Public Health England

Protecting and improving the nation's health

Contraception: Economic Analysis Estimation of the Return on Investment (ROI) for publicly funded contraception in England

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Published: June 2018
PHE publications
gateway number: 2018172

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Glossary of common terms and abbreviations

BCR	Benefit-to-Cost Ratio
CBA	Cost Benefit Analysis
CCG	Clinical Commissioning Group
CTC	Child Tax Credits
DoE	Department of Education
DWP	Department for Work and Pensions
FPA	Family Planning Association
GP	General Practice
HCHS	Hospital and Community Health Services Index
HMRC	Her Majesty's Revenue & Customs
IUD	Intra-Uterine Device
IFS	Institute for Fiscal Studies
LARC	Long-Acting Reversible Contraception
MHCLG	Ministry for Housing, Communities and Local Government
NATSAL	National Survey of Sexual Attitudes & Lifestyles
NAO	National Audit Office
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
OBR	Office for Budget Responsibility
OCP	Oral Contraceptive Pill
ONS	Office for National Statistics
STI	Sexually Transmitted Infection
ROI	Return on Investment
WTC	Working Tax Credits

Executive summary

Introduction

The provision of contraception is widely recognised as a highly cost-effective public health intervention (1,2). This is because it reduces the number of unplanned pregnancies which bear high financial costs to individuals, the health service and to the state (3,4). As a result of ongoing financial pressure on health spending, sexual health funding has reduced across England, with a corresponding reduction in the amount spent on publicly provided contraception (5). It has been suggested that this reduction in spend may ultimately result in higher long-term costs (4). Although, the full extent of any impact is difficult to know at present since much of the economic analysis around contraception is either now out of date or looks at the cost-effectiveness of specific contraceptive methods, rather than as a whole.

This report aims to analyse the Return on Investment (ROI) for publicly funded contraception in England using the latest available evidence and data. This will help policymakers and commissioners to understand the relative value of spending in this area compared to other public health interventions and, more broadly, other areas of government spending.

This report accompanies the Contraceptive Services ROI tool.

Methodology

In broad terms, this methodology is an updated version of that used by McGuire and Hughes (3). The study population is women of child-bearing age (15 to 44 years old) in England in 2016. Although women aged over 44 are often still fertile and capable of childbearing, women aged 15 to 44 represent the majority of conceptions in England.

This is a cost-benefit analysis whereby both costs and benefits are measured in monetary units. The ‘benefits’ are the cost savings that result from averted pregnancies. Benefits include savings on healthcare costs (for example birth costs, abortion costs, miscarriage costs and ongoing child health care costs) and savings on non-healthcare costs (such as education costs, welfare costs, children in care costs). The ‘cost’ is the total amount of public money currently being spent on contraception. Summing the local authority spending

and the NHS spending gives the total annual public spending on contraception: £246.1m.

The methodology requires a calculation of the number of pregnancies each year that are averted as a result of using contraception. Therefore, we first need to know how many pregnancies would occur if no contraception were used. Research suggests that 85% of sexually active women would become pregnant within a year if they were not using contraception (18). Therefore, the remaining 15% does not feature in the calculation of averted pregnancies, because this proportion would not get pregnant even if they were not using contraception. We also need to consider the efficacy of different forms of contraception, as no method is 100% successful in preventing pregnancy.

For each method of contraception, we subtract from 85% the percentage of cases in a year where that method of contraception fails. This leaves, for each contraceptive method, the proportion of women who have averted pregnancy as a result of using that contraception. This is multiplied by the number of users of each method, and the total for each method is summed.

For the counterfactual scenario we have to hypothesise what the pattern of contraceptive use would be if it were not publicly funded. There is no research evidence on which to base this on. However, in the counterfactual scenario used in this paper we reason that if contraception was not publicly provided, short-acting methods of contraception would be more readily accessible and affordable than long-acting methods of contraception. Therefore, we have reallocated the percentage of users using LARC methods to the most common user-dependent forms of contraception: condoms and the combined pill. The model that accompanies this report allows for alternative hypothetical scenarios to be tested by the user.

Some unintended pregnancies do not lead to live-births; 52% and 12% of unplanned pregnancies are assumed to end in abortion and miscarriage respectively. However, we cannot assume that all these unintended pregnancies that do lead to live births, if avoided today, would not have occurred later as a planned birth. This has been described by Montouchet and Trussell (16): ‘Not all unintended pregnancies are unwanted; most are mistimed, and would have occurred as intended births at a later date’. Evidence they cite from the USA National Survey of Family Growth (14) suggests that 60% of unplanned births are mistimed, whereas 40% of births would have otherwise never occurred.

In this analysis, the full direct and indirect costs of birth have only been considered for those 40% of unplanned births that would have not occurred later. For the remaining 60% of births which are mistimed, the cost averted by contraception is the cost of incurring expenditure at an earlier point than otherwise would have occurred.

The time horizon for the analysis, over 1 to 10 years, shows how the ROI changes over the long, medium and short term. A one year time horizon gives the return after the first year, 5 years gives a more medium term assessment, and 10 years gives a longer term perspective, capturing the savings from averted health, welfare and education costs as children age.

Results

In this results section, we take the scenario where we hypothesise that if contraception were not publicly provided, LARC use would be replaced by condom and pill use (Scenario 1 in the ROI tool). An ROI larger than £1 means that the benefits exceed the costs, whereas an ROI less than £1 means that the costs exceed the benefits, and an ROI equal to £1 is break-even.

From a healthcare perspective, the ROI is £1.51 for every £1 spent after one year, reflecting the high savings from averted birth costs. The ROI grows gradually to £2.82 for every £1 spent over 5 years, and £3.68 over 10 years, due to the averted costs of providing healthcare to children as they age.

By contrast, non-healthcare costs are initially not cost-saving, with an ROI of £0.36 after one year. However, in the longer term, there are increasing savings from averted education and welfare costs, resulting in an ROI of £1.82 over 5 years, and £5.32 over 10 years.

When considering total cost savings across the public sector (including both healthcare and non-healthcare cost savings), the ROI is £1.86 after one year (exceeding break-even) and £4.64 over 5 years. Over 10 years, the ROI is £9.00, or in other words, there is an £9.00 saving for every £1 invested in publicly provided contraception.

Discussion

The ROI for contraceptive services is cost-saving whether taking a healthcare, non-healthcare or total perspective. Healthcare savings are more upfront, with more gradual increases in ROI thereafter. Whereas non-

healthcare savings are small initially (below break-even), but increase rapidly after 5 years. The timescales of expected savings will be relevant to decision-makers in both the NHS and local authorities. The biggest cost saving categories were ongoing child healthcare costs (£18,309 per live birth over 10 years) and education costs (£21,429 per live birth over 10 years). The welfare cost savings per birth are also substantial when summed across the various welfare categories.

1. Introduction

1.1 Background

The provision of contraception is widely recognised as a highly cost-effective public health intervention (1, 2). This is because it reduces the number of unplanned pregnancies which bear high financial costs to individuals, the health service and to the state (3,4). As a result of ongoing financial pressure on health spending, sexual health funding has reduced across England, with a corresponding reduction in the amount spent on publicly provided contraception (5). It has been suggested that this reduction in spend may ultimately result in higher long-term costs (4). Although, the full extent of any impact is difficult to know at present since much of the economic analysis around contraception is either now out of date or looks at the cost-effectiveness of specific contraceptive methods, rather than as a whole.

This report therefore aims to analyse the Return on Investment (ROI) for publicly funded contraception in England using the latest available evidence and data. This will help policymakers and commissioners to understand the relative value of spending in this area compared to other public health interventions and, more broadly, other areas of government spending.

This report accompanies the Contraceptive Services ROI tool.

Family planning services have been freely provided to the public since 1974, when sexual health clinics were incorporated into the National Health Service (NHS) (3). Following the shift of public health functions from the NHS to local authorities in 2013, the majority of sexual health commissioning is now the responsibility of public health teams in local government. Indeed, sexual health is one of the largest programme areas of public health spending in England, accounting for 17% (£611m) of the public health grant to local authorities in 2017 (6). Contraceptive services are also available in general practice, mainly contracted through NHS Clinical Commissioning Groups (CCGs), though there is some overlap between local authority and NHS funding streams.

Ideally, all forms of contraception should be made available at the point of access or through an established referral pathway, to provide the full range of choice for women. Longer acting methods - implants and Intra-Uterine Devices (IUDs) are more effective and cost-effective than others and women should be informed of this. However, it is recognised that there are large

regional variations in what is offered and spending on contraception differs across the country. 51% of local authorities decreased their budget allocation to contraceptive services in the 3 years between 2014/15 and 2016/17 (5).

1.2 Existing literature

The economic evaluation of contraception poses some unique challenges (2). The main purpose of contraception is to prevent future pregnancy. So unlike with most medical or public health interventions, there is no direct 'health benefit' to the user, to be measured as a gain in life years or quality of life, as is included in most other health-related economic evaluations. Instead, benefits are usually measured as the number of pregnancies averted by the use of contraception, or as the cost savings that result from these averted pregnancies. The efficacy of different contraceptive methods in averting pregnancies is typically calculated from the failure rates of different methods of contraception.

A number of studies use this approach in comparing the cost-effectiveness between different contraceptive methods. Much of this literature has focussed on the relative cost-effectiveness of Long-Acting Reversible Contraception (LARC) methods as these have been gradually introduced in contraceptive provision over recent decades. For example, a decision analytical model was used by Mavrenezouli in the development of NICE's LARC guidelines (7). This found that the implant was the most cost-effective form of LARC, followed by intra-uterine systems (IUS), intra-uterine devices and injections.

All forms of LARCs dominated the combined pill (were both more effective and cheaper over the long term). These findings are similar to those by Varney et al (8) which found that implants and IUS methods dominated injections, with LARCs overall being highly cost-effective. Analysis by Phillips also found high rates of return for LARCs, in particular the implant (9). All these UK-based analyses only looked at healthcare costs, with averted pregnancies calculated from contraceptive failure rates. Similar studies have been done in the USA. A 5-year Markov model by Trussell et al (10) found all methods of contraception to be cost-effective from a healthcare payer perspective, in particular intra-uterine methods and vasectomy.

However, comparative estimates of cost-effectiveness between different contraceptive methods are less useful to commissioners and policymakers. The importance of user choice of methods is well-recognised (11), and so commissioning decisions are not about which method of contraception to fund, but rather, the overall level of funding to allocate towards contraceptive

services as a whole, from fixed, and increasingly stretched, NHS and public health budgets. In this context, it is more useful to have an overall estimate of ROI for publicly funded contraceptive services.

2 studies were found that attempted to answer this question. In 1995, McGuire and Hughes attempted to calculate the Return on Investment for publicly funded contraception in the UK (3). They compared the number of pregnancies averted from the existing pattern of contraceptive utilisation to counterfactual scenarios where only privately purchased condoms or withdrawal methods are used. Because of the higher failure rates associated with these latter methods, fewer pregnancies are averted, resulting in reduced cost savings to the state from averted birth and welfare costs. Using the counterfactual scenario of replacing existing contraceptive use with condoms alone, they estimated a Return on Investment of £11.09 for every £1 spent on contraception.

For the scenario where withdrawal methods are used as a counterfactual, the figure was £29.29 saved for every £1 saved. The study looked at cost savings to healthcare and the wider public sector, although the costs of ongoing provision of healthcare and education to children were not included. Furthermore, the analysis is now outdated; the welfare benefits systems in the UK has changed significantly from the time the study was written, and so its findings would no longer apply to the present day. There is also no explicit consideration of how the Return on Investment figure changes over time.

A more recent analysis was conducted by the Family Planning Association (FPA) in 2015 (4). This utilised a different approach, estimating the number of averted pregnancies from current conception rates across females of different age groups, and assuming changes to these conception rates following sexual health funding cuts. As before, the study looked at a wide range of costs of pregnancy, including healthcare, education, welfare and housing. Their method led to Return on Investment estimates of £86 saved for every £1 invested, over 5 years, rising to £159 over 10 years, much higher than the McGuire and Hughes estimate.

An unrealistic assumption that underpinned the analysis was that a reduction in contraceptive provision would result in conception rates reverting to 2003 levels (which would include reversing the progress that has been made in reducing teenage pregnancies since then). This is a large assumption as there are a multitude of reasons why conception rates have fallen in young people in the UK (12), and these rates are highly unlikely to immediately revert to 2003 levels if sexual health funding was reduced. The analysis also considered how Sexually Transmitted Infection (STI) rates would change

following funding cuts. Again this used an unrealistic assumption, as there may be a number of reasons underlying the trends in STI rates in England aside from contraceptive funding. These issues with the methodology may explain the unusually high ROI figures.

Both of these analyses fail to consider an important aspect of unplanned pregnancies; that is, that some pregnancies which are unplanned would otherwise have occurred later on as intended pregnancies. Trussell has described how much of the economic analysis on contraception overstates cost-effectiveness because of an erroneous assumption that all unintended births, if avoided today, would not occur at a later point (13). Evidence from the USA National Survey of Family Growth (14) suggests that 60% of unplanned pregnancies are in this way ‘mistimed’. With this adjustment, Trussell estimates that unplanned pregnancies lead to direct healthcare costs of $4.6bn per year in the USA (15) and £193m per year in the UK (16).

1.3 Aim

The aim of this analysis is to estimate the Return on Investment of publicly funded contraception in England. This figure gives some indication of the economic consequences of divestment or investment in contraception services in England. Both a healthcare perspective and a wider public sector perspective are included in the model, over a time horizon of between 1 to 10 years.

The purpose of the accompanying ROI tool is to give overall Return on Investment estimates of publically funded contraception at the national level to strengthen the case for investment in prevention. The tool cannot be used by commissioners to calculate estimates tailored to local settings.

1.4 Not included in this analysis

Barrier methods of contraception also provide protection against the spread of sexually transmitted infections. Due to the nature of the methodology used, this analysis does not consider the role of contraception in reducing rates of STIs. The focus is rather, on the role of contraception in preventing unplanned pregnancies.

This analysis includes a number of wider public sector costs relating to unplanned pregnancies. However, there may be other wider societal costs associated with unplanned pregnancies that are not included here, such as labour market consequences, household stress and mental illness, childhood poverty, and higher crime rates (17). These costs are less tangible and harder to measure in a rigorous way from existing data and evidence. There may also be costs which are borne to the individual/parents having the child, such as costs to house, feed, and clothe a child which are not included in this analysis.

We have, instead, focussed on those costs to the public sector that can be measured accurately using routinely collected national statistics, such as the costs of providing healthcare, education, and welfare. Therefore, the analysis here likely represents a conservative estimate, or lower bound, of the true costs associated with unplanned pregnancy.

It must be noted that the benefits system in the UK is currently going through a period of significant overhaul. ‘Universal Credit’ is designed to replace a number of existing benefits for people who are on a low income or out of work, and it is in the process of gradually being rolled out across the country

(as of June 2018). However, because the benefit is new and roll-out is incomplete there is a lack of available historical data on factors such as average uptake rates and payment levels. Therefore, in this analysis, existing benefit systems have been used, for which there is a large body of historical data. Those benefits analysed here, that will be replaced by Universal Credit in the future, are: Child Tax Credit, Working Tax Credit, Housing Benefit and Income Support for Lone Parents.

2. Methodology

2.1 Overview of methodology

Population: Female population of England aged 15-44 years (2016)

Perspectives: Healthcare and Public Sector

Time horizon: 1 year, 5 years and 10 years

Output measure: ROI = Benefit-cost ratio = $\frac{\text{Benefits}}{\text{Costs}}$

Benefits = cost savings from pregnancies averted due to contraception
= (pregnancies averted in one year) * (cost per pregnancy)

Costs = total annual public spending on contraception in England

This is a cost-benefit analysis whereby both costs and benefits are measured in monetary units. The 'benefits' are the cost savings that result from averted pregnancies. The 'cost' is the total amount of public money currently being spent on contraception. In broad terms, this methodology is an updated version of that used by McGuire and Hughes (3). The study population is women of child-bearing age (15 to 44 years old) in England in 2016. Although women aged over 44 are often still fertile and capable of childbearing, women aged 15 to 44 represent the majority of conceptions in England.

Both a healthcare perspective (costs to the NHS) and a broader public sector perspective (including additionally at costs of education, welfare, and housing) are taken. The time horizon for the analysis, over 1 to 10 years, shows how the ROI changes over the long, medium and short term. A one year time horizon gives the return after the first year, 5 years gives a more medium term assessment, and 10 years gives a longer term perspective, capturing the savings from averted health, welfare and education costs as children age.

2.2 Estimating the number of averted pregnancies

The methodology requires a calculation of the number of pregnancies each year that are averted as a result of using contraception. Therefore, we first need to know how many pregnancies would occur if no contraception were used. Research suggests that 85% of sexually active women would become pregnant within a year if they were not using contraception (18). Therefore, the remaining 15% does not feature in the calculation of averted pregnancies, because this proportion would not get pregnant even if not using contraception.

We also need to consider the efficacy of different forms of contraception, as no method is 100% successful in preventing pregnancy. For each method of contraception, we subtract from 85% the percentage of cases in a year where that method of contraception fails. This leaves, for each contraceptive method, the proportion of women who have averted pregnancy as a result of using that contraception. This is multiplied by the number of users of each method, and the total for each method is summed. Note that we have assumed that those using a contraceptive method are sexually active. The calculation is given by the equation below:

$$\sum (\mathrm{CN} \times (\mathrm{P} - \mathrm{F}))$$

Where:

- C = the percentage of females using a contraceptive method
- N = the number of females of childbearing age (15-44 years) in England
- P = the percentage of women who would get pregnant in a year if not using contraception: 85% (18)
- F = the percentage failure rate for each contraceptive method in a year (18)
- ∑ = sum for each contraceptive method

There were 10,607,577 females of child-bearing age (aged 15-44 years old) in England in 2016 (19). Evidence for the contraceptive use of this population has been taken from the National Survey of Sexual Attitudes & Lifestyles (NATSAL3) survey question *"Which would you say is your most usual method of contraception these days?"* answered by the 5,842 females aged 16-44 years included in the survey (16 being the youngest age of respondents included in the survey) (20). Note the 'no method' category includes those not currently using contraception because they are not sexually active, and those who are actively planning pregnancy.

The failure rate, taken from research in the USA by Trussell (18), is defined as the percentage of women experiencing unintended pregnancy within one year of typical use of that contraceptive method. 'Typical-use' failure rates are higher than 'perfect-use' failure rates, due to incorrect use and non-adherence of particular contraceptive methods (particularly 'user-dependent' methods, such as the condom or pill). Collectively, the population data, survey data and failure rates can be used to estimate the annual number of pregnancies averted by contraceptive use in this population, as in Table 1.

Table 1: Pattern of contraceptive use and number of averted pregnancies

Method	% Users	Estimated no. of Users	Failure Rate	Averted pregnancies
Combined Pill	31.8%	3,375,051	9.0%	2,565,039
Condom	22.5%	2,391,138	18.0%	1,602,063
Withdrawal	1.7%	179,240	22.0%	112,921
IUD	6.1%	644,501	0.5%	544,604
Injection	3.8%	406,150	6.0%	320,859
Implant	6.3%	673,103	0.1%	571,801
Patch	0.1%	7,627	9.0%	5,797
Rhythm method	0.7%	72,459	24.0%	44,200
Cap/diaphragm	0.2%	19,068	12.0%	13,920
Foams/gels	0.1%	7,627	28.0%	4,348
Emergency	0.0%	3,814	9.0%	2,898
Sterilised (F)	2.0%	207,842	0.5%	175,627
Partner sterilised (M)	2.9%	312,717	0.2%	265,340
No method	21.8%	2,307,239	85.0%	0
Total	100.0%			**6,229,415**

Sources: Contraceptive use - NATSAL3 (20), Failure rates – Trussell (18).
Note: Percentage of users has been adjusted to take into account non-respondents in NATSAL3.

Table 1 shows the number of pregnancies averted based on the current pattern of contraceptive use. If contraception were not publicly provided, we hypothesise that this pattern would change. Applying the same formula above to this new hypothesised pattern of contraceptive use would then result in a different number of averted pregnancies, and the difference between the 2 figures gives the change in the number of averted pregnancies that result from public provision of contraception.

For the counterfactual scenarios we have to hypothesise what the pattern of contraceptive use would be if it were not publicly funded. There is no research evidence on which to base this on. However, in the counterfactual

scenario used in this paper, we reason that if contraception was not publicly provided, short-acting methods of contraception would be more readily accessible and affordable than long-acting methods of contraception. Therefore, we have reallocated the percentage of users using LARC methods to the most common user-dependent forms of contraception: condoms and the combined pill. This approach differs slightly to the original McGuire and Hughes methodology, where for their ROI estimate of £1:£11, all contraceptive use was replaced with privately purchased condoms. The model that accompanies this report allows for alternative hypothetical scenarios to be tested by the user.

2.3 Cost savings of averted pregnancies

Each unplanned pregnancy results in costs to the public purse, and thus each pregnancy averted through the use of contraception results in a cost saving. These averted costs can be broadly categorised into healthcare costs and wider costs to the public sector. There will also be lifetime costs to the individual/parents which are necessary to house, feed, clothe a child etc. However, these types of costs are not included in this analysis.

Healthcare costs:	*Costs incurred by*
• Live birth costs	NHS
• Abortions costs	NHS
• Miscarriage costs	NHS
• Ongoing child healthcare costs	NHS
• Public Health services for children	Local authorities
Wider costs to the public sector:	
• Education costs	DfE
• Child Benefit	HMRC
• Child Tax Credits	HMRC
• Working Tax Credit	HMRC
• Income Support for Lone Parents	DWP
• Housing Benefit	DWP
• Maternity Allowance	DWP
• Sure Start Maternity Grant	DWP
• Children in Care	Local authorities

The method for calculating the cost for each of these elements is described below.

2.3.1 Birth costs

Birth costs can be divided into antenatal care, delivery, postnatal care and neonatal care. The cost of these individual elements was calculated in by Thomas and Cameron in 2011 from NHS reference costs and activity levels (21). The Hospital and Community Health Services Index (HCHS) inflation index (22) has been used to convert the 2011 prices to 2016 prices. These costs can be multiplied by the number of averted live births to give the cost savings resulting from contraception. An adjustment needs to be made for the fact that a small proportion of the births would occur in the private sector rather than in the NHS. By comparing Office for National Statistics (ONS) birth statistics (23) with NHS birth statistics (24), we can estimate that 96% of births in England occur within the NHS.

Table 2

Births Costs Key Data	
Average antenatal care costs	£1,809
Average delivery costs	£2,233
Average postnatal care costs	£428
Average neonatal care costs	£1,265
Proportion of all births that occur in the NHS	96%

Sources: Thomas and Cameron (21), ONS (23), NHS Digital (24).

2.3.2 Abortion and miscarriage costs

Research by Sedgh et al (25) on global trends in unplanned pregnancy, finds that in Western Europe, 12% of unplanned pregnancies end in miscarriage and 52% end in abortion (an equivalent figure for England specifically was not found). Given the number of pregnancies averted by contraception, this can be used to calculate the number of averted abortions and miscarriages. As for the birth costs above, the cost of abortions and miscarriages can be calculated from NHS reference costs (21).

Table 3

Abortion and miscarriage cost – key data	
Average NHS abortion cost	£767
Average NHS miscarriage cost	£653
Proportion of unplanned conceptions leading to abortion	52%
Proportion of unplanned conceptions leading to miscarriage	12%

Sources: Thomas and Cameron (21), Sedgh et al (25).

2.3.3 Ongoing child healthcare costs

As well as the costs relating to delivery and care around birth, there will also be ongoing healthcare costs of providing NHS care to children as they age. This includes the cost of primary care, secondary care, and medications. These costs vary by age, with higher per capita costs in the initial years of life, and lower costs in older children. The Office for Budget Responsibility (OBR) has estimated annual per capita health spending by age (26), presented in Table 4. Costs in future years have been discounted in the model.

Table 4

Mean per capita healthcare spending by age (undiscounted)										
Age (years)	0	1	2	3	4	5	6	7	8	9
Secondary Care	£2,500	£2,400	£2,400	£2,200	£2,000	£1,800	£1,600	£1,500	£1,300	£1,100
Primary Care	£300	£300	£300	£200	£200	£200	£200	£100	£100	£100
Prescriptions	£100	£100	£100	£100	£100	£100	£100	£100	£100	£100
Total	£2,800	£2,800	£2,700	£2,500	£2,300	£2,100	£1,900	£1,600	£1,500	£1,300

Source: OBR (26).

2.3.4 Public health services for children

In addition to the health costs paid by the NHS, there will also be some health-related costs paid by local authorities through the Public Health grant. There are 4r services included in the Public Health grant that are for children. These include mandated children services for 0 to 5 year olds, non-mandated children services for 0 to 5 year olds, children's public health programmes for 5 to 19 year olds and the National child measurement programmes. We haven't included this last element as it constitutes a relatively small amount of spending (around £20m).

Table 5

Public Health costs – key data	
Mandated 0-5 children's services (prescribed functions)	£747m
Children's 5-19 public health programmes	£265m
All other 0-5 children's services (non-prescribed functions)	£149m

Source: Ministry of Housing, Communities & Local Government (40).

2.3.5 Education costs

The cost of pre-school and primary school education for children has also been considered in this analysis. The number of averted live births is multiplied by the annual per pupil costs for pre-school and primary school. We have therefore assumed that the government would maintain per pupil funding levels at the current 2016 level. The mean per pupil funding is taken from analysis by the Institute for Fiscal Studies (IFS), which estimates a mean cost of £1,635 per pre-school place, and £4,900 per primary school place (27). Preschool costs are only incurred at age 3 and 4, while primary school costs are incurred from age 5. Costs in future years have been discounted in the model.

Table 6

Education costs – key data	
Average annual pre-school cost per pupil	£1,635
Average annual primary school cost per pupil	£4,900

Source: IFS (27).

2.3.6 Child Benefit

Child Benefit is a regular payment from government to help with the cost of raising a child. It is eligible for all families, but those with an income over £50,000 need to pay back some or all of the benefit in income tax. As of August 2016, there were 7,396,355 families claiming child benefit (28), representing 92.9% of all families in the UK with children (29). The Child Benefit entitlement is £20.70 per week for the first child in the family, and £13.70 for subsequent children, up to a maximum of 2 children.

Table 7

Child Benefit – key data	
Proportion of families claiming Child Benefit	92.9%
Weekly entitlement for a first child	£20.70
Weekly entitlement for a second child	£13.70

Sources: HMRC (28), ONS (29).

Table 8

Current number of children	0	1	2	3	4+
Percentage of females age 15-44 years in England (2015)	50.7%	15.1%	21.0%	8.7%	4.5%

Sources: ONS (19,30).

To estimate the cost savings of these for averted births we have estimated which number child in the family the averted births would be (the first child, second child or third child, etc.) as this has a large influence on the eligible benefit. For our study population (females in England age 15-44 years old) the current distribution of number of children can be calculated from cohort fertility data (30) and population data from the ONS (19), and is shown in Table 8.

Assuming that the averted births are equally distributed among our study population, we can estimate that if the averted births were to occur, 50.7% would be in women with no children currently, and so they would be the first child in the household. If we assume the same proportion of families claim Child Benefit as in the general population (92.9%), then these single-child families will receive £20.70 per week.

By contrast, 15.1% of the births occur in females who already have one child, so these families would only receive an additional £13.70 per week, the award for a second child in the family. The rest of the averted births occur in females who already have 2 or more children and so a further birth would not result in any additional child benefit payment. Child benefit is a continuous payment so the costs accrue over time and costs from future years have been discounted in the model.

2.3.7 Child Tax Credits

Child Tax Credit (CTC) is an annual benefit from government to help with the cost of raising a child, and is dependent on income. There were 3,700,200 families receiving the benefit as of April 2017 (31), which represents 46% of all families with children in the UK (29). The value of the benefit is dependent on circumstances, and there are 4 main elements to the benefit:

- **Family element**: £548 base payment for all families receiving CTC
- **Child element :** £2,780 per child, up to a maximum of 2 children
- **Disabled child element:** an additional £3,140 for every child with a disability, claimed by 2.3% of claiming families currently

- **Severely disabled child element:** an additional £1,275 (on top of the £3,140) for each child with a severe disability, claimed by 0.93% of claiming families currently

As for Child Benefit, to estimate the cost savings from CTC for averted births we must estimate which number child in the household the averted births would be (Table 8). From this, we can estimate that if the averted births were to occur, 50.7% would be in women with no children currently, and so they would be the first child in the household. For these births, the benefit received would be the 'family element' and 'child element', as well as corresponding proportions (2.3% and 0.93%) receiving the payment for disability and severe disability.

By contrast, 15.1% of the averted births would occur in females who already have a child. Therefore, the additional money received would only be the 'child element' and 'disability elements' (as the household would already be receiving the 'family element'). The remainder of averted births would occur in families who already have 2 children, and so the only eligible elements are the 'disability elements' (as the household would already be receiving the 'family element' and the maximum 'child element'). This is summarised in Table 9 below. From these household size calculations and the value of the different CTC elements described above, it is possible to work out the cost savings from CTC through use of contraception.

Table 9

Averted births	Percentage	Eligible claims	Average claim amount
First child	50.7%	Family element	£548
		Child element	£2,780
		Disability element	£3,140
		Severe disability element	£4,415
Second child	15.1%	Child element	£2,780
		Disability element	£3,140
		Severe disability element	£4,415
Third (or more) child	34.2 %	Disability element	£3,140
		Severe disability element	£4,415

However, a further complication is that the amount received is also dependent on income. 77.3% of families claiming CTC receive the maximum amount from each element of the benefit, while 22.7% receive a tapered amount (31). As the extent of the tapering is not known, it is assumed for the purpose of this analysis that, on average, those receiving a tapered amount receive half the amount of the maximum claim. As CTC is an ongoing

payment, these costs accrue over time and costs from future years have been discounted in the model.

2.3.8 Working Tax Credit

Working Tax Credit (WTC) is a payment made by the government to those in work who are on low incomes, and as with other benefits, the amount received is dependent on circumstances, such as income level, hours worked and childcare requirements. Only the 'childcare element' of WTC is relevant in this analysis. From Her Majesty's Revenue & Customs (HMRC) statistics (32), the average weekly payment for childcare is £57, and there were 387,000 families receiving the childcare element of WTC, which is 4.86% of all families with children in the UK in 2016 (29).

WTC is a continual payment, so the averted costs accrue over time and costs from future years have been discounted. However, the payment is only required while childcare is required, and so have only been included in the model up to year 5, at which point the child would likely enter full time schooling.

Table 10

Working Tax Credit – key data	
Proportion of families claiming childcare element of WTC	4.86%
Average weekly payment for childcare	£57

Source: ONS (29), HMRC (32).

2.3.9 Income Support for lone parents

Income Support is a benefit available for lone parents of low income, until their child reaches age 5. The benefit is not dependent on the number of children; only the first child from a single female would result in a new payment. 50.7% of females aged 15-44 are currently childless (Table 8), so for this proportion of the averted births, the child would be the first child in the family. From ONS Statistics, we know that 27% of all single child families are headed by a lone parent (29).

From Department for Work and Pensions (DWP) statistics (33), the caseload of lone parents claiming Income Support, as of May 2017, was 387,440, which is 22% of all lone parent families in the UK (29). The average weekly award is £71.33, or £3,709 per year (33). This value, multiplied by the number of averted live births and the percentages above, gives an estimate

of the cost savings from Income Support averted through contraception. The cost savings accrue over time, until children reach age 5, at which point the benefit would have stopped.

Table 11

Income Support for Lone Parents – key data	
Percentage of averted births that would be first child in family	50.7%
Proportion of all single child families headed by a lone parent	27%
Proportion of lone parent households claiming Income support	22%
Average weekly award	£71.33

Sources: ONS (19,29,30), DWP (33).

2.3.10 Housing benefit

Housing benefit is paid to those on low incomes or claiming benefits to help cover the cost of rent. Though eligibility is not dependent on having children, households with children tend to receive higher benefits, as the value of the benefit received is dependent on household circumstances. The mean weekly increase in benefit payments for single females with children (compared to those without children) is £12.05 (34). For couples, this weekly increase for those with children compared to those without is £28.43.

As of August 2017, there are 1,007,387 single females with children receiving the benefit, and 508,329 couples with children receiving the benefit, representing 13% and 6% respectively of all families in the UK (29,34). We can, therefore, calculate the housing benefit costs averted by contraception by multiplying the number of averted live births, by the percentage of families receiving the claim (for single females and couples), and the corresponding increase in payment for these household types as a result of having children. As housing benefit is a continual payment, the averted costs accrue over time. This calculation assumes there is no change in the initial eligibility for housing benefit as a result of having a child.

Table 12

Housing Benefit – key data	
Single females claiming house benefits as a proportion of all families	13%
Couples claiming housing benefit as a proportion of all families	6%
Average weekly increase in claim costs for single females with children	£12.05
Average weekly increase in claim costs for couples females with children	£28.43

Sources: ONS (29), DWP (34).

2.3.11 Maternity Allowance

Maternity Allowance is a payment provided by the government to pregnant women and new mothers who are unable to claim Statutory Maternity Pay (for example, if they are recently unemployed, haven't worked for an employer for long enough, or if they are self-employed).

From the DWP statistics (35) and birth statistics (23), it is possible to calculate that roughly 9% of all mothers having children receive the allowance each year. The amount received is dependent on circumstances.

For the period above, 69% of claimants received the maximum rate of £141 per week: compared to 32% who claimed a variable rate, averaging £78 per week, and the average allowance duration is 38 weeks and 5 days (35). If we assume that the proportion of claimants is the same for averted births, these costs and proportions can be applied to the number of averted live births to calculate the averted costs from maternity allowance. All the cost savings are realised in the first year, with no ongoing costs.

Table 13

Maternity Allowance – key data	
Proportion of all pregnant mothers receiving maternity allowance	9%
Proportion of claimants claiming the maximum rate	69%
Proportion of claimants claiming a variable rate	32%
Weekly allowance – maximum rate	£141
Weekly allowance – average variable rate	£78
Average allowance duration in weeks	38.7

Sources: ONS (23), DWP (35).

2.3.12 Sure Start Maternity Grant

Sure Start Maternity Grant is a one-off payment of £500 from the DWP Social Fund, received by mothers for whom a new child is the only child under 16 in the family (or if they are expecting a multiple birth such as twins) and who are in receipt of certain benefits. There were 54,900 recipients of the payment in 2016 (36), representing 8.3% of the 663,157 births in the UK (23). If we assume the same proportion of averted live births would receive the benefit, then we can calculate the costs averted by contraception by multiplying this percentage with the number of averted live births and the value of the award (£500). All the cost savings are realised in the first year, with no ongoing costs.

Table 14

Sure Start Maternity Grant – key data	
Value of award	£500
Proportion of all births where the grant is claimed	8.3%

Sources: ONS (23), DWP (36).

2.3.13 Children in care

Children in care (also commonly referred to as 'looked after children') are children for whom local authorities hold parental responsibility, as granted by a court care order. The National Audit Office (NAO) estimates that 0.6% of all children under the age of 18 in England fall into this category (37). Despite this small proportion, the costs of providing care to this group are very high, hence why this aspect has been included in this analysis.

Based on Department of Education data from 2012/13, the NAO estimate that 75% of children in care are placed in foster care, at a cost of £28,778 per year, compared to 25% living in residential care, at a cost of £130,729 per year (37). HM Treasury's GDP deflator series (38) has been used to convert these to 2016/17 prices (£30,568 and £138,861 respectively). Multiplying the weighted average annual cost by the number of live births averted and the proportion affected (0.6%) gives the cost savings from averted births.

Table 15

Children in Care – key data	
Proportion of all children who are in care	0.6%
Average annual spend on a foster place for a child (2016/17 prices)	£30,568
Average annual spend on a residential place for a child (2016/17 prices)	£138,861
Percentage of children in care who are fostered	75%
Percentage of children in care in a residential place	25%

Source: NAO(37), HM Treasury (38).

2.4 Adjustment for ‘mistimed’ births

The calculation described on page 16 estimates the number of pregnancies and births averted through the use of contraception. Some unintended pregnancies do not lead to live-births; 52% and 12% of unplanned pregnancies are assumed to end in abortion and miscarriage respectively. However, we cannot assume that all these unintended pregnancies that do lead to live - births, if avoided today, would not have occurred later as a planned birth.

This has been described by Montouchet and Trussell (16): ‘Not all unintended pregnancies are unwanted; most are mistimed, and would have occurred as intended births at a later date’. Evidence they cite from the USA National Survey of Family Growth (14) suggests that 60% of unplanned births are mistimed, whereas 40% of births would have otherwise never occurred.

The full direct and indirect costs of birth can only be considered for those 40% of unplanned births that would have not occurred later. For the remaining 60% of births which are mistimed, the cost averted by contraception is the cost of incurring expenditure at an earlier point than otherwise would have occurred. Montouchet and Trussell state the cost of a mistimed birth is given by:

$$B - B/(1+r)^{d}$$

Where:

- B = the cost of a birth
- r = the discount rate
- d = the number of years by which the birth would have been delayed, (taken as 2 years in the literature (16))

The adjustment was not relevant for the costs of abortion and miscarriage, because future planned pregnancies would not result in abortion and miscarriage in the future, instead resulting in intended births. So the full cost of abortions and miscarriages is used.

2.5 Public spending on contraception

Since 2013, commissioning responsibilities for sexual health services have been split between local authorities (as part of the public health grant), the main funders of sexual health clinics, and the NHS, the main funders of contraceptive services provided in general practice.

In the financial year 2016/17, £174.5m was spent by local authorities on contraception (6). This relates specifically to spending on contraceptive services, and excludes the spending on other sexual health services such as STI testing and treatment and sexual health promotion, prevention and advice.

From national prescription data (39), £71.6m was spent on contraceptives by General Practices (GP) in England in the financial year 2016/17. Summing the local authority spending and the NHS spending gives the total annual public spending on contraception: £246.1m.

It should be noted that there are likely to be data inconsistencies in these reported spending figures. There is likely to be some overlap of funding for local contraceptive services between local authorities and the NHS. Also, the use of prescription cost data excludes the cost of service provision itself, such as the costs of staff time and other clinic resources.

2.6 Inflation indices

Healthcare unit cost evidence from years prior to 2016 has been inflated using the Hospital and Community Health Services (HCHS) index (22). The index was used specifically in this analysis for inflating the healthcare unit costs of births, abortion and miscarriage, the evidence of which was taken from a paper by Thomas and Cameron (21) using NHS reference cost data from 2011. Evidence for the unit costs of providing social care to children, which was taken from a paper by the National Audit Office using data from 2012/13 (37), was inflated using HM Treasury's GDP deflator series (38).

3. Results

3.1 Number of averted pregnancies

The total annual number of pregnancies averted under the current pattern of contraceptive use is estimated to be 6,229,415 (Table 1). Under the counterfactual scenario where LARC use is reallocated to condom use and pill use (scenario 1), the number of averted pregnancies falls to 6,024,637. So the change in averted pregnancies is 204,779 of which 73,720 are live births. To appreciate the scale of that number, there were 663,157 births in England in 2016, so that would represent an 11.1% increase in the annual number of births.

3.2 Cost savings per pregnancy averted

When all costs above are summed over a 10-year time frame (discounted at 3.5%) and divided by the number of averted pregnancies, this gives the cost saving per averted pregnancy for each cost category (Table 16). Note these are lower than the cost savings per live birth, because not all pregnancies result in a live birth; 52% and 12% of unplanned pregnancies end in abortion and miscarriage respectively (25). Summing all cost categories gives a cost saving per averted pregnancy of £23,909 over 10 years.

Table 16

Cost saving over 10 years	per averted live birth	per averted pregnancy
Birth cost	£5,505	£1,982
Abortion cost	-	£399
Miscarriage cost	-	£78
Healthcare costs	£18,309	£6,591
Public Health costs	£1,107	£398
Education costs	£21,429	£7,714
Child Benefit	£5,055	£1,820
Child Tax Credit	£7,938	£2,858
Working Tax Credit	£651	£234
Income Support for Lone Parents	£499	£180
Housing Benefit	£1,441	£519
Maternity Allowance	£426	£153
Sure Start Maternity Grant	£41	£15

Children in Care	£2,876	£1,035
Total	**£65,276**	**£23,976**

After adjusting to take into account that 60% of averted pregnancies are assumed to be 'mistimed', the total cost of an averted pregnancy over 10 years falls from £23,976 to £10,819. This is calculated using the formula described in section 2.4 (page 28).

3.3 Return on Investment figures

ROI figures are reported in Table 17 for the scenario where we hypothesise that if not publicly provided, LARC use would be replaced by condom and pill use. An ROI larger than one means that the benefits exceed the costs, where an ROI less than £1 means that the costs exceed the benefits, and an ROI equal to £1 is break-even.

From a healthcare perspective, the ROI is £1.51 for every £1 spent after one year, reflecting the high savings from averted birth costs. The ROI grows gradually to £2.82 for every £1 spent over 5 years, and £3.68 over 10 years, due to the averted costs of providing healthcare to children as they age.

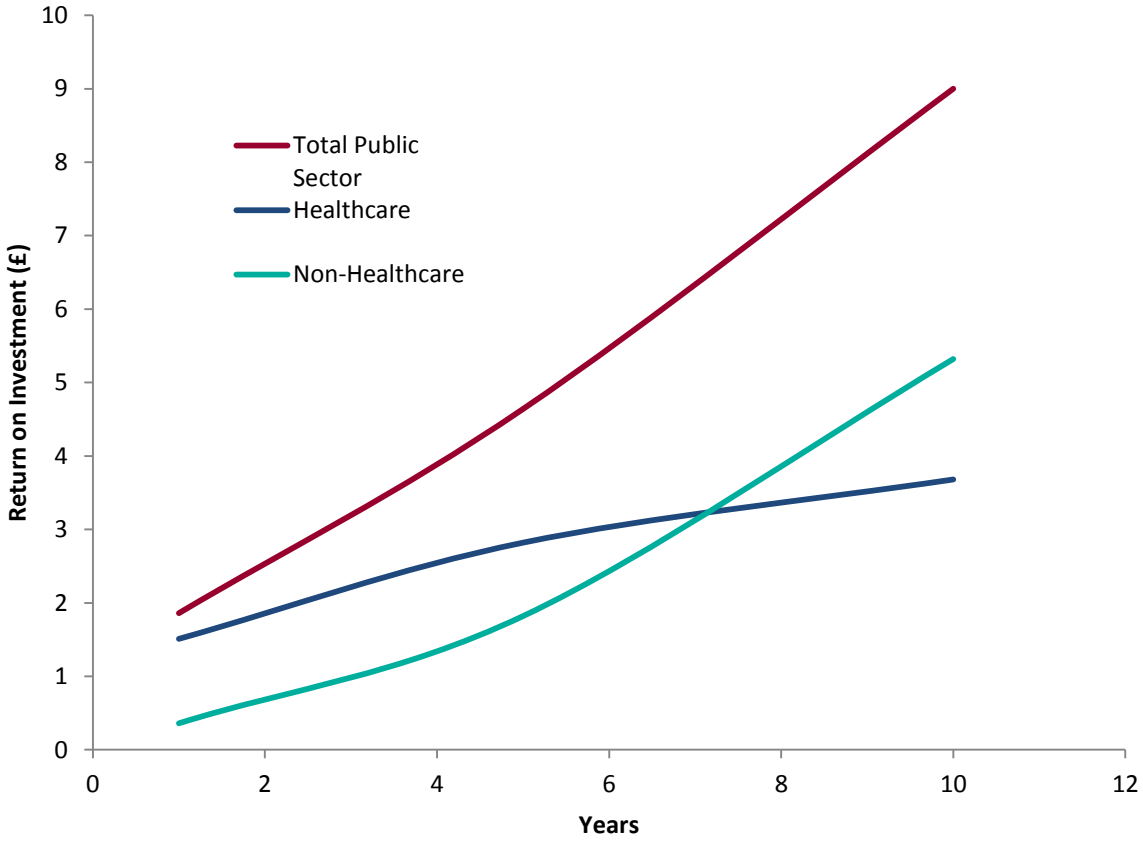
By contrast, non-healthcare costs are initially not cost-saving, with an ROI of £0.36 after one year. However, in the longer term, there are increasing savings from averted education and welfare costs, resulting in an ROI of £1.82 over 5 years, and £5.32 over 10 years.

When considering total cost savings across the public sector, the ROI is £1.86 after one year (exceeding break-even) and £4.64 over 5 years. Over 10 years, the ROI is £9.00, or in other words, there is an £9.00 saving for every £1 invested in publicly provided contraception. Figure 1 demonstrates how the ROI changes over time across the different perspectives.

Table 17

Time Horizon	Perspective		
	Healthcare	Non-Healthcare	Total Public Sector
1 year	£1:£1.51	£1:£0.36	£1:£1.86
5 years	£1:£2.82	£1:£1.82	£1:£4.64
10 years	£1:£3.68	£1:£5.32	£1:£9.00

Figure 1 Return on Investment (ROI) for contraception provision over time



4. Discussion

4.1 Main findings

The ROI suggests there is an £9.00 saving for every £1 invested in contraception provision in England. The results are lower than in the existing literature, though the figures are closer to the range established by McGuire and Hughes(3)(£1:£11-£1:£29) compared to the range established by the Family Planning Association(4)(£1:£85-£1:£159). This is to be expected as the methodology followed a similar approach to McGuire and Hughes study, while that employed by the FPA study differed in a number of ways (8. Appendix). However, none of the analyses can be directly compared owing to differences in the costs included and methodological approaches.

For example, different public sector costs were included in this analysis compared to McGuire and Hughes study. Another improvement of the methodology in this analysis was to account for the fact that many unplanned pregnancies are 'mistimed' and would have likely occurred at a later stage as planned pregnancies, and therefore an adjustment needs to be made to the cost savings from averting such pregnancies. This adjustment substantially reduces the ultimate ROI figure.

The ROI is cost-saving whether taking a healthcare or non-healthcare perspective. Healthcare savings are more upfront, with more gradual increases in ROI thereafter, whereas non-healthcare savings are small initially (below break-even) but increase rapidly after 5 years. The timescales of expected savings will be relevant to decision-makers in both the NHS and local authorities. The biggest cost saving categories were ongoing child healthcare costs (£18,309 per live birth over 10 years) and education costs (£21,429 per live birth over 10 years) (Table 16). The welfare cost savings per birth are also substantial when summed across the various welfare categories.

4.2 Strengths and limitations

A strength of the analysis is that it produces an overall figure for ROI across all contraceptive methods, which is perhaps more useful for decision-makers than the cost-effectiveness of particular contraceptive methods, for which there is a larger body of existing literature (1,2). It also provides different ROI figures depending on a healthcare perspective or broader public sector perspective, which is important because decision-makers in the NHS and

local government may want to focus on the cash savings within their respective areas. Furthermore, the analysis improves on prior estimates by accounting for the fact that a majority of unplanned pregnancies are mistimed rather than unwanted.

The main limitation of this analysis is the difficulty in establishing a counterfactual scenario (if contraception were *not* publicly funded) because we do not know how contraceptive behaviour would change if people had to pay for it, nor do we know what the private market might look like if this were the case. There is limited evidence to establish this. To overcome this limitation, we have suggested a scenario based on the reasonable assumptions that short acting contraceptives would be more accessible and affordable than long acting contraceptives, and we have allowed other results to be explored in the Excel model that accompanies this report.

It would be informative for future analysis if future sexual health surveys in the UK probed at the willingness to pay for different contraceptive methods. Another assumption is that those women utilising contraception currently are sexually active, so perhaps overstating the number of averted pregnancies. However, the effect of this will be minimal as the assumption applies under both the current access and hypothetical access scenarios.

The Return on Investment calculation is sensitive to the assumptions applied throughout the analysis. For example, if we assumed the proportion of pregnancies that was mistimed was 50% (rather than 60%) and the proportion of pregnancies that was unwanted was 50% (rather than 40%), then the ROI increases from £9.00 for every £1 spent on publically provided contraception over a 10-year period to £10.83 for every £1 spent.

There were also some limitations around data sources. Some of the evidence (for example, for typical contraceptive failure rates, and the proportion of pregnancies that are mistimed) was taken from USA-based studies, due to a lack of evidence from the UK. It is possible that these rates may differ in the UK to the USA. However, given both are developed Western countries, we assume they would not be substantially different.

Though our study population was for England, some national statistics were only published at a UK level. For example, the average claim for a particular benefit, or the number of claimants of a particular benefit. In these cases, we assume the average statistic for the UK is also applicable to the England population. Another limitation was spending data for contraception in England. There is likely to be some inconsistencies in the way cost data is

recorded, and some overlap between the prescription costs recorded in general practice and local authority spending. Also, using prescription cost data does not capture the full costs of providing contraception in primary care, such as staff time.

5. Conclusions

Contraception is a highly cost-effective public health intervention. It is already well established that individual contraceptive methods are highly cost-effective (1,2). The importance of contraceptive choice is well-established, and so it is more useful for commissioners to understand the cost-effectiveness of contraceptive services as a whole rather than for individual methods.

This analysis suggests that publicly funded contraception as a whole is also highly cost-effective. Assuming that if contraception were not publicly provided, LARC use would be replaced by condom and pill use, there is a Return on Investment across the public sector of £4.64 per £1 spent over 5 years, and £9.00 per £1 invested, over 10 years. These returns are shared across the NHS and the wider public sector, with healthcare savings featuring more strongly in the short term, whereas non-healthcare savings are a more important factor in the longer term.

The timescale of this analysis contrasts with many other public health interventions, where cash savings and health benefits are only realised over a much longer timescale. It is worth remembering that the analysis here only refers to direct savings to public sector budgets, and so it gives a conservative estimate of ROI, that does not attempt to capture the wider societal impacts of unplanned pregnancy on the outcomes of the mother and child. Taken together, the analysis suggests that cuts to contraceptive services will cost the government in both the short term and long term, through an increase in healthcare, education and welfare costs from unplanned pregnancies.

6. Future work

PHE has commissioned a report from the London School of Hygiene and Tropical Medicine which assesses the feasibility of using the London Measure of Unplanned Pregnancy (LMUP) in routine hospital data collection in hospital settings. Once implemented across the service, this will give us improved data on unplanned pregnancy which can be used to further inform in this analysis.

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8. Appendix

Table 18: Methodological differences between this analysis and prior studies

	McGuire & Hughes	FPA	PHE
Type of economic evaluation	Cost Benefit Analysis	Cost Benefit Analysis	Cost Benefit Analysis
Outcome measure	Benefit: Cost ratio	Benefit: Cost ratio	Benefit: Cost ratio
Benefits	Cost savings from pregnancies averted in one year through public provision of contraceptives	£100m saving from funding reduction over 5 years. £200m savings from funding reduction over 10 years	Cost savings from pregnancies averted in one year through public provision of contraceptives
Costs	Total annual public spending on contraception	Costs incurred over 5 and 10 years, following the increase in pregnancies and increased STI rates	Total annual public spending on contraception
Method for estimating the change in number of pregnancies	Assumed change in pattern of contraceptive use leading to change in efficacy	Assumed change to conception rates following funding cuts	Assumed change in pattern of contraceptive use leading to change in efficacy
Pregnancy/birth/child cost categories considered	• Birth, abortion, miscarriage • Welfare benefits	• Birth, abortion, miscarriage • Ongoing child healthcare • Education • Welfare and social care	• Birth, abortion, miscarriage • Ongoing child healthcare • Education • Welfare and social care
Adjustment for 'mistimed' pregnancies?	No	No	Yes
Time Horizon	16 years	5 years, 10 years	1 year, 5 years, 10 years
ROI Figure	£11 per £1 (counterfactual: condoms) £29 per £1 (counterfactual: withdrawal methods)	£85 per £1 over 5 years £159 per £1 over 10 years	£4.64 per £1 over 5 years £9.00 per £1 over 10 years