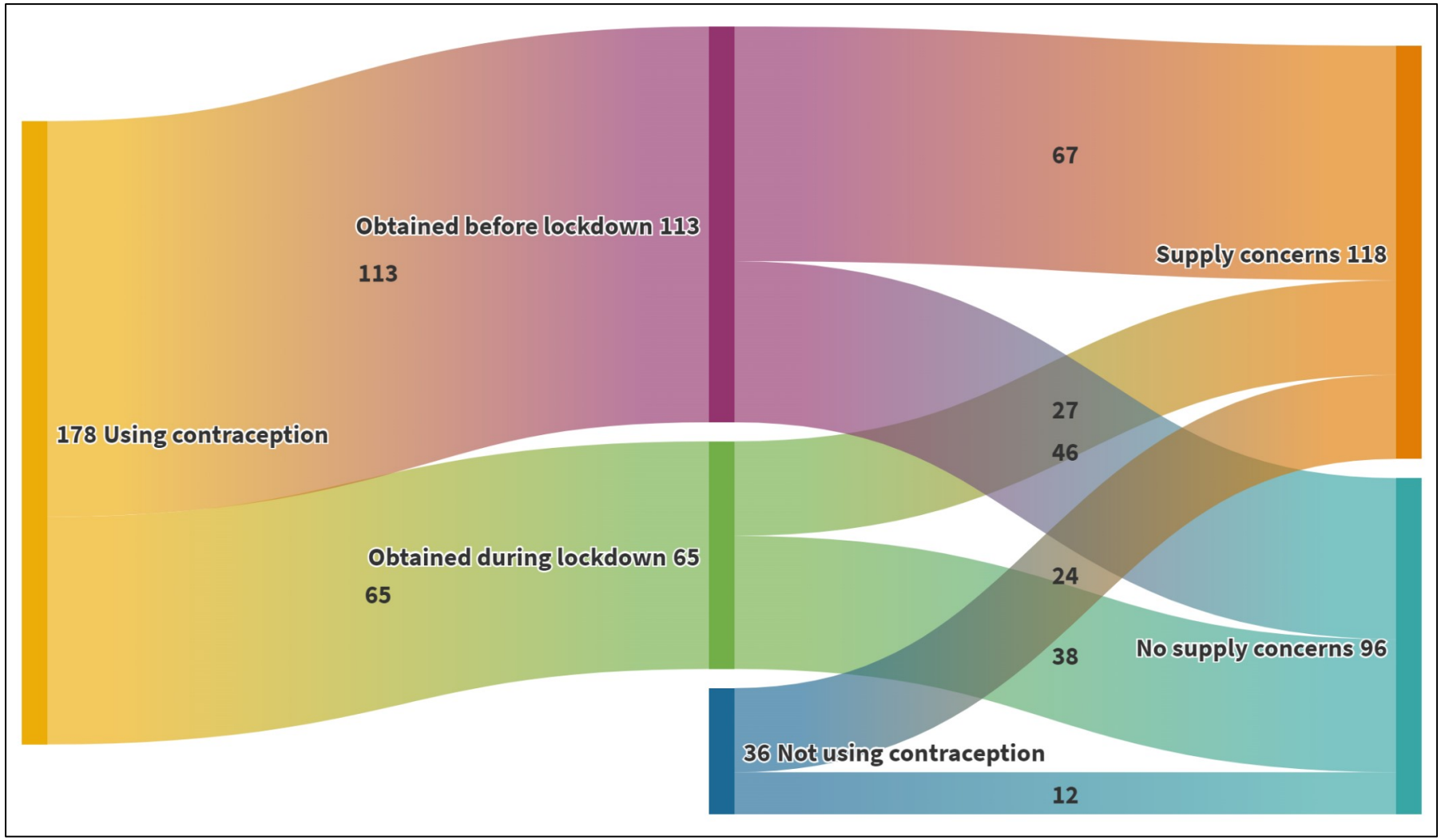


Table 25 Summary of respondents' contraceptive use and needs

Respondents grouped by contraceptive use at time of survey	*Using contraception method*		*Not using contraception method*
	Obtained before lockdown, n (%)	Obtained during lockdown, n (%)	Sought during lockdown, n (%)
Method used or sought			
COCP	25 (22.1)	30 (46.2)	8 (22.2)
Male condoms	25 (22.1)	10 (15.4)	8 (22.2)
*Implant**	23 (20.4)	0 (0)	5 (13.9)
*IUD**	5 (4.4)	1 (1.5)	5 (13.9)
POP	14 (12.4)	17 (26.2)	3 (8.3)
*IUS**	13 (11.5)	2 (3.1)	2 (5.6)
*Depo Provera**	3 (2.7)	4 (6.2)	2 (5.6)
Patch	1 (0.9)	0 (0)	1 (2.8)
NFP	2 (1.8)	0 (0)	1 (2.8)
Sterilisation	0 (0)	0 (0)	1 (2.8)
*Sayana Press**	1 (0.9)	0(0)	0 (0)
EHC	1 (0.9)	1 (1.5)	0 (0)
LAM	0 (0)	0 (0)	0 (0)
Total	**113 (100)**	**65 (100)**	**36 (100)**
Source of method			
General practice	49 (43.4)	34 (52.3)	N/A
CASH clinics	38 (33.6)	6 (9.2)	N/A
Supermarket	11 (9.7)	4 (6.2)	N/A
Online	8 (7.1)	9 (13.8)	N/A
Hospital	3 (2.7)	1 (1.5)	N/A
Abortion clinics	2 (1.8)	1 (1.5)	N/A
Pharmacists	1 (0.9)	10 (15.4)	N/A
Other	1 (0.9)	0 (0)	N/A
Total	**113 (100)**	**65 (100)**	**N/A**
Concerns about supply	67/113 (59.3)	27/65 (41.5)	24/36 (66.7)
Reason			
No LARC at clinic/general practice	0 (0)	0 (0)	14 (58.3)
Other reasons (free text comment)	13 (19.4)	7 (25.9)	5 (20.8)
Not familiar with local services	6 (9.0)	5 (18.5)	2 (8.3)
No remote consult at clinic/ general practice	0 (0)	9 (33.3)	2 (8.3)
No contraceptive injection at Clinic/general practice	0 (0)	0 (0)	1 (4.2)
No appointments at clinic/ general practice	48 (71.6)	6 (22.2)	0 (0)
Total	**67 (100)**	**27 (100)**	**24 (100)**

COCP: combined oral contraceptive pill, POP: progestogen-only pill, IUD: intra-uterine device, IUS: intra-uterine system, NFP: natural family planning, EHC: emergency hormonal contraception LAM: lactational amenorrhoea method

*Long-Acting Reversible Contraceptive (LARC) methods

17.3 Respondents looking to start contraception during lockdown

At the time of the survey, 36 out of 214 respondents (16.8%) were not using contraception and were looking to start using a contraceptive method (Figure 20 and Table 25). The combined oral contraceptive pill (COCP) and male condoms (both n=8, 22.2%) were most sought methods, whereas LARC was sought by 39% (14/36). Two thirds (n=24) perceived or had difficulties getting their preferred contraceptive methods during lockdown; reasons given included sexual health clinic or GP were not offering appointments to administer LARC, no option for remote consultations, and not being in their usual area of residence.

17.4 Respondents on contraception before lockdown needing a change or repeat prescription

Before the lockdown, 178 out of 214 respondents (83.2%) reported using at least one method of contraception (Figure 20 and Table 25). Of all the methods reported, COCP was the most used method before the lockdown (55/178, 30.9%), 29% were using a form of LARC. At the time of the survey, 63.5% (113/178) had obtained contraception before the lockdown and were looking for repeat prescription or change of method. Most obtained contraception before lockdown from GPs (43.4%, 49/113) and CASH clinics (38, 33.6%). 67 (59.3%) anticipated or reported problems getting further supplies during the lockdown; the reasons given include: their GP/clinic was not offering appointments, not knowing how to arrange a consultation and not able to justify it as an “emergency” to use health services during lockdown.

17.5 Respondents on contraception obtained during lockdown

36.5% (65/178) of the respondents reported they obtained contraception during lockdown (Figure 20 and Table 25); these included new or repeat prescriptions. COCP was most used method (30, 46.2%), followed by POP (17, 26.2%) and male condom (10, 15.4%). Fewer respondents reported using LARC during than before lockdown (11% vs 40%).

Over half of respondents obtained contraception from general practice (34, 52.3%); a smaller proportion of women obtained contraception from CASH clinics as they

dropped from second most common source of contraception before lockdown to fourth during lockdown (Table 25). Even though this group obtained contraception during lockdown 41.5% (27/65) did not know how they could get their next supply; reasons given were specific to changes in health services during the lockdown: GP/clinic was not offering any appointments (9, 33.3%), GP/clinic was not offering remote consultations, not knowing how to get a check-up (e.g., blood pressure) and prescription.

17.6 Free text analysis

The survey received a total of 59 free text responses; the text is summarised as a word cloud (Figure 21) which is a visual representation of text that give greater rank to words that appear more. They data were divided into the following themes: access, acceptability, relevance/appropriateness, and equity (Appendix 6).

Figure 21 Word cloud from free text showing commonly used words and their synonyms



17.6.1 Access

Respondents, especially those staying away from their usual residence during lockdown, reported using remote consultations for assessment from GPs and sexual health services and mailed or used electronic prescription service (EPS – a paper-free method to send prescriptions to a nominated pharmacist) to issue contraceptives.(189) Just under half of comments were about poor signposting as they did not know who to call or contact to get contraception.

> *"Changed GP from last issue of contraception to current. Thought it would be a challenge as no previous medical history with practice. However, prescribed over phone based on discussion with aim to test blood pressure after lockdown. I used a repeat prescription from my GP online, very easy to use and I was able to pick up the prescription 2 days after I ordered it."*

> *"Access was actually quicker and more efficient than prior to the lockdown. Services have become more streamline and it's paid off."*

> *"I really struggled to get hold of my tablets, had trouble as i get it through a sexual health clinic and apparently i should have been transferred over to my GP, but was unaware of this. I had to call my doctor and the sexual health clinic number multiple times till i got a clear answer on what to do about my pill, as i had less than a month left but was told i have to get it through my GP, then told i couldn't as i don't have it through my GP, then told to order though Superdrug etc, but then had a lady who worked at my local sexual health clinic call me and she helped me with order my contraceptive pill to me."*

17.6.2 Acceptability

A few respondents were unhappy about changing from their usual and reliable methods to condoms especially. Respondents who wanted LARC reported clinics were suspended so had to use other methods; one had to travel longer distances due to closure of nearby clinic.

> *"I contacted my GP surgery asking about getting an implant but was told they couldn't do it and local sexual health services were suspended during the pandemic as "people could use condoms".*

> *"It has always been concerning to me that GPS in my area do not offer contraceptive options or advice. GPs in London make it much easier and do everything "in-house" whereas in the Midlands I have to drive for over half an hour and be in a place which seems geared towards very young people*

and not for those of my age. This really puts me off using these crucial services!"

"I gave birth at the start of the lockdown, which is why I had no existing IUD. My GP told me they would not fit one during Covid-19 but recommended a clinic that is 30 minutes walking distance from my house that they believed would fit one. I have not gone there due to time constraints having a new baby and because it doesn't feel critical to do right now, so I have not explored every avenue to get an IUD again."

17.6.3 Relevance/ Appropriateness

Getting contraception during the lockdown period was challenging for those staying away from their usual residence who were unfamiliar with local services. It was particularly challenging also for those with anxiety who were unable to go out, and for young people staying with parents during lockdown.

Respondents using methods with non-contraceptive benefits to treat medical conditions (e.g., COCP for acne and IUS for heavy menstrual bleeding) were unable to access them and that meant their symptoms were prolonged or untreated.

"My main issue is that I'm staying in an area that isn't my usual residence and I suffer from social anxiety so don't feel able to phone the GP surgery to ask for a prescription. I paid to have the pill delivered by Superdrug for three months instead of phoning the surgery and getting the pill for free."

"I was unable to have my implant replaced and was offered only the pill despite having ongoing gynaecological difficulties and PMDD [pre-menstrual dysphoria disorder]."

"I was about to change my copper coil to a hormone one as the heavy periods leaving me really anaemic and I didn't want to take supplements, neither do I fancy long festival of the rivers of blood that result. I had an appointment in March but then it was cancelled. I work as a nurse and seriously feel the consequences of low iron levels."

17.6.4 Equity

One respondent noted it was unfair when blood tests and childhood immunisations continued during lockdown but not contraceptive injections or implants. Four reported paying for contraception from online pharmacies; two had to purchase condoms during lockdown which they would have had for free from clinics.

"I don't understand why my doctors' practice can take blood but cannot fit a new implant. Surely the level of risk is the same."

"I think condoms should be offered delivered or collected for free for the people who are unable to have their usual contraception and do not wish to get pregnant."

"I was unable to get my normal method of contraception (injection) or my next supply of the mini pill from my usual sexual health clinic and my GP could only offer a month's worth of emergency supply. I had to pay for the contraceptive pill from Lloyd's pharmacy online when I usually get it free of charge."

"I have not earned any money since the start of lockdown. Usually I would get free condoms from the sexual health clinic, but am having to pay for them as I am not on any other form of birth control."

17.7 Summary of findings

This study examining the experiences women trying to obtain contraception during the pandemic highlighted the need for better information and signposting to obtain free contraception during lockdown restrictions. Women reported difficulties obtaining their preferred method of contraception as some thought and were told some clinics were shut and services to fit LARC were not available. Some respondents also complained about having to use non-preferred methods like condoms, and this also meant women using contraception for other medical conditions had to suffer the symptoms.

I will discuss the strengths and limitations of this study, as well as the implications of the findings in the Discussions chapter.

18 Discussion

In the beginning of this thesis, I set out the scene of the current state of contraceptive care in the UK. A full range of modern contraceptive methods is available, all of which, apart from male and female condoms, are available free from the NHS in the UK from various healthcare settings including general practices, CASH clinics, emergency departments and community pharmacies. Yet, despite their widespread availability and at no cost to the user, there is strong evidence from comparative abortion data among other European countries, and low prevalence of LARC use, that contraceptive needs of women in the UK remained unmet.

My PhD sought to examine what could be done to improve the contraceptive care in general practice; not only to address the unmet need for contraception, but also to improve the effectiveness, equity and experience of care women received when they attend general practice.

18.1 Summary of findings and interpretations

My first study examined the impact of a pay-for-performance (P4P) scheme to offer LARC advice was associated with an increase in LARC prescriptions and reduction in abortion rates following the P4P scheme; there appeared to be greater impact for women in younger age groups at a population level and women from more deprived backgrounds had a greater reduction in abortion rates immediately after the scheme was introduced.

Ecological studies that measure effect of interventions at population level might not accurately reflect the impact at the individual level resulting in wrongly inferring the impact at the population level to the individuals. Hence, the second study examined the impact of LARC advice given to individual women at the time of contraceptive prescriptions on outcomes such as LARC prescriptions and abortions using a cohort study design. This study showed while LARC prescriptions were consistently more likely to be prescribed for those issued with NLHC and given LARC advice, this was not observed in those given LARC advice at the time of EHC prescription. Although LARC advice was not associated with reductions in abortions, there were however, some significant and consistent association between LARC advice given at the time

of NLHC prescriptions and reduced likelihood of abortions in women from more deprived quintiles from stratified analyses.

A possible interpretation is that for those who were already using contraception (and therefore motivated to prevent unplanned pregnancies), receiving information about other options including reliable and long-lasting methods was more likely to encourage them to switch to LARC. Women not using regular contraception but used EHC occasionally might not want to commit to using regular contraception and even less for longer lasting methods such as LARC for various reasons.

The impact on abortion might be more difficult to evaluate and the apparent reduction in abortions at the population level after introduction of the P4P scheme for LARC advice might be an “ecological fallacy”. Firstly, NLHC (and to an extent EHC) is generally effective with “perfect use” so an unplanned pregnancy would be uncommon and abortion even less; the result of that is fewer abortions and rendering Study 2 (Impact of LARC advice on LARC prescriptions and abortions) underpowered to examine the effect of LARC advice on abortions among those taking NLHC or EHC. Secondly, there might be confounders in the causal pathway to an abortion; solely considering whether someone using NLHC switched to LARC due to LARC advice would not account for other associated factors and nuances in that pathway. Establishing a relationship between contraceptive advice given in primary care and subsequent abortion is also more complex because there are numerous interacting mitigating and mediating factors, hence the justification for the next study to examine the factors associated with abortions in women attending primary care.

My third study examined the associations between abortion and the biopsychosocial factors identified in the literature and explored in my cohort of women attending primary care. A history of abuse (domestic or sexual), followed by depression, anxiety, drug overdose, and alcohol misuse were strongly associated with women who had abortions compared with those who did not. The strength of association was much less for severe mental illness, deliberate self-harm, and drugs misuse. Using non-smoker status as a reference, abortion was strongly associated with being a smoker; the direction of association was reversed for ex-smokers where it was significantly less likely to be associated with abortion. Women who had abortions

were significantly more likely from more deprived quintiles compared with those without a history of abortion.

The findings suggest there might be women with certain conditions and circumstances who are vulnerable; their vulnerability might make them less able to exercise optimal reproductive health choices at the right time, and therefore put them at risk of abortions. For example, women who suffered abuse might be in partnerships where she was coerced into not using methods, to get pregnant or have an abortion against their will. On the other hand, women who stopped smoking might be more motivated to make positive change to their lives and have more agency to look after their reproductive health. This study also helps to explain other possible associations with abortions other than non-use of contraception and offers some other explanations.

This focus group study of young women between 16 to 24 years offered some insight into how they sought information and accessed contraceptive care, and what barriers they faced. Participants sought contraceptive information from various sources. When choosing methods, they were cognizant of the trade-offs among discretion, effectiveness, unwanted effects, and non-contraceptive benefits. They trusted health care professionals and although they preferred to attend sexual health clinics, each venue had pros and cons. It was important they could discuss at ease with someone who was competent, non-judgemental, looked after their welfare, made them feel validated for their maturity and responsibility.

Many factors made it difficult for young women to exercise their reproductive rights. They were made to feel ashamed about their sexuality and yet they bore the burden of contraceptive responsibility in heterosexual partnerships. This study suggested merely improving access to more effective contraception would not improve experiences or reproductive care outcomes.

The survey examining the experiences women accessing contraception during the first wave of lockdown highlighted the need for better information and signposting to obtain free contraception during the restrictions. Women reported difficulties obtaining their preferred method of contraception as some thought and were told some clinics were shut and services to fit LARC were not available. Some

respondents also complained about having to use non-preferred methods like condoms, and this also meant women using contraception for other medical conditions had to continue to suffer the symptoms without their usual treatment.

There was an urgent need to prioritise health services during the first lockdown phase of the pandemic due to SARS-CoV-2. However, in doing so, guidance might have been issued quickly without considering the practical implications of the lack of clarity of access to contraception. The guidance was initially risk-adverse and suggested contraception such as LARC should be given in exceptional circumstances (whereas childhood immunisations continued); this became more permissible towards the end of the year and lockdown period. However, the initial message already had an impact as women were under the impression they could not attend their GPs or sexual health clinics to obtain contraception.

18.2 Comparison with current literature

18.2.1 Study 1 - Impact of a pay-for-performance scheme for LARC advice on LARC prescriptions and abortions

At the time of writing, this study was the first to report the impact of the P4P on LARC prescriptions and abortions in Britain with evidence for impact on women from younger age groups and more deprived quintiles.

The prevalence of contraceptive uptake that I found in my study among different age groups is consistent with findings from population surveys. The prevalence of oral contraceptive pill use in 2008/09 was 54% in 20-24 age group and 10% in 40-49 in the last ONS survey; this compares well with 43% in 20-24 years and 11% in 35-54 years respectively in my study.(63) In a large probability sample survey conducted in 2010 to 2012, 26% of women aged 16 to 24 were using hormonal methods (defined as patches, pills and injections) and 11% used LARC (implant, IUD, IUS).(190) In my study, age-specific NLHC rates in 2011/2012 were 21% for women aged 13 to 19 and 41% for women aged 20 to 24 years; age-specific rates for LARC in 2011/2012 were 3% in women aged 13 to 19 and 6% in women aged 20 to 24 years.

The findings are similar to other studies that examined the impact of P4P scheme on LARC prescriptions. One examined the impact using prescription data reported similar trends and patterns in individual LARC prescriptions.(51) The trends in NLHC and LARC in relation to P4P scheme was also found in another study that used repeated cross-sectional analysis using another database of primary care records.(191) This study also examined the impact of the withdrawal of the P4P scheme which was associated with reduced LARC prescriptions for younger age groups; however this study did not report associations with abortions as another outcome measure.

The trends in abortion rates were similar to those from national surveillance records for England and Wales, which showed the 20 to 24 year old age group had the highest rate (30.0 per 1,000 women) of all age groups in 2009; my study's data also showed this age group had the highest rates (44.6 per 1,000 women) of all age groups in 2009/10 in England and Wales.(192) The crude abortion rate in women under 18 years was 11.7 in 2013, which was a 33.5% reduction from 17.6 in 2009; the data from my study showed 59% reduction from 18.3 in 2009/10 to 7.50 in 2013/14 for ages 13 to 19. The surveillance data was likely to be comprehensive so represented the general population, whereas the CPRD population was a sample which reflected a population of women who engaged with primary care services in Britain, so it would make sense that these women benefited from primary care professionals' interactions.

18.2.2 Study 2 - Impact of LARC advice on LARC prescriptions and abortions

At the time of writing, this was the first study that demonstrated the impact of a pay-for-performance intervention of LARC advice given in British primary care on LARC prescriptions and abortions at the individual level, with additional reporting for age groups and deprivation.

A few studies have been published which examined the effect of counselling on the uptake of LARC. A cluster randomised trial evaluated structured contraceptive counselling on LARC and pregnancy rates among women in a sexual health clinic in Sweden found increased LARC uptake and significantly reduced unintended pregnancy rates at 12 month follow-up.(193) Another cluster randomised trial

conducted in sexual health clinics reported provision of counselling on LARC as well as access to devices increased the use of LARC and reduced pregnancy rates.(194) Only one study reported a cluster randomised trial in general practice setting for a complex intervention that involved training of family physicians on contraceptive counselling and rapid access to LARC clinics. The study reported 50% more LARC was chosen by women in the intervention practices.(195) A systematic review that examined the effectiveness of different counselling strategies for modern contraceptive methods (LARC and more permanent methods such as sterilisation) was inconclusive due to the heterogeneity of studies that reported a range of settings and outcome measures which meant the findings were not comparable.(196)

My study reached similar conclusions in that LARC advice/counselling in primary care was associated with greater prescriptions of LARC, (between 12% to 48% increase) compared with those who did not have LARC advice.

18.2.3 Study 3 - What are the biopsychosocial correlates of abortion

Studies have reported correlates and risk factors for abortions in a British population but most of these were cross sectional studies and were underpowered to examine fully the strength of these associations. My study is the first of its kind to use electronic health records to examine the biopsychosocial determinants of abortion in a British primary care population using a well powered study cohort.

One study finding from the third National Survey of Sexual Attitudes and Lifestyles (Natsal-3) that used a subset of 4,911 women aged 16 to 44 years from the total probability sample, reported binge drinking, drug use and current smokers were more likely to be associated with condomless sex and risky sexual behaviours.(83) However due to the low prevalence of abortion and unplanned pregnancy in that probability sample there was insufficient statistical power to analyse these outcomes so risk behaviours such as condomless sex was used instead. Another study using another subset of 5,686 women between ages of 16 to 44 years from the same probability sample reported factors strongly associated with unplanned pregnancy were current smoking, depression, and drug use.(27) A systematic review of 11 studies that examined psychosocial correlates of STI acquisition, unplanned pregnancy, abortion and risky sexual behaviours in women of reproductive age

reported unplanned pregnancy was associated with smoking, depression, being single and sexual debut under 16 years; abortion was associated with poor relationship with parents, relationship break up and leaving home at an early age.(84)

My study reports similar findings but due to the larger sample size, I was able to report stronger correlations with greater statistical significance. For example, my study suggests women who had abortions were three times more likely to be smokers than those who never had a history of abortion. In my study, I found women who had abortions were 2.8 and 2.4 times more likely have associated history of abuse and depression respectively compared with women who did not have abortions. Correlation between intimate partner violence and abortion has been noted in studies from US, Canada, and other parts of the world.(197, 198, 199)

18.2.4 Study 4 - Young women's experiences of contraceptive care

In the focus group study, young women reported contraceptive decisions were often influenced by family, peers, and online sources. Other studies reported negative experiences of friends and family as strong predictors for low acceptability of a method for young women.(200) Mothers also shaped a woman's contraceptive attitudes and behaviours, especially through the nuances of communication, knowledge and relationships.(201)

Some studies have also shown young women want contraceptive discussions to include spontaneity, flexibility, unwanted effects and non-contraceptive benefits to help them make informed decisions; this was also my finding.(202, 203, 204, 205, 206) LARC might be cost-effective but some worry about a perceived lack of control over hormones.(105) Unwanted effects of regular contraception might explain why some women prefer occasional use of emergency hormonal contraception, so their use should not be stigmatised.(207) Another study suggested HCPs should enquire about perceptions and concerns about specific methods to provide context for a more tailored discussion.(208) My study confirmed the importance of a supportive environment and opportunities to ask questions about methods and concerns. (204, 209)

This study also highlighted the burden of contraceptive responsibility within heterosexual relationships, and this could be explained by norms in a society which has created this imbalance in responsibility. A couple of studies attempted to explain the lack of engagement from men; for example, some men blame lack of male-controlled options and social framing of contraception as primarily the women's responsibility.(210, 211)

Some of the participants in my study described how their parents, professionals and even peers shamed and oppressed their sexuality; this made some feel unable to discuss contraception more widely. Shame and stigma regarding contraception use, particularly emergency contraception, has been studied and some have suggested ways to eliminate this.(110, 212, 213, 214, 215)

An understanding of power imbalances between sexual partners, healthcare providers, societal discourse on femininity, and need for patient-centred communication could be used to improve women's experiences of contraceptive care.(114) The oppression of women is a common theme in feminist theories, but in feminist poststructuralist thinking, power relations can be reciprocal. It reframes the view that a young woman who chooses not to use contraception, uses contraception inconsistently, or uses emergency hormonal contraception frequently, from being "problematic" and in need of behaviour change, to one which examines why society has put the onus of contraception responsibility almost entirely on her. My study gave examples where women used their consent to sex as a way of negotiating power with their partners.

18.2.5 Study 5 - Contraception access during COVID-19 lockdown

The findings from the survey of contraceptive access during the COVID-19 pandemic are consistent with reports from other countries during this time. The survey reported some respondents were unsure how to access contraception, some thought clinics were shut and methods such as LARC were unavailable. These findings were similar to those from an online survey of young people aged 16 to 24 years in Scotland who also thought they could not justify their reproductive needs as "essential"; remote consultations also raised privacy concerns while residing with their parents.(216) A similar survey from Australia reported lack of access to methods due to restrictions,

particularly LARC products which was also a finding from my survey.(217) The experience in the USA was similar as over half of women surveyed experienced barriers to accessing their preferred contraception method as some facilities were closed; it also reported that the pandemic worsened existing inequalities to contraception in a country with no universal access to healthcare, particularly for women from Black and Hispanic communities and with lower income.(218, 219)

General practice is a common source of contraception but women under 25 years were more likely to attend sexual health clinics.(44, 77) The survey participants in my study valued sexual health clinics because of confidentiality, specialist knowledge, and perceived to be concerned with their welfare. Whichever the setting, effective communication and a trusting relationship with an HCP that focusses on an individual's needs might improve contraceptive decision making and adherence.(99, 220)

18.3 Strengths and limitations

18.3.1 Literature review

The main strength of the literature review was the scope which specifically examined the contraceptive care in general practice which confirmed that this was under-researched both as a care domain and a setting. It was a useful way to help scope the area of research for this PhD.

A systematic review might have made the findings more robust, but this would have limited the utility due to range of methods, care pathways and outcome measures used in the list of published literature. A systematic approach might be at the expense of the insight into the many approaches to deliver care, and the mix of quantitative and qualitative studies that were included.

The review could have used more databases such as those that indexed articles on health service policy to examine studies of different primary care populations. The review also missed grey literature and studies that were not written in English and was limited mainly for high-income countries with well-established primary care

systems of which there are not many and are mainly limited to Europe, Canada, and Australia/New Zealand.

Despite these limitations, over 200 papers were considered and included for the review which was grouped into themes and provided the data to support the research questions for this thesis.

18.3.2 Study 1 - Impact of a pay-for-performance scheme for LARC advice on LARC prescriptions and abortions

The main strength of this study was the large sample size conferred by CPRD which helped to enhance the representativeness of the findings, not just of the British population but to comparable middle- and high-income countries.

This study's strength lies in its methodology too. Many previous studies on P4P schemes reported processes of care and not outcomes; even those that reported outcomes did not demonstrate long term sustainability (221, 222). This study is one of few that demonstrated changes in both clinical process and patient outcomes in relation to one P4P scheme as well as sustainability for at least four years after its introduction. To strengthen the methodology, I used at least three time points before and after a clear definition of intervention period; used ARMA model for analysis; conducted autocorrelation and sensitivity analysis; in the published version, I also adhered to the recommended reporting framework for ITS studies to improve reporting and enable comparisons in systematic reviews (Appendix 2) (223).

There are some limitations though which relate to accuracy and completeness of the data and design. The CPRD database might have a relatively good coverage of the population in Britain, but it is not a random sample: five out of 12 regions were overrepresented in the population, so there might have been selection bias from the types of practices that contributed to the database. Despite this, the population in 2004/05 and 2013/14 closely matched the age distributions of the mid-year UK census populations (Appendix 2). The deprivation data were only available for the English population which might have introduced another bias in the findings; there were relatively larger number of women in the least deprived group (IMD 1 quintile), and this distribution of IMD was the same throughout the study period. I only used

incident contraceptive prescriptions which might have underestimated NLHC methods as they were usually prescribed more frequently due to their shorter duration of action. The potential bias this introduced was offset by the several folds difference in volume of NLHC prescriptions compared with LARC.

Additionally, it was not possible to tell if the data were complete because there might have been missing events and some patients might be "missing" from either not being registered with a practice, or they might have moved to another practice that did not contribute to the database. There might also be misclassification and miscoding of clinical events by practitioners, for example miscoding an abortion with a code that includes the word "abortion" but with a different meaning ("incomplete abortion" might mean "incomplete miscarriage"). Some event data might be missing if abortion procedures were not reported back to the practice, this can happen occasionally when women do not want to notify the GP of their abortion for fear of being stigmatised for example. Despite these, I have demonstrated the prevalence of the outcome measures matched closely with those from other sources.

Other interventions around the same time as introduction of P4P could have affected validity of ITS analysis. Two important events might be relevant: firstly, national clinical guidance on LARC was published by National Institute of Health and Clinical Excellence (NICE) in 2005 at the start of the study period, it might have contributed to increased awareness of LARC for clinicians and the public and therefore increased number of requests and prescriptions rather than due to the P4P scheme. Secondly, media campaigns to improve awareness of contraception and LARC among young people were introduced in November 2009; however, this only ran for a month and it is unlikely that the impact might have lasted as long as the end of the study period in 2013/14 (224).

18.3.3 Study 2 - Impact of LARC advice on LARC prescriptions and abortions

Many of the strengths mentioned above also apply to this study because the sample came from the same cohort and database. This included the sample size and representativeness. There were similar strengths in the design and analysis in that outcome measures were examined (LARC prescriptions and abortions) and the sensitivity analyses that examined the impact few years after the intervention.

The limitations were similar with Study 1 including the coding and classification of abortion events and documentation and counting of prescriptions and abortions. Despite using patients from the same cohort, the study period was half that of Study 1, which meant the attrition in population denominators seen in some regions in the later years might have been overrepresented. In addition, the way in which the data was set up for analysis meant only one of the two types of prescriptions (NLHC and EHC) and only one abortion event was counted for every patient. This could have accounted for reductions in the number of women eligible for LARC advice from being issued NLHC or EHC. Women who had more than one abortion in any year, and therefore who might have benefited more from LARC advice and contraception, were considered having the same risk as women who had one abortion in any one year. Both could have introduced bias in the analyses. The artificially reduced number of abortions might have reduced the power of the study, so reduced the effect of LARC advice on this outcome measure.

However, despite theoretical loss of patient numbers on NLHC and EHC eligible for LARC advice, more than 70% and 90% were given LARC advice respectively and the analyses for LARC prescription as outcome had statistical significance with narrow confidence intervals which suggests the sample size was not affected. Reduced number of abortions and comparatively lower proportion of patients who did not have LARC advice however could have accounted for the lack of association with LARC advice.

The analysis that used IMD data meant further reduction of the sample size as the IMD linkage was available for England only. Across the English regions, missing IMD data comprised between 17% (London) to 44% (East Midlands) of the regional populations, averaging 22% (593,151/2,711,803) of this subset of the total cohort. Multiple imputation methods could have been used but it would introduce bias as there were no other variables that could be used in the imputation model apart from age groups. Despite this, there were roughly 100,000 individuals per IMD quintile per year for analysis and the relative proportions of each IMD quintile remained stable for each year. For transparency, I intend to use the STROBE framework to report the findings for publication (Appendix 3).(188)

18.3.4 Study 3 - What are the biopsychosocial correlates of abortion

This case-control study using the CPRD has the same limitations as the previous two studies due to the nature of electronic health records which have already been outlined.

As mentioned in the Methods chapter, not all cases of abortion would be documented in general practice records. This might have reduced the number of cases and some patients who had abortions which were not documented might have been wrongly assigned as matched controls. This would have underestimated the effect direction and magnitude. However, the confidence intervals were relatively narrow and p values small so a relatively large number of missing cases would have been needed to affect the results.

The covariates used to examine association with abortion in this study are not exhaustive and they were limited by what might be routinely documented in electronic health records. Previous population studies have examined relationships with schooling, concurrent partnerships, and age at first sexual intercourse. These data were not routinely documented in clinical records. Associations between abortion and contraceptive use and consultation behaviour could be examined but this would need more sophisticated analysis of the data.

Missing smoking data was more prevalent among the controls (96.4% vs 3.7% in the cases) so it was possible for this to introduce bias in the reporting. However the sensitivity analysis has shown this was unlikely and the multiple imputation method was able to allocate the missing information that was close to smoking prevalence in previous studies using CPRD.(182)

It was much more difficult to assess if there were missing data among the covariates; anyone without a diagnosis was assumed not to have it. It would, however, be possible to use more than one code to help triangulate and validate codes used for the covariates. For example, depression and anxiety could be validated using antidepressant prescription data, and examination findings such as validated questionnaires used for diagnosis and monitoring. However, not all covariates will have associated codes (e.g., domestic abuse, deliberate self-harm) and these codes may in themselves be incomplete. The current numbers, though a possible

underestimate, were enough to give odds ratio estimates with narrow confidence intervals and small p values, suggesting undercounting might not be a problem. On the other hand, overcounting due to unvalidated diagnoses might have overestimated their association with abortions.

Case-control studies can only report associations and not causation. It is therefore difficult to assume the causal pathway between the covariates and outcomes; for example, a history of depression is strongly associated with abortion, but we cannot tell if this led to abortion, or if abortion caused the depression. Even if one event (e.g., depression) was documented after another (e.g., abortion), it is difficult to say for certain that one caused the other. Use of interaction terms could have improved the interpretation of the associations of more than one covariate on the outcome compared with their own. The set of covariates chosen could, in theory, be interpreted as part of the causal pathway. This would mean both a long set of analyses looking at different permutations but also means interpreting the interactions could be much more difficult. Use of survival analysis which has a time dimension could clarify the temporal association between abortions (as the “failure” variable) and the covariates.

Not all abortion events are due to unplanned pregnancies and non-use of contraception, so the findings tell us very little about why some women chose to have abortions. There might have been changes in circumstances such as relationship breakdown which rendered continuation of a pregnancy to be undesirable. Some women might be in abusive relationships and were coerced into not using contraception or having an abortion.

Even though the study used a 2.5% random sample of the original database cohort due to memory capacity to run the matching and statistical analyses, this still provided just under 300,000 women to examine which was large enough sample to afford a reasonable statistical power. The ten-year study period also offered enough abortion events for this case-control study. The 1:2 matching based on practice and age meant the cases were as closely matched as possible with the controls as age and deprivation are both confounders for abortions.

Despite all the limitations, this is the first case control study that used an electronic health record to examine the biopsychosocial correlates of abortions in women attending primary care. The study design and analysis methods were robust which reduced the risk of bias and yielded results that had high statistical power and precision. The findings could be used as a hypothesis for further studies to better understand the relationship between these determinants and unplanned pregnancies and abortions. I intend to use the STROBE framework to report my findings for publication (Appendix 4).(188)

18.3.5 Study 4 - Young women's experiences of contraceptive care

The main strength of this study is the focus group method which, compared to standard one-to-one in-depth interview, is strengthened by interactions among participants as they build discussions on one another's responses. The dynamics worked well in the focus groups, requiring little prompting from the facilitator, particularly the older group. The presence of a male GP could have stifled and biased the discussions. This was unlikely as the participants voiced diverse views and sensitive issues spontaneously. Focus group method can also flatten the hierarchical relationship between a researcher and research participants; this adhered to the feminist values in research methods.(225)

Participants' experience of the focus group was positive; some valued the opportunity to share experiences with others. In theory, few individuals could dominate the discussions, but it was moderated well so that everyone contributed.

To improve the validity of the data, I sent out the transcripts to the participants. I received feedback from participants who were able to clarify some transcription errors. To improve rigour, I used a theoretical framework for analysis and shall be using COREC framework to report this study for publication (Appendix 5).(226)

The findings need to be interpreted with caution as participants were from London so their experiences might have differed from those from other parts of the UK, including more rural areas and within different cultures. For this reason, it was not possible to say if the data reached "saturation"; however, saturation could be achieved if data from another focus from each age group did not yield any further

new themes.(227, 228) Despite this, both groups were diverse in terms of age and at least two people declared their ethnicity as other than White British in each focus group.

18.3.6 Study 5 - Contraception access during COVID-19 lockdown

The limitations of online surveys are mainly from selection bias and the validity of questionnaires used, especially so during this pandemic.(229) The findings therefore need to be interpreted with caution. Firstly, the sample of respondents were unlikely to be representative of the UK population as I did not use a probability sample; there was underrepresentation of respondents from outside London and South East England as well as those aged 35 and over.

Adolescents between ages of 16 and 18 years old were overrepresented among this survey's respondents, they might have had different contraceptive needs to other age groups.(190, 230) The nature of an online survey might have meant those who did not use social media regularly, who had sensory impairment or language difficulties would have been excluded. It is possible the survey's findings underestimated the true extent of the issues.

Despite a small non-probability sample, I managed to captured women's experiences from four countries of the UK and from a wide age range. The use of descriptive and free text analysis also offered first-hand insights into the experiences of women getting contraception during the lockdown including both actual and perceived difficulties with access. The high completion rate reduced the risk of reporting bias and reflected the survey's relevance for respondents and the ease of administration. The survey's findings were also consistent with women's experiences from surveys conducted in other countries during this pandemic. This study was published using a CHERRIES framework for reporting of online surveys and the same checklist was used for reporting for this thesis (Appendix 6).(187)

18.4 Implications for practice, policy and research

18.4.1 Study 1 - Impact of a pay-for-performance scheme for LARC advice on LARC prescriptions and abortions

If the changes that were reported in contraceptive uptake and abortions were attributed to the P4P scheme, I estimated that by 2013/14, the P4P scheme would have resulted in an additional 4.53 LARC prescriptions per 1,000 women or relative increase of 13.4%, equivalent to 81,190 extra prescriptions if extrapolated to the British population. Similarly, the modelling showed there was an absolute reduction of 5.31 per 1000 women a year, or a relative reduction by 38.3%, equivalent to 95,170 abortions averted.

I speculate the mechanism for increasing LARC uptake might be that LARC advice from primary care professionals facilitated switching from NLHC to more reliable methods, such as LARC, which in turn prevented more unintended pregnancies. As this was an ecological study, it was not possible to comment on the causal pathway at the individual level. Future studies should examine the impact of LARC advice on individual women, if women on NLHC switched to LARC, and if individuals who responded to advice reduced their risk of unintended pregnancy, and which types of women benefited.

There have been discussions in British primary care that the P4P scheme that has been running for over 15 years might be abolished (231). My study suggests there might be merit in retaining this scheme to support primary care to improve reproductive health outcomes. More recently, a study found that removal of some P4P indicators in British primary care were associated with decline in performance. quality and documentation, including LARC advice (232). An extension of this study for a longer period might yield answers regarding impact on reproductive outcomes – whether the effects on these might be sustained after removal of this P4P scheme. One recent study examined the trends in contraceptives and found a reduction in LARC for younger women after the P4P scheme was withdrawn; its effect on abortion rates was not examined.(191)

I suggest the study findings might be relevant for reproductive health policies, particularly for middle- and high-income countries which have access to LARC, where unintended pregnancies pose a public health issue, and which also use P4P mechanisms in primary care to improve the effectiveness and equity of contraceptive care at population level.

18.4.2 Study 2 - Impact of LARC advice on LARC prescriptions and abortions

This study suggests giving LARC advice to women using NLHC and EHC could help women consider other methods of contraception and increase the likelihood of them getting LARC prescriptions a year later. This impact was also seen two and sometimes three years later. However, unlike the findings from Study 1, there was no associated impact on abortion at the individual level; there appeared to be associations with reduced odds of abortion in some age groups who were on NLHC and given LARC advice.

Unlike the complex interventions mentioned as part of cluster randomised trials earlier, the P4P scheme in UK general practice did not require primary care practitioners to go any further than giving information about LARC; this could be a simple as a leaflet, signposting to other resources including as a text message. As an intervention this was simpler to adopt, and presumably less costly, than the other trials, and yet was associated with similar increases in LARC prescriptions as demonstrated from this study. For this reason, the findings from this study might also be useful for other middle- and high- income countries with primary care systems which have ambitions to increase the use of LARC as part of a broader strategy to improve reproductive health.

The findings from both Study 1 and 2 suggest a simple action of giving LARC advice to women attending for contraceptive care can help them to consider their options and more likely to use LARC. There is strong evidence for increases in LARC use associated with the scheme but its impact on abortion is unclear. Although the P4P scheme has since been withdrawn, LARC advice could still be part of good practice when discussing contraceptive options with women in general. Further research on impact of LARC advice on women who only used EHC using a well powered sample

size might be useful to examine the full extent of the P4P scheme on LARC prescriptions and abortions.

18.4.3 Study 3 - What are the biopsychosocial correlates of abortion

The findings from this study suggested there are strong associations between abortion and smoking, abuse, depression, anxiety, drug overdose and alcohol misuse; whereas being an ex-smoker was significantly less likely to be associated with abortions.

This case-control study is useful because it helps to generate a hypothesis about who is at risk of unplanned pregnancies and therefore abortions in primary care. Further research to confirm this hypothesis and triangulate findings could include qualitative studies exploring contraceptive needs of vulnerable women, what their priorities might be and how they want to change their lives.

One study explored the relationship between depression and use of less effective contraceptive methods. It reported women who screened positive for depression using a validated questionnaire were significantly less likely to use a more effective method of contraception; the authors suggested contraceptive counselling strategies should be individually tailored to help decision making that is appropriate for them.(233) Contraceptive use among women drug misusers has been found to be low and often use less effective methods like condoms according to a systematic review.(234) Another study considered contraceptive care needs among women drug users attending a syringe exchange programme reported while referrals for contraceptive care might be an acceptable approach, there was a high prevalence of intimate partner violence and reproductive coercion so these need to be considered when discussing contraceptive options.(235)

An example of where focussing efforts on giving contraception might fail is in the case of reproductive control. My study findings suggested women who had an abortion were three times more likely to have had a history of documented abuse than those who didn’t have an abortion. Reproductive control of women by others is not a new phenomenon; it can include control or coercion over contraceptive decisions about becoming pregnant and abortion, as well as “contraceptive

sabotage".(236) Contraceptive sabotage refers to when the perpetrator removes the condom without their partner being aware; whether this is classed as non-consensual condom removal (known informally as "stealthing") is primarily a form of reproductive coercion or whether it is a form of sexual violence is open to interpretation. While it is different to intimate partner violence, there are similarities where they overlap. Rather than just focussing on contraceptive advice, other interventions such as looking out for signs of reproductive control might help to reduce risks for unplanned pregnancies and improve the lives of women affected by this.(237)

It is tempting to suggest a policy focus on improving access to reliable contraception for women with these conditions who might be at risk of unplanned pregnancies and abortions, or even a further study to examine a risk prediction model using these correlates and target women who might be at "high risk" of abortion. Identifying those at highest risk is useful only if accompanied by social and economic changes. Such actions would also shift the responsibility from individual women protecting themselves towards a collective responsibility to change the circumstances that place women in vulnerable positions that lead to unwanted pregnancy and abortion. For example, contraceptive access and advice might not be a priority for a woman who might be abused, depressed or dependent on alcohol.

A policy that targets only these women for contraceptive advice might further stigmatise their vulnerability and alienate them from accessing health services and preventative care. Whereas policies that consider the "upstream factors" could make a difference to women's lives so that they are in a better position to make decisions about their reproductive health and improve women's lives in general.

18.4.4 Study 4 - Young women's experiences of contraceptive care

The right to health includes the right to sexual and reproductive freedom and is included in two targets within United Nation's 2030 Agenda for Sustainable Development (ASD).(13) According to United Nations Economics and Social Council, only 52% of women in heterosexual relationships make their own decisions freely about sexual relations, contraceptive use and health care.(238) Inequalities of power and oppression could affect the way young women access and use

contraception. Achieving gender equality and empowering all women and girls is one of the United Nation's Sustainable Development Goals.(13)

My study suggests young women consider factors other than effectiveness when making contraceptive decisions; in other words, not everyone wants or needs to use LARC. We need to create an environment where women can be supported to decide which method of contraception to use and when they wish to use them. Some might prefer to use emergency contraception occasionally or choose to have an abortion; they should not be judged for their choice. Women need to be supported with their decisions that they feel are right for them without feeling judged.(239, 240) HCPs should discuss methods that are tailored to women's concerns and preferences to help them make better decisions, even if this means not using methods that HCPs think are reliable and effective.

The findings have broader implications and the issues regarding changing societal attitude and how that relates to policy is discussed later. It also makes us reflect on whether the policy drive to increase the prevalence of LARC use as realistic and sensitive to the needs of women.

Further studies involving young women from different parts of Britain, cultures and other age groups might be helpful to determine if other themes could be developed and if saturation could be reached. A systematic synthesis of qualitative studies on this topic using methods such as meta-ethnography might be helpful to summarise findings which might have stronger implications for health care practice and policy.(169)

18.4.5 Study 5 - Contraception access during COVID-19 lockdown

This survey's findings might have useful contributions to the planning of future pandemics to facilitate access to contraception. This study and others conducted in other high-income countries found the impact of poor signposting was not unique to just one or two subsets of the population, and perceived problems with access could be a barrier to contraceptive care. A recent study reported higher proportions of unplanned and ambivalent pregnancies conceived during compared with before lockdown in the UK. (241) More effective campaigns about access to contraception

and support could have prevented some of these unplanned pregnancies. Although general practice was used by over half of the survey respondents to access contraceptives during the pandemic, it did not need to be the only option. Message campaigns could have included awareness of other venues for advice such as community pharmacies, which played an important role during lockdown in the US.(242)

Digital access emerged as an important innovation to meet the challenge of healthcare during this COVID-19 pandemic; the respondents from the survey reported the ease and convenience of using this to access contraception during the pandemic, it was also relevant for reproductive health and access for young people.(243, 244, 245) However, one should be mindful of other groups that could be excluded as they do not offer solutions to those unable to use digital technology due to language or sensory barriers, and for LARC access.

Lastly, the lockdown measures produced a situation where women in postnatal period could not get a contraceptive injection, but their babies were able to get their vaccinations. There was unequal access due to affordability and those with long distances to travel and those who were less likely to use digital access. These illustrated how the pandemic exacerbated inequalities as healthcare assess for some groups were prioritised over women and other vulnerable groups.(218) Mitigation measures for future pandemics therefore need to be consistent and fair to different population groups to reduce further inequalities.

18.5 Reflection on feminist approach to research

In the Methodology chapter, I introduced using a feminist theory and epistemology as a framework for this PhD thesis. Feminist values in research could be understood in a variety of ways. (158) The common themes included: construction of new knowledge, social change, research process that looks beyond positivism, recognition of power relationships and the experiences from women's perspective. I shall explain how I used the feminist framework throughout my PhD.

18.5.1 Project Advisory Group (PAG)

One of the principles of feminist research is the recognition of power relationships and acknowledgement of experiences from a woman's perspective. The "feminist praxis" is a feminist belief system which advocates equal relationship between researchers and the research subjects, i.e. people whose lives are being researched. (170)

I set up a Project Advisory Group (PAG) for my PhD and the NIHR Doctoral Fellowship. It was important for me that the members of the group had meaningful participation in my research programme. I felt strongly that a research programme on contraceptive care should include and hear from service users. In addition, the potential research outputs should be meaningful to and make a difference for users.

Apart from the intended role of the PAG described above, they also helped me to understand the research from a feminist perspective. For example, initially, I had thought that abortion was a measurable outcome to determine the success of a reproductive health programme, I had an assumption that abortions were preventable, and they could be prevented if only women had access to effective contraception. I learnt from the PAG that this way of thinking could be "problematising abortion".

I found out abortion is not always "preventable"; suggesting abortions need to be prevented or reduced as a desired outcome of reproductive health programmes or contraceptive care might inadvertently stigmatise abortion and women who have abortion.(246) Such a focus creates a negative narrative which worsens the stigma and some have called for more normalising language on this issue.(247) It is only by normalising abortion as part of essential healthcare that it can be destigmatised. Health professionals and researchers can play a key role in normalising abortion, by thinking about how to present abortion to women and frame their work to others more widely respectively.

Another example of how the PAG had helped me change my thinking was how to interpret the findings for Study 3 (Biopsychosocial determinants of abortion). Initially, I thought this study helped to identify the risk factors associated with abortion and therefore identify women who might be at risk and benefit from intervention such as

discussion about contraception. I quickly understood how interventions at the individual level could stigmatise the woman further but instead, there might be value in considering the upstream factors that put these women in vulnerable situations. Lastly, as one of the PAG team was involved with data analysis of the focus group study, I learned more about the feminist perspective when interpreting the data and findings.

Due to the contribution of PAG, I became more and more familiar with the feminist orientation as the research progressed. This was an unexpected but useful development of this PhD as I returned to the research I had done and applied the findings using this perspective.

18.5.2 Framing of data, research outputs and policy

Jenkins et al suggested “feminist researchers should reflect on their own position … in relation to their research participant sharing their self-reflections on who they are and how their lives have shaped the ways they see and understand the world around them.” (170) The following is a summary of my reflection of the research process using a feminist approach.

Rather than completely rejecting positivism, which is one feature of some feminist research, I used a variety of methods (including quantitative methods) to answer the research questions proposed for my PhD, in addition to a web-based survey for the contraception during covid study. There were other feminist principles which I used including: using a diversity of methods, interpreting findings from a woman’s point of view, acknowledging the power differential which shape women’s experiences as well as between the researcher and research participant, allowing end users to participate and be involved in the research process, and to continually reflect on the research process. Another feature which is production of social change through construction of new knowledge is beyond the scope of this PhD but already included in the dissemination plan in the Fellowship, which will be guided by the PAG.

I mentioned in my introduction that while many countries including Britain have reproductive health programmes to reduce unplanned pregnancies and improve women’s lives, some measure their success by not only how many abortions are

averted but in whom. The data that are available do not directly measure whether women at risk of pregnancy and do not want to be pregnant were able to access and use a method of contraception that suited them. Related to that is the conception statistics which is defined as pregnancy of a woman that leads to either a maternity or an abortion; this statistic does not include miscarriages.(248) It is from these statistics that reproductive healthcare is judged – such as the level of teenage pregnancies or abortions.

Abortion is not always “preventable”; suggesting abortions need to be prevented or reduced, and not having an abortion being a desired outcome of reproductive health programmes or contraceptive care may inadvertently stigmatise abortion and women who have abortion.(246) Such a focus creates a negative narrative which worsens the stigma and some have called for more normalising language on this issue.(247) It is only by normalising abortion as part of essential healthcare that it can be destigmatised. Health professionals and researchers can play a key role in normalising abortion, by thinking about how to present abortion to women and frame their work to others more widely respectively.

The focus on LARC and teenage pregnancy might also be problematic from a feminist point of view. Problematising one group as “unfit to parent” could inadvertently add to the stigma and oppression for an already marginalised group of women. As one paper put it: “targeting young people for LARC fails to recognise that social inequality is the context for teenage pregnancy, not the result of it. Provider pressure on women of colour to use LARC is linked to institutional racism, whilst policy for those with physical and intellectual disabilities is shaped by disability discrimination.”(249)

Out of this PhD, the focus group study best illustrated the feminist approach to research. Starting with the design, focus groups is one study method that could be described as “egalitarian”. This was because of the number of participants simultaneously involved in the research interaction, they reduced the researcher's relative power and control in that interaction.(250)

18.5.3 Critiques and challenges of feminist approach in research

Although the feminist approach to research methodology can help to understand more about gender inequality and power struggles for women and other marginalised groups, it is not without problems.

Earlier waves of feminism have been criticised for their focus on white, heterosexual, cisgender bias and failed to recognise other marginalised groups. “Black feminism” and intersectionality theory demonstrate how race, class, ability, and appearance interact with gender to generate privilege and discrimination.(251, 252) Most modern feminist thinking now include a diverse viewpoint of who the power struggles relate to. As Gorelick puts it, women's oppression is “a complex of many contradictions” which needs a methodology that is created by researchers and participants of diverse race, class, and other oppressed groups, to refocus and re-vision knowledge that is based on theory, action, and experience. (253)

Participatory approaches are one of the principles of feminist methods. Co-production and Patient and Public Involvement (PPI) are often a requirement for research council funding (https://www.ukri.org/about-us/policies-standards-and-data/good-research-resource-hub/research-co-production/); however, this way in which PPI is used in research is not consistent and sometimes researchers do not understand the value. The NIHR is one of the first research funders to review its approach and impact of PPI policies. It found a range of barriers and enablers to progress, including attitudes, resources, infrastructure, training and support and leadership. There appeared to be some scepticism and confusion about what it entails.(254) Participatory approaches can also create conflict with researchers; for example, my thinking about some research design was challenged by the PAG and I had to discard a research idea due to their concerns. This is why open minded, non-hierarchical approaches need to be adopted.(255) Even with journal policies on documentation, PPI is not often reported, inconsistent or varied in quality.(256)

From an epistemological point of view, changing from a familiar paradigm can be challenging and uncomfortable for many established researchers in their fields. It can also be difficult to be humble as a researcher/scientist and accept opinions from lay person as equally valid. This can be more challenging for champions of “evidence-

based medicine (EBM)" which is fashionable and favours positivism and hierarchical approaches that value quantitative methods over people's experiences. In a paper summarising the philosophical challenges of EBM written almost 20 years ago, Ashcroft stated further work was needed on the epistemology of EMB including: theory of evidence and inference, causation and correlation, among others, but the concluding line "methodological modesty is the order of the day" still holds true even today.(257)

18.6 Future research, advocacy, and change from a feminist's perspective

In an introduction to a series of articles on feminist research, Jenkins et al argued feminist values should underpin every aspect of research to support development of women's rights and gender equality. Historically, research and knowledge production had been predominately led by educated men from the northern hemisphere, with a high value placed on "objectivity" and "facts". There had also been an assumption that there is nothing distinctive, significant or important difference about experiences of women, girls and gender non-conforming groups; experiences of men had been assumed to be the norm. (170)

The stereotyped gendered role is also perpetuated by biomedical texts on contraception, where women's lives and experiences are often reduced to their reproductive capacities.(258) Much of women's/reproductive health policies in many countries focus on access to effective contraception, especially LARC, and reductions in abortions. Contraceptive provision should be based on user needs and preferences, not what is most effective and efficient from the health service's point of view. Women should not be pressured into using regular contraception, nor should they be coerced into using LARC if they feel they are not their best option.

The key message from the case control study on the biopsychosocial correlates of abortion is that we should focus less on the individual and whether they use contraception "responsibility" or make judgements about their reproductive health based on presumed risk factors for abortion, but rather, reproductive health policies need to challenge the patriarchy and allow advocacy from feminist perspectives. This means focussing on the wider determinants of poor reproductive health for women

and girls such as gender inequality (i.e., offering the same opportunities for education, employment, healthcare and status in society); protection from intimate partner violence and reproductive coercion; challenging the power relationships between healthcare professionals and patients that underly paternalism and health care gaslighting which would improve better informed decisions about an individual's reproductive healthcare. Women make better decisions for their reproductive health if they have autonomy and agency; but they could only do so within an instution that allows equality, if their rights were protected and they could live freely without oppression.(259)

Abortions are a crude measure of unplanned and unwanted pregnancies, and not all abortions are preventable. The London Measure of Unplanned Pregnancy LMUP is a psychometric measure of unplanned pregnancy which has been available for nearly a decade and now in different languages; in keeping with feminist methodology, its development was also informed by lay views. The measure is suitable for use with any pregnancy regardless of outcome (that is, birth, abortion, miscarriage) and is highly acceptable to women." (260) However this may not be practical for large scale epidemiological studies as it requires an individual to do a questionnaire for each pregnancy and outcome. Policy makers and practitioners should also shift focus away from their anxiety over abortion rates as a proxy indicator and consider the user satisfaction with reproductive health as markers for "good" reproductive healthcare.

Many of the findings from the focus group study such as gender inequality, shaming of young women's sexuality, and power and oppression are not new. Adolescents' sexuality, particularly young women's, is often pathologized in research.(261, 262) Gender inequality also manifests in sex education material where young men and women's sexual agency are considered: male sexual desire is legitimised whereas female desire is problematised.(263) Some of the research using a feminist perspective have been published almost 20 years ago.(111) The fact that same issues were elicited from the focus group suggests not enough research and policy have been considered from the feminist perspective, and that the institutions (academic, societal, political) might be too deeply patriarchal which render it difficult for feminist advocates to change the status quo.

There is currently a paucity of research on contraception and reproductive healthcare informed by feminist theories. As mentioned in the focus group study, a better understanding of structural forms of gender power is needed to tackle the continued marginalisation of adolescent girls and young women in a society that is highly inequitable.(264) A review article examined the use of feminism as a lens to conduct research has wide-ranging utility and allows researchers to explore women's views and experiences across a range of issues such as academia, child rearing, violence, homelessness. Much discussion and conceptualisation about feminism focussed on the importance of advocacy and empowerment. However there was a lack of articles that defined feminist theory and empirical tests of these components. (265) This thesis' contribution to the literature is not just the findings from each of the individual studies, but more from the use of feminist perspective as a theoretical orientation which helped to contribute to better understanding of reproductive health policies in general, and to offer parity to patients and public in research.

18.7 Conclusions

For this PhD, I sought to examine how general practice could offer more effective and equitable contraceptive care. Using measures such as contraceptive prescriptions (including LARC) and abortion rates as outcomes, a P4P scheme was associated with more LARC prescriptions, with greater impact for younger women and those from deprived backgrounds, but it had uncertain impact on abortion rates. Women who attend primary care might have conditions and circumstances which make them more likely to have abortions. Improving access to effective contraception won't necessarily change the circumstances associated with abortions but managing some upstream factors might change women's lives and improve reproductive health outcomes. I learnt through the contraception during COVID-19 survey about the struggles some women had to get the contraception they needed. The focus group study gave me insight into what young women needed to make choices about contraceptives, and some of the barriers that made it difficult for them to exercise their choice, some of these included gender inequality and societal attitudes to young women. The use of a feminist approach in this PhD not only enhanced my understanding of the issues involved, but it also enabled me to interpret the findings for the benefit of women.

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20 Appendix 1 – Literature review search strategy

Database: Ovid MEDLINE(R) ALL <1946 to March 21, 2019>
Search Strategy:
---
1 exp Contraceptive Agents/ (68626)
2 contraceptive*.mp. (73270)
3 exp Contraceptive Devices/ (24242)
4 exp Contraception/ (25776)
5 Contraception/ (19022)
6 Family Planning Services/ (24242)
7 family planning.mp. (47597)
8 exp General Practice/ (72938)
9 General Practice/ (12094)
10 general practitioner*.mp. (49107)
11 General Practitioners/ (6763)
12 Family Practice/ (64333)
13 family practice*.mp. (67685)
14 1 or 2 or 3 or 4 or 5 or 6 or 7 (142639)
15 8 or 9 or 10 or 11 or 12 or 13 (109465)
16 14 and 15 (1286)
17 limit 16 to (abstracts and yr="2000 - 2019") (468)
18 from 17 keep 1,6,20-21,37-38,43,48,51-52,56,59,68-69,71,74-76,80,85,93-96,99-100,105-106,116-119,123,127,133-134,145-146,154-155,157-158,164,172,174,177-178,183,190,199 (50)
19 from 17 keep 199,201,208,211,214-215,227,232,234,236,245,253,257,259,265,268-270,275-276,285-286,291-292,296,300,306,309,312,314,322,325,329,331,339,342-343,347,355,361,364,367,372,390,392,397,405,407,414-417,420,427,437,439,447,450-451,453,455,461-463 (64)
20 exp Contraceptive Agents/ (68626)
21 contraceptive*.mp. (73270)
22 exp Contraceptive Devices/ (24242)
23 exp Contraception/ (25776)
24 Contraception/ (19022)
25 Family Planning Services/ (24242)
26 family planning.mp. (47597)
27 exp General Practice/ (72938)
28 General Practice/ (12094)
29 general practitioner*.mp. (49107)
30 General Practitioners/ (6763)
31 Family Practice/ (64333)
32 family practice*.mp. (67685)
33 20 or 21 or 22 or 23 or 24 or 25 or 26 (142639)
34 27 or 28 or 29 or 30 or 31 or 32 (109465)
35 33 and 34 (1286)
36 limit 35 to (abstracts and yr="2000 - 2019") (468)
37 primary care*.mp. (109640)

38 27 or 28 or 29 or 30 or 31 or 32 or 37 (201245)
39 33 and 38 (1995)
40 limit 39 to yr="2000 - 2019" (1055)
41 limit 40 to abstracts (973)
42 endometri*.mp. or exp Endometriosis/ (98740)
43 41 not 42 (940)
44 exp africa/ or exp belize/ or exp costa rica/ or exp el salvador/ or exp guatemala/ or exp honduras/ or exp nicaragua/ or bolivia/ or brazil/ or colombia/ or ecuador/ or french guiana/ or guyana/ or paraguay/ or peru/ or suriname/ or venezuela/ or kazakhstan/ or kyrgyzstan/ or tajikistan/ or turkmenistan/ or uzbekistan/ or exp russia/ or borneo/ or cambodia/ or indochina/ or indonesia/ or laos/ or malaysia/ or mekong valley/ or myanmar/ or philippines/ or thailand/ or timor-leste/ or vietnam/ or exp china/ or exp mongolia/ (653830)
45 43 not 44 (884)
46 exp Menorrhagia/ (4115)
47 heavy menstrual bleeding.mp. or Menorrhagia/ (4465)
48 46 or 47 (4465)
49 45 not 48 (873)
50 exp india/ or afghanistan/ or iran/ or iraq/ or jordan/ or lebanon/ or syria/ or turkey/ or yemen/ or nepal/ or pakistan/ or sri lanka/ (192594)
51 49 not 50 (851)
52 turkish.mp. (16918)
53 51 not 52 (848)
54 from 51 keep 2 (1)
55 from 53 keep 1-2,5-7,15,21-22,27-28,30-31,35,48,55,57,59,68-70,73,80-81,84,94-95,105,107-111,115,117-123,126,129-130,132,135,137-138,140,147-149,154,172,179-180,183,190,196,198,200,204,211,215-220,223,227,229,232,235,237-238,240,249-250,252,254,257,265-266,268-273,275-280,284,286-287,291,299,301,303,308,312-313,316-317,319-320,322-323,329,336,338-339,342,344,346,348,354,356-357,360,369,378,380,382,384-385,388,390,394,398,400,405-406,414,417,422,429,431-432,436,440,443,445,453,457,459-460,486,489,504-505,510,521,532-533,545,549-552,560,562,564,570-571,578,583,593,595,597-600,606,609,615,617,632-633,644,654,664,690,699,703,706,731,733,742,745,755,758,774,776-777,780,790,795-797,807,809-810,820,823-824,828,830,832,834,840-842 (216)

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21 Appendix 2 – Supplementary materials for Study 1 – Impact of P4P on LARC and abortions

21.1 CPRD approval ISAC protocol no 16_076R2

ISAC EVALUATION OF PROTOCOLS FOR RESEARCH INVOLVING CPRD DATA

FEEDBACK TO APPLICANTS

CONFIDENTIAL			by e-mail
PROTOCOL NO:	15_076R2		
PROTOCOL TITLE:	What is the impact of financial incentives for UK general practitioners to offer advice on long acting reversible contraception on abortion rates and contraceptive uptake especially in teenage women?		
APPLICANT:	Dr Richard Ma, In-Practice Fellow, Imperial College London, Charing Cross Campus Room 319, Reynolds Building St Dunstans Road London W6 8RP		
APPROVED ☐	**APPROVED WITH COMMENTS (resubmission not required)** ☒	**REVISION/ RESUBMISSION REQUESTED** ☐	**REJECTED** ☐

INSTRUCTIONS:

Please include your response/s to the Reviewer's feedback below only if you are required to Revise/ Resubmit your protocol.

Protocols with an outcome of 'Approved' or 'Approved with comments' do not require resubmission to the ISAC

Protocol 15_076R2 is approved with the following comment:

Your application form still contains incorrect information in question 15 suggesting you are seeking access to a local dataset with less than one million patients. We have indicated your confusion relates to the access to HES data on abortions. Rather than ask for a further resubmission of the application form please liaise with CPRD when you come to extract the data.

DATE OF ISAC FEEDBACK:	1st May 2015

DATE OF APPLICANT FEEDBACK:	

For protocols approved from 01 April 2014 onwards, applicants are required to include the ISAC protocol in their journal submission with a statement in the manuscript indicating that it had been approved by the ISAC (with the reference number) and made available to the journal reviewers. If the protocol was subject to any amendments, the last amended version should be the one submitted.

** Please refer to the ISAC advice about protocol amendments provided below**

During the course of some studies, it may become necessary to deviate from a protocol which has been approved by ISAC. Any deviation to an ISAC approved protocol should be clearly documented by the applicant but not all such amendments need be submitted for ISAC review and approval. The general principles to be applied in regard to the need for submission are as follows:

- Major amendments should be submitted
- Minor amendments need not be submitted (but must still be documented by the applicant and should normally be mentioned at the publication stage)

In cases of uncertainty, the applicant should contact the ISAC secretariat for advice quoting the original reference number and providing a brief explanation of the nature of the amendment(s) and underlying reason(s).

Major Amendments

We consider an amendment as major if it substantially changes the study design or analysis plan of the proposed research. An amendment should be considered major if it involves the following (although this is not necessarily an exhaustive list):

- A change to the primary hypothesis being tested in the research
- A change to the design of the study
- Additional outcomes or exposures unrelated to the main focus of the approved study*
- Non-trivial changes to the analysis strategy
- Change of principal investigator
- Use of additional linkages to other databases
- Any new proposal involving contact with health professionals or patients or change in regard to such matters

* N.B. extensive changes in this respect will require a new protocol rather than an amendment - if in doubt please consult the Secretariat

Minor Amendments

Examples of amendments which can generally be considered minor include the following:

- Change of personnel other than the principal investigator
- A change to the definition of the study population, providing the change is mentioned and justified in the paper/output [NB previously major]
- Extension of the time period in relation to defining the study population
- Changes to the definitions of outcomes or exposures of interest, providing the change is mentioned and justified in the paper/output [NB previously major]
- Limited additional analysis suggested by unexpected findings, provided these are clearly presented as post-hoc
- Additional methods to further control for confounding or sensitivity analysis provided these are to be reported as secondary to the main findings

To submit an amendment of protocol to the ISAC, please submit the following documents to the ISAC mailbox isac@cprd.com

- A covering letter providing justification for the request
- A completed and, if necessary, updated application form with all changes highlighted; if new linkages are required the current version of the ISAC application form must be completed. Otherwise, the original form may be amended as necessary
- **The updated protocol document containing the heading 'Amendment' at the end of it**. Please include all amendments to the protocol under this heading. No other changes should be made to the already approved document.

21.2 Interrupted time series study reporting check list

Item		No	Recommendation	Section & para no
Title and abstract		1	Indicate the study design (interrupted time series) in the title or abstract	Title
Introduction	Background/ rationale	2	Provide background regarding the intervention and setting under investigation to support the study rationale and methods	Introduction 1-3
	Objectives	3	(a) State specific objectives and any prespecified hypotheses	Introduction 4
			(b) Distinguish between primary and secondary objectives	Introduction 4
Methods	Intervention	4	Define the intervention time point(s) used in the analysis	Method 2
	Participants	5	(a) List eligibility criteria and methods of selection	Method 2
			(b) Define subgroups	Method 3
			(c) Consider including a comparison group not exposed to the intervention as a secondary group of participants	Method 5 – comparison outcome
	Data sources and measurement	6	(a) List data source(s)	Method 1
			(b) Comment on data completeness, validity, and changes in data coverage over time	Method 1
	Variables	7	(a) Define all variables	Method
			_ Outcome variable(s)	5, 7
			_ Descriptive and stratifying variable(s)	5, 10
			(b) Comment on change in variable coding over time	6, 8, 9
			(c) Consider including details of variable coding in supplemental material, for example, appendix or research Web site	In protocol
	Statistical methods	8	(a) Report all statistical methods	Method
			_ Study time intervals, for example, monthly, quarterly	11 ,13 -statistical analysis
			_ Regression model, for example, ARIMA, linear, segmented	12
			B For ARIMA models, indicate the intervention function, for example, point, ramp, or step	13
			B Indicate the appropriateness of linear model(s) when applied	(Discussion 10)
			_ Number of preintervention, postintervention, and between intervention data points	13
			(b) Define the study period and number of preintervention data points used in forecasting	14
			(c) Indicate how autocorrelation, non-stationarity, and seasonality were tested and handled	13
			(d) Consider a lag period if intervention effects are gradual or delayed	We used a phase-in period
			(e) Define and distinguish between primary and secondary or sensitivity analyses	16
			(f) Consider use of comparison outcome(s)	We used NLHC as

			and/or population(s) not exposed to the intervention(s) as secondary analyses	comparison 5
			(g) Report statistical software used for analysis	18
Results	Participants	9	(a) Report the number of individuals and/or observations in each group analyzed	Results 1
			(b) Consider use of a flow diagram	NA
			(c) Describe characteristics and indicate missing data	1 Table 1
	Outcome data		10 (a) Report the number of outcomes examined over the study period	Table1
			(b) Report the average, minimum, and maximum number of outcomes across time intervals	Table 1
			(c) Report on data variability	2, 6, 9
			(d) Comment on outliers and ceiling or floor effects where relevant	
	Main results	11	(a) Present results using a graphical display with intervention time point(s) clearly defined	Figure 1
			(b) Consider including forecasted results graphically	Figure 1
			(c) Report absolute and/or relative change(s) and their significance, for example, clinical or policy and statistical	5, 8, 11
	Other analyses	12	Report additional results (secondary and sensitivity analyses) in the article, appendix, or research Web site	Results 12, 13
Discussion	Key results	13	Summarize key results with reference to study objectives	Discussion 1
	Context	14	(a) Provide context related to possible confounding	
			i Discuss relevant cointerventions that occurred during the study period	11
			ii Comment on the stability of participant characteristics over time	6
			iii Comment on the stability of outcome coding over time	7, 8, 9
			(b) Discuss results of comparison analyses or provide a rationale if no comparison group was considered	3, 4
	Limitations	15	(a) Discuss limitations of the study	5, 6, 7, 8, 9, 10
			(b) Comment on data variability and appropriateness of the number of data points	3
			(c) Comment on ceiling or floor effects and outliers where relevant	NA
			(d) Discuss direction and magnitude of any potential bias	7, 9, 11
	Interpretation	16	other relevant evidence	Social/political/ economic context Discussion 14,15,16
Other information	Funding	17	List funding source(s) and role of funders	Enclosed in submission
	References	18	Reference methodological articles that support statistical methods used	Method 13

21.3 Medication Code list – LARC products

Product code	Product name
59213	Medroxyprogesterone 104mg/0.65ml suspension for injection pre-filled disposable devices
57542	Depo-Provera 150mg/1ml suspension for injection pre-filled syringes (Waymade Healthcare Plc)
3892	Depo-provera 50mg/ml Injection (Pharmacia Ltd)
35001	Depo-Provera 150mg/1ml suspension for injection pre-filled syringes (Pfizer Ltd)
35075	Medroxyprogesterone 150mg/1ml suspension for injection pre-filled syringes
51351	Depo-Provera 150mg/1ml suspension for injection pre-filled syringes (Necessity Supplies Ltd)
57037	Sayana Press 104mg/0.65 ml suspension for injection pre-filled disposable devices (Pfizer Ltd)
49666	Depo-Provera 150mg/1ml suspension for injection pre-filled syringes (Mawdsley-Brooks & Company Ltd)
3982	Medroxyprogesterone acetate contraceptive 150mg/ml Injection
49518	Depo-Provera 150mg/1ml suspension for injection pre-filled syringes (DE Pharmaceuticals)
3445	Medroxyprogesterone acetate contraceptive 50mg/ml Injection
2748	Mirena 20micrograms/24hours intrauterine device (Bayer Plc)
16624	Levonorgestrel 228mg Implant
57359	Mirena 20micrograms/24hours intrauterine device (Mawdsley-Brooks & Company Ltd)
60564	Levonorgestrel 13.5mg intrauterine device
6906	Levonorgestrel 20micrograms/24hours intrauterine device
2819	Norplant 228mg Implant (Hoechst Marion Roussel)
60632	Jaydess 13.5mg intrauterine device (Bayer Plc)
13209	Etonogestrel 68mg implant
9592	Implanon 68mg implant (Organon Laboratories Ltd)
44196	Nexplanon 68mg implant (Merck Sharp & Dohme Ltd)
1196	Novagard type 6 Intrauterine device (Pharmacia Ltd)
18826	Multi-Safe 375 intrauterine contraceptive device (Williams Medical Supplies Ltd)
938	Nova-T intrauterine contraceptive device (Schering Health Care Ltd)
26488	Neo-Safe T380 intrauterine contraceptive device (Williams Medical Supplies Ltd)
2747	Multiload Cu250 intrauterine contraceptive device (Organon Laboratories Ltd)
45739	Optima TCu 380A intrauterine contraceptive device (Farla Medical Ltd)
36995	UT380 Short intrauterine contraceptive device (Durbin Plc)
14295	Flexi-T+ 380 intrauterine contraceptive device (Durbin Plc)
14959	TT380 Slimline intrauterine contraceptive device (Durbin Plc)
4904	Gyne-T 380S intrauterine device (Janssen-Cilag Ltd)
5647	T-Safe 380A QL intrauterine contraceptive device (Williams Medical Supplies Ltd)
36984	Mini TT380 Slimline intrauterine contraceptive device (Durbin Plc)
5265	Multiload Cu375 intrauterine contraceptive device (Organon Laboratories Ltd)
12146	Ortho-gyne type 4a iucd -t Intrauterine device (Janssen-Cilag Ltd)
14158	Multiload Cu250 Short intrauterine contraceptive device (Organon Laboratories Ltd)
13678	Ortho-gyne type 4b Intrauterine device T380S (Janssen-Cilag Ltd)
5405	Nova-T 380 intrauterine contraceptive device (Bayer Plc)
14038	Flexi-T 300 intrauterine contraceptive device (Durbin Plc)
33367	Load 375 intrauterine contraceptive device (Durbin Plc)
21686	GyneFixPT intrauterine contraceptive device (Family Planning Sales Ltd)
43404	Steriload intrauterine contraceptive device (Farla Medical Ltd)

19143	GyneFix intrauterine contraceptive device (Williams Medical Supplies Ltd)
38015	UT380 Standard intrauterine contraceptive device (Durbin Plc)

21.4 Medication code list – Non-LARC hormonal contraception NLHC – Combined Hormonal Contraception

Product code	Product name
1988	Binovum tablets (Janssen-Cilag Ltd)
8103	Conova 30 Tablet (Pharmacia Ltd)
19551	Controvlar Tablet (Schering Health Care Ltd)
65711	Daylette 0.02mg/3mg tablets (Consilient Health Ltd)
65312	Eloine 0.02mg/3mg tablets (Bayer Plc)
40618	Estradiol valerate and (estradiol valerate with dienogest) tablets
65005	Ethinylestradiol 20microgram / Drospirenone 3mg tablets
42510	Ethinylestradiol with levonorgestrel Tablet
3471	Femodene ED tablets (Bayer Plc)
65224	Generic Binovum tablets
65475	Generic Femodene ED tablets
56868	Generic Logynon ED tablets
61088	Generic Logynon tablets
51482	Generic Microgynon 30 ED tablets
59149	Generic Qlaira tablets
56483	Generic Tri-Minulet tablets
56553	Generic Trinovum tablets
14459	Gynovlar 21 Tablet (Schering Health Care Ltd)
2026	Logynon ED tablets (Bayer Plc)
978	Logynon tablets (Bayer Plc)
4917	Microgynon 30 ED tablets (Bayer Plc)
9119	Minilyn Tablet (Organon Laboratories Ltd)
43009	Minovlar 21 Tablet (Schering Health Care Ltd)
21343	Minovlar ed Tablet (Schering Health Care Ltd)
40305	Qlaira tablets (Bayer Plc)
5576	Synphase tablets (Pfizer Ltd)
3693	Triadene tablets (Bayer Plc)
3472	Trinovum ed ED tablets (Janssen-Cilag Ltd)
1601	Trinovum tablets (Janssen-Cilag Ltd)
44278	TriRegol tablets (Consilient Health Ltd)
56311	Yaz tablets (Imported (United States))
60739	Yaz tablets (Imported (United States))
57264	Estradiol 1.5mg / Nomegestrol 2.5mg tablets
56539	Zoely 2.5mg/1.5mg tablets (Merck Sharp & Dohme Ltd)
18823	Ethinylestradiol 30microgram / Norethisterone acetate 1.5mg tablets
1352	Loestrin 30 tablets (Galen Ltd)
40512	Ethinylestradiol 2.7mg / Etonogestrel 11.7mg vaginal delivery system
70179	Alenini 150microgram/20microgram tablets (Actavis UK Ltd)
65777	Bimizza 150microgram/20microgram tablets (Morningside Healthcare Ltd)

16110	Ethinylestradiol 20microgram / Desogestrel 150microgram tablets
44457	Gedarel 20microgram/150microgram tablets (Consilient Health Ltd)
63102	Lestramyl 20microgram/150microgram tablets (Mylan Ltd)
1378	Mercilon 150microgram/20microgram tablets (Merck Sharp & Dohme Ltd)
63752	Munalea 150microgram/20microgram tablets (Lupin (Europe) Ltd)
70050	Alenvona 150microgram/30microgram tablets (Teva UK Ltd)
58642	Cimizt 30microgram/150microgram tablets (Morningside Healthcare Ltd)
47281	Elevin 150microgram/30microgram tablets (MedRx Licences Ltd)
67520	Erlibelle 30microgram/150microgram tablets (Actavis UK Ltd)
13248	Ethinylestradiol 30microgram / Desogestrel 150microgram tablets
65786	Ethinylestradiol 30microgram / Desogestrel 150microgram tablets (AM Distributions (Yorkshire) Ltd)
6686	Ethinylestradiol 30microgram / Levonorgestrel 150microgram tablets
61808	Ethinylestradiol 30microgram / Levonorgestrel 150microgram tablets (A A H Pharmaceuticals Ltd)
44336	Gedarel 30microgram/150microgram tablets (Consilient Health Ltd)
59383	Lestramyl 30microgram/150microgram tablets (Mylan Ltd)
45557	Levest 150/30 tablets (Actavis UK Ltd)
43003	Levest 150/30 tablets (Morningside Healthcare Ltd)
62968	Maexeni 150microgram/30microgram tablets (Lupin (Europe) Ltd)
49700	Marvelon tablets (DE Pharmaceuticals)
63595	Marvelon tablets (Mawdsley-Brooks & Company Ltd)
935	Marvelon tablets (Merck Sharp & Dohme Ltd)
41	Microgynon 30 tablets (Bayer Plc)
52443	Microgynon 30 tablets (Mawdsley-Brooks & Company Ltd)
63258	Munalea 150microgram/30microgram tablets (Lupin (Europe) Ltd)
1062	Ovranette 150microgram/30microgram tablets (Pfizer Ltd)
44046	Rigevidon tablets (Consilient Health Ltd)
443	Desogestrel with ethinylestradiol 150micrograms with 20micrograms tablets
23211	Desogestrel with ethinylestradiol 150micrograms with 30micrograms tablets
8176	Ethinylestradiol 20microgram / Norethisterone acetate 1mg tablets
1427	Loestrin 20 tablets (Galen Ltd)
8482	Ethinylestradiol 35microgram / Norethisterone 1mg tablets
3538	Neocon 1/35 Tablet (Cilag Pharmaceuticals Ltd)
2856	Norimin 1mg/35microgram tablets (Pfizer Ltd)
17756	Mestranol 50microgram / Norethisterone 1mg tablets
5862	Norinyl-1 tablets (Pfizer Ltd)
3436	Ortho-novin 1/50 Tablet (Janssen-Cilag Ltd)
39517	NuvaRing 0.12mg/0.015mg per day vaginal delivery system (Merck Sharp & Dohme Ltd)
6596	Norelgestromin with ethinylestradiol 203micrograms + 33.9micrograms/24hours Transdermal patch
2084	Ovran 30 Tablet (Wyeth Pharmaceuticals)
1071	Cilest 35microgram/250microgram tablets (Janssen-Cilag Ltd)
49214	Cilest 35microgram/250microgram tablets (Mawdsley-Brooks & Company Ltd)

66154	Cilique 250microgram/35microgram tablets (Consilient Health Ltd)
14601	Ethinylestradiol 35microgram / Norgestimate 250microgram tablets
57181	Lizinna 250microgram/35microgram tablets (Morningside Healthcare Ltd)
25263	Norgestimate with ethinylestradiol 250micrograms + 35micrograms Tablet
25124	Acnocin 2000microgram/35microgram tablets (Sandoz Ltd)
31902	Cicafem 2000/35 tablets (Galen Ltd)
22603	Clairette 2000/35 tablets (Stragen UK Ltd)
6431	Co-cyprindiol 2000microgram/35microgram tablets
61190	Co-cyprindiol 2000microgram/35microgram tablets (A A H Pharmaceuticals Ltd)
38500	Co-cyprindiol 2000microgram/35microgram tablets (Fannin UK Ltd)
47132	Co-cyprindiol 2mg+35microgram Tablet (Sandoz Ltd)
125	Dianette tablets (Bayer Plc)
53201	Dianette tablets (Lexon (UK) Ltd)
4608	Dianette tablets (Mylan Ltd)
67274	Dianette tablets (Sigma Pharmaceuticals Plc)
67248	Dianette tablets (Waymade Healthcare Plc)
33098	Diva 2000/35 tablets (Zeroderma Ltd)
68515	Teragezza 2000microgram/35microgram tablets (Morningside Healthcare Ltd)
2769	Cyproterone acetate with ethinylestradiol 2mg with 35micrograms tablets
12631	Ethinylestradiol with levonorgestrel and placebo 30micrograms + 150micrograms Tablet
45059	Ethinylestradiol with levonorgestrel 30micrograms + 50micrograms Tablet
19131	Ethinylestradiol with gestodene and placebo 30micrograms + 75micrograms Tablet
29499	Ethinylestradiol 33.9micrograms/24hours / Norelgestromin 203micrograms/24hours transdermal patches
67318	Evra transdermal patches (Dowelhurst Ltd)
6166	Evra transdermal patches (Janssen-Cilag Ltd)
23218	Ethinylestradiol with cyproterone acetate 35microgram with 2mg tablets
40650	Ethinylestradiol with norethisterone 35micrograms + 750micrograms Tablet
61962	Acondro 0.03mg/3mg tablets (Mylan Ltd)
69098	Cleosensa 0.03mg/3mg tablets (Actavis UK Ltd)
63725	Dretine 0.03mg/3mg tablets (Teva UK Ltd)
6716	Ethinylestradiol 30microgram / Drospirenone 3mg tablets
68841	Ethinylestradiol 30microgram / Drospirenone 3mg tablets (Colorama Pharmaceuticals Ltd)
59503	Lucette 0.03mg/3mg tablets (Consilient Health Ltd)
65068	Yacella 0.03mg/3mg tablets (Morningside Healthcare Ltd)
697	Yasmin tablets (Bayer Plc)
52818	Yasmin tablets (Mawdsley-Brooks & Company Ltd)
70318	Yiznell 0.03mg/3mg tablets (Lupin (Europe) Ltd)
47057	Yasminelle 3mg+20microgram Tablet (Bayer Plc)
1354	Brevinor 500microgram/35microgram tablets (Pfizer Ltd)
7814	Ethinylestradiol 35microgram / Norethisterone 500microgram tablets
2354	Ovysmen 500microgram/35microgram tablets (Janssen-Cilag Ltd)

14977	Ethinylestradiol with gestodene - triphasic 6 x 30+50mcg; 5 x 40+70mcg; 10 x 30+100mcg Tablet
15886	Ethinylestradiol with levonorgestrel - triphasic 6x30+50mcg; 5x40+75mcg; 10x30+125mcg Tablet
23897	Ethinylestradiol with levonorgestrel - triphasic with placebo 6x30+50mcg; 5x40+75mcg; 10x30+125mcg Tablet
15987	Ethinylestradiol with norethisterone - triphasic 7 x 35+500mcg; 7 x 35+750mcg; 7 x 35mcg+1mg Tablet
14670	Ethinylestradiol with norethisterone - biphasic 7 x 35mcg+500mcg; 14 x 35mcg+1mg Tablet
64918	Aidulan 20microgram/75microgram tablets (Lupin (Europe) Ltd)
11910	Ethinylestradiol 20microgram / Gestodene 75microgram tablets
4964	Femodette tablets (Bayer Plc)
44229	Millinette 20microgram/75microgram tablets (Consilient Health Ltd)
37073	Sunya 20/75 tablets (Stragen UK Ltd)
68352	Aidulan 30microgram/75microgram tablets (Lupin (Europe) Ltd)
7776	Ethinylestradiol 30microgram / Gestodene 75microgram tablets
936	Femodene tablets (Bayer Plc)
36829	Katya 30/75 tablets (Stragen UK Ltd)
44994	Millinette 30microgram/75microgram tablets (Consilient Health Ltd)
977	Minulet tablets (Wyeth Pharmaceuticals)
18569	Gestodene with ethinylestradiol 75microgramwith20microgram Tablet
21733	Gestodene with ethinylestradiol 75microgramwith30microgram Tablet
31528	Ethinylestradiol with norethisterone - triphasic 7x35+500mcg; 9x35mcg+1mg; 5x35+500mcg Tablet

21.5 Medication code list – Non-LARC hormonal contraception NLHC – Progestogen-only pills

Product code	**Product name**
2265	Etynodiol 500microgram tablets
54527	Cerelle 75microgram tablets (Consilient Health Ltd)
2061	Norethisterone 350microgram tablets
239	Micronor 350microgram tablets (Janssen-Cilag Ltd)
1720	Levonorgestrel 30microgram tablets
2553	Norgeston 30microgram tablets (Bayer Plc)
1348	Noriday 350microgram tablets (Pfizer Ltd)
54800	Desorex 75microgram tablets (Somex Pharma)
1613	Microval 30microgram tablets (Wyeth Pharmaceuticals)
56103	Cerelle 75microgram tablets (Consilient Health Ltd)
1466	Femulen 500microgram tablets (Pfizer Ltd)
10201	Desogestrel 75microgram tablets
56732	Aizea 75microgram tablets (Besins Healthcare (UK) Ltd)
61890	Desogestrel 75microgram tablets (A A H Pharmaceuticals Ltd)
5986	Cerazette 75microgram tablets (Merck Sharp & Dohme Ltd)
55819	Nacrez 75microgram tablets (Teva UK Ltd)
59414	Desogestrel 75microgram tablets (Actavis UK Ltd)
61465	Feanolla 75microgram tablets (Lupin (Europe) Ltd)
48570	Cerazette 75microgram tablets (Mawdsley-Brooks & Company Ltd)

58485	Zelleta 75microgram tablets (Morningside Healthcare Ltd)
57748	Desomono 75microgram tablets (MedRx Licences Ltd)

21.6 Procedure codes for Abortion

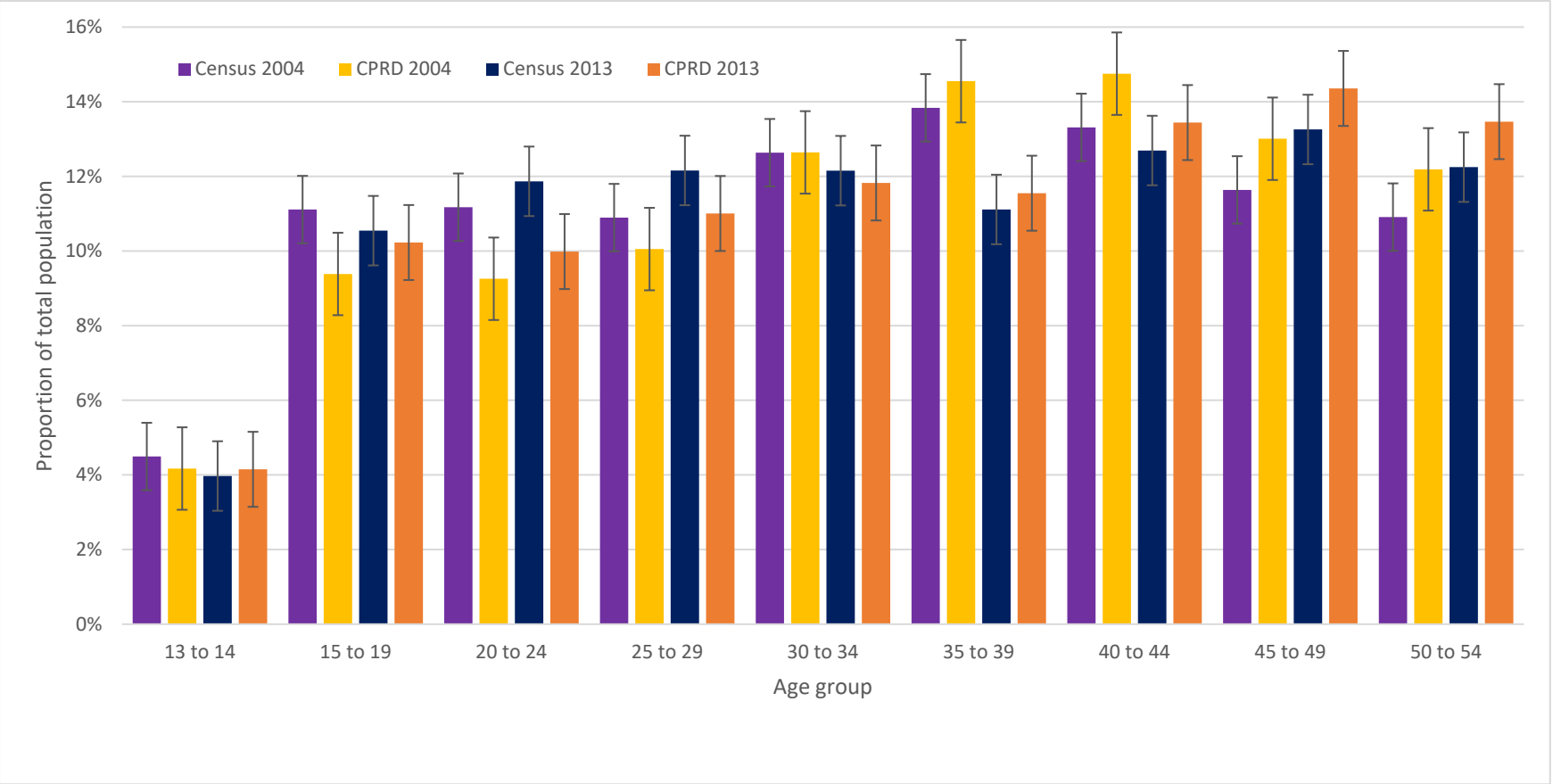
Med code	Read code	Read Term
255	L05..12	Termination of pregnancy
2187	L05..00	Legally induced abortion
1439	L07..00	Unspecified abortion
31431	L05..13	Therapeutic abortion
18944	7E07011	Dilation cervix uteria and curettage for termination pregnancy
56822	L050.00	Legal abortion unspecified
58085	L052z00	Complete legal abortion NOS
60771	L05..11	Elective abortion
38415	L052z00	Unspecified legal abortion NOS
70384	L050y00	Unspecified legal abortion with no mention of complication
12337	L051.00	Legal abortion incomplete
47298	L052.00	Legal abortion - complete
41379	L052.11	Medical abortion - complete
49849	L052.12	Surgical abortion - complete
1439	L07..00	Unsepecified abortion
70643	L070.00	Unspecified abortion
56224	L070z00	Unspecified abortion NOS
1686	7E08600	Termnation of pregnancy NEC
1748	7E08400	Suction termination of pregnancy
21438	7E08411	Vacuum termination of pregnancy
39754	L051.11	Medical abortion - incomplete
6730	L051.12	Surgical abortion - incomplete
101218	L051700	Incompelte medical abortion
33770	L05z.00	Legally induced abortion NOS
102576	L051711	Incomplete termination of pregtnancy

21.7 Referral codes for Abortion

medcode	readcode	readterm
9199	6776.12	TOP counselling
8076	8H7W.00	Refer to TOP counselling
102648	6776100	Pre-termination counselling
17294	6776.13	Termination counselling
20933	6776	Preg. termination counselling
9407	6776.11	Abortion counselling
102494	8Hh3.00	Self referral to termination of pregnancy service
11989	8HHV.00	Referral for termination of pregnancy

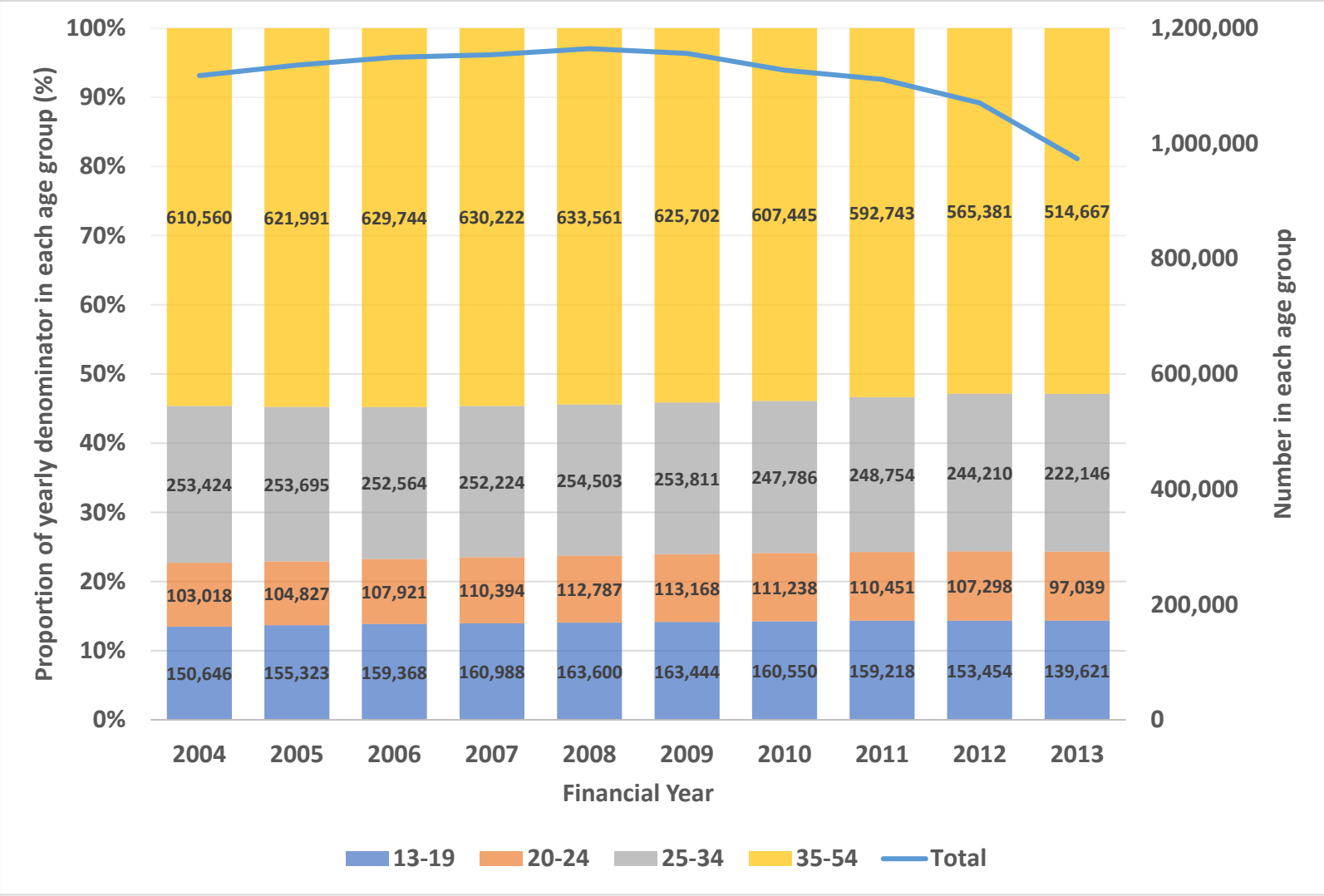
21.8 Comparison between CPRD and UK Census populations

Figure 22 Comparison between CPRD and UK census populations for 2004 and 2013



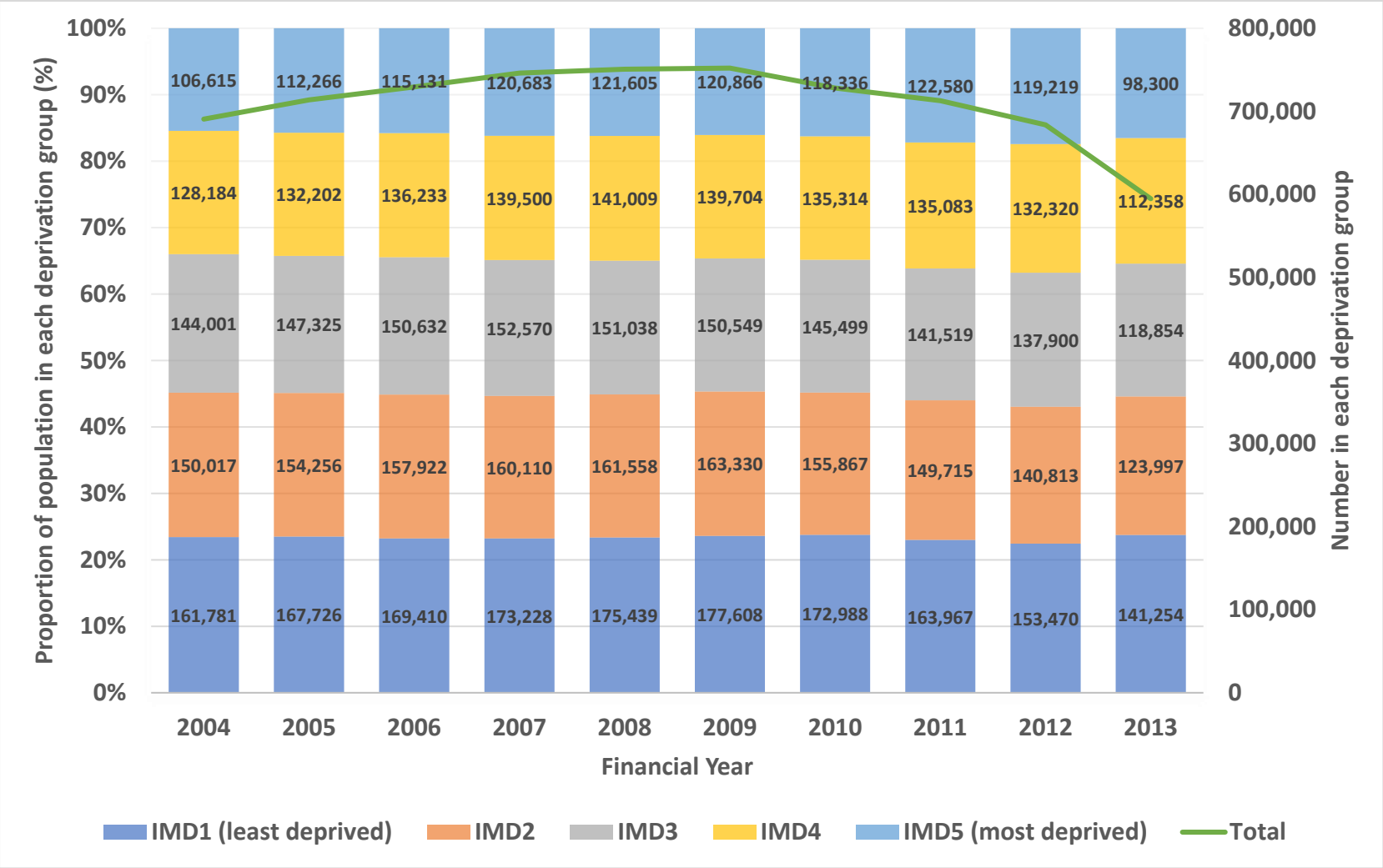
21.9 Distribution of age groups per yearly denominator population

Figure 23 Distribution of annual denominator population by age group



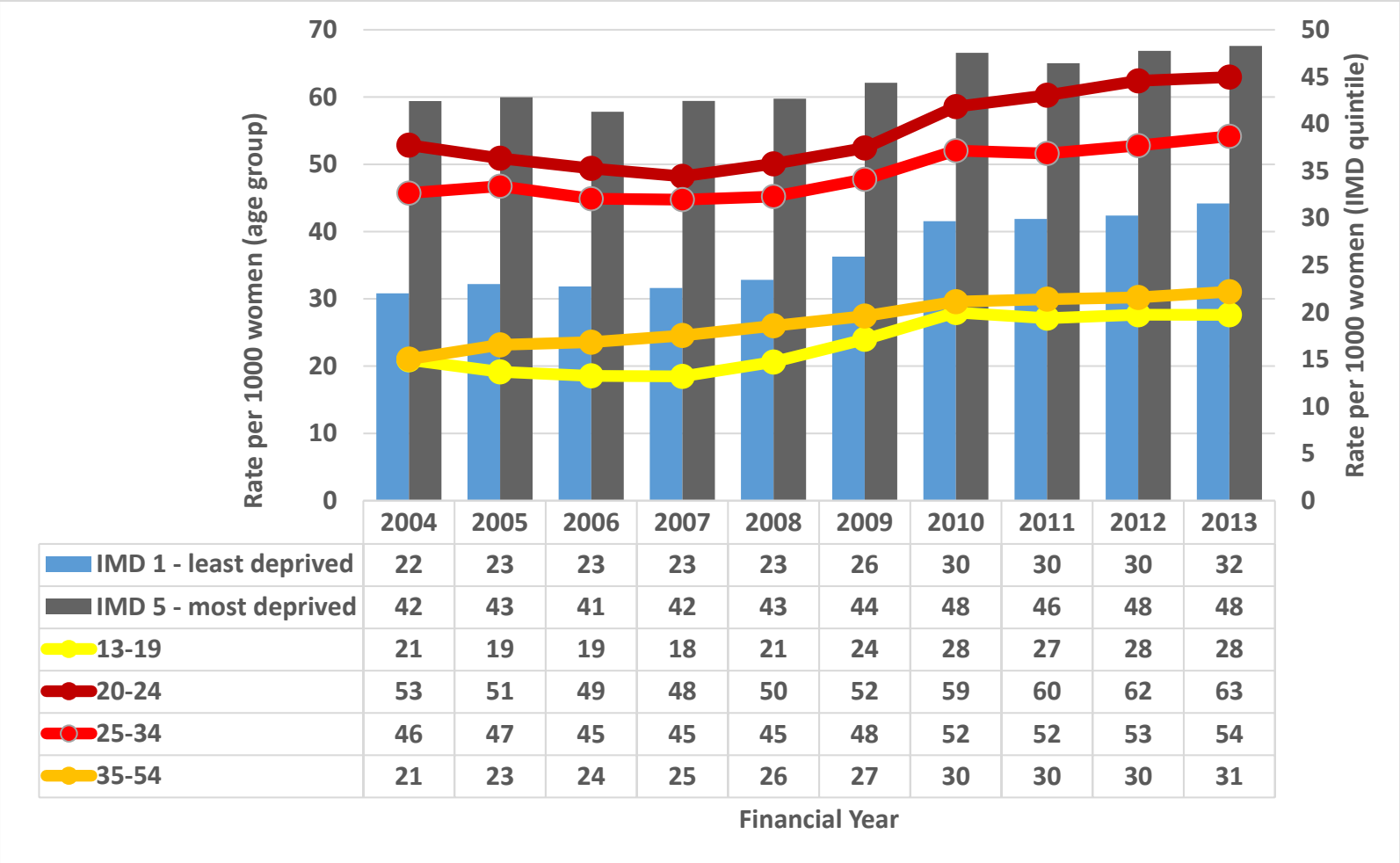
21.10 Distribution of women from deprivation quintiles per yearly denominator population

Figure 24 Distribution of annual denominator population by deprivation quintile



21.11 Distribution of LARC rates per year by age group and deprivation quintile

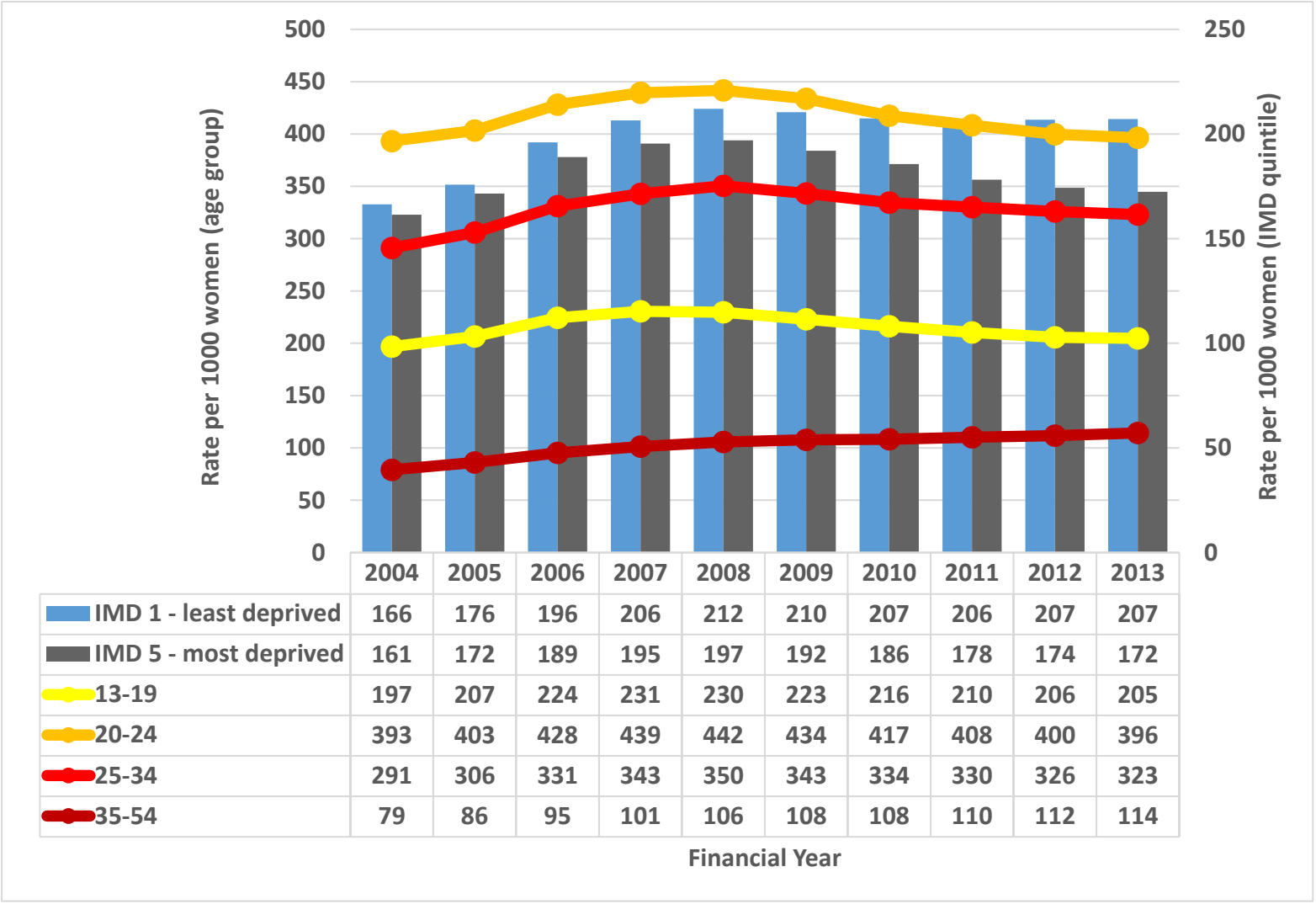
Figure 25 LARC rates by age group and deprivation quintile



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
IMD 1 - least deprived	22	23	23	23	23	26	30	30	30	32
IMD 5 - most deprived	42	43	41	42	43	44	48	46	48	48
13-19	21	19	19	18	21	24	28	27	28	28
20-24	53	51	49	48	50	52	59	60	62	63
25-34	46	47	45	45	45	48	52	52	53	54
35-54	21	23	24	25	26	27	30	30	30	31

21.12NPHC prescription rates per year by age group and deprivation quintile

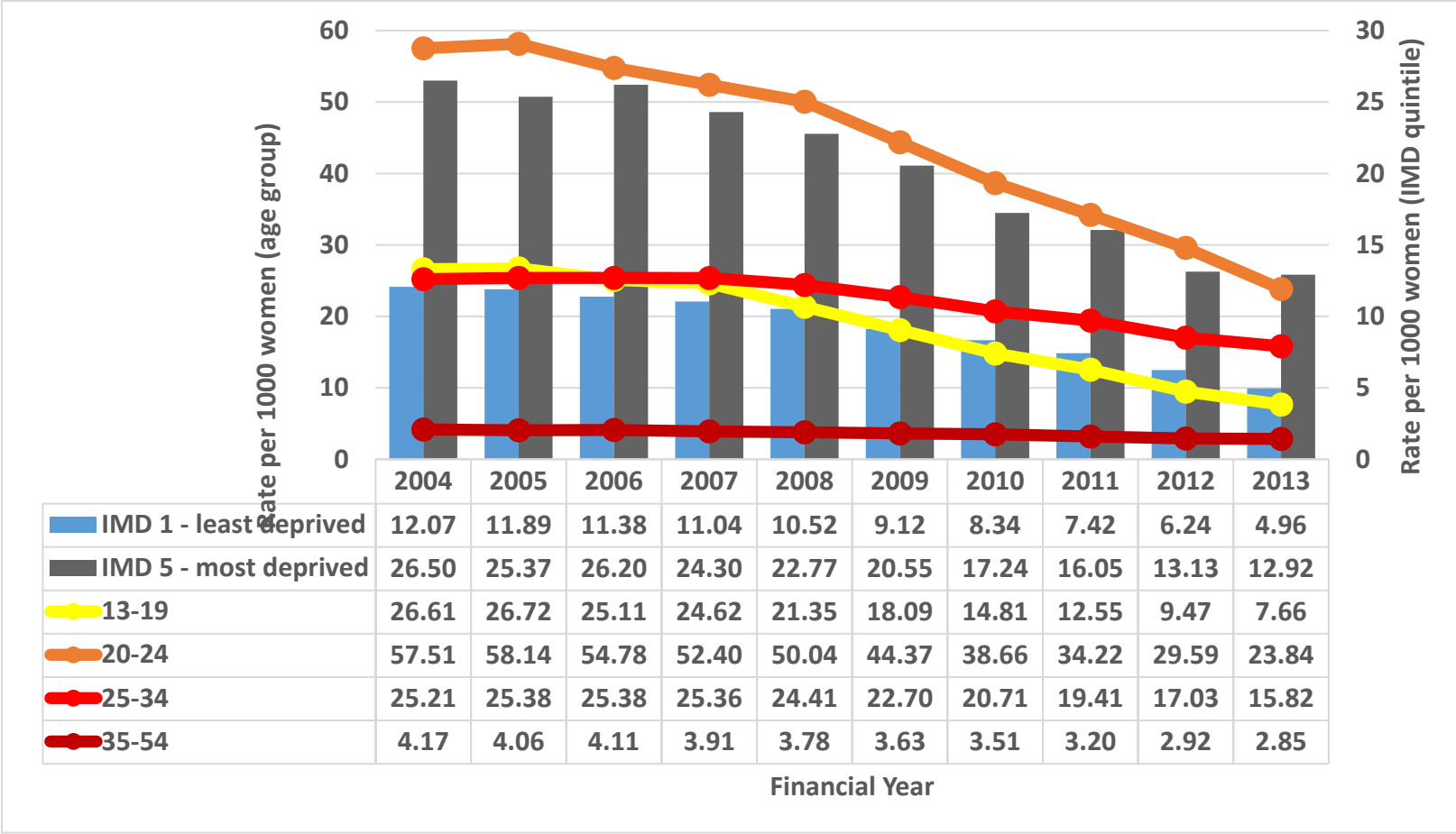
Figure 26 NLHC rates by age groups and deprivation quintiles



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
IMD 1 - least deprived	166	176	196	206	212	210	207	206	207	207
IMD 5 - most deprived	161	172	189	195	197	192	186	178	174	172
13-19	197	207	224	231	230	223	216	210	206	205
20-24	393	403	428	439	442	434	417	408	400	396
25-34	291	306	331	343	350	343	334	330	326	323
35-54	79	86	95	101	106	108	108	110	112	114

21.13Abortion rates per year by age group and deprivation quintile

Figure 27 Abortion rates by age group and deprivation quintile



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
IMD 1 - least deprived	12.07	11.89	11.38	11.04	10.52	9.12	8.34	7.42	6.24	4.96
IMD 5 - most deprived	26.50	25.37	26.20	24.30	22.77	20.55	17.24	16.05	13.13	12.92
13-19	26.61	26.72	25.11	24.62	21.35	18.09	14.81	12.55	9.47	7.66
20-24	57.51	58.14	54.78	52.40	50.04	44.37	38.66	34.22	29.59	23.84
25-34	25.21	25.38	25.38	25.36	24.41	22.70	20.71	19.41	17.03	15.82
35-54	4.17	4.06	4.11	3.91	3.78	3.63	3.51	3.20	2.92	2.85

22 Appendix 3 - Supplementary material for Study 2 – What is the impact of P4P scheme on LARC and abortions at individual level

22.1 Read code list for LARC advice

Medcode	ReadCode	Description
96915	8CAw.00	Advice about long acting reversible contraception
102309	8CAw100	Verbal advice about long acting reversible contraception
107247	8I6r000	Advice about long acting reversible contraception not indicated
102308	8CAw200	Written advice about long acting reversible contraception
96937	8CEG.00	Long acting reversible contraception leaflet given

22.2 Emergency hormonal contraception code list

medcode	readcode	readterm
6477	614F.00	Emergency contraception advice
8538	61M..00	Emergency contraception
26475	61A1.11	Post coital pills given
6635	61A..11	Morning-after pill
715	61A1.00	'Morning after' pills given
43242	61F2.00	'Morning after' IUCD fitted

22.3 Prescription codes for emergency hormonal contraception

prodcode	productname	drugsubstancename	substancestrength
7092	Levonelle 1500microgram tablets (Bayer Plc)	Levonorgestrel	1.5mg
59121	Upostelle 1500microgram tablets (Consilient Health Ltd)	Levonorgestrel	1.5mg
10045	Levonelle One Step 1.5mg tablets (Bayer Plc)	Levonorgestrel	1.5mg
50070	Levonelle 1500microgram tablets (Waymade Healthcare Plc)	Levonorgestrel	1.5mg
7292	Levonorgestrel 1.5mg tablets	Levonorgestrel	1.5mg
64956	Emerres 1.5mg tablets (Morningside Healthcare Ltd)	Levonorgestrel	1.5mg
58789	Levonorgestrel 1.5mg tablets (Consilient Health Ltd)	Levonorgestrel	1.5mg
65523	Isteranda 1.5mg tablets (Sandoz Ltd)	Levonorgestrel	1.5mg
5466	Levonorgestrel 750microgram tablets	Levonorgestrel	750microgram
15734	Postinor-2 750microgram Tablet (Medimpex (UK) Ltd)	Levonorgestrel	750microgram
5729	Levonelle 750microgram tablets (Schering Health Care Ltd)	Levonorgestrel	750microgram
5018	Levonelle-2 750microgram tablets (Schering Health Care Ltd)	Levonorgestrel	750microgram
41095	EllaOne 30mg tablets (HRA Pharma UK Ltd)	Ulipristal acetate	30mg
41234	Ulipristal 30mg tablets	Ulipristal Acetate	30mg

22.4 STROBE Statement—What is the impact of LARC advice on LARC prescription and abortions

	Item No	Recommendation	Chapter Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	NA
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Background
Objectives	3	State specific objectives, including any prespecified hypotheses	Aims/ Objectives
Methods			
Study design	4	Present key elements of study design early in the paper	Method
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Method
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up (*b*) For matched studies, give matching criteria and number of exposed and unexposed	Method NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Method
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Method
Bias	9	Describe any efforts to address potential sources of bias	Method
Study size	10	Explain how the study size was arrived at	Method
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Method
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding (*b*) Describe any methods used to examine subgroups and interactions (*c*) Explain how missing data were addressed (*d*) If applicable, explain how loss to follow-up was addressed (*e*) Describe any sensitivity analyses	Method
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-	Results

		up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	
EDescriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) Summarise follow-up time (eg, average and total amount)	Results
Outcome data	15*	Report numbers of outcome events or summary measures over time	

Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (*b*) Report category boundaries when continuous variables were categorized (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Results
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Results
Discussion			
Key results	18	Summarise key results with reference to study objectives	Discussion
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Discussion
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Discussion
Generalisability	21	Discuss the generalisability (external validity) of the study results	Discussion
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Copyright/ disclaimers

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

22.5 Logistic regression and post-estimation likelihood ratio tests

```
*******************************************************************************
** Logistic regression with AMENDED AGEGROUP with IMD *************************
*******************************************************************************

. logistic LARC2010 i.advice2009 i.agegroup2009 i.patimd if nlhc2009==1 & den2009==1 & ehc2009==0
Logistic regression                                     Number of obs = 149,323
                                                        LR chi2(8)    =  573.44
                                                        Prob > chi2   =  0.0000
Log likelihood = -28448.038                             Pseudo R2     =  0.0100

------------------------------------------------------------------------------
     LARC2010 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
--------------+---------------------------------------------------------------
   advice2009 |
LARC advice given |   1.365007   .0459845     9.24   0.000     1.277791    1.458177
              |
  agegroup2009 |
        20-24 |   .6159914     .02287   -13.05   0.000      .572759     .662487
        25-34 |   .5443859   .0180821   -18.31   0.000     .5100745    .5810052
        35-54 |   .5413671   .0191291   -17.37   0.000     .5051435    .5801883
              |
        patimd |
            2 |   1.065824   .0403737     1.68   0.092     .9895594    1.147967
            3 |   1.188731   .0449453     4.57   0.000     1.103825    1.280168
            4 |   1.277771   .0487212     6.43   0.000      1.18576    1.376921
            5 |   1.430373    .056533     9.06   0.000     1.323753     1.54558
              |
         _cons |   .0533457   .0024005   -65.13   0.000     .0488423    .0582644
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2010 if nlhc2009==1 & den2009==1 & ehc2009==0
Logistic regression                                     Number of obs = 149,323
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -28734.757                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
    LARC2010 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0503647     .00061  -246.74   0.000     .0491832    .0515746
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
```

```
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 573.44
Prob > chi2 = 0.0000
. drop _est_A _est_B

. logistic LARC2010 i.advice2009 i.agegroup2009 i.patimd if nlhc2009==0 & den2009==1 & ehc2009==1

Logistic regression                                     Number of obs =  3,506
                                                        LR chi2(8)    =  22.30
                                                        Prob > chi2   = 0.0044
Log likelihood = -1249.7255                             Pseudo R2     = 0.0088

------------------------------------------------------------------------------
     LARC2010 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
--------------+---------------------------------------------------------------
    advice2009 |
LARC advice given |    1.47576   .2676666     2.15   0.032     1.034257     2.10573
              |
  agegroup2009 |
        20-24 |   .9210286   .1560798    -0.49   0.627     .6607336    1.283866
        25-34 |   .7159355   .1068071    -2.24   0.025     .5344253    .9590931
        35-54 |   .6186257    .098643    -3.01   0.003     .4525844    .8455831
              |
        patimd |
            2 |   .8155045   .1488483    -1.12   0.264     .5702464    1.166246
            3 |   .8584078   .1511868    -0.87   0.386     .6078215    1.212303
            4 |    1.05806   .1806901     0.33   0.741     .7570883     1.47868
            5 |   1.111827   .1877894     0.63   0.530     .7984869    1.548127
              |
         _cons |   .1256904   .0296099    -8.80   0.000     .0792096    .1994466
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. . logistic LARC2010 if nlhc2009==0 & den2009==1 & ehc2009==1

Logistic regression                                     Number of obs =  3,506
                                                        LR chi2(0)    =   0.00
                                                        Prob > chi2   =      .
Log likelihood = -1260.8749                             Pseudo R2     = 0.0000

------------------------------------------------------------------------------
    LARC2010 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .1316979   .0069361   -38.49   0.000     .1187815    .1460188
------------------------------------------------------------------------------
```

```
 . estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  22.30
Prob > chi2 = 0.0044

. logistic abort2010 i.advice2009 i.agegroup2009 i.patimd if nlhc2009==1 & den2009==1 & ehc2009==0

Logistic regression                                     Number of obs = 149,323
                                                        LR chi2(8)    =  430.70
                                                        Prob > chi2   =  0.0000
Log likelihood = -8113.7262                             Pseudo R2     =  0.0259

------------------------------------------------------------------------------
         abort2010 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2009 |
LARC advice given  |   .9118439   .0583968    -1.44   0.150     .8042802    1.033793
                   |
      agegroup2009 |
             20-24 |   .8289935   .0587073    -2.65   0.008     .7215577    .9524259
             25-34 |   .5539459    .037618    -8.70   0.000      .484912    .6328077
             35-54 |   .2219256   .0211286   -15.81   0.000     .1841485    .2674524
                   |
             patimd |
                 2 |   1.107812   .0959006     1.18   0.237     .9349307     1.31266
                 3 |   1.284098   .1092745     2.94   0.003     1.086832    1.517169
                 4 |   1.517903   .1265904     5.00   0.000     1.289007    1.787445
                 5 |   1.773716   .1504489     6.76   0.000     1.502049    2.094518
                   |
              _cons |   .0143157   .0013087   -46.45   0.000     .0119674    .0171248
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2010 if nlhc2009==1 & den2009==1 & ehc2009==0
Logistic regression                                     Number of obs = 149,323
                                                        LR chi2(0)    =   -0.00
                                                        Prob > chi2   =       .
Log likelihood = -8329.0767                             Pseudo R2     = -0.0000

------------------------------------------------------------------------------
   abort2010 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0100516   .0002621  -176.44   0.000     .0095509    .0105786
------------------------------------------------------------------------------
```

```
. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 430.70
Prob > chi2 = 0.0000

. logistic abort2010 i.advice2009 i.agegroup2009 i.patimd if nlhc2009==0 & den2009==1 & ehc2009==1

Logistic regression                                     Number of obs =  3,506
                                                        LR chi2(8)    =  22.31
                                                        Prob > chi2   = 0.0044
Log likelihood = -505.03908                             Pseudo R2     = 0.0216

------------------------------------------------------------------------------
         abort2010 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2009 |
LARC advice given  |   1.121238   .3363355     0.38   0.703     .6228227     2.01851
                   |
      agegroup2009 |
             20-24 |   1.768075   .5062771     1.99   0.047     1.008706    3.099109
             25-34 |   .9536764   .2620451    -0.17   0.863     .5565618    1.634138
             35-54 |   .4704488   .1551509    -2.29   0.022     .2464857    .8979105
                   |
             patimd |
                 2 |   1.086975   .3463683     0.26   0.794      .582078    2.029821
                 3 |    .952416   .3034668    -0.15   0.878     .5100464    1.778458
                 4 |    .985462   .3101913    -0.05   0.963     .5317523    1.826293
                 5 |   .9675831   .3043545    -0.10   0.917     .5223261      1.7924
                   |
              _cons |   .0334101   .0138418    -8.20   0.000     .0148329    .0752539
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2010 if nlhc2009==0 & den2009==1 & ehc2009==1
Logistic regression                                     Number of obs =  3,506
                                                        LR chi2(0)    =   0.00
                                                        Prob > chi2   =      .
Log likelihood = -516.19408                             Pseudo R2     = 0.0000

------------------------------------------------------------------------------
   abort2010 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0348288   .0032616   -35.85   0.000     .0289885    .0418457
------------------------------------------------------------------------------
```

```
. estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  22.31
Prob > chi2 = 0.0044

. logistic LARC2011 i.advice2010 i.agegroup2010 i.patimd if nlhc2010==1 & den2010==1 & ehc2010==0

Logistic regression                                     Number of obs = 142,460
                                                        LR chi2(8)    =  580.58
                                                        Prob > chi2   =  0.0000
Log likelihood = -25723.533                             Pseudo R2     =  0.0112

------------------------------------------------------------------------------
     LARC2011 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
--------------+---------------------------------------------------------------
   advice2010 |
LARC advice given |   1.255723   .0398511     7.18   0.000     1.179996     1.33631
              |
  agegroup2010 |
            1 |   .6811545   .0264532    -9.89   0.000     .6312313    .7350261
            2 |   .5677096   .0199708   -16.09   0.000     .5298866    .6082325
            3 |    .514914    .019574   -17.46   0.000      .477944    .5547438
              |
        patimd |
            2 |   1.083616   .0438573     1.98   0.047     1.000978    1.173076
            3 |   1.142567   .0466147     3.27   0.001     1.054761    1.237682
            4 |   1.356084   .0545612     7.57   0.000     1.253254    1.467352
            5 |   1.581973   .0652343    11.12   0.000     1.459146    1.715138
              |
         _cons |   .0512655   .0023026   -66.14   0.000     .0469454    .0559832
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2011  if nlhc2010==1 & den2010==1 & ehc2010==0
Logistic regression                                     Number of obs = 142,460
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -26013.821                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
    LARC2011 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0467919   .0005999  -238.83   0.000     .0456307    .0479826
------------------------------------------------------------------------------
```

```
. estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 580.58
Prob > chi2 = 0.0000

. logistic LARC2011 i.advice2010 i.agegroup2010 i.patimd if nlhc2010==0 & den2010==1 & ehc2010==1
Logistic regression                                     Number of obs =  3,183
                                                        LR chi2(8)    =  31.35
                                                        Prob > chi2   = 0.0001
Log likelihood = -1172.1026                             Pseudo R2     = 0.0132

------------------------------------------------------------------------------
     LARC2011 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
--------------+---------------------------------------------------------------
  advice2010 |
LARC advice given  |   1.483674   .3356778     1.74   0.081     .9522614    2.311643
             |
  agegroup2010 |
           1  |   .9200683   .1640824    -0.47   0.640     .6486631    1.305031
           2  |   .9070405   .1394699    -0.63   0.526     .6710314    1.226057
           3  |   .5259892   .0922779    -3.66   0.000      .372945    .7418378
             |
       patimd |
           2  |   1.059452   .2018011     0.30   0.762      .729369    1.538918
           3  |   .9393296   .1767218    -0.33   0.739     .6496452    1.358188
           4  |   1.183386   .2128359     0.94   0.349     .8318313    1.683519
           5  |   1.336573   .2344013     1.65   0.098     .9477927    1.884829
             |
        _cons |   .1085388   .0300994    -8.01   0.000      .063028    .1869115
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. logistic LARC2011  if nlhc2010==0 & den2010==1 & ehc2010==1
Logistic regression                                     Number of obs =  3,183
                                                        LR chi2(0)    =   0.00
                                                        Prob > chi2   =      .
Log likelihood = -1187.7774                             Pseudo R2     = 0.0000

------------------------------------------------------------------------------
    LARC2011 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .1404515   .0075757   -36.39   0.000     .1263613    .1561128
------------------------------------------------------------------------------
```

```
. logistic LARC2011 i.advice2010 i.agegroup2010 i.patimd if nlhc2010==0 & den2010==1 & ehc2010==1
Logistic regression                                     Number of obs =  3,183
                                                        LR chi2(8)    =  31.35
                                                        Prob > chi2   = 0.0001
Log likelihood = -1172.1026                             Pseudo R2     = 0.0132

------------------------------------------------------------------------------
     LARC2011 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
--------------+---------------------------------------------------------------
    advice2010 |
LARC advice given |   1.483674   .3356778     1.74   0.081     .9522614    2.311643
              |
  agegroup2010 |
            1 |   .9200683   .1640824    -0.47   0.640     .6486631    1.305031
            2 |   .9070405   .1394699    -0.63   0.526     .6710314    1.226057
            3 |   .5259892   .0922779    -3.66   0.000      .372945    .7418378
              |
        patimd |
            2 |   1.059452   .2018011     0.30   0.762      .729369    1.538918
            3 |   .9393296   .1767218    -0.33   0.739     .6496452    1.358188
            4 |   1.183386   .2128359     0.94   0.349     .8318313    1.683519
            5 |   1.336573   .2344013     1.65   0.098     .9477927    1.884829
              |
         _cons |   .1085388   .0300994    -8.01   0.000      .063028    .1869115
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2011  if nlhc2010==0 & den2010==1 & ehc2010==1
Logistic regression                                     Number of obs =  3,183
                                                        LR chi2(0)    =   0.00
                                                        Prob > chi2   =      .
Log likelihood = -1187.7774                             Pseudo R2     = 0.0000

------------------------------------------------------------------------------
    LARC2011 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .1404515   .0075757   -36.39   0.000     .1263613    .1561128
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  31.35
Prob > chi2 = 0.0001

. drop _est_A _est_B
```

```
. logistic abort2011 i.advice2010 i.agegroup2010 i.patimd if nlhc2010==1 & den2010==1 & ehc2010==0

Logistic regression                                     Number of obs = 142,460
                                                        LR chi2(8)    =  479.98
                                                        Prob > chi2   =  0.0000
Log likelihood = -7564.7049                             Pseudo R2     =  0.0307

------------------------------------------------------------------------------
         abort2011 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2010 |
LARC advice given  |   .9313504   .0579874    -1.14   0.253      .824358    1.052229
                   |
      agegroup2010 |
                 1 |   .8935285    .065188    -1.54   0.123     .7744768    1.030881
                 2 |   .5762453   .0405237    -7.84   0.000      .502051    .6614043
                 3 |   .1879521    .019653   -15.99   0.000     .1531236    .2307025
                   |
             patimd |
                 2 |   1.107176   .1002662     1.12   0.261     .9271112    1.322214
                 3 |   1.355924   .1190248     3.47   0.001     1.141605    1.610479
                 4 |   1.531888   .1333503     4.90   0.000     1.291606     1.81687
                 5 |    1.90418     .16634     7.37   0.000     1.604542    2.259773
                   |
              _cons |    .013178   .0012111   -47.10   0.000     .0110057    .0157791
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2011  if nlhc2010==1 & den2010==1 & ehc2010==0
Logistic regression                                     Number of obs = 142,460
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -7804.6964                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
   abort2011 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0098318   .0002653  -171.30   0.000     .0093253    .0103657
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 479.98
Prob > chi2 = 0.0000
```

```
. logistic abort2011 i.advice2010 i.agegroup2010  i.patimd if nlhc2010==0 & den2010==1 & ehc2010==1

Logistic regression                                     Number of obs =  3,183
                                                        LR chi2(8)    =  18.02
                                                        Prob > chi2   = 0.0211
Log likelihood = -469.22653                             Pseudo R2     = 0.0188

------------------------------------------------------------------------------
         abort2011 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2010 |
LARC advice given  |    1.28583   .5107855     0.63   0.527     .5902701    2.801021
                   |
      agegroup2010 |
                 1 |   1.192403   .3871375     0.54   0.588     .6310495    2.253111
                 2 |   1.232388   .3507723     0.73   0.463      .705459    2.152898
                 3 |   .4839504   .1709716    -2.05   0.040     .2421506    .9671998
                   |
             patimd |
                 2 |   1.485007   .5335629     1.10   0.271     .7343309    3.003068
                 3 |   1.258702   .4518894     0.64   0.522     .6227752    2.543986
                 4 |   1.296365   .4587343     0.73   0.463     .6479175    2.593792
                 5 |   1.697114   .5711534     1.57   0.116     .8774942    3.282296
                   |
              _cons |   .0214557    .011048    -7.46   0.000     .0078207    .0588632
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2011 if nlhc2010==0 & den2010==1 & ehc2010==1
Logistic regression                                     Number of obs =   3,183
                                                        LR chi2(0)    =   -0.00
                                                        Prob > chi2   =       .
Log likelihood = -478.23789                             Pseudo R2     = -0.0000

------------------------------------------------------------------------------
   abort2011 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0357956   .0034735   -34.32   0.000     .0295959    .0432941
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  18.02
Prob > chi2 = 0.0211
```

```
. logistic LARC2012 i.advice2011 i.agegroup2011 i.patimd if nlhc2011==1 & den2011==1 & ehc2011==0

Logistic regression                                     Number of obs = 137,319
                                                        LR chi2(8)    =  591.24
                                                        Prob > chi2   =  0.0000
Log likelihood = -24450.209                             Pseudo R2     =  0.0119

------------------------------------------------------------------------------
          LARC2012 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2011 |
LARC advice given  |     1.1219   .0379963     3.40   0.001     1.049847    1.198899
                   |
      agegroup2011 |
             20-24 |   .6958122   .0276409    -9.13   0.000     .6436923    .7521523
             25-34 |   .5543878   .0200391   -16.32   0.000     .5164708    .5950884
             35-54 |   .4693695   .0185413   -19.15   0.000     .4344004    .5071537
                   |
            patimd |
                 2 |   1.057924   .0448777     1.33   0.184     .9735224    1.149643
                 3 |   1.226512   .0511583     4.90   0.000     1.130232    1.330993
                 4 |   1.354755   .0564742     7.28   0.000     1.248468     1.47009
                 5 |   1.600888    .067938    11.09   0.000     1.473119    1.739738
                   |
             _cons |   .0555444   .0026101   -61.51   0.000     .0506573     .060903
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2012  if nlhc2011==1 & den2011==1 & ehc2011==0
Logistic regression                                     Number of obs = 137,319
                                                        LR chi2(0)    =   -0.00
                                                        Prob > chi2   =       .
Log likelihood = -24745.828                             Pseudo R2     = -0.0000

------------------------------------------------------------------------------
    LARC2012 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0459372    .000605  -233.92   0.000     .0447667    .0471383
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 591.24
Prob > chi2 = 0.0000
```

```
. logistic LARC2012 i.advice2011 i.agegroup2011 i.patimd if nlhc2011==0 & den2011==1 & ehc2011==1

Logistic regression                                     Number of obs =  3,013
                                                        LR chi2(8)    =  37.21
                                                        Prob > chi2   = 0.0000
Log likelihood = -1132.7941                             Pseudo R2     = 0.0162

------------------------------------------------------------------------------
     LARC2012 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
--------------+---------------------------------------------------------------
    advice2011 |
LARC advice given |    1.24105   .2689778     1.00   0.319     .8115311    1.897902
              |
  agegroup2011 |
        20-24 |   1.332311   .2345416     1.63   0.103     .9435374    1.881274
        25-34 |   .6782838   .1108267    -2.38   0.018      .492415    .9343113
        35-54 |   .6391923   .1110114    -2.58   0.010     .4547781    .8983871
              |
        patimd |
            2 |   1.168442   .2388991     0.76   0.446      .782656     1.74439
            3 |   1.342096   .2632441     1.50   0.134     .9137464     1.97125
            4 |   1.315585   .2565878     1.41   0.160     .8976421    1.928123
            5 |   1.528209   .2866393     2.26   0.024       1.0581    2.207185
              |
         _cons |   .1141553   .0320931    -7.72   0.000     .0657951    .1980608
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2012 if nlhc2011==0 & den2011==1 & ehc2011==1

Logistic regression                                     Number of obs =  3,013
                                                        LR chi2(0)    =   0.00
                                                        Prob > chi2   =      .
Log likelihood = -1151.3997                             Pseudo R2     = 0.0000

------------------------------------------------------------------------------
    LARC2012 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .1464992   .0079945   -35.20   0.000     .1316391    .1630368
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  37.21
Prob > chi2 = 0.0000
```

```
. logistic abort2012 i.advice2011 i.agegroup2011 i.patimd if nlhc2011==1 & den2011==1 & ehc2011==0

Logistic regression                                     Number of obs = 137,319
                                                        LR chi2(8)    =  345.81
                                                        Prob > chi2   =  0.0000
Log likelihood = -6827.8399                             Pseudo R2     =  0.0247

------------------------------------------------------------------------------
         abort2012 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2011 |
LARC advice given  |   1.031002   .0745575     0.42   0.673     .8947552    1.187995
                   |
      agegroup2011 |
             20-24 |   1.109295   .0908812     1.27   0.205     .9447368    1.302517
             25-34 |    .729815   .0574201    -4.00   0.000     .6255215    .8514973
             35-54 |   .2537198   .0276475   -12.59   0.000     .2049275    .3141294
                   |
            patimd |
                2  |   1.303384   .1248402     2.77   0.006     1.080297    1.572541
                3  |   1.539894   .1442237     4.61   0.000     1.281648    1.850175
                4  |   1.478716   .1417393     4.08   0.000     1.225447    1.784329
                5  |   1.867475   .1785239     6.53   0.000     1.548399    2.252302
                   |
             _cons |   .0089044   .0009486   -44.32   0.000     .0072265    .0109718
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2012  if nlhc2011==1 & den2011==1 & ehc2011==0
Logistic regression                                     Number of obs = 137,319
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -7000.7428                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
   abort2012 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0090011   .0002583  -164.13   0.000     .0085088     .009522
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 345.81
Prob > chi2 = 0.0000
```

```
. logistic abort2012 i.advice2011 i.agegroup2011 i.patimd if nlhc2011==0 & den2011==1 & ehc2011==1

Logistic regression                                     Number of obs =  3,013
                                                        LR chi2(8)    =  26.88
                                                        Prob > chi2   = 0.0007
Log likelihood = -362.96102                             Pseudo R2     = 0.0357

------------------------------------------------------------------------------
     abort2012 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
---------------+--------------------------------------------------------------
    advice2011 |
LARC advice given |    .804471    .306225    -0.57   0.568     .3815023    1.696382
               |
  agegroup2011 |
         20-24 |   1.408216   .5006259     0.96   0.336      .701559    2.826666
         25-34 |   .8975371   .2982482    -0.33   0.745      .467952    1.721486
         35-54 |   .4376384   .1774655    -2.04   0.042     .1976729    .9689107
               |
         patimd |
             2 |   4.146432   2.640334     2.23   0.026      1.19029    14.44429
             3 |   3.732008   2.375382     2.07   0.039     1.071919    12.99341
             4 |   4.835199    3.00716     2.53   0.011     1.428979    16.36074
             5 |   5.534514   3.391459     2.79   0.005     1.665242    18.39424
               |
          _cons |   .0097446   .0070058    -6.44   0.000     .0023812    .0398778
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2012  if nlhc2011==0 & den2011==1 & ehc2011==1
Logistic regression                                     Number of obs =  3,013
                                                        LR chi2(0)    =   0.00
                                                        Prob > chi2   =      .
Log likelihood = -376.39963                             Pseudo R2     = 0.0000

------------------------------------------------------------------------------
   abort2012 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0279768   .0031324   -31.94   0.000     .0224643     .034842
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  26.88
Prob > chi2 = 0.0007
```

```
. logistic LARC2013 i.advice2012 i.agegroup2012 i.patimd if nlhc2012==1 & den2012==1 & ehc2012==0

Logistic regression                                     Number of obs = 130,651
                                                        LR chi2(8)    =  520.33
                                                        Prob > chi2   =  0.0000
Log likelihood = -22629.509                             Pseudo R2     =  0.0114

------------------------------------------------------------------------------
          LARC2013 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2012 |
LARC advice given  |   1.165672   .0415305     4.30   0.000      1.08705    1.249979
                   |
      agegroup2012 |
             20-24 |   .6346072   .0265989   -10.85   0.000     .5845582    .6889413
             25-34 |   .5296983   .0198015   -17.00   0.000     .4922758    .5699658
             35-54 |   .4498181   .0183925   -19.54   0.000     .4151762    .4873506
                   |
            patimd |
                2  |   .9571134   .0418359    -1.00   0.316     .8785307    1.042725
                3  |   1.092437   .0466845     2.07   0.039     1.004664    1.187878
                4  |   1.218909   .0518806     4.65   0.000     1.121351    1.324955
                5  |   1.366873    .060253     7.09   0.000     1.253737    1.490219
                   |
             _cons |   .0596785   .0028886   -58.24   0.000     .0542773    .0656173
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2013 if nlhc2012==1 & den2012==1 & ehc2012==0
Logistic regression                                     Number of obs = 130,651
                                                        LR chi2(0)    =   -0.00
                                                        Prob > chi2   =       .
Log likelihood = -22889.672                             Pseudo R2     = -0.0000

------------------------------------------------------------------------------
    LARC2013 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0441722   .0006071  -226.97   0.000     .0429981    .0453783
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 520.33
Prob > chi2 = 0.0000
```

```
. logistic LARC2013 i.advice2012 i.agegroup2012 i.patimd if nlhc2012==0 & den2012==1 & ehc2012==1

Logistic regression                                     Number of obs =  2,798
                                                        LR chi2(8)    =  17.38
                                                        Prob > chi2   = 0.0264
Log likelihood = -990.22606                             Pseudo R2     = 0.0087

------------------------------------------------------------------------------
          LARC2013 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2012 |
LARC advice given  |   1.086971    .232256     0.39   0.696     .7150549    1.652329
                   |
      agegroup2012 |
             20-24 |   1.085701   .2140832     0.42   0.677     .7376776    1.597916
             25-34 |   .9028395   .1564615    -0.59   0.555     .6428326    1.268011
             35-54 |   .6279821   .1217363    -2.40   0.016     .4294762    .9182383
                   |
            patimd |
                 2 |   .9297478   .2061129    -0.33   0.742      .602095    1.435705
                 3 |   .9941438     .20836    -0.03   0.978      .659247    1.499168
                 4 |   1.320686   .2619405     1.40   0.161     .8953133    1.948157
                 5 |   1.189689   .2365251     0.87   0.382      .805757     1.75656
                   |
             _cons |   .1261877   .0360018    -7.26   0.000     .0721384    .2207332
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2013 if nlhc2012==0 & den2012==1 & ehc2012==1
Logistic regression                                     Number of obs =  2,798
                                                        LR chi2(0)    =   0.00
                                                        Prob > chi2   =      .
Log likelihood = -998.91602                             Pseudo R2     = 0.0000

------------------------------------------------------------------------------
    LARC2013 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .1300485   .0077042   -34.43   0.000     .1157922    .1460599
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  17.38
Prob > chi2 = 0.0264
```

```
. logistic abort2013 i.advice2012 i.agegroup2012 i.patimd if nlhc2012==1 & den2012==1 & ehc2012==0

Logistic regression                                     Number of obs = 130,651
                                                        LR chi2(8)    =  337.07
                                                        Prob > chi2   =  0.0000
Log likelihood = -5913.2489                             Pseudo R2     =  0.0277

------------------------------------------------------------------------------
         abort2013 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2012 |
LARC advice given  |   .9857166   .0762897    -0.19   0.853     .8469801    1.147178
                   |
      agegroup2012 |
             20-24 |   1.164635   .1062326     1.67   0.095     .9739739     1.39262
             25-34 |   .8160007   .0704054    -2.36   0.018     .6890456    .9663471
             35-54 |   .2511264   .0306816   -11.31   0.000     .1976497    .3190719
                   |
            patimd |
                 2 |   1.257299   .1354833     2.12   0.034     1.017924    1.552966
                 3 |   1.465616   .1534855     3.65   0.000     1.193655    1.799541
                 4 |   1.642385   .1704786     4.78   0.000     1.340049    2.012933
                 5 |    2.26143   .2310298     7.99   0.000     1.851073    2.762757
                   |
             _cons |   .0074577   .0008787   -41.58   0.000     .0059199     .009395
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2013 if nlhc2012==1 & den2012==1 & ehc2012==0
Logistic regression                                     Number of obs = 130,651
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -6081.7845                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
   abort2013 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0080551   .0002503  -155.16   0.000     .0075792    .0085609
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 337.07
Prob > chi2 = 0.0000
```

```
. logistic abort2013 i.advice2012 i.agegroup2012 i.patimd if nlhc2012==0 & den2012==1 & ehc2012==1

Logistic regression                                     Number of obs =  2,798
                                                        LR chi2(8)    =  15.07
                                                        Prob > chi2   = 0.0578
Log likelihood = -301.25148                             Pseudo R2     = 0.0244

------------------------------------------------------------------------------
         abort2013 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2012 |
LARC advice given  |   1.419949   .7414152     0.67   0.502     .5102984    3.951127
                   |
      agegroup2012 |
             20-24 |   1.962444   .8461969     1.56   0.118     .8428746    4.569109
             25-34 |   1.431245   .5748939     0.89   0.372      .651341    3.144992
             35-54 |   .5148067   .2597859    -1.32   0.188     .1914715    1.384154
                   |
            patimd |
                2  |    .754614   .3515062    -0.60   0.546     .3028498     1.88028
                3  |   .7450359   .3302796    -0.66   0.507     .3124883    1.776318
                4  |   .9279666    .385475    -0.18   0.857      .411098    2.094688
                5  |   1.081419   .4280782     0.20   0.843      .497791    2.349313
                   |
             _cons |    .015871   .0106558    -6.17   0.000      .004257    .0591703
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2013 if nlhc2012==0 & den2012==1 & ehc2012==1
Logistic regression                                     Number of obs =  2,798
                                                        LR chi2(0)    =   0.00
                                                        Prob > chi2   =      .
Log likelihood = -308.78682                             Pseudo R2     = 0.0000

------------------------------------------------------------------------------
   abort2013 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0237834   .0029848   -29.79   0.000     .0185972    .0304159
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  15.07
Prob > chi2 = 0.0578
```

```
*******************************************************************************
** sensitivity analysis TWO YEAR GAP                                         **
*******************************************************************************

// 2009 vs 2011 //
. logistic LARC2011 i.advice2009 i.agegroup2009 i.patimd if nlhc2009==1 & den2009==1 & ehc2009==0

Logistic regression                                     Number of obs = 149,323
                                                        LR chi2(8)    =  639.12
                                                        Prob > chi2   =  0.0000
Log likelihood = -25748.065                             Pseudo R2     =  0.0123

------------------------------------------------------------------------------
     LARC2011 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
--------------+---------------------------------------------------------------
   advice2009 |
LARC advice g |   1.186884   .0407199     4.99   0.000     1.109698    1.269438
              |
  agegroup2009 |
        20-24 |    .628396   .0242561   -12.04   0.000     .5826088    .6777817
        25-34 |   .5571405   .0192473   -16.93   0.000     .5206652     .596171
        35-54 |   .4405992   .0170901   -21.13   0.000     .4083448    .4754013
              |
       patimd |
            2 |     1.0477   .0426419     1.14   0.252     .9673699      1.1347
            3 |   1.136056    .046371     3.13   0.002     1.048711    1.230675
            4 |   1.324756   .0534479     6.97   0.000     1.224035    1.433765
            5 |   1.499798    .062451     9.73   0.000     1.382258    1.627333
              |
        _cons |    .054003   .0025116   -62.76   0.000      .049298    .0591571
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2011 if nlhc2009==1 & den2009==1 & ehc2009==0
Logistic regression                                     Number of obs = 149,323
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -26067.626                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
    LARC2011 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |    .043954   .0005664  -242.48   0.000     .0428578    .0450782
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
```

```
Assumption: B nested within A

 LR chi2(8) = 639.12
Prob > chi2 = 0.0000
. logistic LARC2011 i.advice2009 i.agegroup2009 i.patimd if nlhc2009==0 & den2009==1 & ehc2009==1

Logistic regression                                     Number of obs =  3,506
                                                        LR chi2(8)    =  22.94
                                                        Prob > chi2   = 0.0034
Log likelihood = -1012.8472                             Pseudo R2     = 0.0112

------------------------------------------------------------------------------
     LARC2011 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
--------------+---------------------------------------------------------------
   advice2009 |
LARC advice g |   1.594072    .344715     2.16   0.031     1.043368    2.435447
              |
  agegroup2009 |
        20-24 |   1.382169   .2705842     1.65   0.098     .9417228    2.028612
        25-34 |   .9148961   .1644007    -0.49   0.621     .6433044    1.301149
        35-54 |   .7643636   .1472454    -1.39   0.163      .523994    1.114997
              |
       patimd |
            2 |   1.339406   .2786633     1.40   0.160     .8908811    2.013746
            3 |   .9557439   .2057309    -0.21   0.833     .6267786    1.457367
            4 |   1.288165   .2645087     1.23   0.218     .8613658    1.926438
            5 |    1.27637   .2614521     1.19   0.234      .854311     1.90694
              |
        _cons |   .0546892   .0158478   -10.03   0.000     .0309914    .0965077
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2011  if nlhc2009==0 & den2009==1 & ehc2009==1

Logistic regression                                     Number of obs =   3,506
                                                        LR chi2(0)    =   -0.00
                                                        Prob > chi2   =       .
Log likelihood = -1024.3168                             Pseudo R2     = -0.0000

------------------------------------------------------------------------------
    LARC2011 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0935745   .0056496   -39.24   0.000     .0831315    .1053294
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
```

```
Assumption: B nested within A

 LR chi2(8) =  22.94
Prob > chi2 = 0.0034

. logistic abort2011 i.advice2009 i.agegroup2009 i.patimd if nlhc2009==1 & den2009==1 & ehc2009==0

Logistic regression                                     Number of obs = 149,323
                                                        LR chi2(8)    =  459.25
                                                        Prob > chi2   =  0.0000
Log likelihood = -7203.148                              Pseudo R2     =  0.0309

------------------------------------------------------------------------------
         abort2011 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2009 |
LARC advice given  |   1.041747   .0740784     0.58   0.565     .9062195    1.197542
                   |
      agegroup2009 |
             20-24 |     .61298   .0464323    -6.46   0.000     .5284076    .7110883
             25-34 |   .4867422   .0337461   -10.39   0.000     .4248981    .5575878
             35-54 |   .1653773   .0173986   -17.10   0.000     .1345627    .2032483
                   |
             patimd |
                 2 |   1.071959   .1016507     0.73   0.464     .8901458    1.290907
                 3 |   1.439033    .129792     4.04   0.000     1.205862    1.717291
                 4 |   1.546808   .1396086     4.83   0.000     1.296016     1.84613
                 5 |   1.828206   .1672481     6.60   0.000     1.528113    2.187232
                   |
              _cons |   .0127104   .0012502   -44.38   0.000     .0104818    .0154128
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2011 if nlhc2009==1 & den2009==1 & ehc2009==0

Logistic regression                                     Number of obs = 149,323
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -7432.7723                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
   abort2011 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0087415   .0002441  -169.76   0.000      .008276    .0092332
------------------------------------------------------------------------------

. estimates store B
```

```
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 459.25
Prob > chi2 = 0.0000
. logistic abort2011 i.advice2009 i.agegroup2009 i.patimd if nlhc2009==0 & den2009==1 & ehc2009==1

Logistic regression                                     Number of obs =  3,506
                                                        LR chi2(8)    =  14.51
                                                        Prob > chi2   = 0.0693
Log likelihood = -347.61697                             Pseudo R2     = 0.0204

------------------------------------------------------------------------------
         abort2011 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2009 |
LARC advice given  |   1.038075    .375045     0.10   0.918     .5113275    2.107456
                   |
      agegroup2009 |
             20-24 |   .9497612   .3275143    -0.15   0.881     .4831559    1.866988
             25-34 |    .616986    .196883    -1.51   0.130     .3301058    1.153181
             35-54 |   .4104489   .1531802    -2.39   0.017     .1975101    .8529603
                   |
             patimd |
                 2 |   1.530535   .7831371     0.83   0.406     .5614416    4.172364
                 3 |   2.272771   1.081448     1.73   0.084     .8943965    5.775388
                 4 |   2.445116   1.152317     1.90   0.058     .9708482    6.158113
                 5 |   2.174633    1.03734     1.63   0.103     .8537826    5.538914
                   |
              _cons |   .0157899   .0088846    -7.37   0.000     .0052411    .0475698
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2011 if nlhc2009==0 & den2009==1 & ehc2009==1

Logistic regression                                     Number of obs =   3,506
                                                        LR chi2(0)    =   -0.00
                                                        Prob > chi2   =       .
Log likelihood = -354.87402                             Pseudo R2     = -0.0000

------------------------------------------------------------------------------
   abort2011 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0212642   .0025151   -32.56   0.000     .0168644    .0268119
------------------------------------------------------------------------------

. estimates store B
```

```
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  14.51
Prob > chi2 = 0.0693

// advice 2010 vs outcomes 2012 //
. logistic LARC2012 i.advice2010 i.agegroup2010 i.patimd if nlhc2010==1 & den2010==1 & ehc2010==0

Logistic regression                                     Number of obs = 142,460
                                                        LR chi2(8)    =  878.22
                                                        Prob > chi2   =  0.0000
Log likelihood = -24239.36                              Pseudo R2     =  0.0178

------------------------------------------------------------------------------
     LARC2012 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
--------------+---------------------------------------------------------------
  advice2010 |
LARC advice given |   1.145301   .0367767     4.22   0.000     1.075442    1.219699
             |
 agegroup2010 |
           1 |   .5931795   .0232321   -13.33   0.000     .5493492    .6405068
           2 |   .5173126   .0180729   -18.87   0.000     .4830758    .5539757
           3 |    .373608   .0149955   -24.53   0.000     .3453437    .4041855
             |
       patimd |
           2 |   1.123197    .047771     2.73   0.006     1.033364     1.22084
           3 |   1.227339   .0521379     4.82   0.000     1.129289    1.333902
           4 |   1.386928   .0586837     7.73   0.000      1.27655     1.50685
           5 |   1.733964   .0739671    12.90   0.000     1.594886     1.88517
             |
        _cons |   .0557445   .0025308   -63.59   0.000     .0509985    .0609321
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2012 if nlhc2010==1 & den2010==1 & ehc2010==0
Logistic regression                                     Number of obs = 142,460
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -24678.472                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
    LARC2012 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0434872   .0005765  -236.49   0.000     .0423718     .044632
------------------------------------------------------------------------------
```

```
. estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 878.22
Prob > chi2 = 0.0000

. logistic LARC2012 i.advice2010 i.agegroup2010 i.patimd if nlhc2010==0 & den2010==1 & ehc2010==1
Logistic regression                                     Number of obs =  3,183
                                                        LR chi2(8)    =  23.33
                                                        Prob > chi2   = 0.0030
Log likelihood = -938.59917                             Pseudo R2     = 0.0123

------------------------------------------------------------------------------
     LARC2012 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
--------------+---------------------------------------------------------------
  advice2010 |
LARC advice given |   1.621576   .4448896     1.76   0.078     .9471198    2.776322
              |
 agegroup2010 |
           1  |   1.147335     .24056     0.66   0.512      .760712    1.730456
           2  |    1.08521   .1995183     0.44   0.656     .7568652    1.555998
           3  |   .6129997   .1285286    -2.33   0.020     .4064316    .9245556
              |
       patimd |
           2  |   .9523607   .2024368    -0.23   0.818     .6278666     1.44456
           3  |   .7899345   .1682529    -1.11   0.268     .5203417    1.199205
           4  |   .8942822   .1840813    -0.54   0.587     .5973943    1.338715
           5  |   1.128925    .221294     0.62   0.536     .7687958    1.657751
              |
        _cons |   .0688676   .0227861    -8.09   0.000     .0360064    .1317197
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2012 if nlhc2010==0 & den2010==1 & ehc2010==1
Logistic regression                                     Number of obs =   3,183
                                                        LR chi2(0)    =   -0.00
                                                        Prob > chi2   =       .
Log likelihood = -950.26459                             Pseudo R2     = -0.0000

------------------------------------------------------------------------------
    LARC2012 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0968298   .0060496   -37.37   0.000       .08567    .1094432
------------------------------------------------------------------------------
```

```
. estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  23.33
Prob > chi2 = 0.0030
. logistic abort2012 i.advice2010 i.agegroup2010 i.patimd if nlhc2010==1 & den2010==1 & ehc2010==0

Logistic regression                                     Number of obs = 142,460
                                                        LR chi2(8)    =  346.08
                                                        Prob > chi2   =  0.0000
Log likelihood = -6102.3015                             Pseudo R2     =  0.0276

------------------------------------------------------------------------------
         abort2012 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2010 |
LARC advice given  |   .9726658   .0696686    -0.39   0.699     .8452693    1.119263
                   |
      agegroup2010 |
                1  |   .7708683   .0638873    -3.14   0.002     .6552923    .9068287
                2  |   .5302197    .041662    -8.07   0.000     .4545407     .618499
                3  |   .1807989   .0210324   -14.70   0.000      .143938    .2270995
                   |
            patimd |
                2  |     1.3216   .1319776     2.79   0.005     1.086669    1.607321
                3  |   1.391983   .1394485     3.30   0.001     1.143828    1.693976
                4  |   1.428657    .144948     3.52   0.000     1.171028    1.742965
                5  |   1.797289   .1823591     5.78   0.000     1.473167    2.192723
                   |
             _cons |   .0103878   .0010841   -43.76   0.000     .0084661    .0127455
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2012 if nlhc2010==1 & den2010==1 & ehc2010==0
Logistic regression                                     Number of obs = 142,460
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -6275.3413                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
   abort2012 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0075321   .0002317  -158.94   0.000     .0070914    .0080001
------------------------------------------------------------------------------
```

```
. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 346.08
Prob > chi2 = 0.0000

.  logistic abort2012 i.advice2010 i.agegroup2010 i.patimd if nlhc2010==0 & den2010==1 & ehc2010==1

Logistic regression                                     Number of obs =  3,183
                                                        LR chi2(8)    =  28.39
                                                        Prob > chi2   = 0.0004
Log likelihood = -306.92834                             Pseudo R2     = 0.0442

------------------------------------------------------------------------------
         abort2012 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2010 |
LARC advice given  |   .8485899   .3700292    -0.38   0.707     .3610188    1.994646
                   |
      agegroup2010 |
                1  |    1.80745   .7388235     1.45   0.148     .8111929    4.027247
                2  |    1.22767   .4746723     0.53   0.596     .5753985    2.619355
                3  |   .4600469    .225525    -1.58   0.113     .1760048    1.202485
                   |
            patimd |
                2  |   .7237679   .4414039    -0.53   0.596     .2190169    2.391779
                3  |   1.513633   .7642711     0.82   0.412     .5626359    4.072054
                4  |   2.948489    1.35919     2.35   0.019     1.194576    7.277549
                5  |   1.935363    .925308     1.38   0.167     .7582252    4.939998
                   |
             _cons |   .0135449   .0087272    -6.68   0.000     .0038312    .0478871
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2012 if nlhc2010==0 & den2010==1 & ehc2010==1
Logistic regression                                     Number of obs =   3,183
                                                        LR chi2(0)    =   -0.00
                                                        Prob > chi2   =       .
Log likelihood = -321.12199                             Pseudo R2     = -0.0000

------------------------------------------------------------------------------
   abort2012 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0211742   .0026338   -30.99   0.000     .0165931    .0270201
------------------------------------------------------------------------------
```

```
. estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  28.39
Prob > chi2 = 0.0004

// advice 2011 vs outcomes 2013 ///

. logistic LARC2013 i.advice2011 i.agegroup2011 i.patimd if nlhc2011==1 & den2011==1 & ehc2011==0

Logistic regression                                     Number of obs = 137,319
                                                        LR chi2(8)    =  665.17
                                                        Prob > chi2   =  0.0000
Log likelihood = -22555.022                             Pseudo R2     =  0.0145

------------------------------------------------------------------------------
     LARC2013 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
--------------+---------------------------------------------------------------
   advice2011 |
LARC advice given |   1.036563   .0360642     1.03   0.302     .9682349    1.109713
              |
  agegroup2011 |
        20-24 |   .6157651   .0253964   -11.76   0.000     .5679477    .6676084
        25-34 |   .5174918   .0191176   -17.83   0.000     .4813463    .5563515
        35-54 |   .3927709   .0163383   -22.47   0.000     .3620191     .426135
              |
        patimd |
            2 |   .9912037    .043922    -0.20   0.842     .9087504    1.081138
            3 |   1.141063   .0497412     3.03   0.002     1.047621     1.24284
            4 |   1.324744   .0570458     6.53   0.000     1.217525    1.441406
            5 |   1.459985   .0649761     8.50   0.000     1.338031    1.593056
              |
         _cons |   .0609646   .0029047   -58.71   0.000     .0555293    .0669321
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2013 if nlhc2011==1 & den2011==1 & ehc2011==0

Logistic regression                                     Number of obs = 137,319
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -22887.607                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
```

```
    LARC2013 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0412341   .0005706  -230.43   0.000     .0401309    .0423677
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 665.17
Prob > chi2 = 0.0000

. drop _est_A _est_B
. logistic LARC2013 i.advice2011 i.agegroup2011 i.patimd if nlhc2011==0 & den2011==1 & ehc2011==1

Logistic regression                                     Number of obs =  3,013
                                                        LR chi2(8)    =  42.28
                                                        Prob > chi2   = 0.0000
Log likelihood = -840.4951                              Pseudo R2     = 0.0245

------------------------------------------------------------------------------
          LARC2013 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2011 |
LARC advice given  |   .8935242   .2112877    -0.48   0.634     .5621167     1.42032
                   |
      agegroup2011 |
            20-24  |    1.04606    .213144     0.22   0.825     .7016439     1.55954
            25-34  |   .6117858   .1145049    -2.63   0.009     .4239203     .882906
            35-54  |   .4288885   .0912579    -3.98   0.000     .2826361    .6508204
                   |
            patimd |
                2  |   1.357025    .353478     1.17   0.241     .8144543    2.261044
                3  |   1.270543   .3274957     0.93   0.353     .7666258    2.105695
                4  |   1.637714    .403489     2.00   0.045     1.010473    2.654309
                5  |   2.051957   .4843693     3.05   0.002     1.291934     3.25909
                   |
             _cons |   .0978786   .0316717    -7.18   0.000     .0519105    .1845529
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2013 if nlhc2011==0 & den2011==1 & ehc2011==1

Logistic regression                                     Number of obs =  3,013
                                                        LR chi2(0)    =   0.00
                                                        Prob > chi2   =      .
```

```
Log likelihood = -861.63654                           Pseudo R2     = 0.0000

------------------------------------------------------------------------------
    LARC2013 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0904814   .0059758   -36.38   0.000     .0794953    .1029856
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  42.28
Prob > chi2 = 0.0000

.  logistic abort2013 i.advice2011 i.agegroup2011 i.patimd if nlhc2011==1 & den2011==1 & ehc2011==0

Logistic regression                                     Number of obs = 137,319
                                                        LR chi2(8)    =  313.44
                                                        Prob > chi2   =  0.0000
Log likelihood = -5455.2286                             Pseudo R2     =  0.0279

------------------------------------------------------------------------------
         abort2013 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2011 |
LARC advice given  |   1.185515   .1019142     1.98   0.048     1.001688    1.403077
                   |
      agegroup2011 |
             20-24 |   .7505964   .0677098    -3.18   0.001     .6289575      .89576
             25-34 |   .5283151   .0447142    -7.54   0.000     .4475599    .6236414
             35-54 |   .2216681   .0256856   -13.00   0.000     .1766326    .2781862
                   |
             patimd |
                 2 |   1.240625   .1414996     1.89   0.059     .9921026    1.551402
                 3 |   1.464797   .1632539     3.42   0.001     1.177361    1.822406
                 4 |    1.69651   .1861913     4.82   0.000     1.368162     2.10366
                 5 |   2.402241   .2570589     8.19   0.000     1.947742    2.962798
                   |
              _cons |   .0072736   .0008824   -40.59   0.000     .0057344     .009226
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2013  if nlhc2011==1 & den2011==1 & ehc2011==0

Logistic regression                                     Number of obs = 137,319
```

```
                                                LR chi2(0)    =    0.00
                                                Prob > chi2   =       .
Log likelihood = -5611.9497                     Pseudo R2     =  0.0000

------------------------------------------------------------------------------
   abort2013 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0068778   .0002253  -151.98   0.000       .00645    .0073339
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 313.44
Prob > chi2 = 0.0000

. logistic abort2013 i.advice2011 i.agegroup2011 i.patimd if nlhc2011==0 & den2011==1 & ehc2011==1
Logistic regression                             Number of obs =  3,013
                                                LR chi2(8)    =  27.16
                                                Prob > chi2   = 0.0007
Log likelihood = -261.09933                     Pseudo R2     = 0.0494

------------------------------------------------------------------------------
         abort2013 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2011 |
LARC advice given  |   2.337207   1.695298     1.17   0.242     .5639959    9.685415
                   |
      agegroup2011 |
             20-24 |   1.511783    .635823     0.98   0.326     .6629678    3.447357
             25-34 |   .9226763   .3658179    -0.20   0.839     .4241988    2.006917
             35-54 |   .2687864   .1509343    -2.34   0.019     .0894177    .8079623
                   |
             patimd |
                 2 |    1.63355   1.162241     0.69   0.490     .4050588    6.587895
                 3 |   3.268824   2.108227     1.84   0.066     .9234419    11.57107
                 4 |   2.914086   1.882371     1.66   0.098     .8216061    10.33573
                 5 |    3.88729   2.430701     2.17   0.030     1.141288    13.24032
                   |
              _cons |   .0036803   .0035197    -5.86   0.000     .0005647    .0239847
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2013 if nlhc2011==0 & den2011==1 & ehc2011==1

Logistic regression                             Number of obs =   3,013
```

```
                                                LR chi2(0)    =   -0.00
                                                Prob > chi2   =       .
Log likelihood = -274.67964                     Pseudo R2     = -0.0000

------------------------------------------------------------------------------
   abort2013 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0185936   .0025304   -29.28   0.000     .0142405    .0242774
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  27.16
Prob > chi2 = 0.0007

*******************************************************************************
** Sensitivty analysis 3 year gap                                            **
*******************************************************************************

// advice 2009 outcome 2012 //
. logistic LARC2012 i.advice2009 i.agegroup2009 i.patimd if nlhc2009==1 & den2009==1 & ehc2009==0

Logistic regression                             Number of obs = 149,323
                                                LR chi2(8)    =  846.50
                                                Prob > chi2   =  0.0000
Log likelihood = -24521.296                     Pseudo R2     =  0.0170

------------------------------------------------------------------------------
          LARC2012 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2009 |
LARC advice given  |   1.235688   .0440903     5.93   0.000     1.152225    1.325197
                   |
      agegroup2009 |
             20-24 |   .5493828   .0216848   -15.17   0.000     .5084837    .5935715
             25-34 |   .5163768     .01791   -19.06   0.000     .4824403    .5527005
             35-54 |   .3766653   .0150592   -24.42   0.000     .3482765    .4073681
                   |
             patimd |
                 2 |   1.154591    .048885     3.40   0.001     1.062646    1.254492
                 3 |   1.204851   .0515697     4.35   0.000       1.1079    1.310287
                 4 |   1.453749   .0610554     8.91   0.000     1.338876    1.578479
                 5 |    1.63942    .070986    11.42   0.000      1.50603    1.784624
                   |
              _cons |   .0499971   .0024089   -62.18   0.000     .0454918    .0549486
------------------------------------------------------------------------------
```

```
Note: _cons estimates baseline odds.
. estimates store A
. logistic LARC2012 if nlhc2009==1 & den2009==1 & ehc2009==0

Logistic regression                                     Number of obs = 149,323
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -24944.546                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
    LARC2012 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0413621   .0005481  -240.40   0.000     .0403018    .0424504
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 846.50
Prob > chi2 = 0.0000
. logistic LARC2012 i.advice2009 i.agegroup2009 i.patimd if nlhc2009==0 & den2009==1 & ehc2009==1

Logistic regression                                     Number of obs =  3,506
                                                        LR chi2(8)    =  47.11
                                                        Prob > chi2   = 0.0000
Log likelihood = -932.95892                             Pseudo R2     = 0.0246

------------------------------------------------------------------------------
          LARC2012 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2009 |
LARC advice given  |   2.421726   .6392497     3.35   0.001     1.443571    4.062674
                   |
      agegroup2009 |
             20-24 |   1.106094   .2200353     0.51   0.612     .7489666    1.633509
             25-34 |   .8235414   .1474986    -1.08   0.278     .5797395    1.169871
             35-54 |   .5453725    .110616    -2.99   0.003     .3664772    .8115952
                   |
            patimd |
                2  |    1.58002    .384623     1.88   0.060     .9805175    2.546068
                3  |   1.356291   .3319176     1.25   0.213     .8395435    2.191103
                4  |   1.986462   .4623298     2.95   0.003     1.258842    3.134651
                5  |   2.031361   .4694134     3.07   0.002     1.291483    3.195108
                   |
             _cons |   .0286084   .0097827   -10.39   0.000      .014636    .0559195
------------------------------------------------------------------------------
```

```
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2012  if nlhc2009==0 & den2009==1 & ehc2009==1

Logistic regression                                     Number of obs =   3,506
                                                        LR chi2(0)    =   -0.00
                                                        Prob > chi2   =       .
Log likelihood = -956.51367                             Pseudo R2     = -0.0000

------------------------------------------------------------------------------
    LARC2012 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0841064   .0053098   -39.21   0.000     .0743174    .0951847
------------------------------------------------------------------------------
. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  47.11
Prob > chi2 = 0.0000

. logistic abort2012 i.advice2009 i.agegroup2009 i.patimd if nlhc2009==1 & den2009==1 & ehc2009==0

Logistic regression                                     Number of obs = 149,323
                                                        LR chi2(8)    =  374.37
                                                        Prob > chi2   =  0.0000
Log likelihood = -5800.5688                             Pseudo R2     =  0.0313

------------------------------------------------------------------------------
         abort2012 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2009 |
LARC advice given  |   .9848745   .0783385    -0.19   0.848     .8427038     1.15103
                   |
      agegroup2009 |
             20-24 |   .6707942   .0557963    -4.80   0.000     .5698844    .7895721
             25-34 |   .4256314   .0342255   -10.62   0.000     .3635696    .4982872
             35-54 |   .1619876   .0193198   -15.26   0.000     .1282217    .2046454
                   |
             patimd |
                 2 |   1.277393   .1343172     2.33   0.020     1.039492    1.569741
                 3 |   1.336274   .1413271     2.74   0.006     1.086102     1.64407
                 4 |   1.677985   .1717181     5.06   0.000     1.373028    2.050673
                 5 |   1.734288   .1849511     5.16   0.000     1.407167    2.137453
                   |
              _cons |    .010192   .0011339   -41.22   0.000     .0081952    .0126753
------------------------------------------------------------------------------
```

```
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2012 if nlhc2009==1 & den2009==1 & ehc2009==0

Logistic regression                                     Number of obs = 149,323
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -5987.7531                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
   abort2012 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0067217   .0002136  -157.42   0.000     .0063158    .0071536
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 374.37
Prob > chi2 = 0.0000

. logistic abort2012 i.advice2009 i.agegroup2009 i.patimd if nlhc2009==0 & den2009==1 & ehc2009==1
Logistic regression                                     Number of obs =  3,506
                                                        LR chi2(8)    =  24.24
                                                        Prob > chi2   = 0.0021
Log likelihood = -254.26012                             Pseudo R2     = 0.0455

------------------------------------------------------------------------------
         abort2012 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2009 |
LARC advice given  |   .8867874     .36586    -0.29   0.771       .39504    1.990664
                   |
      agegroup2009 |
             20-24 |   .8003385   .3640714    -0.49   0.624     .3281444    1.952012
             25-34 |    1.13294   .4078902     0.35   0.729     .5594359    2.294369
             35-54 |   .1439775    .094191    -2.96   0.003     .0399423    .5189864
                   |
             patimd |
                 2 |   1.568798   .7343103     0.96   0.336     .6268208    3.926364
                 3 |   1.028896   .5122293     0.06   0.954     .3877985    2.729837
                 4 |   1.257158   .5974035     0.48   0.630     .4953334    3.190672
                 5 |   .6421761   .3465296    -0.82   0.412     .2230133    1.849173
                   |
              _cons |   .0199726   .0117551    -6.65   0.000     .0063016    .0633024
------------------------------------------------------------------------------
```

```
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2012 if nlhc2009==0 & den2009==1 & ehc2009==1
Logistic regression                                     Number of obs =  3,506
                                                        LR chi2(0)    =   0.00
                                                        Prob > chi2   =      .
Log likelihood = -266.37793                             Pseudo R2     = 0.0000

------------------------------------------------------------------------------
   abort2012 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0147612   .0020822   -29.89   0.000     .0111958    .0194621
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  24.24
Prob > chi2 = 0.0021

// advice 2010 outcome 2013 //
. logistic LARC2013 i.advice2010 i.agegroup2010 i.patimd if nlhc2010==1 & den2010==1 & ehc2010==0
Logistic regression                                     Number of obs = 142,460
                                                        LR chi2(8)    =  739.85
                                                        Prob > chi2   =  0.0000
Log likelihood = -22349.196                             Pseudo R2     =  0.0163

------------------------------------------------------------------------------
          LARC2013 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2010 |
LARC advice given  |    1.19319     .04077     5.17   0.000     1.115899    1.275834
                   |
      agegroup2010 |
                1  |   .5931908   .0243658   -12.71   0.000     .5473064    .6429219
                2  |   .4903027    .018157   -19.25   0.000     .4559764     .527213
                3  |   .3933459   .0163388   -22.46   0.000     .3625914     .426709
                   |
            patimd |
                2  |   .9879424   .0440999    -0.27   0.786     .9051813     1.07827
                3  |   1.159616   .0508419     3.38   0.001     1.064129    1.263671
                4  |   1.316408   .0574187     6.30   0.000     1.208546    1.433897
                5  |   1.523851   .0681561     9.42   0.000     1.395955    1.663464
                   |
             _cons |   .0521766   .0024687   -62.42   0.000     .0475556    .0572465
------------------------------------------------------------------------------
```

```
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2013 if nlhc2010==1 & den2010==1 & ehc2010==0
Logistic regression                                     Number of obs = 142,460
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -22719.121                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
    LARC2013 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0388152   .0005422  -232.57   0.000     .0377668    .0398927
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) = 739.85
Prob > chi2 = 0.0000
. logistic LARC2013 i.advice2010 i.agegroup2010 i.patimd if nlhc2010==0 & den2010==1 & ehc2010==1

Logistic regression                                     Number of obs =  3,183
                                                        LR chi2(8)    =  27.11
                                                        Prob > chi2   = 0.0007
Log likelihood = -854.98403                             Pseudo R2     = 0.0156

------------------------------------------------------------------------------
          LARC2013 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2010 |
LARC advice given  |   3.862642   1.618052     3.23   0.001     1.699488    8.779117
                   |
      agegroup2010 |
                 1 |   .6244846   .1370854    -2.14   0.032     .4061327    .9602304
                 2 |   .6543692   .1193639    -2.32   0.020     .4576723    .9356017
                 3 |    .576707   .1138721    -2.79   0.005     .3916369     .849233
                   |
            patimd |
                 2 |   .9459869   .2257585    -0.23   0.816       .59258    1.510161
                 3 |   1.134925   .2530003     0.57   0.570     .7331881    1.756787
                 4 |   1.268736   .2768297     1.09   0.275     .8272657    1.945798
                 5 |   1.233047   .2687281     0.96   0.336     .8043966    1.890118
                   |
             _cons |   .0305388   .0140054    -7.61   0.000     .0124303    .0750277
------------------------------------------------------------------------------
```

```
Note: _cons estimates baseline odds.

. estimates store A
. logistic LARC2013 if nlhc2010==0 & den2010==1 & ehc2010==1
Logistic regression                                     Number of obs =   3,183
                                                        LR chi2(0)    =   -0.00
                                                        Prob > chi2   =       .
Log likelihood = -868.53765                             Pseudo R2     = -0.0000

------------------------------------------------------------------------------
    LARC2013 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0841281   .0055736   -37.36   0.000     .0738836     .095793
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  27.11
Prob > chi2 = 0.0007
. logistic abort2013 i.advice2010 i.agegroup2010 i.patimd if nlhc2010==1 & den2010==1 & ehc2010==0

Logistic regression                                     Number of obs = 142,460
                                                        LR chi2(8)    =  302.68
                                                        Prob > chi2   =  0.0000
Log likelihood = -5013.6231                             Pseudo R2     =  0.0293

------------------------------------------------------------------------------
         abort2013 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2010 |
LARC advice given  |   1.024194    .083579     0.29   0.770     .8728107    1.201833
                   |
      agegroup2010 |
                1  |   .7941308   .0734454    -2.49   0.013     .6624735    .9519532
                2  |   .5246918   .0464756    -7.28   0.000       .44107    .6241674
                3  |    .180599   .0237365   -13.02   0.000     .1395855    .2336633
                   |
            patimd |
                2  |   1.247029   .1417586     1.94   0.052     .9979633    1.558256
                3  |   1.283739   .1471631     2.18   0.029     1.025411    1.607146
                4  |   1.391276   .1595572     2.88   0.004     1.111204    1.741937
                5  |   2.101508   .2315698     6.74   0.000     1.693305    2.608115
                   |
             _cons |   .0078517   .0009278   -41.02   0.000     .0062284     .009898
------------------------------------------------------------------------------
```

```
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2013 if nlhc2010==1 & den2010==1 & ehc2010==0

Logistic regression                                     Number of obs = 142,460
                                                        LR chi2(0)    =    0.00
                                                        Prob > chi2   =       .
Log likelihood = -5164.9641                             Pseudo R2     =  0.0000

------------------------------------------------------------------------------
   abort2013 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0059527   .0002056  -148.33   0.000      .005563    .0063697
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B

Likelihood-ratio test
Assumption: B nested within A
 LR chi2(8) = 302.68
Prob > chi2 = 0.0000
.  logistic abort2013 i.advice2010 i.agegroup2010 i.patimd if nlhc2010==0 & den2010==1 & ehc2010==1

Logistic regression                                     Number of obs =  3,183
                                                        LR chi2(8)    =  13.73
                                                        Prob > chi2   = 0.0889
Log likelihood = -237.90917                             Pseudo R2     = 0.0281

------------------------------------------------------------------------------
         abort2013 | Odds ratio   Std. err.      z    P>|z|     [95% conf. interval]
-------------------+----------------------------------------------------------------
        advice2010 |
LARC advice given  |   .5904488   .2621443    -1.19   0.235     .2473263    1.409594
                   |
      agegroup2010 |
                 1 |   .8082116   .3666385    -0.47   0.639     .3321885    1.966372
                 2 |   .7241163   .2864215    -0.82   0.414     .3335176    1.572164
                 3 |   .4192784   .2007643    -1.82   0.069     .1640285    1.071731
                   |
            patimd |
                 2 |   3.750642   2.977128     1.67   0.096     .7915014    17.77295
                 3 |   4.907049   3.763948     2.07   0.038     1.091207    22.06652
                 4 |     3.8358   2.986682     1.73   0.084     .8338389    17.64533
                 5 |   5.394721   4.086488     2.22   0.026     1.222323     23.8096
                   |
             _cons |   .0088786   .0075555    -5.55   0.000     .0016749     .047065
------------------------------------------------------------------------------
```

```
Note: _cons estimates baseline odds.

. estimates store A
. logistic abort2013 if nlhc2010==0 & den2010==1 & ehc2010==1
Logistic regression                                     Number of obs =   3,183
                                                        LR chi2(0)    =   -0.00
                                                        Prob > chi2   =       .
Log likelihood = -244.77658                             Pseudo R2     = -0.0000

------------------------------------------------------------------------------
   abort2013 |       Odds   Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
       _cons |   .0149872   .0022024   -28.58   0.000     .0112366    .0199898
------------------------------------------------------------------------------

. estimates store B
. lrtest  A B

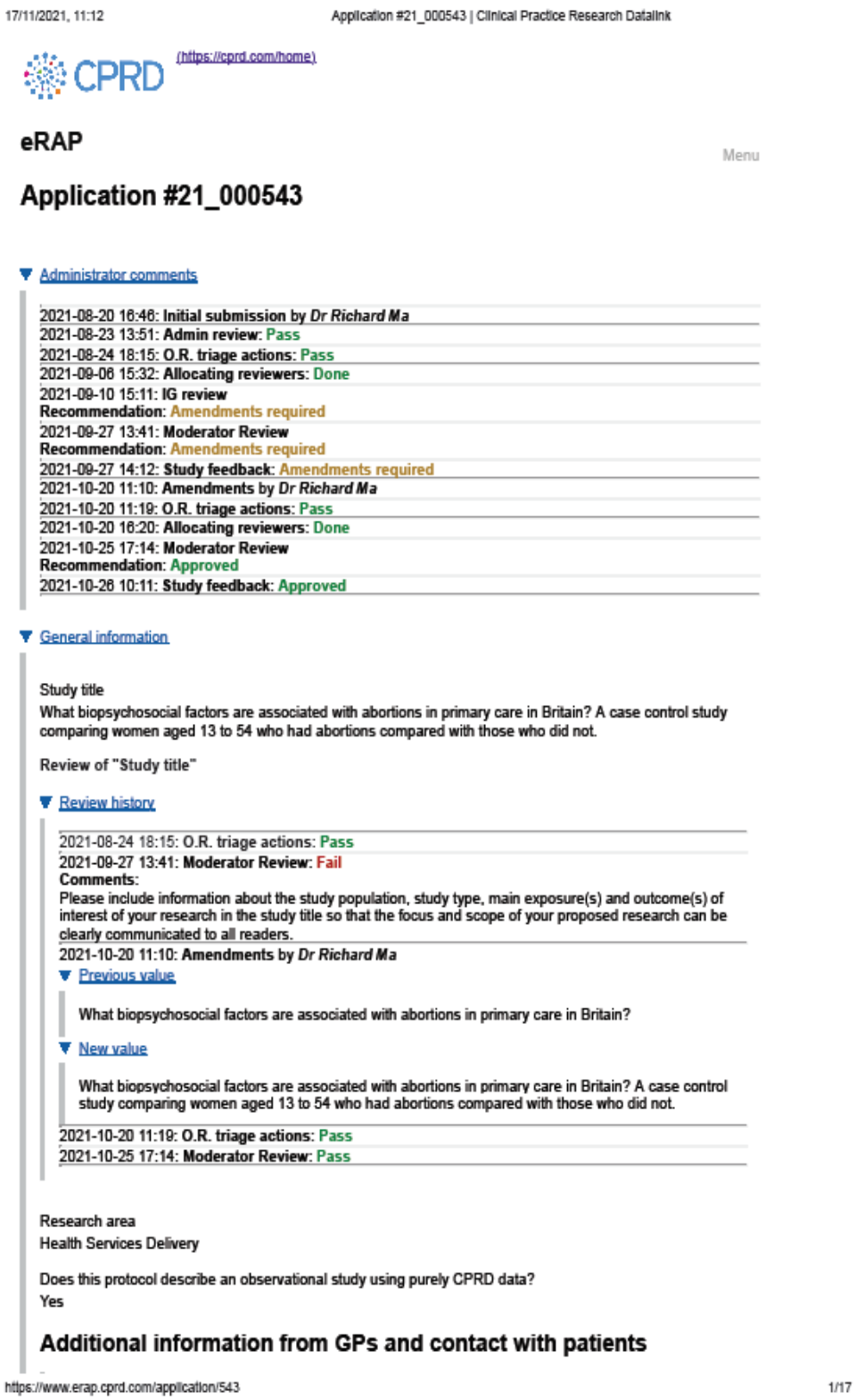
Likelihood-ratio test
Assumption: B nested within A

 LR chi2(8) =  13.73
Prob > chi2 = 0.0889

. drop _est_A _est_B

******************************** END ****************************************
```

23 Appendix 4 - Supplementary material for Study 3 – Biopsychosocial correlates of abortion



17/11/2021, 11:12 Application #21_000543 | Clinical Practice Research Datalink

CPRD (https://cprd.com/home)

eRAP

Menu

Application #21_000543

▼ Administrator comments

2021-08-20 16:46: **Initial submission** by ***Dr Richard Ma***
2021-08-23 13:51: **Admin review**: Pass
2021-08-24 18:15: **O.R. triage actions**: Pass
2021-09-06 15:32: **Allocating reviewers**: Done
2021-09-10 15:11: **IG review**
Recommendation: Amendments required
2021-09-27 13:41: **Moderator Review**
Recommendation: Amendments required
2021-09-27 14:12: **Study feedback**: Amendments required
2021-10-20 11:10: **Amendments** by ***Dr Richard Ma***
2021-10-20 11:19: **O.R. triage actions**: Pass
2021-10-20 16:20: **Allocating reviewers**: Done
2021-10-25 17:14: **Moderator Review**
Recommendation: Approved
2021-10-26 10:11: **Study feedback**: Approved

▼ General information

Study title
What biopsychosocial factors are associated with abortions in primary care in Britain? A case control study comparing women aged 13 to 54 who had abortions compared with those who did not.

Review of "Study title"

▼ Review history

2021-08-24 18:15: O.R. triage actions: Pass
2021-09-27 13:41: **Moderator Review**: Fail
Comments:
Please include information about the study population, study type, main exposure(s) and outcome(s) of interest of your research in the study title so that the focus and scope of your proposed research can be clearly communicated to all readers.
2021-10-20 11:10: **Amendments** by ***Dr Richard Ma***
▼ Previous value
What biopsychosocial factors are associated with abortions in primary care in Britain?
▼ New value
What biopsychosocial factors are associated with abortions in primary care in Britain? A case control study comparing women aged 13 to 54 who had abortions compared with those who did not.
2021-10-20 11:19: **O.R. triage actions**: Pass
2021-10-25 17:14: **Moderator Review**: Pass

Research area
Health Services Delivery

Does this protocol describe an observational study using purely CPRD data?
Yes

Additional information from GPs and contact with patients

https://www.erap.cprd.com/application/543 1/17

23.1 Code lists for co-variates

category	medcode	readterm
smok0	33	Never smoked tobacco
smok1	60	Current non-smoker
smok1	90	Ex smoker
smok1	11788	Non-smoker
smok1	12946	Ex-smoker - amount unknown
smok1	12955	Ex-moderate smoker (10-19/day)
smok1	12956	Ex-heavy smoker (20-39/day)
smok1	12957	Ex-light smoker (1-9/day)
smok1	12959	Ex-very heavy smoker (40+/day)
smok1	12961	Ex-trivial smoker (<1/day)
smok1	19488	Ex cigar smoker
smok1	26470	Ex pipe smoker
smok1	97210	Ex-cigarette smoker
smok1	100495	Ex roll-up cigarette smoker
smok2	93	Cigarette smoker
smok2	776	Stopped smoking
smok2	1822	Very heavy smoker - 40+cigs/d
smok2	1823	Smoker
smok2	1878	Moderate smoker - 10-19 cigs/d
smok2	3568	Heavy smoker - 20-39 cigs/day
smok2	10558	Current smoker
smok2	12941	Occasional smoker
smok2	12942	Smoker - amount smoked
smok2	12943	Cigar smoker
smok2	12944	Light smoker - 1-9 cigs/day
smok2	12947	Pipe smoker
smok2	12958	Trivial smoker - < 1 cig/day

abuse	8605	History of physical abuse
abuse	10074	History of emotional abuse
abuse	11246	At risk violence in the home
abuse	11572	History of domestic violence
abuse	12537	Victim of physical abuse
abuse	12684	Victim of domestic violence
abuse	26008	At risk of physical abuse
abuse	26418	Advice about domestic violence
abuse	28782	Sexual abuse counselling
abuse	30298	Domestic abuse counselling
abuse	35408	At risk of sexual abuse
abuse	48546	Victim of emotional abuse
abuse	52024	At risk of emotional/psychological abuse
abuse	82472	Advice about domestic abuse
abuse	93502	History of domestic abuse
abuse	102501	Referral to domestic violence advocate

abuse	105329	History of being victim of domestic violence
abuse	107307	Domestic abuse victim in household
abuse	107316	Victim of domestic abuse
abuse	110392	Notifctn received of alleged domestic violence in household

anx	636	Anxiety states
anx	655	Anxiety with depression
anx	962	[X]Anxiety neurosis
anx	1758	Chronic anxiety
anx	3407	H/O: anxiety state
anx	4534	Anxiety state NOS
anx	4634	Recurrent anxiety
anx	4659	Generalised anxiety disorder
anx	5385	[X]Other anxiety disorders
anx	6939	Anxiety state unspecified
anx	7749	[X]Mild anxiety depression
anx	7999	Anxiety counselling
anx	8424	[X]Anxious [avoidant] personality disorder
anx	9386	[X]Phobic anxiety disorders
anx	9944	Phobic anxiety
anx	10344	[X]Generalized anxiety disorder
anx	11913	[X]Mixed anxiety and depressive disorder
anx	15220	[X]Persistant anxiety depression
anx	23838	[X]Anxiety disorder, unspecified
anx	24066	[X]Other specified anxiety disorders
anx	25638	[X]Anxiety NOS
anx	27685	[X]Other phobic anxiety disorders
anx	28925	Referral for guided self-help for anxiety
anx	34064	[X]Phobic anxiety disorder, unspecified
anx	44321	[X]Other mixed anxiety disorders
anx	50191	[X]Anxiety state

dep	324	Depressive disorder NEC
dep	543	[X]Depression NOS
dep	595	Endogenous depression
dep	655	Anxiety with depression
dep	1055	Agitated depression
dep	1131	Neurotic depression reactive type
dep	1908	O/E - depressed
dep	1996	Depressed
dep	2639	Postnatal depression
dep	2716	H/O: depression
dep	2923	Puerperal depression
dep	2970	[X]Depressive episode, unspecified
dep	2972	Postviral depression

dep	3291	[X]Depressive disorder NOS
dep	3292	[X]Recurrent depressive disorder
dep	4323	Chronic depression
dep	4639	[X]Depressive episode
dep	4824	C/O - feeling depressed
dep	4979	[X]Postpartum depression NOS
dep	5879	Agitated depression
dep	5987	[X] Reactive depression NOS
dep	6482	Recurrent depression
dep	6546	Endogenous depression first episode
dep	6854	[X]Other depressive episodes
dep	6932	Endogenous depression - recurrent
dep	6950	Endogenous depression first episode
dep	7011	Single major depressive episode NOS
dep	7604	[X]Single episode of reactive depression
dep	7737	[X]Neurotic depression
dep	7749	[X]Mild anxiety depression
dep	8584	[X]Depressive neurosis
dep	8851	[X]Recurrent episodes of depressive reaction
dep	8902	[X]Recurrent episodes of reactive depression
dep	9055	[X]Single episode of depressive reaction
dep	9183	Masked depression
dep	9211	[X]Moderate depressive episode
dep	9667	[X]Severe depressive episode without psychotic symptoms
dep	9796	Symptoms of depression
dep	10015	Depressed mood
dep	10290	[X]Depressive personality disorder
dep	10438	Depressive symptoms
dep	10455	Depressive personality disorder
dep	10610	Single major depressive episode
dep	10667	[X]Mild depression
dep	10720	[X]Atypical depression
dep	11252	[X]Major depression, recurrent without psychotic symptoms
dep	11329	[X]Endogenous depression without psychotic symptoms
dep	11717	[X]Mild depressive episode
dep	11913	[X]Mixed anxiety and depressive disorder
dep	12122	Depression medication review
dep	12399	Depression annual review
dep	13307	[X]Postnatal depression NOS
dep	14709	Recurrent major depressive episodes, moderate
dep	15099	Recurrent major depressive episode
dep	15155	Single major depressive episode, moderate
dep	15219	Single major depressive episode, severe, without psychosis
dep	15220	[X]Persistant anxiety depression
dep	16506	Single major depressive episode, mild
dep	16632	Prolonged depressive reaction

dep	18702	Postnatal depression counselling
dep	19054	[X]Recurrent brief depressive episodes
dep	19439	Depression resolved
dep	19696	[X]Recurrent episodes of psychogenic depression
dep	22116	[X]Recurrent depressive disorder, currently in remission
dep	22806	[X]Single episode major depression w'out psychotic symptoms
dep	25563	Recurrent major depressive episode NOS
dep	25697	Recurrent major depressive episodes, severe, no psychosis
dep	28248	[X]Prolonged single episode of reactive depression
dep	28756	[X]Seasonal depressive disorder
dep	29342	Recurrent major depressive episodes, mild
dep	29520	[X]Recurrent depressive disorder, current episode moderate
dep	29527	[D]Postoperative depression
dep	29784	[X]Recurrent depressive disorder, current episode mild
dep	30405	Depression interim review
dep	30483	Patient given advice about management of depression
dep	30583	Depression - enhanced services administration
dep	32841	Referral for guided self-help for depression
dep	32845	[X]Depressive conduct disorder
dep	33469	[X]Recurr depress disorder cur epi severe without psyc sympt
dep	34390	Single major depressive episode, unspecified
dep	36246	Brief depressive reaction NOS
dep	42931	On depression register
dep	43324	Single major depressive episode, partial or unspec remission
dep	44300	[X]Recurrent depressive disorder, unspecified
dep	44848	Depression management programme
dep	47731	[X]Other recurrent depressive disorders
dep	55384	Recurrent major depressive episodes, in full remission
dep	56609	[X]Single episode of masked depression NOS
dep	57409	Single major depressive episode, in full remission
dep	98252	[X]Major depression, moderately severe
dep	98346	[X]Major depression, mild
dep	98414	[X]Major depression, severe without psychotic symptoms
dep	102632	Antidepressant drug treatment started
dep	103677	[X]Antenatal depression

drug	1588	Misuse of drugs NOS
drug	3222	Detoxification dependence drug
drug	3519	Drug addiction
drug	4701	H/O: drug dependency
drug	5105	Drug dependence
drug	6111	Drug addictn therap-methadone
drug	6988	[V]Drug use
drug	7234	Suspected abuse hard drugs
drug	7496	Drug addiction therapy
drug	7747	Nondependent abuse of drugs

drug	8284	Cannabis type drug dependence
drug	8463	[V]Drug abuse counselling and surveillance
drug	8490	Drug user
drug	9024	Drug dependence therapy
drug	9151	Drugs of abuse screening
drug	9615	[X]Drug addiction NOS
drug	10045	[X]Drug addiction-other stimul
drug	10538	[X]Drug addiction - opioids
drug	10656	[X]Men & behav disorder multiple drug use/psychoactive subst
drug	11746	[X]Drug addiction - cocaine
drug	11840	Cocaine type drug dependence
drug	11842	Referral to community drug dependency team
drug	12554	Referral to community drug and alcohol team
drug	12628	Drug-induced paranoid state
drug	12651	H/O: drug abuse
drug	12856	Referral to drug abuse counsellor
drug	14809	Combined drug dependence, excluding opioids
drug	16161	Nondependent other drug abuse
drug	16243	Opioid type drug dependence
drug	21087	Ecstasy type drug dependence
drug	21623	Drug addict notific admin
drug	21662	[X]Drug addiction - cannabis
drug	22079	Injecting drug user
drug	22675	H/O: recreational drug use
drug	24441	Opioid drug dependence NOS
drug	24849	Drug addict notific to CMO
drug	25522	Dependent drug detoxification
drug	25757	[X]Drug addiction- sedative / hypnotics
drug	26061	Combined opioid with other drug dependence
drug	26096	Smokes drugs
drug	28422	[V]Drug rehabilitation
drug	28976	Drug addiction detoxification therapy - methadone
drug	29017	Drug rehabilitation
drug	29446	Drug dependence NOS
drug	29728	Drug addiction notification
drug	30251	Intravenous drug user
drug	30614	Drug detoxification programme completed
drug	30694	Drug addiction maintenance therapy - methadone
drug	30750	Delivery of rehabilitation for drug addiction
drug	32653	Drug dependence self detoxification
drug	32709	Previously injecting drug user
drug	33462	Cannabis drug dependence NOS
drug	33585	[X]Drug addiction - solvent
drug	33838	Nondependent mixed drug abuse NOS
drug	33942	Cocaine drug dependence NOS
drug	34115	Lifestyle advice regarding drug misuse

drug	34398	Drug misuse - enhanced services administration
drug	38029	Misuses drugs orally
drug	40781	Other specified drug dependence NOS
drug	43487	Drug addiction maintenance therapy - buprenorphine
drug	45027	Intermittent drugs used more
drug	47784	[X]Drug addiction - hallucinogen
drug	49618	Current drug user
drug	51052	Drug addiction detoxification therapy - buprenorphine
drug	51197	Other specified drug dependence
drug	53008	Nondependent mixed drug abuse
drug	54019	[X]Unspecif drug/medic caus adverse effects in therap use
drug	54356	Drug abuse monitoring
drug	56337	Nondependent mixed drug abuse, unspecified
drug	56409	Referral to drug treatment centre
drug	62490	Drug misuse - enhanced service completed
drug	64316	Nondependent other drug abuse NOS
drug	84413	Referral to drugs worker
drug	85095	Referral to drugs therapist
drug	97025	Drug misuse behaviour
drug	97028	Illicit drug use
drug	97578	Misuses drugs
drug	97586	Shared care drug misuse treatment - enhanced services admin
drug	97648	Occasional drug user
drug	97676	Drug misuse treatment primary care - enhanced services admin
drug	98169	Buying drugs
drug	102985	Referred by drug statutory service
drug	103241	Shared care drug misuse treatment
drug	106397	Seen by community drug team
drug	107355	Seen in drug misuse clinic

smi	576	Acute schizophrenic episode
smi	694	[X]Psychosis NOS
smi	854	Schizophrenic disorders
smi	1494	Paranoid schizophrenia
smi	1531	[X]Manic-depressive illness
smi	2113	[X]Paranoid psychosis
smi	2114	Unspecified puerperal psychosis
smi	2117	Schizo-affective schizophrenia
smi	2560	Depressive psychoses
smi	2741	[X]Hypomania
smi	3369	Schizoid personality disorder
smi	3636	Psychotic episode NOS
smi	3702	Bipolar affective disorder, currently manic
smi	3890	Chronic paranoid psychosis
smi	3984	Chronic schizophrenic
smi	4677	Bipolar affective disorder, currently depressed

smi	4678	[X]Mania NOS
smi	4732	[X]Bipolar affect dis cur epi severe depres with psyc symp
smi	5726	[X]Mood - affective disorders
smi	6325	H/O: schizophrenia
smi	6709	[X]Epileptic psychosis NOS
smi	6710	[X]Manic-depressive psychosis
smi	6874	[X]Bipolar affective disorder
smi	7233	Organic psychotic conditions
smi	8407	Schizophrenia NOS
smi	8478	Reactive depressive psychosis
smi	8567	Bipolar psychoses
smi	8766	[X]Symptomatic psychosis NOS
smi	9281	Paranoid schizophrenia NOS
smi	9422	[X]Schizoaffective disorders
smi	9521	[X]Bipolar disorder, single manic episode
smi	10575	Schizo-affective schizophrenia NOS
smi	11055	[X]Schizoaffective disorder, depressive type
smi	11244	[X]Unspecified nonorganic psychosis
smi	11548	H/O: manic depressive disorder
smi	11596	Unspecified manic-depressive psychoses
smi	11778	[X]Acute schizophrenia-like psychotic disorder
smi	11973	[X]Induced psychotic disorder
smi	12099	[X]Severe depressive episode with psychotic symptoms
smi	12173	[X]Manic episode
smi	12228	Hypomanic personality disorder
smi	12771	Paranoid psychosis NOS
smi	12831	Manic-depressive - now depressed
smi	13024	[X]Mania without psychotic symptoms
smi	14656	Affective psychoses
smi	14728	Single manic episode, mild
smi	14747	Schizoid personality disorder NOS
smi	14784	Unspecified bipolar affective disorder
smi	14965	Nonorganic psychosis NOS
smi	14979	Affective personality disorder
smi	15117	[V]Personal history of affective disorder
smi	15733	Unspecified schizophrenia
smi	15923	Bipolar affective disorder, currently depressed, unspecified
smi	15958	Non-organic psychoses
smi	16333	Other reactive psychoses
smi	16562	[X]Bipolar affect disorder cur epi mild or moderate depressn
smi	16764	[X]Paranoid schizophrenia
smi	16808	[X]Bipolar affective disorder, current episode hypomanic
smi	16861	[X]Recurrent severe episodes of psychotic depression
smi	16905	[X]Schizoaffective psychosis, manic type
smi	17281	[X]Schizophrenia, schizotypal and delusional disorders
smi	17385	Manic-depressive - now manic

smi	17614	[X]Puerperal psychosis NOS
smi	17770	Psychotic reactive depression
smi	18053	[X]Schizophrenifrm psychos NOS
smi	18909	Hypomanic psychoses
smi	19345	Psychosis, schizophrenia + bipolar affective disord resolved
smi	19967	Recurrent manic episodes, unspecified
smi	20110	Single manic episode, unspecified
smi	20228	Reactive psychoses
smi	21065	[X]Mania with psychotic symptoms
smi	21077	Psychoneurotic personality disorder
smi	21595	[X]Acute polymorphic psychot disord with symp of schizophren
smi	21985	[X]Organic psychosis NOS
smi	21986	[X]Organic delusional [schizophrenia-like] disorder
smi	22080	[V]Personal history of manic-depressive psychosis
smi	22104	[V]Personal history of schizophrenia
smi	22188	Non-organic psychosis NOS
smi	22713	Manic mood
smi	23538	Brief reactive psychosis
smi	23616	Subchronic schizophrenia
smi	23713	[X]Bipol aff disord, curr epis sev depress, no psychot symp
smi	23731	[X]Endogenous depression with psychotic symptoms
smi	23835	Korsakoff's non-alcoholic psychosis
smi	23963	[V]Personal history of manic-depressive psychosis
smi	24107	[X]Chronic undifferentiated schizophrenia
smi	24112	[X]Single episode of psychotic depression
smi	24117	[X]Single episode of major depression and psychotic symptoms
smi	24171	Recurrent major depressive episodes, severe, with psychosis
smi	24230	Unspecified bipolar affective disorder, in full remission
smi	24387	[X]Acute / subacute infective psychosis
smi	24510	Organic affective syndrome
smi	24640	Single manic episode, moderate
smi	25019	[X]Acute and transient psychotic disorders
smi	25546	Catatonic schizophrenia
smi	26161	Manic psychoses
smi	26227	Recurrent manic episodes
smi	26839	[X]Affective personality disorder
smi	26859	[X]Schizotypal personality disorder
smi	27584	[X]Bipolar affective disorder, currently in remission
smi	27770	[X]Psychogenic paranoid psychosis
smi	27986	Unspecified bipolar affective disorder, NOS
smi	28168	[X]Hysterical psychosis
smi	28277	[X]Bipolar affect disorder cur epi manic with psychotic symp
smi	28677	[X]Manic-depress psychosis,depressed type+psychotic symptoms
smi	28863	[X]Single episode of reactive depressive psychosis
smi	29451	[X]Manic-depress psychosis,depressd,no psychotic symptoms
smi	29651	[X]Reactive psychosis

smi	29937	Acute hysterical psychosis
smi	30282	Profile of mood states, bipolar
smi	30619	Hebephrenic schizophrenia
smi	30688	[X]Mixed affective episode
smi	30985	[X]Other nonorganic psychotic disorders
smi	31316	Mixed bipolar affective disorder
smi	31362	Chronic paranoid schizophrenia
smi	31535	Mixed bipolar affective disorder, unspecified
smi	31633	[X]Affective psychosis NOS
smi	31707	[X]Brief reactive psychosis NOS
smi	31738	[X]Chronic hallucinatory psychosis
smi	31984	Other nonorganic psychoses
smi	32088	[X]Other manic episodes
smi	32159	Single major depressive episode, severe, with psychosis
smi	32222	Simple schizophrenia
smi	32941	[X]Recurr severe episodes/major depression+psychotic symptom
smi	33338	Atypical schizophrenia
smi	33383	Unspecified paranoid schizophrenia
smi	33410	[X]Schizoaffective psychosis NOS
smi	33425	Other affective psychosis NOS
smi	33693	[X]Schizoaffective disorder, mixed type
smi	33751	[X]Bipolar affective disorder, unspecified
smi	33847	[X]Schizoaffective disorder, manic type
smi	34168	[X]Acute and transient psychotic disorder, unspecified
smi	34236	[X]Schizophrenia
smi	34275	Mood affective checklist
smi	34966	[X]Schizophrenia, unspecified
smi	35274	[X]Schizoaffective psychosis, depressive type
smi	35738	Bipolar affective disorder, currently manic, unspecified
smi	35848	[X]Simple schizophrenia
smi	36172	Paranoid schizophrenia in remission
smi	36611	Manic disorder, single episode NOS
smi	36720	[X]Acute polymorphic psychot disord without symp of schizoph
smi	36861	Organic psychoses NOS
smi	37070	Manic disorder, single episode
smi	37090	[X]Unspecified mood affective disorder
smi	37178	Recurrent manic episodes, in full remission
smi	37296	Bipolar affective disorder, currently depressed, NOS
smi	37580	[X]Mixed schizophrenic and affective psychosis
smi	37681	[X]Schizoaffective disorder, unspecified
smi	38063	Residual schizophrenia
smi	38371	[X]Schizoid personality disorder
smi	39062	Other schizophrenia
smi	39316	[X]Schizotypal disorder
smi	39625	Chronic organic psychosis NOS
smi	41992	Other and unspecified affective psychoses

smi	43800	Chronic schizo-affective schizophrenia
smi	44498	Acute exacerbation of chronic schizophrenia
smi	44513	[X]Manic episode, unspecified
smi	44693	[X]Bipolar affective disorder, current episode mixed
smi	46415	Recurrent manic episode NOS
smi	46425	Recurrent manic episodes, mild
smi	49763	Unspecified bipolar affective disorder, unspecified
smi	51032	[X]Recurrent manic episodes
smi	53032	Acute exacerbation of chronic paranoid schizophrenia
smi	53625	Simple schizophrenia NOS
smi	53840	[X]Other bipolar affective disorders
smi	54607	Unspecified affective psychoses NOS
smi	55064	Mixed bipolar affective disorder, in full remission
smi	55150	Transient organic psychoses
smi	56260	Manic-depression association member
smi	56438	Schizo-affective schizophrenia in remission
smi	57465	Bipolar affective disorder, now depressed, in full remission
smi	57605	Bipolar affective disorder, currently manic, NOS
smi	58687	Schizophrenia in remission
smi	58862	Unspecified schizo-affective schizophrenia
smi	59011	Bipolar affect disord,currently manic, part/unspec remission
smi	60178	Other and unspecified manic-depressive psychoses
smi	63583	Mixed bipolar affective disorder, NOS
smi	63784	Bipolar affective disorder, currently manic, full remission
smi	70000	Single manic episode in full remission
smi	70925	Atypical manic disorder
smi	73924	[X]Bipolar II disorder
smi	85102	Bipolar affective disorder resolved
smi	85972	Psychosis resolved
smi	88275	Schizophrenia resolved
smi	98417	[X]Major depression, severe with psychotic symptoms
smi	101987	[X]Nonorganic psychosis in remission
smi	103676	Antipsychotic medication review
smi	103915	[X]Bipolar affective disorder type II
smi	109252	Antipsychotic medication physical health check

alco	9489	Under care of community alcohol team
alco	64389	[X]Ment & behav dis due use alcohol: unsp ment & behav dis
alco	2084	Alcohol dependence syndrome
alco	1399	Alcohol problem drinking
alco	669	Nondependent alcohol abuse, unspecified
alco	2081	Alcoholism
alco	7746	Nondependent alcohol abuse
alco	2083	Alcohol detoxification
alco	94553	Referral to specialist alcohol treatment service
alco	9849	Referral to community alcohol team

alco	2082	Alcohol withdrawal syndrome
alco	12982	Alcohol intake above recommended sensible limits
alco	96053	Brief intervention for excessive alcohol consumptn completed
alco	35330	Alcohol consumption counselling
alco	8030	[V]Alcohol abuse counselling and surveillance
alco	30695	Harmful alcohol use
alco	19494	Hazardous alcohol use
alco	12442	Alcohol disorder monitoring
alco	97126	Alcohol units consumed on heaviest drinking day
alco	4743	Alcoholic cirrhosis of liver
alco	7885	Alcoholic liver damage unspecified
alco	4506	Alcoholic gastritis
alco	6169	Alcohol dependence syndrome NOS
alco	32964	Alcohol abuse monitoring
alco	32927	[X]Alcohol withdrawal-induced seizure
alco	7545	[V] Alcohol use
alco	7389	[X]Acute / subacute confusional state, nonalcoholic
alco	10691	Alcoholic fatty liver
alco	12554	Referral to community drug and alcohol team
alco	28150	Nondependent alcohol abuse NOS
alco	5740	Acute alcoholic intoxication in alcoholism
alco	63529	Alcohol misuse - enhanced service completed
alco	94670	Alcohol misuse
alco	96054	Extended intervention for excessive alcohol consumptn complt
alco	37264	Alcohol leaflet given
alco	3216	Acute alcoholic hepatitis
alco	31443	Chronic alcoholism
alco	7943	Alcoholic hepatitis
alco	28780	[X]Alcohol addiction
alco	12974	Nondependent alcohol abuse, episodic
alco	33635	Chronic alcoholism NOS
alco	21650	Admitted to alcohol detoxification centre
alco	9169	[D]Alcohol blood level excessive
alco	5758	[X]Chronic alcoholism
alco	9508	[X]Acute alcoholic drunkenness
alco	18156	Alcoholics anonymous
alco	4500	Korsakov's alcoholic psychosis
alco	5611	[X]Mental and behavioural disorders due to use of alcohol
alco	10658	HoNOS item 3 - alcohol/drug problem
alco	16225	Alcohol withdrawal delirium
alco	17259	[X]Delirium tremens, alcohol induced
alco	39327	[X]Mental and behav dis due to use alcohol: dependence syndr
alco	7123	[V]Personal history of alcoholism
alco	8388	[V]Alcohol rehabilitation
alco	19217	Alcohol causing toxic effect
alco	8430	H/O: alcoholism

alco	2925	Alcoholic polyneuropathy
alco	18252	Accidental poisoning by alcohol, NEC
alco	4915	Alcoholic cardiomyopathy
alco	97309	Advised to contact primary care alcohol worker
alco	30460	Alcoholism counselling
alco	47123	Alcohol counselling by other agencies
alco	23610	Nondependent alcohol abuse, continuous
alco	24984	Alcohol-induced chronic pancreatitis
alco	27342	Alcoholic dementia NOS
alco	44299	[X]Mental & behav dis due to use alcohol: acute intoxication
alco	102564	Advised to abstain from alcohol consumption
alco	26323	[X]Alcoholic dementia NOS
alco	38061	Alcohol induced hallucinations
alco	16237	Alcoholic psychoses
alco	17607	[X]Alcoholic psychosis NOS
alco	30604	Alcohol-induced epilepsy
alco	36748	Alcoholic encephalopathy
alco	10463	[X]Intent self poison/exposure to alcohol
alco	23978	[X]Evid of alcohol involv determind by level of intoxication
alco	26106	Episodic chronic alcoholism
alco	6467	[X]Alcoholic hallucinosis
alco	24064	Continuous chronic alcoholism
alco	56410	Delivery of rehabilitation for alcohol addiction
alco	104611	Alcohol-induced acute pancreatitis
alco	8363	Oesophageal varices in alcoholic cirrhosis of the liver
alco	21879	[X]Mental and behav dis due to use of alcohol: harmful use
alco	17330	Alcoholic hepatic failure
alco	84218	Disqualified from driving due to excess alcohol
alco	11670	[X]Korsakov's psychosis, alcohol induced
alco	24485	Chronic alcoholism in remission
alco	29691	Aversion therapy - alcoholism
alco	36296	Acute alcoholic intoxication in alcoholism NOS
alco	31605	[X]Accident poisoning/exposure to alcohol
alco	25110	Alcohol withdrawal hallucinosis
alco	20514	[X]Mental and behav dis due to use alcohol: withdrawal state
alco	37691	[X]Chronic alcoholic brain syndrome
alco	96993	Referral to alcohol brief intervention service
alco	33670	Other alcoholic psychosis
alco	43193	Unspecified chronic alcoholism
alco	41983	Alcohol detoxification
alco	12353	[X]Mental & behav dis due to use alcohol: psychotic disorder
alco	21713	Alcoholic fibrosis and sclerosis of liver
alco	40530	Acute alcoholic intoxication, unspecified, in alcoholism
alco	54505	Other alcoholic dementia
alco	36499	Alcohol causing toxic effect NOS
alco	40541	Accidental poisoning by alcoholic beverages

alco	30404	Alcoholic paranoia
alco	109800	Hospital attendance related to personal alcohol consumption
alco	31742	Alcoholic myopathy
alco	8984	Ethyl alcohol causing toxic effect
alco	31569	Nondependent alcohol abuse in remission
alco	7602	Chronic alcoholic hepatitis
alco	59574	Acute alcoholic intoxication in remission, in alcoholism
alco	16587	[V]Problems related to lifestyle alcohol use
alco	46677	Alcohol withdrawal regime
alco	39799	[X]Mental and behav dis due to use alcohol: amnesic syndrome
alco	67651	Alcoholic psychosis NOS
alco	21624	Episodic acute alcoholic intoxication in alcoholism
alco	30162	[X]Alcoholic paranoia
alco	55415	Accidental poisoning by alcohol NOS
alco	47555	Cerebral degeneration due to alcoholism
alco	15503	Accidental poisoning by other ethyl alcohol and its products
alco	11106	Korsakov's alcoholic psychosis with peripheral neuritis
alco	57714	Alcohol dependence with acute alcoholic intoxication
alco	33839	Cerebellar ataxia due to alcoholism
alco	109668	Specialist alcohol treatment service signposted
alco	20762	Alcohol amnestic syndrome
alco	108644	In-house alcohol detoxification

ovd	171	Overdose of drug
ovd	697	[X]Deliberate drug overdose / other poisoning
ovd	6595	Cause of overdose - deliberate
ovd	18379	[X]Overdose - paracetamol
ovd	3390	[X]Accidental drug overdose / other poisoning
ovd	11708	Overdose of biological substance
ovd	99775	Intentional overdose of prescription only medication
ovd	13568	H/O: repeated overdose
ovd	28710	[X]Overdose - heroin
ovd	103643	Suspected drug overdose
ovd	29861	[X]Overdose - aspirin
ovd	45748	[X]Overdose - diazepam
ovd	46280	[X]Overdose - antidepressant
ovd	44886	[X]Overdose - ibuprofen
ovd	48324	[X]Overdose - benzodiazepine
ovd	51381	[X]Overdose - temazepam
ovd	34703	[X]Overdose - amitriptyline
ovd	55395	[X]Overdose - sleeping tabs

dsh	7372	H/O: deliberate self harm
dsh	26465	[X]Intentional self harm by sharp object
dsh	12694	Thoughts of deliberate self harm

dsh	21027	Suicide and self harm
dsh	30360	[X]Intent self harm by hanging strangulation / suffocation
dsh	34156	[X]Intentional self harm by unspecified means
dsh	38760	[X]Intentional self harm by other specified means
dsh	11753	Intent of deliberate self harm with detailed plans
dsh	30074	[X]Intentional self harm by sharp object occurrence at home
dsh	46747	[X]Intentional self harm by jumping from a high place
dsh	52778	[X]Intentional self harm by sharp object occ unspecif place
dsh	47022	Plans for deliberate self harm without intent
dsh	22877	Unknown risk of deliberate self harm

23.2 STROBE Statement—Checklist of items that should be included in reports of case-control studies

	Item No	Recommendation	Chapter / Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	NA
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	NA
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Background
Objectives	3	State specific objectives, including any prespecified hypotheses	Hypothesis/ aims
Methods			
Study design	4	Present key elements of study design early in the paper	Methods
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Method
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	Method
		(*b*) For matched studies, give matching criteria and the number of controls per case	Mehod
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Method
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Method
Bias	9	Describe any efforts to address potential sources of bias	Method
Study size	10	Explain how the study size was arrived at	Method
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Method
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	Method
		(*b*) Describe any methods used to examine subgroups and interactions	Method
		(*c*) Explain how missing data were addressed	Method
		(*d*) If applicable, explain how matching of cases and controls was addressed	Method
		(*e*) Describe any sensitivity analyses	Method
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and	Results

		analysed	
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Results
		(b) Indicate number of participants with missing data for each variable of interest	Results
Outcome data	15*	Report numbers in each exposure category, or summary measures of exposure	Results

Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Results
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Results
Discussion			
Key results	18	Summarise key results with reference to study objectives	Discussion
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Discussion
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Discussion
Generalisability	21	Discuss the generalisability (external validity) of the study results	Discussion
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Copyright/ disclaimers

*Give information separately for cases and controls.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

24 Appendix 5- Supplementary materials for Study 4 - focus group study

24.1 Imperial College Research Ethics Committee approval

Imperial College London

Imperial College Research Ethics Committee
Imperial College London
Room 221
Medical School Building
St Marys Campus
London
W2 1PG
Tel: +44 (0)207 594 1872

researchethicscommittee@imperial.ac.uk

13 March 2019

Dear Dr Richard Ma

Study Title: How can primary care professionals support contraceptive decision making for women?

ICREC reference: 19IC5086

The above study was reviewed by the Imperial College Research Ethics Committee on 12/03/19.

Following the review of your documents the Joint Research Compliance Office would like to grant full approval of the study on the basis described in the documents:

Documents
The documents reviewed were:

- ICREC application form
- Protocol (v2 04/03/19)
- Participant Information Sheet (v1 22/02/19)
- Consent Form (v1 22/02/19)
- Invitation Letter (v2 04/03/19)
- Topic Guide (v2 04/03/19)
- Sponsorship and Insurance Request Form

Membership of the Committee

The members of the Ethics Committee who reviewed the study were:

Michael Dixon	Christopher Mason
Andrew Parry	Biddy Passmore
Christopher Brierley	Ruth Nicholson

Yours sincerely,

Michael Dixon,
Chair, Imperial College Ethics Committee

-

24.2 ICREC Application Form

Part 1 and 3 of this application are for low risk studies, as determined by researcher assessment using the risk-based checklist on page 2.

Part 1, 2 and 3 of this application are for high risk studies, as determined by researcher assessment using the risk-based checklist on page 2.

Research involving human participants and or their data (aside from that which falls under the remit of Health Research Authority Research Ethics Committee (HRA REC) with the primary aim of answering a science, engineering or technology research question will be reviewed by the RGIT/Science, Engineering and Technology Research Ethics Committee (SETREC).

Non-NHS health research involving human participants and or their data (aside from that which falls under the remit of HRA REC) with the primary aim of answering a human health research question will be reviewed by the RGIT/Imperial College Research Ethics Committee (ICREC).

All applications should be submitted to the Ethics and Research Governance Coordinator at jrcocoordinator@imperial.ac.uk.

SECTION 1: Filter for ICREC and SETREC

This section determines whether your study will be classified as an Imperial College Research Ethics Committee study or a Science Engineering Technology Research Ethics Committee Study.

Select as appropriate	Yes/No
1. Is the primary aim of your research answering a human health related question?	Yes
2. Is the primary aim of your research answering a science, engineering or technology related question?	No
For Office use only JRCO reference:	

SECTION 2: Risk level categorisation	
This section determines the research risk level and if it requires full committee review. *(Select as appropriate to indicate your response)*	Yes/No
1. Does the research involve drugs/medication? *If yes, please attach the SmPc.*	No
2. Does the research involve genetically modified materials? *If yes, please also complete appendix two and attach the GM Safety Committee letter.*	No
3. Will you be recruiting vulnerable participants? i.e. children (15 years or younger), adults (16 years or over) who are unable to consent, people in care, the mentally ill or individuals with learning difficulties? *If yes, please provide reasons for their inclusion in section 8.*	No
4. Will participants take part in the study without their explicit consent? i.e. observational studies. *If yes, please provide reasons why in section 8.*	No

5. Will you be collecting sensitive or personal data this includes primary and secondary data collection?	Yes
6. Will you be recruiting prisoners or young offenders? *If yes, please provide reasons for their inclusion in section 8.*	No
7. Is there any aspect of the proposed research which could potentially cause harm to the reputation of the College? i.e. could the research be considered controversial or prejudiced? *If yes, please provide reasons in section 8.*	No
8. Could participants disclose any illegal or harmful activity due to the nature of the research? *If yes, please provide reasons in section 8.*	Yes
9. Will personally sensitive subjects be discussed that participants might not be willing to otherwise talk about in public (i.e. subjects that are embarrassing or could lead to disclosure)? *If yes, please provide reasons in section 8*	Yes
10. Will the researcher be in a position of influence or authority over participants that could give rise to a perceived pressure to participate (i.e. lecturers/teachers and students)? *If yes, please provide reasons in section 8.*	No
11. Does the study have the potential to induce stress, anxiety or negative consequences on the participant?	Yes
12. Does the study involve physically intrusive procedures, administration of substances, use of bodily fluids, tissues, DNA or RNA? *If yes, please provide reasons in section 8.*	No
13. Does the study involve ultrasound or sources of non-ionizing radiation e.g. x-rays, radiation, MRI, fMRI,?	No
14. Are there any potential conflicts of interest, or what could be perceived by an outside observer as conflicts of interest? *If yes, please explain these conflicts in section 8.*	Yes
15. Do you foresee any issues which might prevent or significantly delay requesting participants and stakeholders from accessing the research findings? *If yes, please provide reasons in section 8.*	No
16. Will undue incentives for participants be offered? Incentives should be proportionate to the burden imposed and justified by the benefits. *If yes, please provide reasons in section 8.*	Yes
17. Are you using any medical device in the UK that is CE marked and is it being used outside its product limitation and non CE marked products?	No
18. Does the proposed research raise any ethical issues that are not covered above?	No
For JRCO use only Risk Categorisation	Choose an item.

If you answered <u>Yes to ANY</u> of the questions, your study is considered high risk and you must complete the entire application, parts 1,2 and 3 of this form.

If you answered <u>No to ALL</u> of the questions above, your study is considered low risk. Please complete part 1 and part 3, skipping part 2.

This form must be signed by both the PI and HoD (or delegated person) prior to submitting to the Ethics and Research Governance Coordinator at jrcocoordinator@imperial.ac.uk

PART 1

SECTION 3: Details of Principal Investigator *If the application is a student project, please name the student's supervisor as the Principal Investigator. Please add the student's name and details of all other co-investigators or collaborators in Section 15.*	
1. Name:	Dr Richard Ma
2. Position:	Clinical Research Fellow
3. Faculty:	Faculty of Medicine
4. Division / School / Department:	School of Public Health, Department of Primary Care and Public Health
5. Telephone: *Imperial College not private*	
6. Email: *Imperial College not private*	r.ma@imperial.ac.uk
7. Summary of skills, experience relevant to the study and in any procedures to be used.*(350 characters max)*	I am a GP with interest in sexual and reproductive health. I have delivered sexual health to a wide range of individuals including the demographic proposed in this study. As a GP, I am used to discussing sensitive issues with patients. I also have experience of interviewing for research and published qualitative studies in journals, masters & doctoral theses.

SECTION 4: Project Description

1. Full title of study:	How can primary care professionals support contraceptive decision making for women?
2. List of location(s) where study will be conducted:	To be confirmed – but likely to be meeting venues.
3. Proposed j date: *From the start of advertising and/or recruitment.*	01/05/2019
4. Proposed end date: *To the end of data collection.*	31/10/2019

Section 5: Project Summary *Please provide a summary of the project in LAY terms: a brief description of reasons for doing the study, the aims, how data will be disseminated and any expected benefits to the participant, researchers or others.*
(500 words max) Unplanned pregnancies can have emotional and financial costs to mother and society and poor health outcomes for both mother and child. Government plans to reduce unplanned pregnancies have included: Teenage Pregnancy Strategy (aimed to improve access to contraception, sex education and tackling social exclusion) and National Institute for Health and Care Excellence (NICE) recommending

long acting reversible contraception (LARC) including injections, implants, and intrauterine devices (IUDs or "coils") because they work better. However, the number of women having abortions (which is used as a proxy indicator of unplanned and unwanted pregnancies) has not reduced significantly over the last ten years, particularly in women under 25.

From previous research we know women are more likely to have an unplanned pregnancy if they are under 25, from poorer backgrounds, if they smoke, use drugs, or if they suffer from a mental health condition. Many women visit their general practitioners (GPs) for contraception but not all are able to discuss their contraceptive needs, such as those with learning disabilities and mental health problems.

For this study, we want to explore what it is like for young women to get contraception from general practice. We want to know what can be improved to make it a better experience for all women to get the contraceptives they want and when they need it. We also want to look at what advice women found helpful to decide on the contraception that is best suited to them.

We will invite women from different backgrounds, aged 16 to 19 and 20 to 24, to share their experiences of getting contraception – what they found helpful, any barriers they encountered, and their views on contraceptive advice provided by their GPs.

The findings will help to improve women's experiences of getting contraception from GPs, and reduce unplanned and unwanted pregnancies. Women might benefit from sharing their own experiences and hearing those of others. They might feel more informed about how to choose the contraception that is right for them.

We have a Project Advisory Group (PAG) which consists of members of the public including students, expert patients, as well as charity representatives. The PAG is involved in the design of the project, and members will be helping with delivery of information and facilitation of the focus groups. They will also be involved in the interpretation of findings, involving media input, and disseminating research findings and in public engagement. They also contributed to this application and had input in designing the participant information leaflet and consent form. Their involvement will help the project to be more relevant and applicable to the public.

Section 6: Participant Recruitment

Please provide details of methods of recruitment, participant inclusion and exclusion criteria and the number of participants you are aiming to recruit. Please include any incentives (such as financial reimbursement).

Please ensure you attach as separate documents (if applicable)

- *Recruitment and advertising material (email, poster, social media advert)*
- *Oral information scripts*

(250 words max)

We will recruit from a variety of settings such as: universities, colleges, further education colleges and charities such as Brook and Sexpression (sex education network across UK). We will also use social media such as Twitter to recruit people which will include a link to information and contacts. Brook charity has 13,600 followers on Twitter; Sexpression UK has 6000. We also have representatives from young people's organisations on the PAG who will help us recruit via their networks.

We plan to include women aged 16 to 19 and 20 to 24 and between 6-8 people per group.
We separated young women into these distinct groups as they may have different experiences. We want to include women who obtained contraception from a variety of providers and not limited to GPs.

Main exclusion criteria are: women outside this age range, if they are unable to understand enough English to consent and take part in focus group discussions, and women with impaired or limited capacity to give consent. They must also be willing to travel to a central London venue for a 2 hour focus group discussion.

Participants will be reimbursed travel expenses and their time to recognise their participation in the discussions. Each participant will spend no more than 2 hours on groups and will receive £50 as an Amazon voucher or a donation to their chosen charity, and up to £10 travel expenses. These are already costed using a template provided by NIHR INVOLVE and are included in the fellowship budget.

Section 7: Informed Consent

Please provide details of how you will be obtaining informed consent.

i. Please detail your process for ensuring the informed consent of all research participants.
ii. The withdrawal process
iii. If vulnerable persons are to be used in the study, please give separate specific information on how you will ensure informed consent.
iv. If participants whose first language is not English are to be recruited, please state clearly how the details of the study will be explained and the informed consent process will be handled.

Please ensure you attach as separate documents (if applicable)

- *Participant Information Sheet (adults and/ children)*
- *Parent Information Sheet*
- *Informed Consent Form*
- *Children Assent Form*
- *Parent Consent Form*

- *School Permission Letter*
- *School Participant Information Sheet*

(400 words max)

Informed consent
Participants will be given study information at time of recruitment and in the beginning of focus group discussion so that they have adequate time to consider if they wish to participate. The study information sheet and will provide details of the study – the purpose, how it will be conducted, who is funding it, who is responsible, and what will happen when it is published.

I will assess individuals' capacity to give consent and offer choices within their capabilities. Potential participants can choose or refuse to participate. I will make effort to seek informed consent and record evidence that the individual consented to participate after weighing up potential risks and benefits. The consent form will note that the participant has read the information sheet had is satisfied that any queries they have had been answered; that taking part is entirely voluntary; they have the right not to answer any questions or leave the focus group discussion at any time; they can have their quotes to be redacted from the transcript or not used in the final manuscript.

On the day of focus group, all participants will sign a written consent from prior to focus group taking place. There will be another reminder about the consent procedure and how participants can withdraw at any time during the study.

Withdrawal
Participants can withdraw consent before the day of the focus group, during or even after without having to give a reason. They will need to notify the investigator. If for any reason participants lose capacity to consent during the study they will be withdrawn from the study based on exclusion criteria.

Participants who withdraw after the focus group discussions will be asked if they would like to have their quotes redacted from transcripts and not contribute to final analysis. Participants will still be paid expenses if they have travelled to the meeting but withdrew at any time.

For the proposed study, we will not be recruiting anyone who might be vulnerable such as young people under 16, or 16 and over who lack capacity to consent. We will exclude anyone who is unable to communicate in English.

Section 8: Ethical Summary

Please provide details of what you consider to be the ethical issues surrounding this project in LAY terms: your own physical safety, data protection/ confidentiality and how you have addressed this.

(500 words max)

Legal implications and Vulnerability
Our patient information leaflet and consent will mention possible legal issues which might arise when participants discuss past experiences. I will refer to General Medical Council on "Good Practice in Research and Consent to Research" which covers research involving young people, vulnerable adults and adults who might lack capacity. Inclusion criteria is age 16 or over, but they might discuss past sexual experience such as underage sex, non-consensual sex, and sexual abuse. I would need to assess their capacity to consent to sexual activity using "Fraser Guidelines" and assess risk of child sexual exploitation. Participant should not include names of third parties during discussions. We might halt discussions to take time out and ask if participants want to continue talking about it.

The discussion of sensitive issues could lead to emotional distress for participants. As a GP I am familiar with sensitive issues and how to manage these. We will have facilitators to run the focus groups, who will be trained to deal with sensitive issues and conflict resolution, and will be given a protocol on how to address issues. Participants can stop discussion of sensitive issues at any time and have this retracted from transcript. I have access to safe and secure rooms in Imperial College campus e.g. Sherfield Building SALC rooms and White City sites for group meetings.

Facilitators might be distressed from the discussions – there will be opportunity for debrief and also a protocol on how to seek help and advice.

Data protection/confidentiality
Digital recording device will be used to record discussions and stored on memory card of the Dictaphone. As soon as the interview is completed, files will be downloaded to a password-encoded drive on my PC at Imperial College London. There will be no back up on the Dictaphone or elsewhere.

I will hold a list of participants' contact details which will be on a spreadsheet and kept in my password-protected university computer hard drive. This spreadsheet also links participants to coded data that acts as a key, will only be held and accessible by me and will be and stored on a my secure university computer drive. No other identifiable personal data will be kept in any format or for anyone to access.

This contact list will only be kept as long as necessary:
1) to reimburse participants for attendance,
2) to send transcript to check for accuracy,
3) To send final manuscript.

All contact details will be destroyed after submission and publication of manuscript. Participants can ask for their contact details to be deleted at any time.

Prior to focus group discussions all participants will be given ground rules to respect confidentiality. Participants can use real name or pseudonym but they won't be identified during transcription process. They will not be identified from publication of qualitative research because data will be presented as quotes using codes or referred name for each participant. The key linking participants to their referred names will be held and accessed only by me. Any contact by email, website or social media will only be accessed by me.

Section 9: Protocol

Briefly describe in lay terms: what will happen, the number of times, the order and any data collection techniques.

(500 words max)

I will send out invitations to the focus group study with information sheets and consent forms designed using input from the Project Advisory Group. I will facilitate with one other researcher or facilitators who are used to working with specific demographics such as young people.

We will have two focus groups: women aged 16 to 19 and 20 to 24. We will recruit between 6 to 8 participants for each focus group. We will choose a date and time that is convenient for most participants; this might be after college or work or a weekend, and not during school holidays. We will find a venue that is easy to get to such as near major transport links such as King's Cross.

Topics for discussions will be based on previous literature. The engagement on social media and online forums might also generate discussion topics suitable for a focus group discussion. The topics for discussion might include:

- Getting contraception (routine, emergency, LARC) from different settings
- Getting advice, profiling, and unsolicited, opportunistic advice regarding contraception.
- Appropriateness of contraceptive discussions – assumptions made by healthcare professionals about individuals' risks. Sometimes overestimating risk in young people and underestimating risk in older women or people with long term conditions; or too embarrassed to discuss
- Appropriateness of discussing after an abortion

The focus group meetings will be 2-hour discussion recorded digitally (with backup). Commercial transcription service will be used to record the discussions. Transcript Diva is approved by Imperial College London and has confidentiality and ethics agreement in place.

We encourage participants to check the accuracy of transcripts by sending a copy to them by email if they consent to this. If there is no response, we will have to assume they have no comments to make.

Data will be organised using NVivo (data management software). Two researchers will code and compare coding schedules to identify key themes and concepts from transcripts. These categories will be discussed between the two researchers and any differences will be checked with a third, until all categories are agreed.

PAG will be involved to discuss how the findings relate to the real world, and how the public might interpret it. I will meet with the study team regularly to monitor the research.

Section 10: Documentation checklist – Self Declaration	
Select as appropriate. *These DO NOT need to be submitted to gain ethics approval.*	Yes/No/In process/Not needed
1. Have you had a Disclosure and Barring Service (DBS) check carried out? *If yes, when* Click or tap to enter a date.	Yes
2. Do you have a collaborative agreement in place? *This is needed if you are collaborating with organisations outside of Imperial College London. For further information, please contact your faculty research service.*	Not needed
3. Do you have a data access agreement in place? *This may be required if you are looking at secondary data.*	Not needed
4. Do you have a data sharing agreement in place? *This is needed if you are sharing data with organisations outside of Imperial College London. For further information, please contact your faculty research service.*	Not needed
5. Has Imperial College's Risk Assessment procedure been followed? *Please contact your departmental administrator for further information.*	Yes
6. Do Imperial College' insurers need to be notified about your project?	No

Insurance for all Imperial studies is provided by a commercial insurer, (please refer to website) https://www.imperial.ac.uk/joint-research-compliance-office/project-planning/insurance/ *For the majority of studies, the cover is automatic. However, for a minority of studies in certain categories, the insurer requires prior notification of the project before cover can be provided. For insurance enquiries please contact* insurance@imperial.ac.uk *If Yes, please provide confirmation that the appropriate insurance cover has been agreed. Please attach your Imperial College registration form and any related correspondence*	
7. Has your research project been independently peer reviewed? *This can be organised by the Peer Review Office (within the JRCO)* peerreviewoffice@imperial.ac.uk	Yes
8. Have you considered how best to store participant data to ensure compliance with General Data Protection Regulations?	Yes

PART 2

Section 11: Mitigation of Ethical Issues

For all ethical issues mentioned in sections 2 and 8, please provide further details explaining the rationale behind each issue and how it will be mitigated.

(500 words max)

The focus group discussions might include topics about the previous pregnancies whatever their outcome, their pregnancy intention at that time, and participants' experiences about getting routine and emergency contraception from general practice. Any responses that might involve abortion which might be sensitive for some participants and cause distress. I will ensure there will be "ground rules" at the beginning of each focus group about respecting participants' experiences and decisions and not to make judgemental statements, as well as keeping the information confidential. The participants will also be informed before the meetings that they do not need to disclose any personal experiences if they did not wish to.

We will explain ground rules on respecting participants' experiences and not to make judgemental statements. Participants will be told they do not need to disclose any personal experiences if they do not wish and can also retract these from the final transcript. There will be "time out" for participants who need this, for time to leave the room or discuss with trained facilitators. We will develop a protocol for facilitators on how to handle sensitive issues. Where sensitive issues are touched upon women will be offered helplines or leaflets regarding these issues.

There may be mentions of abortion (legal/illegal), sexual assault, non-consensual sex, domestic abuse, safeguarding issues during the focus groups. It will be made explicit in participant information leaflet and consent – participant should not include names of third parties, if there are potential legal implications then we may have time out and ask if participants want to continue talking about it. If these topics come up participants will be asked if they are fully aware of the legal implications of talking about these.

As previously mentioned, I will also refer to General Medical Council on "Good Practice in Research and Consent to Research" which covers research involving young people, vulnerable adults and adults who might lack capacity.

Financial incentives will be offered to participants, which will include reimbursements for travel expenses and their time to recognise their participation in the discussions. Each participant will spend no more than 2 hours on groups and will receive £50 as an Amazon voucher or a donation to their chosen charity, and up to £10 travel expenses. These are already costed using a template provided by NIHR INVOLVE and are included in the fellowship budget.

As a GP, I am interested in how patients use general practices for contraceptive advice. I also provide LARC services in my practice for which our practice receives extra income. I will mention how this might affect the conduct of focus group discussion and interpretation of the findings as part of the process of writing up a qualitative study (reflexivity).

Section 12: Previous Ethics Approval

Has any part of this proposal received prior ethics approval?

Select as appropriate **No**

If yes or rejected, please give details and attach any relevant documents.

(150 words max)

Section 13: Mitigation of Risks

i. Please state briefly the precautions being taken to protect the health and safety of researchers and others associated with the project (as distinct from the research participants).

ii. Please state briefly the precautions being taken to protect the health and safety of research participants.

(500 words max)

The discussion of sensitive issues could lead to emotional distress and discomfort for participants. I am a GP and familiar with sensitive issues and how to manage these. We will have trained facilitators to run the focus groups – they will be trained in how to deal with sensitive issues and conflict resolution, and in addition be given a protocol on how to address issues.

Participants can stop discussion of sensitive issues at any time and have this retracted from transcript also. Facilitators themselves may be distressed as a result of the discussion – there will be opportunity for them to debrief and also a protocol on how to seek help and advice.

We will mention some legal implications of certain topics such as underage sex, non-consensual sex and domestic violence in the study information sheet. We will direct participants to appropriate support and helplines if appropriate. As researcher and a healthcare professional, I have a duty of care to the participants. As a registered medical practitioner, I have a professional duty to report any potentially illegal activity such as sexual abuse, underage sex and rape, particularly if a third party has been harmed.

Section 14: Confidentiality and Management of personal and other research data

Please describe how you intend to ensure anonymity and confidentiality. To ensure compliance with the General Data Protection Regulation participants must be informed of what information will be held about them and who will have access to it (this relates to information that is identifiable or could potentially be linked back to an individual.

In your answer please consider the following:

i. from whom are you collecting personal data
ii. what types of personal data will be collected?
iii. will you be sharing personal data outside the research team and if so with whom?
iv. is expected that any personal data will be shared or stored in services located outside the EEA;
v. what measures will be in place to protect personal data (e.g. who can access the data, pseudonymisation)

(400 words max)

Participants will be recruited from various settings such as schools, social media and other networks such as young people's charities. Only details sufficient to make contact and allocate age group will be collected; this may include mobile phone number, email address or Twitter handle using direct messaging which is more private. Researchers do not have direct access to participants' records whichever setting the participants are recruited from.

There will be ground rules on maintaining confidentiality, which will also be on their participant information leaflets. Facilitators will be given a protocol for conducting the focus groups to maintain confidentiality. The discussions are digitally recorded on audio, and participants will only have to give a name (real or pseudonym) so they won't be identified during the transcription process. As soon as the interview is completed, files will be downloaded to a password-encoded drive on my PC at Imperial College. There will be no back up on the Dictaphone or elsewhere.

Participants can change identifiable details within the transcripts and researchers might alter some identifiable details in the transcript so participants cannot be identified. They will not be identified from publication of qualitative research because data will be presented as quotes using codes or referred name for each participant. A key for the linkages between the names and codes will only be accessed by me. A commercial transcription service that is approved by Imperial College London will be used with adequate encryption (Transcript Divas).

I will hold a list of participants' contact details which will be on a spreadsheet and kept in a university computer hard drive and will be password protected. There will also be a spreadsheet linking participants to coded data that acts as a key – this will only be held and accessible by me and will be password protected and stored on a secure university computer drive belonging to me. Bank details will be collected later to reimburse participants and these will be held securely on a password-protected computer and processed securely via Imperial College London finance department. No other identifiable personal data will be kept in any format or for anyone to access.

The list will only be kept as long as necessary: 1) to reimburse participants for attendance 2) to send transcript to check for accuracy 3) to send final manuscript. All contact details will be destroyed after submission and publication of manuscript. Participants can ask for their contact details to be deleted at any time.

PART 3

Section 15: Co-investigators/ Collaborators

If there are more than 3 co-investigators, please use a separate sheet and follow the format below

1. Name:	Dr Maggie Cheung
2. Position:	Foundation Year Doctor, Imperial College London
3. Telephone: *Imperial College not private*	

4. Email: *Imperial College not private*	

5. Name:	Professor Helen Ward
6. Position:	Professor and secondary Supervisor
7. Telephone: *Imperial College not private*	+44 20 7594 3303
8. Email: *Imperial College not private*	

9. Name:	Professor Sonia Saxena
10. Position:	Professor, Child Health Unit and primary supervisor
11. Telephone: *Imperial College not private*	+44 20 7594 0839
12. Email: *Imperial College not private*	

13. Name:	Ms Rebecca Blaylock
14. Position:	Research and Engagement Officer British Pregnancy Advisory Service (BPAS)
15. Telephone: *Imperial College not private*	020 7601 3380
16. Email: *Imperial College not private*	

17. Name:	Dr Lorna Hobbs
18. Position:	Clinical Psychologist, Gender Identity Development Service GIDS, The Tavistock Centre 120 Belsize Lane London NW3 5BA
19. Telephone: *Imperial College not private*	
20. Email: *Imperial College not private*	

Signatures Page - PI Declaration

I declare that:

- I undertake to abide by the ethical principles underlying the Declaration of Helsinki (1964) and subsequent amendments and good practice guidelines on the proper conduct of research.
- I undertake to abide by the Data Protection Act 2018 and General Data Protection Regulation (Europe) and any applicable local laws.
- I undertake to abide by all local laws and regulations for non-UK research.
- I will report any adverse or unforeseen events which occur to the Ethics and Research Governance Co-ordinator within 24 hours.
- I will provide an annual progress report of the project until the end of the study.
- I will provide notification of the end or early termination of the research project.
- I will provide notification of amendment to ICREC/SETREC if there are any changes to the research protocol or personnel which affect the ethical aspects of the project.
- I will assist ICREC/SETREC in any continuing review of the project deemed necessary by the Committee or Faculty Members.
- I will reapply for ethics approval after 5 years.
- All information on this form is correct.

Name:	Dr Richard Ma
Signature:	
Date:	01/02/2019
If full committee review is required would you be willing to attend the ICREC/SETREC meeting to answer any questions about your proposal? Yes	

Any attendance must be by the PI named in section three of this application form. If this is a student application, the student may attend only if the supervisor is present. Dates for the meeting can be found here. Attendance at the meeting will give you the opportunity to answer any ethical questions raised by the committee.

Head of Department *(please indicate below your decision and the reasons for it)*			
Decision	Approved	Referral to Committee	ICREC
Reason:	Focus-group study, non-interventional		
Signature:		Date: 13/02/2019	
Name:	Choose an item.	Prof. Azeem Majeed	

RGIT decision *(please indicate below your decision and the reasons for it)*			
Decision	Choose an item.	Referral to Committee	Choose an item.
Reason:			
Signature:		Date: Click or tap to enter a date.	
Name:	Choose an item.	RGIT ref: Choose an item.	

24.3 ICREC Protocol

How can primary care professionals support contraceptive decision making for women?

<Vers3 27/7/19>

Study Management Group
Principal Investigator: Dr Richard Ma [RM]

Co-investigators: Dr Lorna Hobbs [LH], Ms Rebecca Blaylock [RB], Dr Maggie Cheung [MC], Professor Helen Ward [HW], Professor Sonia Saxena [SS]

Sponsor

Imperial College London is the main research Sponsor for this study. For further information regarding the sponsorship conditions, please contact the Head of Research Governance and Integrity at r.nicholson@imperial.ac.uk .

Funder

National Institute of Health Research – Doctoral Research Fellowship - reference DRF-2017-10-181

This protocol describes the title study –"How can primary care professionals support contraceptive decision making for women?" and provides information about procedures for entering participants. Every care was taken in its drafting, but corrections or amendments may be necessary. These will be circulated to investigators in the study. Problems relating to this study should be referred, in the first instance, to the Principal Investigator.

This study will adhere to the principles outlined in the UK Policy Frame Work for Health and Social Care Research It will be conducted in compliance with the protocol, Data Protection Act 2018 and General Data Protection Regulations (Europe) and other regulatory requirements as appropriate.

INTRODUCTION

1.1 Background

Unplanned pregnancies can have emotional and financial costs to mother and society and poor health outcomes for both mother and child. Government plans to reduce unplanned pregnancies have included: Teenage Pregnancy Strategy (aimed to improve access to contraception, sex education and tackling social exclusion) and National Institute for Health and Care Excellence (NICE) recommending long acting reversible contraception (LARC) including injections, implants, and intrauterine devices (IUDs or "coils") because they work better. In the UK, general practice is the preferred setting for women to obtain contraception according to national surveys. In 2009 general practitioners (GPs) were incentivised to give advice about LARC for women attending for contraceptive care.

However, despite these, the number of women having abortions (which is used as a proxy indicator of unplanned and unwanted pregnancies) has not reduced significantly over the last ten years, particularly in women under 25.

1.2 Study Rationale

From previous research we know women are more likely to have an unplanned pregnancy if they are under 25, from poorer backgrounds, if they smoke, use drugs, or if they suffer from a mental health condition. Many women visit their general practitioners (GPs) for contraception but not all are able to discuss their contraceptive needs, such as those with learning disabilities and mental health problems. Some clinicians might also make assumptions about what a woman might want, or just recommend what they are familiar with, thus potentially restricting the right choice for the individual.

There might be differences in the way women make choices about their use of contraceptives and these might vary indifferent demographics. Contraceptive preferences might change throughout a woman's life course; the same woman might want to use one method in her younger years compared with older years after her family is complete.

To date, there are not many qualitative studies of different demographics of women to understand the particular contraceptive needs of these individual groups.

STUDY OBJECTIVES

For this study, we want to explore what it is like for young women to get contraception from different healthcare settings particularly general practice. We want to know what can be improved to make it a better experience for all women to get the contraceptives they want and when they need it. We also want to look at what advice women found helpful to decide on the contraception that is best suited to them.

STUDY DESIGN

We will be conducting focus group studies of two demographics of young women: one group of 16 to 19 years old and another group of 20 to 24, consisting of between 6 to 8 people per group. Women aged under 25 are overrepresented in abortion statistics so they might have most to gain from contraceptive care. We further divided the group into 16 to 19 and 20 to 24 as they might have different needs and experiences for contraceptive care; for example the younger group might be in full time education and the older group in university or working and even include some young mums.

We will recruit from a variety of settings such as: universities, colleges, further education colleges and charities such as Brook. We will also use social media such as Twitter to recruit people which will include a link to information and contacts. We also have representatives from young people's organisations on the Project Advisory Group (PAG) who will help us recruit via their networks.

Participants will be given study information at time of recruitment and in the beginning of focus group discussion so that they have adequate time to consider if they wish to participate. The study information sheet and will provide details of the study – the purpose, how it will be conducted, who is funding it, who is responsible, and what will happen when it is published.

We will assess individuals' capacity to give consent and offer choices within their capabilities. Potential participants can choose or refuse to participate. We will make effort to seek informed consent and record evidence that the individual consented to participate after weighing up potential risks and benefits. The consent form will note that the participant has read the information sheet had is satisfied that any queries they have had been answered; that taking part is entirely voluntary; they have the right not to answer any questions or leave the focus group discussion at any time; they can have their quotes to be redacted from the transcript or not used in the final manuscript.

On the day of focus group, all participants will sign a written consent from prior to focus group taking place. There will be another reminder about the consent procedure and how participants can withdraw at any time during the study. We will also make a risk assessment of the room we are using – to ensure it is private and confidential space for discussion.

We plan to recruit in spring 2019 and for the focus groups to have been conducted by the summer. Topics for discussions will be based on previous literature. The engagement on social media and online forums might also generate discussion topics suitable for a focus group discussion. The topics for discussion might include:

- Getting contraception (routine, emergency, LARC) from different settings
- Getting advice, profiling, and unsolicited, opportunistic advice regarding contraception.
- Appropriateness of contraceptive discussions – assumptions made by healthcare professionals about individuals' risks. Sometimes overestimating risk in young people and underestimating risk in older women or people with long term conditions; or too embarrassed to discuss
- Appropriateness of discussing after an abortion

The focus group meetings will be 2-hour discussion recorded digitally (with backup). This will be facilitated by LH and observed by RM making initial notes. Commercial transcription service will be used to record the discussions. I will use Transcript Divas which as confidentiality and ethics agreement with Imperial College London.

We will check the accuracy of transcripts with individual group members by sending a copy to them by email.

Data will be organised using NVivo (data management software). Three researchers will code and compare coding schedules to identify key themes and concepts from transcripts [RM, LH, RB]. These categories will be discussed between the researchers and any differences will be checked with a fourth [MC], until all categories are agreed.

PARTICIPANT RECRUITMENT

4.1 Pre-recruitment evaluations

There are no evaluations pre-recruitment.

4.2 Inclusion Criteria

Any woman who is aged 16 to 24, who has obtained contraception from a non-healthcare setting, can read and speak English, and has capacity to consent.

4.3 Exclusion Criteria

Main exclusion criteria are: women outside this age range, if they are unable to under-stand enough English to consent and take part in focus group discussions, and women with impaired or limited capacity to give consent. They must also be willing to travel to a central London venue for a 2 hour focus group discussion.

4.4 Withdrawal Criteria

Participants can withdraw consent before the day of the focus group, during or even after without having to give a reason. They will need to notify the investigator. If for any reason participants lose capacity to consent during the study they will be withdrawn from the study based on exclusion criteria.

Participants who withdraw after the focus group discussions will be asked if they would like to have their quotes redacted from transcripts and not contribute to final analysis. Participants will still be paid expenses if they have travelled to the meeting but withdrew at any time.

ADVERSE EVENTS
5.1 Definitions
Adverse Event (AE): any untoward occurrence in a participant.

Serious Adverse Event (SAE): any untoward and unexpected occurrence or effect that:
Results in death
Is life-threatening – refers to an event in which the subject was at risk of death at the time of the event; it does not refer to an event which hypothetically might have caused death if it were more severe

Requires hospitalisation
Results in persistent or significant disability or incapacity

The focus group discussions might include topics about the previous pregnancies whatever their outcome, their pregnancy intention at that time, and participants' experiences about getting routine and emergency contraception from general practice. Any responses that might involve abortion which might be sensitive for some participants and cause distress. I will ensure there will be "ground rules" at the beginning of each focus group about respecting participants' experiences and decisions and not to make judgemental statements, as well as keeping the information confidential. The participants will also be in-formed before the meetings that they do not need to disclose any personal experiences if they did not wish to.

We will explain ground rules on respecting participants' experiences and not to make judgemental statements. Participants will be told they do not need to disclose any person-al experiences if they do not wish and can also retract these from the final transcript. There will be "time out" for participants who need this, for time to leave the room or dis-cuss with trained facilitators. We will develop a protocol for facilitators on how to handle sensitive issues. Where sensitive issues are touched upon women will be offered helplines or leaflets regarding these issues.

There may be mentions of abortion (legal/illegal), sexual assault, non-consensual sex, domestic abuse, safeguarding issues during the focus groups. It will be made explicit in patient information leaflet and consent – participant should not include names of third parties, if there are potential legal implications then we may have time out and ask if participants want to continue talking about it. If these topics come up participants will be asked if they are fully aware of the legal implications of talking about these.

As previously mentioned, I will also refer to General Medical Council on "Good Practice in Research and Consent to Research" which covers research involving young people, vulnerable adults and adults who might lack capacity.
Reporting Procedures
All adverse events should be reported. Any questions concerning adverse event reporting should be directed to the Principal Investigator in the first instance.

5.2.1 Non serious AEs
All such events, whether expected or not, should be recorded.

5.2.2 Serious AEs
An SAE form should be completed and emailed to the Principal Investigator within 24 hours.

All SAEs should be reported to the Ethics and Research Governance Coordinator where in the opinion of the Principal Investigator, the event was:
'related', i.e. resulted from the administration of any of the research procedures; and
'unexpected', i.e. an event that is not listed in the protocol as an expected occurrence

Local investigators should report any SAEs as required by their Local Research Ethics Committee, Sponsor and/or Research & Development Office.

ASSESMENT AND FOLLOW UP

The follow up will be limited to:
Data validation to check accuracy of transcript
Arranging expenses claim
Giving details of publication and dissemination

REGULATORY ISSUES

7.1 Ethics approval

The Principal Investigator has obtained approval from the Head of Department and Imperial College Research Ethics Committee (ICREC). The study will be conducted in accordance with the recommendations for physicians involved in research on human subjects adopted by the 18th World Medical Assembly, Helsinki 1964 and later revisions.

7.2 Consent

Consent to enter the study must be sought from each participant only after a full explanation has been given, an information leaflet offered and time allowed for consideration. Signed participant consent should be obtained. The right of the participant to refuse to participate without giving reasons must be respected. All participants are free to withdraw at any time.

7.3 Confidentiality

The Principal Investigator will preserve the confidentiality of participants taking part in the study and fulfil transparency requirements under the General Data Protection Regulation for health and care research. Data and all appropriate documentation will be stored for a minimum of 10 years after the completion of the study, including the follow-up period.

Participants will be recruited from various settings such as social media and other networks such as young people's charities. Only details sufficient to make contact and allocate age group will be collected; this may include mobile phone number, email address or Twitter handle. Recruitment from clinics will be direct from participating sites and researchers do not have direct access to patients' records.

There will be ground rules on maintaining confidentiality, which will also be on their patient information leaflets. Facilitators will be given a protocol for conducting the focus groups to maintain confidentiality. The discussions are digitally recorded on audio, and participants will only have to give a name (real or pseudonym) so they won't be identified during the transcription process. As soon as the interview is completed, files will be down-loaded to a password-encoded drive on my PC at Imperial College. There will be no back up on the Dictaphone or elsewhere.

Participants can change identifiable details within the transcripts and researchers might alter some identifiable details in the transcript so participants cannot be identified. They will not be identified from publication of qualitative research because data will be presented as quotes using codes or referred name for each participant. A key for the linkages between the names and codes will only be accessed by me. A commercial transcription service that is approved by Imperial College London will be used with adequate encryption.

I will hold a list of participants' contact details which will be on a spreadsheet and kept in a university computer hard drive and will be password protected. There will also be a spreadsheet linking participants to coded data that acts as a key – this will only be held and accessible by me and will be password protected and stored on a secure university computer drive belonging to me. Bank details will be collected later to reimburse participants and these will be held securely on a password-protected computer and processed securely via Imperial College London finance department. No other identifiable personal data will be kept in any format or for anyone to access.

The list will only be kept as long as necessary: 1) to reimburse participants for attendance 2) to send transcript to check for accuracy 3) to send final manuscript. All contact details will be destroyed after submission and publication of manuscript. Participants can ask for their contact details to be deleted at any time.

7.4 Indemnity

Imperial College London holds negligent harm insurance policies which apply to this study.

7.5 Sponsor
Imperial College London will act as the main Sponsor for this study

7.6 Funding
The National Institute for Health Research are funding this study. Their funding includes:
Salary for PI
PhD fees
Structure costs eg supervision and host institution
Training costs for fellow including conferences and courses
Research costs including software, hardware, participant costs, equipment.

Financial incentives will be offered to participants, which will include reimbursements for travel expenses and their time to recognise their participation in the discussions. Each participant will spend no more than 2 hours on groups and will receive £50 as an Amazon voucher or a donation to their chosen charity, and up to £10 travel expenses. These are already costed using a template provided by NIHR INVOLVE and are included in the fellowship budget.

7.7 Audits
The study may be subject to inspection and audit by Imperial College London under their remit as sponsor and other regulatory bodies to ensure adherence to GCP and the UK Policy Framework for Health and Social Care Research.

STUDY MANAGEMENT
The day-to-day management of the study will be co-ordinated through Dr Richard Ma, supervised by Professor Helen Ward and Professor Sonia Saxena

PUBLICATION POLICY

The NIHR has its own publication policy:

“[the NIHR} expect that all NIHR funded research will be reported fully and publicly available when the research has been completed. The standard NIHR contract with researchers includes the following statement:
“17.7 The Contractor shall ensure that the outcome of the Research is prepared for publication in a suitable peer-reviewed journal”

We expect that all researchers who have a contract with the NIHR to undertake research shall ensure that the outcome of the research is prepared as a research paper for publication in a suitable peer-reviewed journal. There is also a contractual obligation that the researchers should, at the time of submission of their research paper to a peer-reviewed journal, send a copy of this to the NIHR Programme issuing the contract. This is to fulfil reporting requirements. It will also allow a mechanism by which NIHR Programmes can monitor the contractual obligation of researchers to prepare such a research paper on all NIHR funded research.”

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24.4 ICREC Participant Information Sheet

PARTICIPANT INFORMATION SHEET

Study title: How can primary care professionals support contraceptive decision making for women?

Investigator Name and Contact No: Dr Richard Ma 07979 752 420

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish.

Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for reading this.

What is the purpose of the study?

This project is a component of a Fellowship funded by the National Institute for Health Research (NIHR). The NIHR funds, supports and delivers high quality research that benefits the NHS, public health and social care.

We know that young women under the age of 25 find it more difficult to discuss their contraceptive needs with healthcare professionals, and also have higher rates of unwanted pregnancy. We want to explore young women's experiences of getting contraceptive advice in healthcare settings, what helpful or unhelpful advice they have received, and what they think healthcare professionals could do to help women make better decisions about their contraception.

The study will use focus groups to explore women's experiences of getting contraceptive advice, any barriers they faced, and their views on how to support them to make the right choice for them. Each focus group will be no more than 2hours long, with a maximum of 8 participants consisting of women aged 16 to 19 and 20 to 24. The discussions will be moderated by trained facilitators.

Why have I been chosen?

You have been chosen because you fit the key demographic of interest – aged between 16 and 24 years old.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. A copy of the written information and signed Informed Consent form will be given to you to keep.

What will happen to me if I take part?

You will be contact by the principal researcher (Dr Richard Ma) to check you understand the study and what to expect at the focus group. We will give you plenty of notice of the date and time of the focus group meeting in a central London venue.

There will be a total of up to 8 participants. The discussion will be led by a facilitator (Dr Lorna Hobbs) and will take no more than 2 hours. During this time there will be opportunities to discuss your experiences of getting contraception from any healthcare setting.

The focus group will be recorded using digital audio recording device and transcript typed up. The transcripts of interviews are available to the investigators (Dr Richard Ma, Dr Lorna Hobbs and Ms Rebecca Blaylock) and his supervisor only. Information obtained through interviews will be used in aggregate form. Where transcripts are quoted no reference will be made to your name or age. All transcripts will be kept by the principal investigator (RM) in a secured file and for the duration of the doctorate study, after which they will be destroyed.

What are the possible disadvantages and risks of taking part?

During the discussion you might discuss your experiences of getting pregnant whatever the outcome; this might include abortion or miscarriage. You might also discuss past relationships, which might include abusive relationships. You do not have to disclose your own experiences if you do not want to share them. If you feel upset after the discussion, we can help you and direct you to support networks or further advice.

What are the possible benefits of taking part?

You will share your experience of contraception with other women of similar age. You might learn about other contraceptive methods from other group members which might suit you better now or in the future. You will be better informed about the choices available and how to ask for them when you next see a doctor or nurse.

You will be compensated for your time for taking part, this includes a small token of appreciation in the form of an Amazon voucher and travel expenses. You may need to declare this if you receive income support.

What if something goes wrong?

'Imperial College holds Public Liability ("negligent harm") insurance policies which apply to this study. If you can demonstrate that you experienced serious and enduring harm as a result of your participation in this study, you may be eligible to claim compensation without having to prove that Imperial College is at fault. If the injury resulted from any procedure which is not part of the study, Imperial College will not be required to compensate you in this way. Your legal rights to claim compensation for injury where you can prove negligence are not affected. Please contact the Principal Investigator if you would like further information about the insurance arrangements which apply to the trial'

Will my taking part in this study be kept confidential?

Imperial College London is the sponsor for this study based in the United Kingdom. We will be using information from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Imperial College London will keep identifiable information about you.

- 10 years after the study has finished in relation to data subject consent forms.
- 10 years after the study has completed in relation to primary research data.

Further information on Imperial College London's retention periods may be found at https://www.imperial.ac.uk/media/imperial-college/administration-and-support-services/records-and-archives/public/RetentionSchedule.pdf

Your rights to access, change or move your information are limited, as we need to manage your information in specific ways in order for the research to be reliable and accurate. If you withdraw from the study, we will keep the information about you that we have already obtained. To safeguard your rights, we will use the minimum personally-identifiable information possible.

You can find out more about how we use your data by contacting Dr Richard Ma 07979 752 420 or at r.ma@imperial.ac.uk.

LEGAL BASIS

As a university we use personally-identifiable information to conduct research to improve health, care and services. As a publicly-funded organisation, we have to ensure that it is in the public interest when we use personally-identifiable information from people who have agreed to take part in research. This means that when you agree to take part in a research study, we will use your data in the ways needed to conduct and analyse the research study.

Health and care research should serve the public interest, which means that we have to demonstrate that our research serves the interests of society as a whole. We do this by following the UK Policy Framework for Health and Social Care Research.

INTERNATIONAL TRANSFERS

There may be a requirement to transfer information to countries outside the European Economic Area (for example, to a research partner). Where this information contains your personal data, Imperial College London will ensure that it is transferred in accordance with data protection legislation. If the data is transferred to a country which is not subject to a European Commission (**EC**) adequacy decision in respect of its data protection standards, Imperial College London will

enter into a data sharing agreement with the recipient organisation that incorporates EC approved standard contractual clauses that safeguard how your personal data is processed.

CONTACT US

If you wish to raise a complaint on how we have handled your personal data or if you want to find out more about how we use your information, please contact Imperial College London's Data Protection Officer via email at dpo@imperial.ac.uk, via telephone on 020 7594 3502 and via post at Imperial College London, Data Protection Officer, Faculty Building Level 4, London SW7 2AZ.

If you are not satisfied with our response or believe we are processing your personal data in a way that is not lawful you can complain to the Information Commissioner's Office (ICO). The ICO does recommend that you seek to resolve matters with the data controller (us) first before involving the regulator.

Dr Richard Ma will keep your name and contact details confidential and will not pass this information to NIHR. Imperial College London will use this information as needed, to contact you about the research study, to make reimbursements, and make sure that relevant information about the study is recorded for your care, and to oversee the quality of the study. Certain individuals from Imperial College London and regulatory organisations may look at your research records to check the accuracy of the research study. Imperial College London will only receive information without any identifying information. The people who analyse the information will not be able to identify you and will not be able to find out your name or contact details.

What will happen to the results of the research study?

Results of the research will be published in a scientific journal. The NIHR is committed to free access to studies that it funds so any member of the public can access the research without paying for it.

Who is organising and funding the research?

This project is a component of a Fellowship funded by the National Institute for Health Research (NIHR). The NIHR funds, supports and delivers high quality research that benefits the NHS, public health and social care.

Dr Richard Ma is funded by a Doctoral Research Fellowship (DRF-2017-10-181) for this research project. This project presents independent research. The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health and Social Care.

Who has reviewed the study?

This study was given ethical approval by Imperial College Research Ethics Committee (ICREC).

Contact for Further Information

If you have any further questions or queries about the study please do not hesitate to contact me at r.ma@imperial.ac.uk.

If you have any concerns about the conduct of this study, please contact my supervisor Helen Ward at h.ward@imperial.ac.uk.

24.5 Consent Form

Consent Form for Participants Able to Give Consent

Full Title of Project: Study title: How can primary care professionals support contraceptive decision making for women?

Name of Principal Investigator: Dr Richard Ma

	Please initial box
1. I confirm that I have read and I understand the participant information sheet dated 17/07/2019 version 3 for the above study and have had the opportunity to ask questions which have been answered fully.	
2. I understand that my participation is voluntary and I am free to withdraw at any time, without giving any reason and without my legal rights being affected.	
3. I agree to be audio recorded.	
4. I agree to having my audio sent to a commercial transcription service (Transcript Divas – which has full confidentiality and ethics agreement with Imperial College London)	
5. I have been informed that the meeting room has been risk assessed and agree for it to be used for focus group meeting.	
6. I agree to take part in the study.	

_____	_____	_____
Name of Participant	**Signature**	**Date**
_____	_____	_____
Name of Person taking consent (if different from Principal Investigator)	**Signature**	**Date**
Dr Richard Ma		15th August 2019
Principal Investigator	**Signature**	**Date**

1 copy for participant; 1 copy for Principal Investigator

24.6 Study invitation

Date: 17/7/2019

Dear Participant,

Thank you for your interest in this research.

I am a part-time GP with an interest in sexual health. I am doing a study on contraceptive care in general practice as part of my PhD, funded by the National Institute for Health Research (NIHR).

We know from current research that young women under the age of 25 find it more difficult to discuss contraception with their GPs, and have higher rates of unplanned pregnancies. I want to know what sort of things women would like from their GPs to help them make the right choice about their contraception.

I want to find out your experience of getting contraception from general practice, sexual health or family planning clinics, what helpful or unhelpful advice you have been given, and what you think professionals like GPs and nurses can do to make it a better experience for you.

I would like to invite you to participate in a focus group with other women of similar age (16 to 19 years or 20 to 24), to discuss your experiences. The focus group will have no more than 8 participants and will last no more than 2 hours.

To compensate for your time, we can offer £50 in the form of an Amazon voucher or an equivalent donation to a charity of your choice. You will also receive up to £10 for travel expenses.

What you discuss during the focus group will be kept confidential. Your personal information will be coded and anonymised, and therefore will be unidentifiable. If during the discussion, you disclose harmful or distressing experience (such as domestic violence or sexual abuse), we may pause the focus group discussion, advise you of any possible legal implication and check if you wish to continue the discussion or withdraw what you discussed, and offer you information and support if needed. You will receive a copy of the transcript to the focus group, a copy of the study findings and a copy of the final manuscript.

I enclose further details about the study and consent form for you to sign on the day.

Yours sincerely

Dr Richard Ma
r.ma@imperial.ac.uk

24.7 Topic guide

Imperial College London

Improving the effectiveness, equity and experiences of contraceptive care in general practice – focus group study

Objectives:

- *To explore the knowledge and attitudes of young women about contraceptive methods*
- *To explore the experiences of obtaining and using contraceptives*
- *To explore their views on what a "good" contraceptive service might be like*

1. Introduction – 5 minutes
    - Introduce facilitators, organisation and funder
    - Nature and purpose of research
    - Digital recorder, transcription, consent forms
    - Confidentiality, anonymity
    - How focus groups work, ground rules, no right or wrong answers

A range of contraceptives will be put to the group to explore. Participants will be encouraged to pick one from the pile for whatever reason.

Prompt: you might recognise methods you have used, currently using, had or heard of good or bad things. Or you might be curious about a contraceptive.

2. "Tell us your name and why you have picked out that particular contraceptive" – 25 mins
    - This section aims to encourage discussion about different contraceptive methods including what people's experiences and preferences.
    - Why did you pick that method?
    - Positive or negative experience?
    - Are you curious/ambivalent about another method?
    - What would help you decide on what to use?
    - Non-contraceptive benefits? Discretion? Recommendations by friends/peers? What you read? What the healthcare professional recommended?
    - What would you recommend a friend/peer/your child?

3. "Tell us about the last time you went to get a contraceptive" – 25 mins
    - Where did you go?
    - How was the experience?
    - Was it what you expected?

- Would you go again? Recommend a friend?

4. What do you think about the services now? - 20 mins
    - What does a “good service” look like?
    - What needs to change?
    - What would help you make the right choice for you?
    - What else would you use or do to get more information?

5. Close – 5 mins
    - Thank participants
    - Emphasise confidentiality and anonymity
    - How to contact research team in case of any queries or concerns
    - Reimbursements

Total 80mins + 10mins buffer

Dr Richard Ma
r.ma@imperial.ac.uk

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

Developed from:
Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

YOU MUST PROVIDE A RESPONSE FOR ALL ITEMS. ENTER N/A IF NOT APPLICABLE

No. Item	Guide questions/description	Reported on Page #
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Inter viewer/facilitator	Which author/s conducted the inter view or focus group?	Method
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	NA – will mention for manuscript
3. Occupation	What was their occupation at the time of the study?	Method
4. Gender	Was the researcher male or female?	Method
5. Experience and training	What experience or training did the researcher have?	Method
Relationship with participants		
6. Relationship established	Was a relationship established prior to study commencement?	Method
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Method
8. Interviewer characteristics	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	Method
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Method
Participant selection		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Method
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	Method
12. Sample size	How many participants were in the study?	Results
13. Non-participation	How many people refused to participate or dropped out? Reasons?	Results
Setting		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	Method
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	Results
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	Results
Data collection		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Method
18. Repeat interviews	Were repeat inter views carried out? If yes, how many?	N/A
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	Method
20. Field notes	Were field notes made during and/or after the inter view or focus group?	Method

21. Duration	What was the duration of the inter views or focus group?	Method
22. Data saturation	Was data saturation discussed?	Discussion
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	Result
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	How many data coders coded the data?	Method
25. Description of the coding tree	Did authors provide a description of the coding tree?	N/A
26. Derivation of themes	Were themes identified in advance or derived from the data?	Results
27. Software	What software, if applicable, was used to manage the data?	NVivo
28. Participant checking	Did participants provide feedback on the findings?	Method
Reporting		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Results
30. Data and findings consistent	Was there consistency between the data presented and the findings?	Results/Discussion
31. Clarity of major themes	Were major themes clearly presented in the findings?	Results
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Results

24.8 Codebook of qualitative data– different iterations

Name	Description	Files	References
A good service		1	1
A good first impression		1	4
Competence		1	1
Confidential		1	1
Empathy		2	4
Enquires about emotional well being and safety		2	3
Good rapport		2	4
Makes no assumptions about contraceptive need		2	2
Non judgemental		2	3
Not patronising		1	4
Offers time		1	1
Questions that are routine - part of check list	Not feel being singled out for these questions	1	2
Respectful non condescending		1	7
Responsitve		1	1
Validates the maturity and responsibility of action		2	4
Access		2	10
A&E		1	3
Confidentiality		2	2

Name	Description	Files	References
Feeling anonymous		1	1
GP		2	7
Perception of appropriateness		2	5
SH clinic		2	14
Venue		2	6
Advice about sex and contraception		2	17
Background research		1	1
Family		1	3
GP		2	17
Online		1	1
Parents		2	12
Peers		2	3
PHSE in school		2	14
School		2	15
School nurse		2	5
Sexual health clinic		2	14
Holistic assessment		2	7
Safeguarding		1	3
STI HIV risk assessment		1	2
Sibliings		2	5
Uni and colleges - advisor		1	1
Youth clubs		0	0

Name	Description	Files	References
Barriers		1	3
Timeliness		1	2
User reliability		1	3
Benefits		1	1
Caps and diaphragms		1	2
Disruptive		1	1
Messy		1	1
Specific demographic		1	1
Condoms		2	31
C card scheme		2	6
Comfort and acceptability		1	3
Effectiveness and reliability		2	5
Female condoms		1	2
Free		2	7
Out of pocket expense		1	1
Quantity		1	3
Restrictions		1	1
Shops		1	1
Cultural	Cultural norms about using some methods or other methods frowned upon.	2	13
Disapproval from family or parents mainly mum		2	10
Discontinuation		1	4
Drug mules and agents		2	3

Name	Description	Files	References
Emergency Contraception		2	14
A&E		1	1
Community pharmacies		1	2
Out of pocket		2	3
Time limit		2	3
Types of EHC		1	3
Uncertainty of effectiveness		2	3
Empowerment		1	1
Exercising choice		2	23
Assumptions about need		1	2
Default option		1	3
Discretion		2	3
Ease of use		1	1
Finding information		1	11
Preferences and exercising choice		2	10
Trade offs		1	2
Fear of being found out		2	10
Feeling isolated		1	1
Feeling judged and shamed		2	34
Gender differences in talking about sex		2	12
Gender roles in contraception		2	12
Harm minimisation		1	3

Name	Description	Files	References
Hormones		2	21
Confouding effects		1	4
Mood problems		2	5
Side effects		2	14
LARC		2	8
Implant		2	10
Injection		0	0
IUD		2	7
IUS		2	3
Men		2	17
Complacency about sexual health		1	4
Dads		1	3
Gaming behaviour		1	3
Responsibility		2	17
Shared		0	0
Sole responsibilty		2	2
Trust		1	4
Understanding women's reproductive health		1	4
Natural FP		1	1
Non contraceptive benefits		2	14
Open discussion group		1	7

Name	Description	Files	References
Openness to talk about sex and sexuality		2	11
Parents being overprotecdtive		2	4
Patches		2	7
Peer support		2	8
Perception of naivity of family and peers	Apparently unaware of sexual activity	2	4
Pill		2	10
Effectivenes		1	2
User reliability		1	5
Pressure to conform to have sex		1	1
Recognitiion of maturity and responsibilty		2	4
Status symbol, cool		1	1
Undesirable effects		1	5

Focus Group 16-24

Nodes

Name	Description	Files	References
Access and venues		2	93
A&E		1	4
Confidentiality		2	5
Feeling anonymous		2	6
GP		2	22

Name	Description	Files	References
Mules and agents		2	3
Perception of appropriateness		2	6
Pharmacy		2	7
SH clinic		2	27
Shops or supermarkets		1	2
Youth clubs		1	1
Barriers to information and access		2	101
Availability of service or product supply		1	2
Cost and user charges		2	2
Culture and religion	Cultural norms about using some methods or other methods frowned upon.	2	16
Disapproval from family or parents mainly mum		2	14
Drug mules and agents		2	3
Fear of being found out		2	13
Feeling judged and shamed		2	39
Knowlege and experience of provider		1	1
Location and geography		1	1
Protocol and procedures		1	1
Timeliness		2	5
User factors and reliability		1	4
Contraception decision making		2	137
Appropriate for age or peer group		1	1

Name	Description	Files	References
Assumptions about need		2	6
Being in a relationship or not		1	2
Default option		2	5
Discontinuation		1	5
Discretion		2	4
Ease of use		2	5
Event dependent and spontaneity		1	1
Finding information		2	13
Flexibility		1	1
Happy with current method		1	5
Long lasting		1	2
Non contraceptive benefits		2	15
Trojan horse to contraceptive use		1	2
Past experience		1	5
Preferences and exercising choice		2	11
Professional advice		1	2
Recommendation		1	11
Trade offs		2	5
Trial		2	2
Unwanted effects		2	13
Facilitators to information and access		2	57
Anonymity		2	5

Name	Description	Files	References
Assurance of confidentiality		2	6
Free or cost neutral		1	2
Harm minimisation	Giving information and skills to negotiate sex but not to pressure into having sex	2	5
Online appointments		1	1
Online forum		1	3
Parents who are approachable and supportive		1	4
Peer support		2	8
Pharmacies		1	2
Role models and influence		1	8
Schools colleges and universities		2	5
Specific clinics	Eg young persons clinics	2	2
Time saving		2	2
Walk in - no pre booked appointment		2	3
Gender roles in contraception		2	105
Improve men's knowledge to change attitudes		1	6
Men		2	19
Men's complacency about sexual health		1	8
Men's refusal to use condoms		2	7
Responsibility		2	27
Shared		2	3
Sole responsibilty		2	6

Name	Description	Files	References
Trust and gaming		1	8
Women's assumed role and responsibility		2	18
Methods	Experiences of using different methods	2	253
Caps and diaphragms		1	10
Disruptive		1	1
Messy		1	1
Specific demographic		1	3
User reliability		1	2
Condoms		2	69
C card scheme		2	6
Discreet		1	1
Comfort and acceptability		1	3
Easy to use		0	0
Effectiveness and reliability		2	7
Female condoms		1	2
Free		2	6
Out of pocket expense		1	1
Quantity		1	4
Restrictions		1	5
Shops		1	1
Variety of sizes and types		1	1
Emergency Contraception		2	36

Name	Description	Files	References
A&E		1	2
Community pharmacies		1	2
Out of pocket		2	5
Time dependent		2	5
Types of EHC		1	3
Uncertainty of effectiveness		2	4
Hormones		2	52
Confouding effects		1	5
Mood problems		2	6
Unwated effects		2	17
LARC		2	47
Implant		2	12
Injection		1	1
IUD		2	13
IUS		2	10
Unwanted effects		1	3
Natural FP		1	1
Reliability and effectiveness		1	1
Patches		2	9
Pill		2	29
Effectivenes		1	2
User reliability		2	10

Name	Description	Files	References
Sex and sexuality		2	97
Assumptions about sexual behaviour	Apparently unaware of sexual activity	2	6
Contraceptive pill as status symbol		1	1
Empowerment		2	10
Feeling isolated		1	2
Gender differences in talking about sex		2	16
Harm minimisation		1	3
Open discussion group		1	6
Openness to talk about sex and sexuality		2	23
Pressure to conform to have sex		2	4
Recognition of maturity and responsibilty		2	7
Shame and disapproval about having sex		2	18
Sources of information on sex and contraception		2	176
Online		2	6
Own research		2	4
People		2	83
Family		2	39
Dads		1	4
Parents		2	15
Parents being overprotecdtive		2	8
Sibliings		2	6
GP		2	17

Name	Description	Files	References
Nurse at university and college		1	1
Peers		2	20
School nurse		2	6
Places		2	36
School		2	34
PHSE in school		2	16
Uni and colleges		1	1
Youth clubs		1	1
Sexual health clinic		2	31
Holistic assessment		2	9
Safeguarding		1	4
STI HIV risk assessment		2	3
What women want from a servivce		2	75
A good first impression		1	4
Accessible		1	1
Confidential		2	5
Emotional well being and safety		2	10
Empathy		2	7
Good rapport		2	4
Makes no assumptions about contraceptive need		2	4
Motherly figure		1	1

Name	Description	Files	References
Non judgemental		2	7
Not patronising		1	4
Offers time		1	3
Opportunity to ask questions		1	3
Perceived knowledge and competence		1	3
Respectful non condescending		2	10
Responsitve		1	1
Routine and comprehensive checklist	Not feel being singled out for these questions	1	3
Validates the maturity and responsibility		2	4

Focus Group 16-24

Nodes\\Feminist perspective

Name	Description
Emotional well being and safety	
Gender differences	Men and women assume different roles
Different perception of risks STIs and pregnancy	
Expectations around growing up and maturity	
Maturity and responsibility	
Sex education	
Talking about sex	

Name	Description
Gender inequality	Status differential
Assumption that women cannot be trusted to take contraception	
Different experiences in clinics	
Emotional burden re sexual health	Growing up, dealing with relationship
Girls treated differently in family units	
Responsibility for contraception	
Talking about sex	
Gender oppression	Women's status actively suppressed
Oppression of sexuality	
Parental disapproval mainly from mother	
Peers	
Intersectionality	Further impact due to race, culture, religion and young age
School	
PHSE in school	
Structural oppression	Systematic oppression through economics, patriarchy, racism
Shaming of sexuality	Women and girls are ashamed of their sexuality, Even doing the responsible thing such as using contraception makes them feel judged. Sometimes to the point of having to ask someone to obtain it for them.
Contacts with health services	Some experiences of women attending health services suggest they feel uncomfortable about the way they were treated. Sometimes impersonal, condescending, patronising.
Family netowrks	
Mules, agents and disguises	Women too ashamed to get contraception themselves

Name	Description
Schools	

Focus Group 16-24

Nodes\\Main themes

Name	Description
Access and venues	
A&E	
Confidentiality	
Feeling anonymous	
GP	
Mules and agents	
Perception of appropriateness	
Pharmacy	
SH clinic	
Shops or supermarkets	
Youth clubs	
Barriers to information and access	
Availability of service or product supply	
Cost and user charges	
Culture and religion	Cultural norms about using some methods or other methods frowned upon.
Disapproval from family or parents mainly mum	

Name	Description
Drug mules and agents	
Fear of being found out	
Feeling judged and shamed	
Knowlege and experience of provider	
Location and geography	
Protocol and procedures	
Timeliness	
User factors and reliability	
Contraception decision making	
Appropriate for age or peer group	
Assumptions about need	
Being in a relationship or not	
Default option	
Discontinuation	
Discretion	
Ease of use	
Event dependent and spontaneity	
Finding information	
Flexibility	
Happy with current method	
Long lasting	
Non contraceptive benefits	

Name	Description
Less stigmatising reason as young person	
Past experience	
Preferences and exercising choice	
Professional advice	
Recommendation	
Trade offs	
Trial	
Unwanted effects	
Facilitators to information and access	
Anonymity	
Assurance of confidentiality	
Free or cost neutral	
Harm minimisation	Giving information and skills to negotiate sex but not to pressure into having sex
Online appointments	
Online forum	
Parents who are approachable and supportive	
Peer support	
Pharmacies	
Role models and influence	
Schools colleges and universities	
Specific clinics	Eg young persons clinics

Name	Description
Time saving	
Walk in - no pre booked appointment	
Gender roles in contraception	
Improve men's knowledge to change attitudes	
Men	
Men's complacency about sexual health	
Men's refusal to use condoms	
Responsibility	
Shared	
Sole responsibilty	
Trust and gaming	
Women's assumed role and responsibility	
Methods	Experiences of using different methods
Caps and diaphragms	
Disruptive	
Messy	
Specific demographic	
User reliability	
Condoms	
C card scheme	
Discreet	

Name	Description
Comfort and acceptability	
Easy to use	
Effectiveness and reliability	
Female condoms	
Free	
Out of pocket expense	
Quantity	
Restrictions	
Shops	
Variety of sizes and types	
Emergency Contraception	
A&E	
Community pharmacies	
Out of pocket	
Time dependent	
Types of EHC	
Uncertainty of effectiveness	
Hormones	
Confouding effects	
Mood problems	
Unwated effects	
LARC	

Name	Description
Implant	
Injection	
IUD	
IUS	
Unwanted effects	
Natural FP	
Reliability and effectiveness	
Patches	
Pill	
Effectivenes	
User reliability	
Sex and sexuality	
Assumptions about sexual behaviour	Apparently unaware of sexual activity
Contraceptive pill as status symbol	
Empowerment	
Feeling isolated	
Gender differences in talking about sex	
Harm minimisation	
Open discussion group	
Openness to talk about sex and sexuality	
Pressure to conform to have sex	
Recognition of maturity and responsibilty	

Name	Description
Shame and disapproval about having sex	
Sources of information on sex and contraception	
Online	
Own research	
People	
Family	
Dads	
Parents	
Parents being overprotecdtive	
Sibliings	
GP	
Nurse at university and college	
Peers	
School nurse	
Places	
School	
PHSE in school	
Uni and colleges	
Youth clubs	
Sexual health clinic	
Holistic assessment	
Safeguarding	

Name	Description
STI HIV risk assessment	
What women want from a servivce	
A good first impression	
Accessible	
Confidential	
Emotional well being and safety	
Empathy	
Good rapport	
Makes no assumptions about contraceptive need	
Motherly figure	
Non judgemental	
Not patronising	
Offers time	
Opportunity to ask questions	
Perceived knowledge and competence	
Respectful non condescending	
Responsive	
Routine and comprehensive checklist	Not feel being singled out for these questions
Validates the maturity and responsibility	

25 Appendix 6- Supplementary material for Study 5 Covid survey

25.1 Checklist for Reporting Results of Internet E-Surveys (CHERRIES)

Checklist Item	***Explanation***	***Chapter***
Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In “open” surveys this is most likely.)	Method
IRB approval	Mention whether the study has been approved by an IRB.	Method
Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	Method
Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	Method
Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	Method
Open survey versus closed survey	An “open survey” is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey).	Method
Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)	Method
Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.	Method
Web/E-mail	State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?	Method
Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on a anti-immunization Web site will have different results from a Web survey conducted on a government Web site	NA
Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?	Method
Incentives	Were any incentives offered (eg, monetary, prizes, or non-monetary incentives such as an offer to	Method

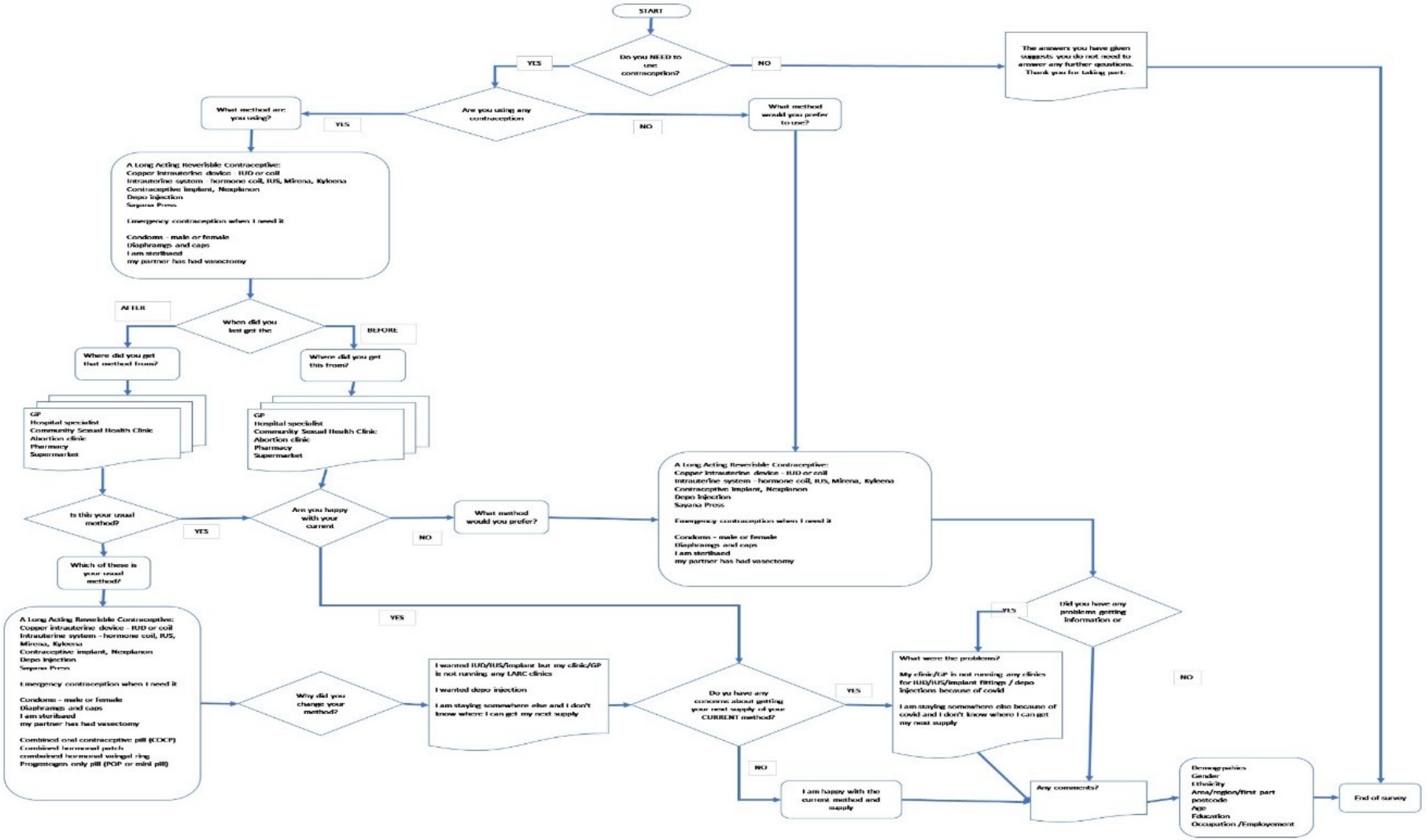
	provide the survey results)?	
Time/Date	In what timeframe were the data collected?	Method
Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.	Not applicable.
Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.	Method
Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	Method
Number of screens (pages)	Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.	Method
Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if “yes”, how (usually JAVAScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-response option such as “not applicable” or “rather not say”, and selection of one response option should be enforced.	Method/ results
Review step	State whether respondents were able to review and change their answers (eg, through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct).	Method
Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	Results
View rate (Ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1 % if the survey is voluntary.	Results
Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called “recruitment” rate.	Results
Completion rate (Ratio of users who finished the survey/users who agreed to participate)	The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate “informed consent” page or if the survey goes over several pages. This is a measure for attrition. Note that “completion” can involve leaving questionnaire items blank. This is not a measure for how completely questionnaires were filled in. (If you need a measure for this, use the word “completeness rate”.)	Results
Cookies used	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (eg, the first entry or the most recent)?	NA – IP check
IP check	Indicate whether the IP address of the client computer was used to identify potential duplicate	Results

	entries from the same user. If so, mention the period of time for which no two entries from the same IP address were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	
Log file analysis	Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.	N/A
Registration	In “closed” (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example, was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	N/A
Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	Results
Questionnaires submitted with an atypical timestamp	Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.	N/A
Statistical correction	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods.	N/A

This checklist has been modified from Eysenbach G. Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). J Med Internet Res. 2004 Sep 29;6(3):e34 [erratum in J Med Internet Res. 2012; 14(1): e8.]. Article available at https://www.jmir.org/2004/3/e34/; erratum available https://www.jmir.org/2012/1/e8/. Copyright ©Gunther Eysenbach. Originally published in the Journal of Medical Internet Research, 29.9.2004 and 04.01.2012.

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25.2 Survey algorithm



25.3 Codebook of text analysis from NVivo

Name	Description	Files	References
Cancelled, postponed or no LARC		1	11
Implant		1	1
IUD IUS		1	6
Provider unable to offer LARC or plan fittings after lockdown		1	4
Expressed uncertainty how and where to get contraception or advice		1	17
Forced to use non-preferred method		1	4
No concerns, enough supplies or not due replacing		1	4
Enough supplies or duration of LARC		1	2
Good access already pre-lockdown		1	3
Happy with options post lockdown		1	1
Non-prioritision of contraceptive services		1	3
GP		1	2
SH clinic		0	0
Other suggestions or opinions		1	13
Post lockdown care by providers		1	57
Electronic prescriptions sent to pharmacies		1	3
Poor access to contraception post-		1	30

Name	Description	Files	References
lockdown			
GP		1	9
Postnatal		1	3
SH Clinic		1	8
Poor advice or service from provider		1	8
GP		1	4
NHS App		1	1
SH clinic		1	2
Post lockdown supply from other sources		1	8
Incurring costs to obtain contraception from suppliers		1	6
Remote or online consultations		1	6
Pre-lockdown difficulty with access		1	2
Differences due to location		1	1

26 Appendix 7 - Project Advisory Group (PAG)

I set up a Project Advisory Group (PAG) for my PhD and the NIHR Doctoral Fellowship. The group comprised of contraception users, sexual health care professionals, representatives from sexual health and abortion services charities, and peer education organisations.

The aim of this group was to ensure that the research programme was relevant to the end users, i.e., women who need to use contraception. We aimed to meet at least once a year to discuss the project and findings. During the pandemic we met using an online platform.

This group will continue to contribute to my Fellowship until August 2023 when all remaining studies from this PhD are published.

The membership of the PAG included:

- Adam Foster
- Bekki Burbidge
- Dr Hazel Philips
- Dr Jayne Kavanagh
- Joanna Melville
- Lisa Hallgarten
- Rachel Kerr
- Rebecca Blaylock
- Sinead Gavin
- Felicity Young

The following photos were taken from our meetings.



From left: Lisa Hallgarten, Felicity Young, Richard Ma, Bekki Burbidge, Hazel Philips

From left: Felicity Young, Rebecca Blaylock, Hazel Philips





From left: Adam Foster, Joanna Melville, Rachel Kerr

From top left: Felicity Young, Hazel Philips, Richard Ma, Rebecca Blaylock, Rachel Kerr, Adam Foster, Joanna Melville

