Human Fertilisation & Embryology Authority

Fertility treatment 2014–2016

Trends and figures

March 2018

www.hfea.gov.uk

We are the UK's independent regulator of fertility treatment and research using human embryos. A world-class expert organisation in the fertility sector, we were the first statutory body of our type in the world.

Contents

Contents

About this report

We are the independent regulator of fertility treatment in the UK. Part of our role is to collect data from every licensed fertility clinic about the tens of thousands of treatment cycles they perform each year. We hold this information in our database called the Register.

This report provides key information about the number and type of fertility treatments that have been carried out across the country and how many of these have led to a birth. The information in this report relates to data on treatment cycles carried out in 2014, 2015 and 2016. The last report on this subject was published in 2016 and can be found on our website.

This report will be supplemented by an extended report on egg freezing and an additional report on egg and sperm donation later in 2018.

Chair's foreword

As the NHS approaches its 70th anniversary this year, we and all those involved in fertility treatment, will be celebrating another significant UK medical achievement: the 40th anniversary of the birth of the world's first IVF baby, Louise Brown.

The news of Louise Brown's birth in 1978 made headlines around the world; today IVF is much more common. In the UK alone, more than 68,000 treatments were provided in 2016. I am delighted to present our sixth Fertility treatment report, which gives us the opportunity to reflect on the progress which has been made in improving patient care and outcomes, and the future direction in which the sector is heading.

The picture that emerges is a largely positive one. Clinics have maintained birth rates, while multiple birth rates have continued to fall, representing much safer experiences for women and their children, and a genuine public health success. Overall, this means that more people have the opportunity to create the family they want, through the safest clinical methods.

We have just completed a large programme of work which has transformed the way we collect, use and publish information to benefit patients, the wider public and clinics. This publication marks the beginning of a new collection of reports that will help to inform and empower patients, promote research, and drive up standards in clinics to the benefit of tens of thousands of people each year.

In this report, for the first time, we have included data on intrauterine insemination treatment (IUI) and surrogacy, as well as having expanded the information we provide on pre-implantation genetic diagnosis (PGD) and egg sharing cycles. We have also broken down our IVF data by the use of partner and donor eggs and sperm to help us better understand the activity levels and demographics for these different types of IVF. It is important to recognise that although related, these are distinct types of treatment, and patients will benefit from knowing more about the treatment that is most relevant to their circumstances. This analysis also provides useful detail on the impact of donor eggs and sperm on birth rates.

Through analysing and publishing the data we hold, we are enabling researchers, clinics and patients to better understand fertility treatment outcomes, and supporting our aim to place patients at the centre of high quality care.

Sally Cheshire CBE
Chair, HFEA

Executive summary

So just how far has fertility treatment come since the first IVF baby was born? Over the past 40 years, there have been significant innovations in clinical practice and access to fertility treatment has become more widespread. Viewed over the long term, three key features are most apparent.

Firstly, birth rates have improved significantly. Since 1991, when the Human Fertilisation and Embryology Authority (HFEA) was set up, birth rates from IVF treatment in the UK have increased by over 85% – around one in three treatment cycles now result in a birth for patients under 35. In 2016, over 20,000 children were born through IVF and donor insemination treatment.

Secondly, births from fertility treatment have become safer. In recent years, we have worked hard with clinics and patients to raise awareness of, and minimise, the number of multiple births. In 2008, one in four pregnancies from IVF resulted in a multiple birth, leading us to set a target that no more than 10% of IVF births should be multiples. Working together with patient groups, clinics and professional bodies, the national multiple birth rate has decreased from 24% in 2008 to 11% today, without reducing birth rates. This is a fantastic achievement which has increased the safety of IVF for mothers and their babies and reduced the burden on NHS maternity and neonatal services.

Thirdly, fertility treatment has become available to a wider range of people who are accessing a broader range of treatment types, and media coverage often focusses on these new clinical innovations or new family forms. Yet, in amongst such change, it's easy to miss continuity – the overwhelming majority of IVF treatment cycles performed in UK clinics are still for patients using their own eggs and their partner's sperm in treatment (88% of all IVF treatment cycles in 2016).

The period covered by this report, 2014–16, reveals a number of significant developments in UK fertility services. The rise in birth rates for frozen treatment cycles, both those using frozen embryos and frozen eggs, is particularly striking. The number of frozen IVF treatment cycles has increased year on year and in 2015, for the first time, birth rates from frozen embryo cycles surpassed those from fresh cycles. Birth rates from egg freezing cycles have also increased, with 26% of patients finishing their treatment cycles with a live birth in 2016, compared to 20% in 2013.

The highest birth rates for fresh and frozen IVF cycles are for women under 35, and the birth rate falls as a patient's age increases. The exception is in the over 44 age group, which we know has a much higher proportion of patients using donor eggs. The overall birth rate per embryo transferred for the 43–44 age category is just 7% for fresh cycles, but for women using donor eggs and partner sperm, this figure is some four times higher at 31%. This data helps us to understand the impact of donor eggs on success rates in older patients. This knowledge could have important implications for patients' treatment options.

This report also provides details of less frequent forms of fertility treatment, including egg sharing and pre-implantation genetic diagnosis (PGD). There has been a decline in egg sharing cycles, with just 577 cycles in 2016, a 7% decrease since 2015, and a consistent decline over the past 10 years. PGD, on the other hand, continues to increase. In 2016 there were 712 PGD treatments for an increasing number of serious inherited conditions, of which the overwhelming majority (81%) were frozen cycles. We can see from the data that not only is the proportion of frozen (PGD) cycles significantly different to all IVF cycles, but that the age profile of women undertaking PGD cycles is younger. This is because patients seeking PGD treatment are likely to be a different demographic to most fertility patients as they rarely have infertility problems, and are seeking PGD to avoid passing on serious genetic diseases known to be in their family.

What have we learned from this? Information is said to be power and we are beginning to gain more value from it. We are using the full range of our data to continually question our understanding and assumptions of issues, and challenge all those involved in delivering fertility treatments to achieve ever higher standards of clinical excellence. We know that effective benchmarking, analysis and research can inform policy and clinical practice. We believe that better intelligence, and outstanding clinic leadership, can drive the performance of clinics across the UK to deliver even better care for patients.

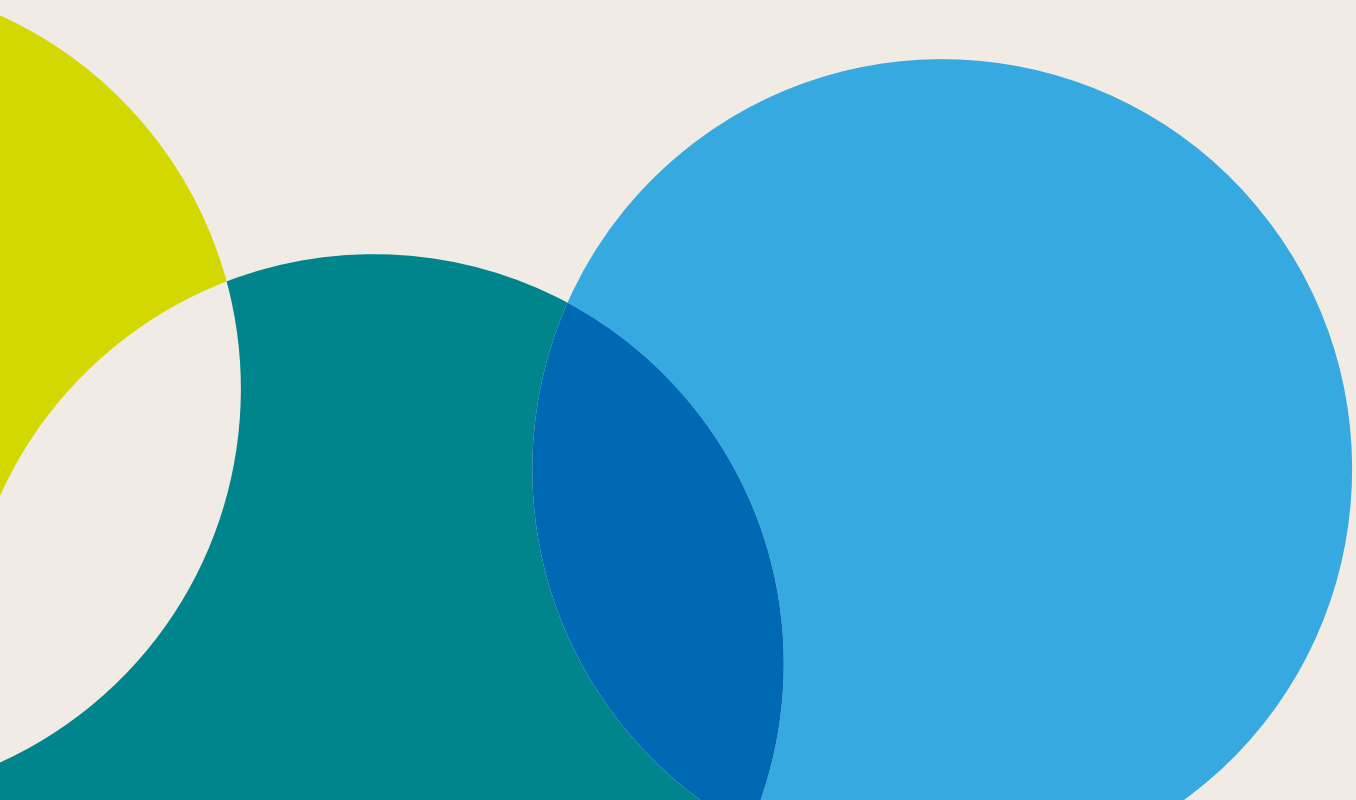
Key terms used in this report

Full term	Description[1]
Birth rate per embryo transferred (PET)	The number of births divided by the sum of embryos transferred for treatment cycles starting in that year.
Birth rate per treatment cycle (PTC)	The percentage of treatment cycles started in that year which resulted in a live birth.
Cycle	All treatments cycles plus storage, donation and freezing cycles that are conducted at a fertility clinic.
Donor eggs and donor sperm (DEDS)	IVF treatment cycles using donor eggs and donor sperm.
Donor eggs and partner sperm (DEPS)	IVF treatment cycles using donor eggs and the patient's partner's sperm.
Donor insemination (DI)	Donor insemination is a treatment where donor sperm is placed directly into the womb.
Freeze cycle	A cycle in which a patient has eggs collected with the intention of freezing them for future use.
Human Fertilisation and Embryology Authority (HFEA)	The HFEA regulates fertility treatment in the UK.
Intra-cytoplasmic sperm injection (ICSI)	ICSI is treatment where sperm is injected directly into the egg.
Intrauterine insemination (IUI)	IUI is a treatment where partner sperm is placed directly into the womb.
In vitro fertilisation (IVF)	IVF is a treatment where a woman's eggs are fertilised with sperm in a lab.
Multiple birth rate	The percentage of all live births resulting from treatment cycles started in that year which resulted in the birth of more than one live baby.
Own eggs and donor sperm (OEDS)	IVF treatment cycles using a patient's own eggs and donor sperm.
Own eggs and partner sperm (OEPS)	IVF treatment cycles using a patient's own eggs and their partner's sperm.
Pre-implantation genetic diagnosis (PGD)	PGD is a treatment which allows people with a serious inheritable genetic condition in their family to avoid passing it on by testing the patient's embryos for the condition.
Thaw cycle	A treatment where patients use previously frozen eggs in an IVF treatment cycle.
Treatment cycle	Only those cycles where the patient recorded on their registration form that they intended to become pregnant (compare to the cycle term above).

[1]See 'Background information' for further details on definitions and calculation methods.

IVF

In vitro fertilisation (IVF) is the most common fertility treatment for people who are unable to conceive naturally. It involves collecting a woman's eggs and fertilising them with sperm in the lab to create embryos which are then transferred back to the woman's womb. Often several embryos will be created through fertilising the eggs and those not transferred may be frozen for patients to use in later treatment.



Key statistics

- Between 1991[2] and 2016, there have been over 1,100,000 IVF treatment cycles in UK licensed clinics.
- In 2016, there were just over 68,000 IVF treatment cycles[†], resulting in 20,028 births. This was a 4% increase from 2015 to 2016.
- Since 2014, frozen IVF treatment cycles have increased by 39%.
- In 2015, birth rates for frozen cycles exceeded fresh for the first time.

In 2016:

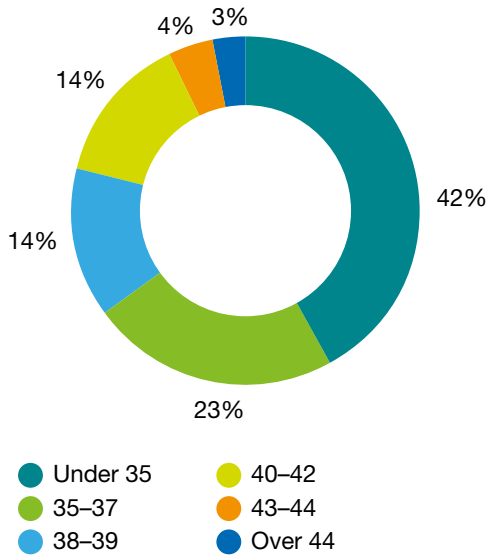
- 31% of IVF treatment cycles were frozen, up from 27% in 2015.
- 12% of IVF treatment cycles used donor eggs, sperm or both.
- The birth rate per embryo transferred (PET) was 21% for all cycles.
- The birth rate PET for frozen cycles was higher than for fresh cycles for the second year in a row (22% frozen, 21% fresh).
- 41% of IVF treatment cycles were funded by the NHS.
- 42% of IVF patients were under 35, with 58% over 35.

Patient characteristics

Age

In 2016, 42% of patients undergoing IVF treatment cycles were under 35. 23% were aged between 35–37, 14% aged 38–39, 14% aged 40–42 and 4% aged 43–44. Of all IVF treatment cycles, 3% were for women over 44 (1,812), up from 2% in 2014[3].

Figure 1: IVF treatment cycles by age, 2016



The average (mean) age of an IVF patient was 35.5 in 2016. Since 2000, the average age has increased by around a year. In 2016, there were variations in the average age of patients by nation/region where treatment was sought. The highest average age for an IVF patient is in London.

[†]The term 'treatment cycle' has been defined differently from its use in our State of the sector 2016–2017 report to reflect our future reporting methodology.

[2]We were established in 1991 and this was therefore the first year we collected data on fertility treatment.

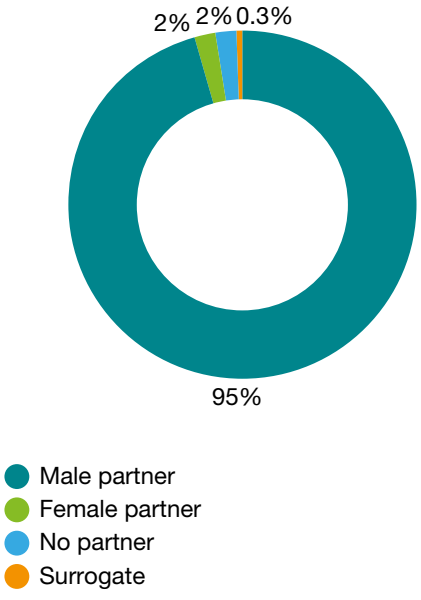
[3]We use the internationally recognised data ranges to represent assisted conception outcomes (< 35, 35–37, 38–39 40–42 etc.) because age is the most important factor in determining the success rate for IVF regardless of the denominator used.

Partner status

In 2016, 64,903 IVF treatments were for women who registered with a male partner (95.3%), 1,683 for women who registered with a female partner (2.5%), 1,272 for women who registered with no partner (1.9%), and 232 for women who registered as a surrogate (0.3%).

Since 2014, the number of IVF treatments for patients with a male partner increased by 6%, the number of IVF treatments for patients with a female partner increased by 30%, and the number of IVF treatments for patients with no partner increased by 35%.

Figure 2: IVF treatment cycles by patient partner type, 2016



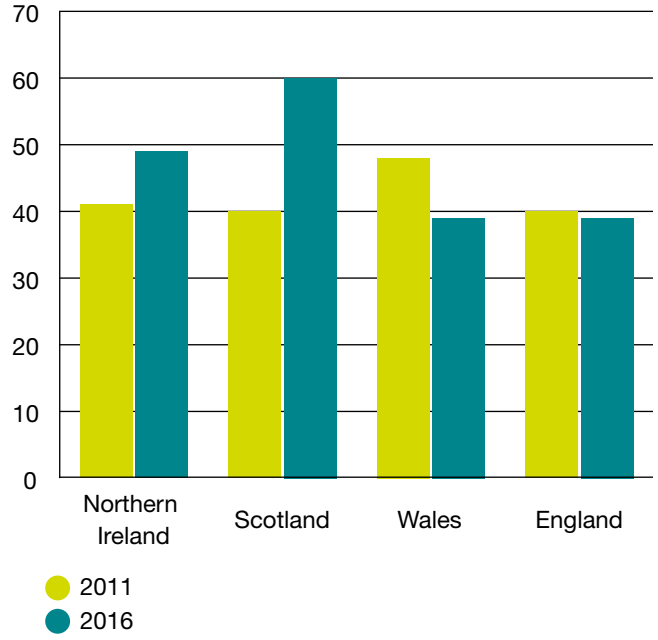
Funding status

Although regulation of fertility services is UK-wide, commissioning is devolved to the national level. The trend over the past few years has been for English Clinical Commissioning Groups (CCGs) to reduce the number of treatment cycles they fund. In 2013, 24% of CCGs followed The National Institute for Health and Care Excellence (NICE) guideline[4]; in 2017, it is 12%. Some have cut the service altogether. In 2013, 1% of CCGs offered no service; in 2017, it is 3%, with a further 7% consulting on a reduced or removed service. The result is a patchy service across England, with neighbouring CCGs in the same region offering differing levels of access to fertility patients.

Changes in the proportion of NHS-funded IVF cycles in the past five years vary by nation and region, due in large part to different commissioning decisions. Scotland has seen a sizeable increase in the proportion of NHS-funded IVF cycles (from 40% to 60%), though Northern Ireland and some English regions have also seen increases in their rates of NHS-funded IVF cycles. The East of England has seen the largest decrease in the proportion of NHS-funded cycles in the past five years, from 63% in 2011 to 46% in 2016.

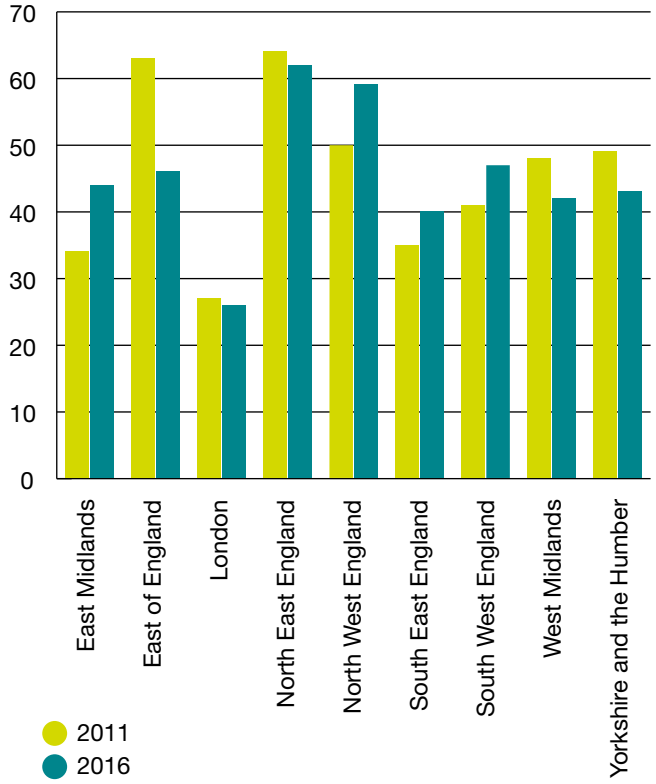
[4]The NICE clinical guideline states that the most cost-effective use of IVF is that women under the age of 40, and who meet certain criteria, should be offered three full cycles of IVF. NICE define a cycle as 'one episode of ovarian stimulation and the transfer of any resultant fresh and frozen embryo(s)'.

Figure 3: Proportion of NHS funded IVF by nation



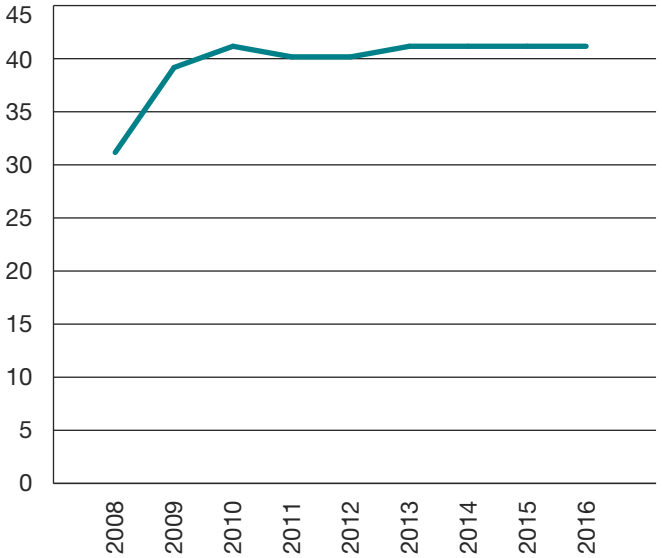
In 2016, 41% of IVF treatments were funded by the NHS, which has remained broadly stable since around 2010[5]. However this does not take into account the different levels of provision across the UK.

Figure 4: Proportion of NHS-funded IVF by English region



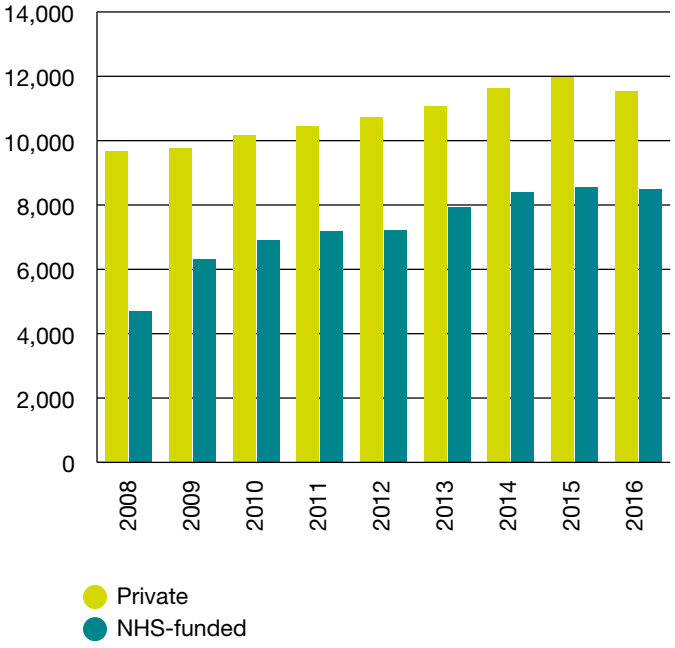
[5]Where funding status was known.

Figure 5: Proportion of IVF treatment cycles funded by the NHS



Since 2008, there have been 65,730 babies born in the UK through NHS funding for IVF treatments, with 8,507 in 2016.

Figure 6: IVF births by funding type



Cause of infertility

Patients may have multiple causes of infertility, so our data does not allow us to accurately identify the main single cause of infertility for each treatment cycle.

The most common reasons for IVF treatment cycles being carried out were male infertility (37% of recorded reasons), unexplained (32%), an ovulatory disorder (13%), tubal disease (12%) and endometriosis (6%).

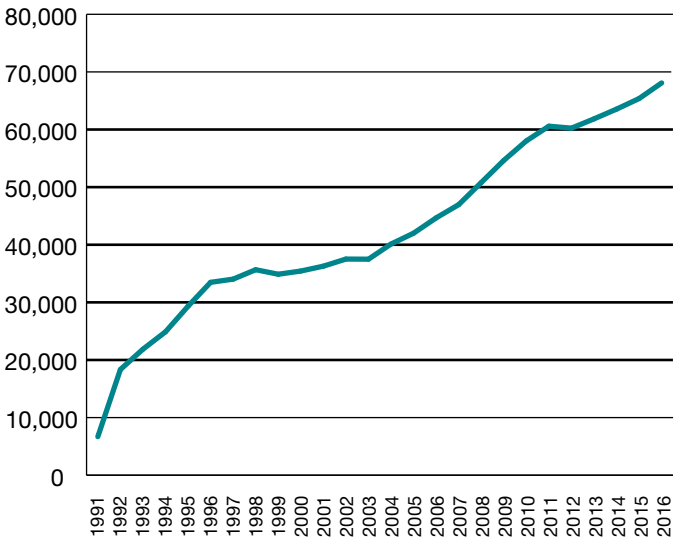
As expected, the cause of infertility affects the choice of treatment type to some extent. This is most evident with ICSI cycles, where male infertility is more likely to be a factor.

Treatment numbers and birth rates

All IVF treatment numbers

Between 1991 and 2016, there have been around 1,103,000 IVF treatment cycles in the UK. In 2016, just over 68,000 IVF treatment cycles were carried out, a 4% increase on 2015. This increase forms part of the continuous upwards trend in IVF treatment cycles since 1991.

Figure 7: Total IVF treatment cycles



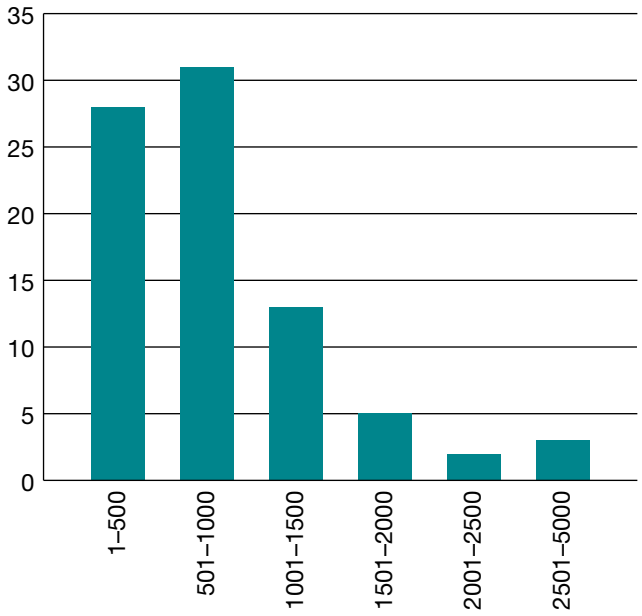
In 2016, 82 clinics were licensed to perform IVF treatment, with the majority of these being in England. The largest concentration of clinics is in London and the South East.

Clinics carrying out IVF treatments

Nation/region	2014	2015	2016
Northern Ireland	**3**	**3**	**3**
Scotland	**7**	**7**	**6**
Wales	**4**	**4**	**4**
England	**68**	**71**	**69**
East Midlands	4	4	4
East of England	6	6	6
London	20	22	22
North East	5	5	5
North West	5	6	6
South East	11	10	9
South West	6	6	5
West Midlands	7	8	7
Yorkshire and the Humber	4	4	5
Total	**82**	**85**	**82**

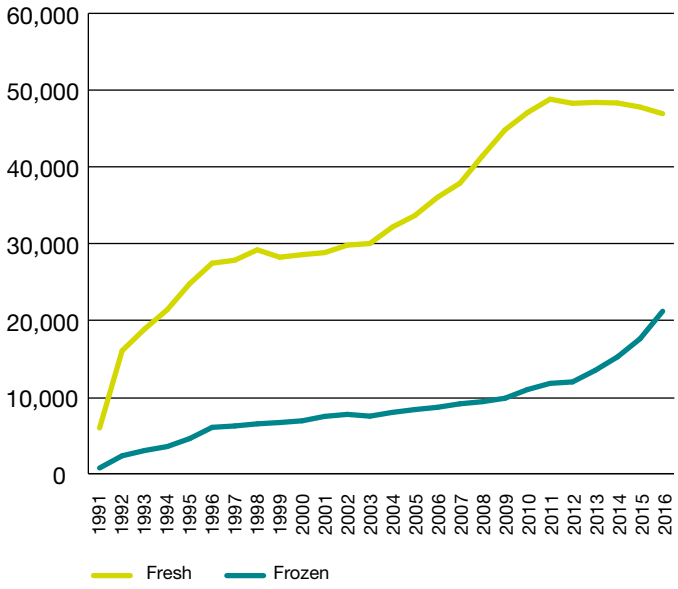
Clinics carried out widely different numbers of IVF treatments, from fewer than five cycles to more than 3,500. The largest number of clinics performed between 501–1,000 IVF treatments in 2016.

Figure 8: Number of clinics by IVF treatment activity, 2016



In 2016, 31% of all treatment cycles were frozen, and 69% were fresh. The number of fresh treatment cycles has remained broadly steady at around 48,000 treatment cycles per year over the last few years. Over the same period, the number of frozen treatment cycles increased significantly, from 15,227 in 2014, to 21,169 in 2016 (+39%).

Figure 9: Number of fresh and frozen treatment cycles

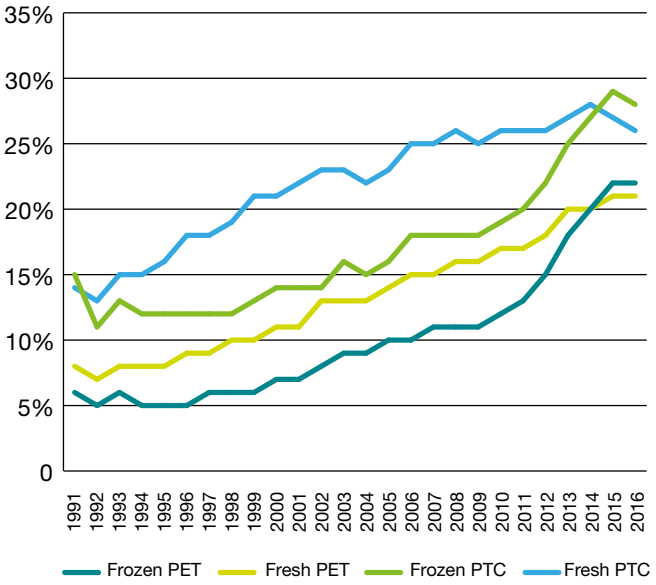


The increase in the use of frozen cycles is most likely due to a range of factors, including improvements in freezing processes and the increased uptake in single embryo transfer to reduce the number of multiple births.

All IVF birth rates

In 2016, the birth rate PET was 21% for fresh cycles, and 22% for frozen, continuing the consistent upward trend since 1991, when the birth rate was only 8% for fresh treatment cycles and 6% for frozen. The birth rate PET for frozen cycles has improved from 10% to 22% over the last 10 years (+120%), with an increase in fresh cycles from 15% to 21% (+40%).

Figure 10: IVF birth rates



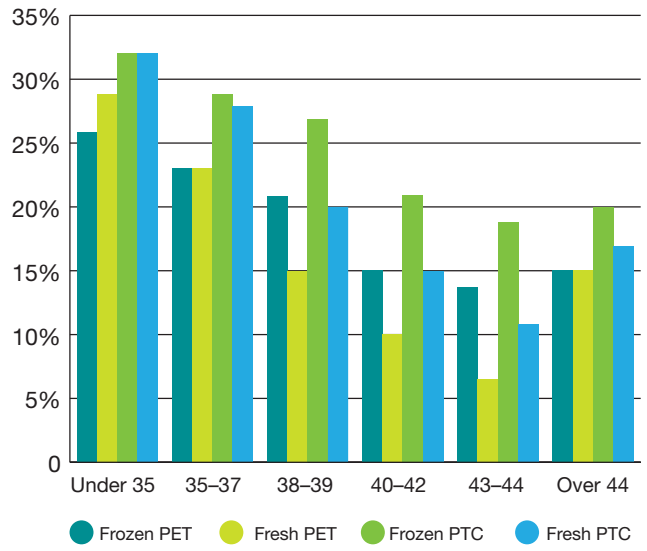
Historically, birth rates have been higher for fresh cycles, however in 2014 the birth rate PET was equal for fresh and frozen IVF cycles at 20%. In 2015, the birth rate PET for frozen cycles exceeded fresh for the first time. This is an important milestone in the development of IVF, and provides further support for the strategy to reduce multiple births by encouraging patients and clinicians, when appropriate, to transfer one fresh embryo and freeze those remaining for future transfers[6].

Birth rates were also higher for frozen cycles when looking at the birth rate per treatment cycle (PTC). In 2016, 26% of fresh treatment cycles ended in a live birth and 28% of frozen treatment cycles. These results demonstrate an impressive continuous improvement in birth rates for both fresh and frozen cycles of IVF since 1991 when the birth rate PTC was only 14%.

[6]For further information, see 'Our campaign to reduce multiple births'.

When broken down by age, birth rates vary considerably, with the under 35s having the highest birth rate PET across both fresh and frozen cycles (29% fresh, 26% frozen), compared with 21% across all IVF treatment cycles. Birth rates decrease as the age of patients increase, up until over the age of 44, when there is a small spike. This is likely because a higher proportion of over 44s use donor eggs in treatment. In 2016, 59% of over 44s used donor eggs in their treatment, compared with 21% for 43–44s and 8% of 40–42s.

Figure 11: IVF birth rates by age, 2016



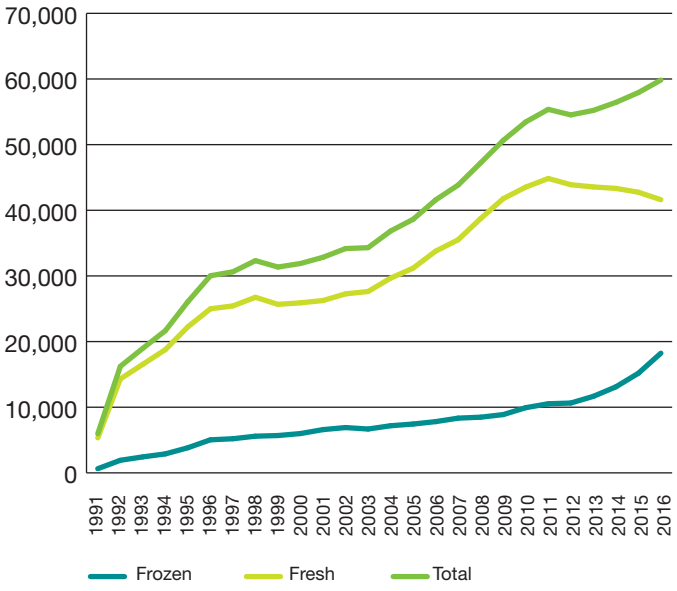
In 2016, under 35s were the only age group where fresh IVF had a notably higher birth rate PET than frozen. In the 35–37 age band, the birth rate PET has remained steady, at around 23% for both fresh and frozen cycles. For the 38–39, 40–42 and 43–44 age groups, frozen cycles were around five percentage points more successful than fresh cycles. For the over 44 age group, the birth rate PET for fresh and frozen cycles remains just below 15%.

Own eggs, partner sperm

Most IVF treatment cycles performed in UK clinics in 2016 were when a patient used their own eggs and their partner's sperm in their treatment (OEPS). In 2016, there were 59,839 OEPS treatment cycles, which is 88% of all IVF. Of these, 70% were fresh and 30% were frozen, compared to 69% and 31% for IVF treatment cycles overall.

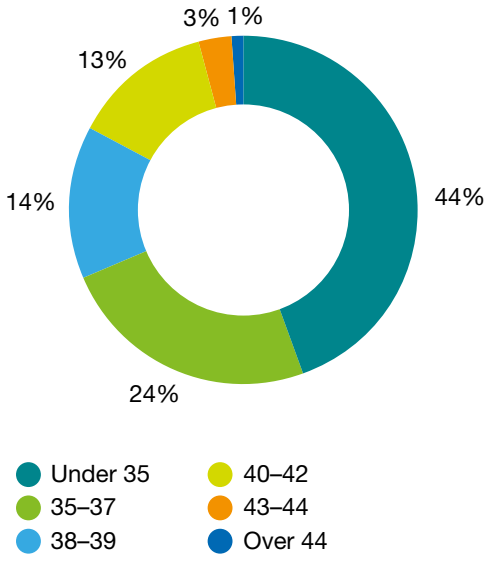
Overall, the total number of OEPS cycles has steadily increased, with 1,914 more cycles in 2016 than 2015 (+3%). There has been a reduction in fresh OEPS treatment cycles since the 44,800 cycles peak in 2011, with around 41,600 cycles in 2016. In 2016 there were around 18,200 frozen cycles, demonstrating a steady increase since 2012 (+ 53%).

Figure 12: OEPS treatment cycles



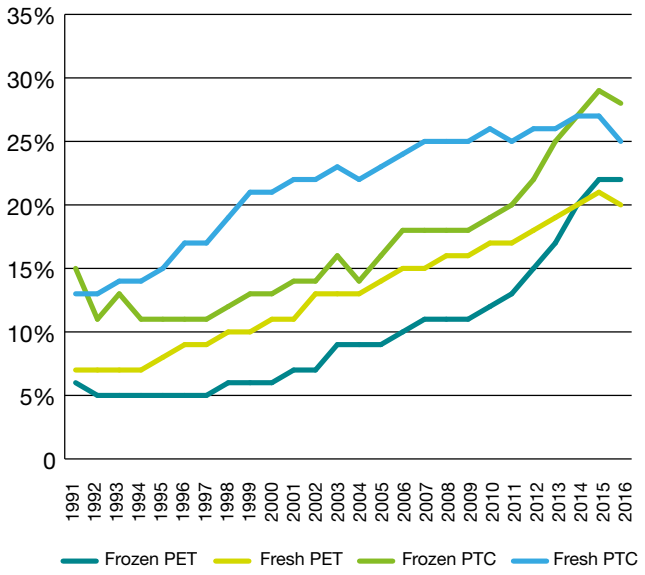
Of OEPS treatment cycles, 44% of patients were aged under 35, which is two percentage points higher than for IVF overall (42%). When broken down further, the 35–37 age category makes up 24% of all OEPS cycles, compared with 23% of IVF overall, and the 38–39 category remains the same as IVF overall at 14%. The over 44 age group makes up just 1% of OEPS treatment cycles, compared with 3% of IVF overall.

Figure 13: OEPS treatment cycles by age, 2016



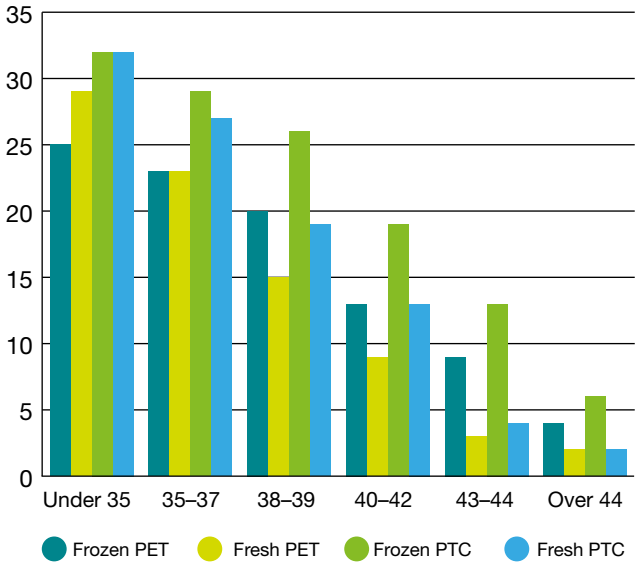
As OEPS treatment cycles make up the majority of IVF cycles, the trends are similar to those outlined for all IVF treatment cycles. In 2016, the birth rate PET for OEPS cycles was 22% (frozen) and 20% (fresh). The birth rate PTC for OEPS cycles also reflects overall trends, with higher rates for frozen cycles since 2014. In 2016, the birth rate PTC was higher in frozen than fresh, with 28% of frozen treatment cycles ending in a live birth compared with 25% of fresh cycles.

Figure 14: OEPS birth rates



When looking at birth rates PET broken down by age category for OEPS cycles, birth rates decrease in line with expected trends. For under 35s, fresh cycles have a slightly higher birth rate PET than frozen cycles (29% vs. 25%), and for the 35–37 age group the birth rate PET is the same for fresh and frozen (23%). In the older age categories, frozen cycles have a higher birth rate PET than fresh by between two and six percentage points.

Figure 15: OEPS birth rates by age, 2016

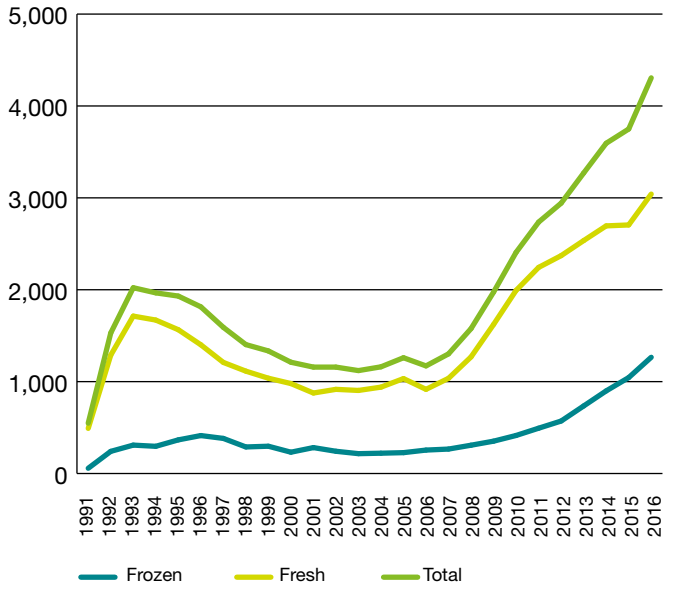


Own eggs, donor sperm

In 2016, there were 4,306 treatment cycles where a patient used their own eggs and donor sperm (OEDS), up from 3,749 in 2015 (+15%). Cycles of this type make up around 6% of all IVF treatment cycles. Of the OEDS treatment cycles, 29% were frozen and 71% were fresh, which is a slightly higher proportion of fresh cycles compared to IVF overall.

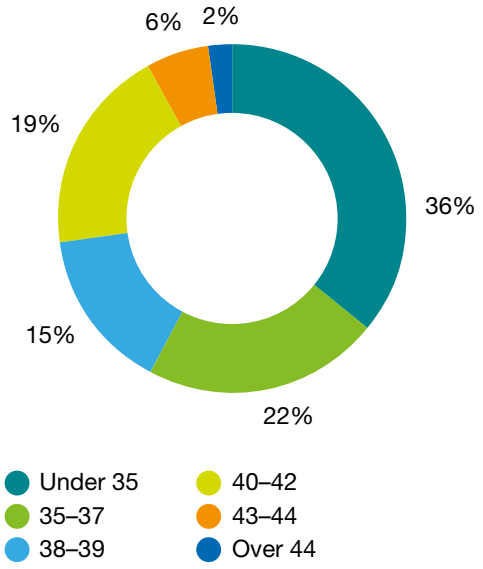
Over the last 10 years, there has been a significant increase in both fresh (+232%) and frozen (+396%) OEDS treatment cycles. We plan to undertake further work to explore the possible reasons for the increasing treatment activity of different IVF types.

Figure 16: OEDS treatment cycles



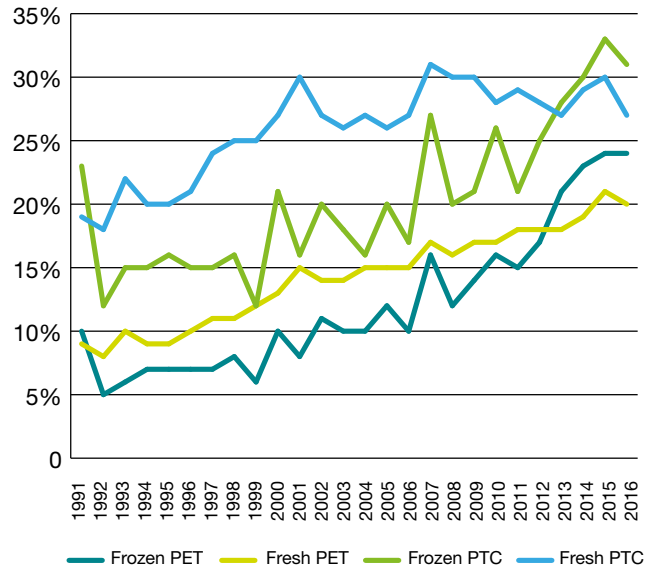
The age breakdown of OEDS treatment cycles shows a slightly older patient demographic than IVF overall. In 2016, 36% of OEDS patients were aged under 35, which is six percentage points lower than IVF overall, with the 40–42 age category being five percentage points higher. All other age groups were within two percentage points of IVF overall.

Figure 17: OEDS treatment cycles by age, 2016



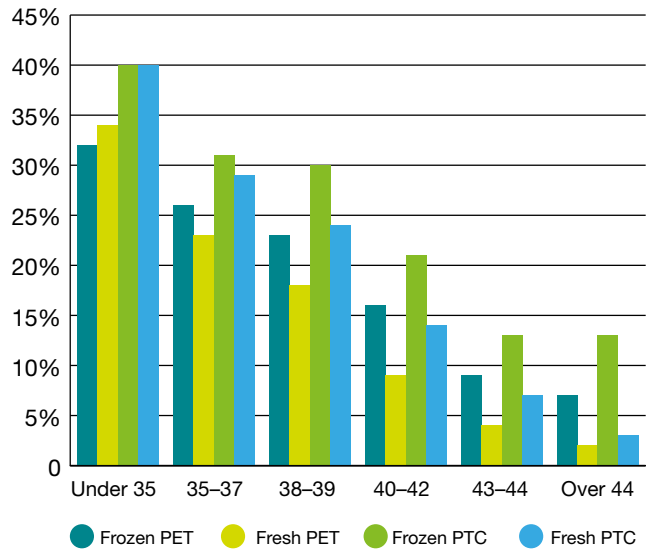
Since 1991 there has been a broadly upwards trend for OEDS birth rates. The rates for fresh cycles have been more stable, which is likely due to larger treatment numbers, with greater fluctuations for frozen treatment cycles. However, since 2011 there has been a steady increase in the birth rate PET for frozen cycles (nine percentage points), with a more modest increase for fresh treatment cycles (two percentage points). In 2013, frozen treatment cycles were more successful than fresh for both PET and PTC for the first time, which broadly reflects overall trends.

Figure 18: OEDS birth rates



When broken down by age, birth rates for OEDS cycles broadly reflect similar trends to the overall IVF rates, with a steady decrease in line with the age of patients. Another similarity between OEDS cycles and overall birth rates is that fresh cycles were only more successful than frozen for under 35s, with frozen rates being notably higher for both PET and PTC in most age groups. Birth rates for OEDS treatment cycles were higher than the overall IVF rate for under 35s for both fresh and frozen. However, for older groups, frozen rates remained similar to IVF overall, and fresh cycles were lower.

Figure 19: OEDS birth rates by age, 2016

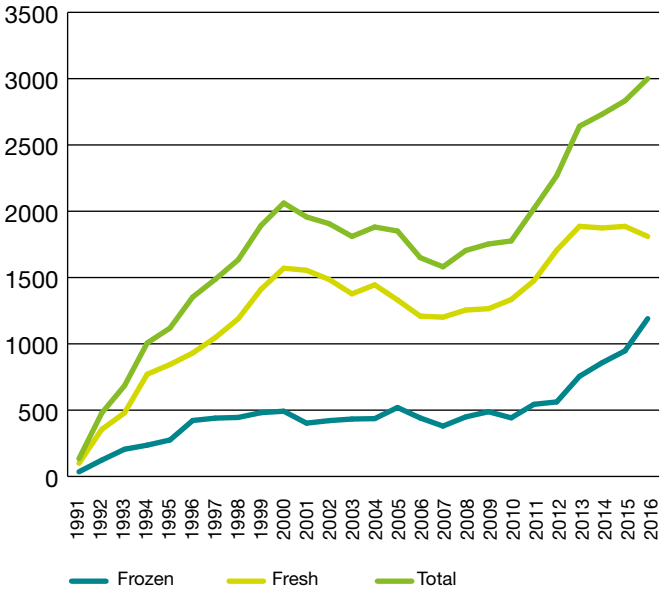


Donor eggs, partner sperm

In 2016, there were 3,000 IVF treatment cycles using donor eggs and partner sperm (DEPS). Cycles of this type make up around 4% of all IVF treatment cycles.

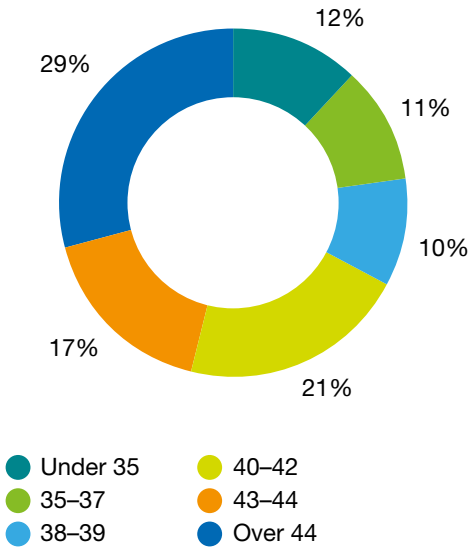
After remaining relatively stagnant between 2006 and 2011, DEPS treatment cycles have since been steadily increasing (+49% since 2011) driven in large part by an increase in frozen cycles. In 2016, 60% of DEPS treatment cycles were fresh and 40% frozen.

Figure 20: DEPS treatment cycles



The age breakdown below shows that DEPS cycles were more likely to be undertaken by older patients compared with IVF overall. The over 44 category represents 29% of patients, with the next largest age groups being 40–42 (21%) and 43–44 (17%). Only 12% of DEPS cycles were undertaken by patients under 35, compared with 42% of IVF overall.

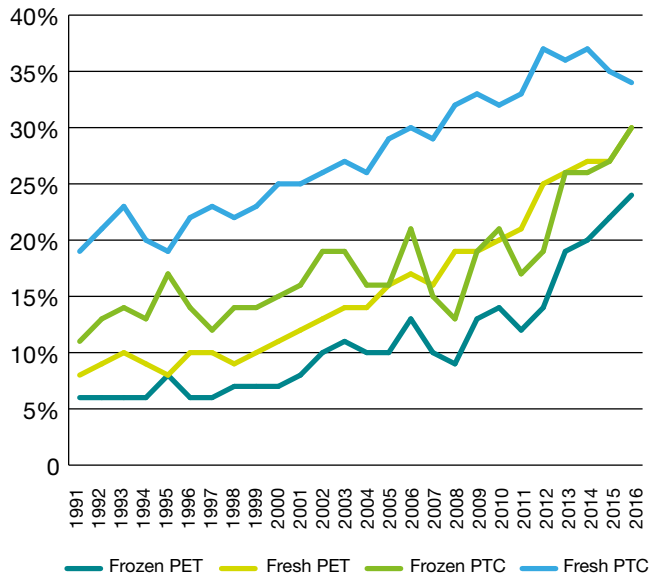
Figure 21: DEPS treatment cycles by age, 2016



Since 2011, the birth rate PET has significantly increased for frozen cycles (12 percentage points), with the fresh birth rate PET also steadily increasing during this period (nine percentage points). Interestingly, fresh cycles have a continuously higher success rate than frozen cycles. This differs from the overall birth rate for IVF, which has seen the birth rate PET for frozen cycles overtake fresh cycles in recent years.

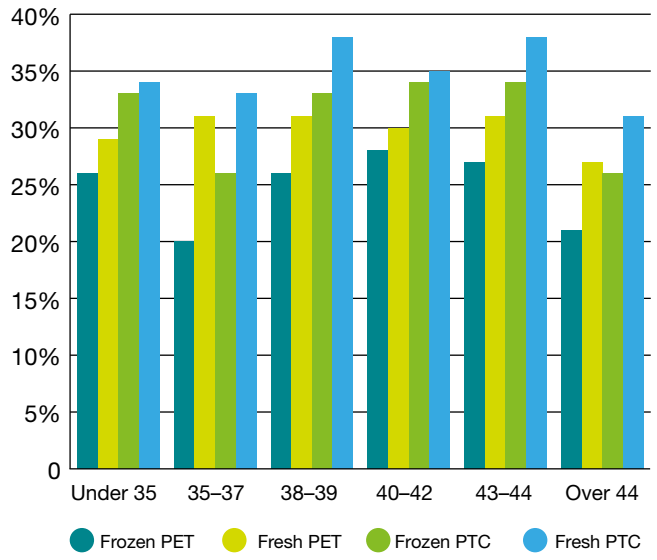
The DEPS birth rates were higher than IVF overall for both fresh and frozen cycles. In 2016, the birth rate PET for frozen DEPS was two percentage points higher than the overall IVF rate (24% vs. 22%) and nine percentage points higher for fresh cycles (30% vs. 21%).

Figure 22: DEPS birth rates



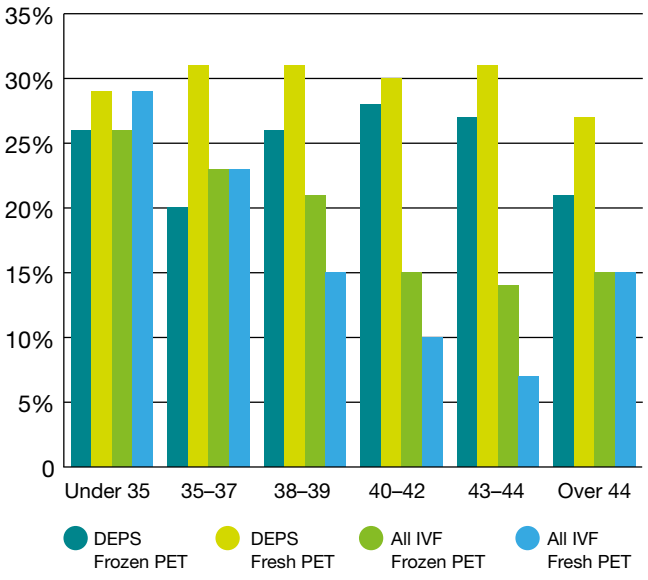
Earlier we saw that the overall IVF birth rate decreases as a patient's age increases, with an exception in the over 44 age group, which we know has a much higher proportion of patients using donor eggs. When looking at all fresh IVF cycles, there is a 14 percentage point gap for the birth rate PET between the under 35 (29%) and the over 44 (15%) age categories. However, in DEPS there is only a two percentage point difference in birth rates PET between these two age categories (29%, 27%). Therefore, for DEPS cycles there is not an equivalent downward trend.

Figure 23: DEPS birth rates by age, 2016



For under 35s, the birth rate PET is the same for DEPS cycles as the overall IVF birth rate (frozen 26%, fresh 29%). However, when comparing older age categories, a substantial variation emerges. The birth rate PET for IVF overall for the 43–44 age category is just 7% for fresh cycles, but for DEPS cycles this figure is some four times higher at 31%. This data helps us to understand the impact of donor eggs on success rates in older patients.

Figure 24: DEPS birth rates compared to overall IVF birth rates, 2016

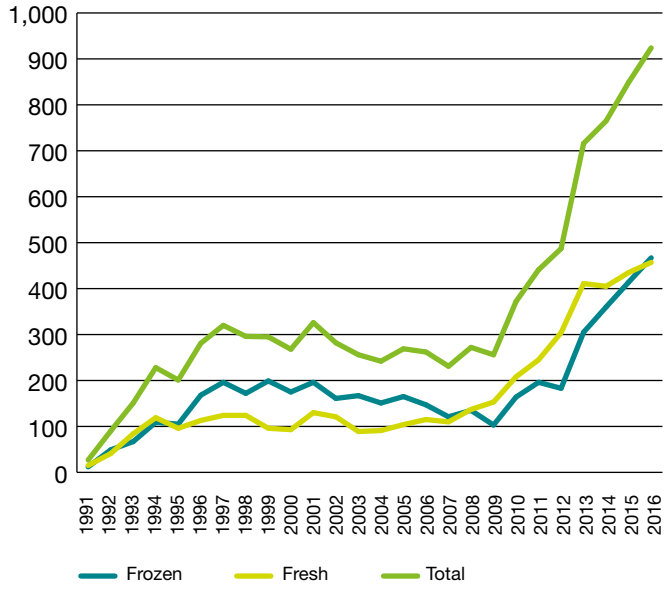


Donor eggs, donor sperm

In 2016, there were 924 treatment cycles where patients used donor eggs and donor sperm (DEDS). DEDS treatment cycles make up around 1% of all IVF cycles. Of these cycles, 51% were frozen and 49% were fresh, which is a higher proportion of frozen cycles, compared with IVF overall (69% fresh, 31% frozen).

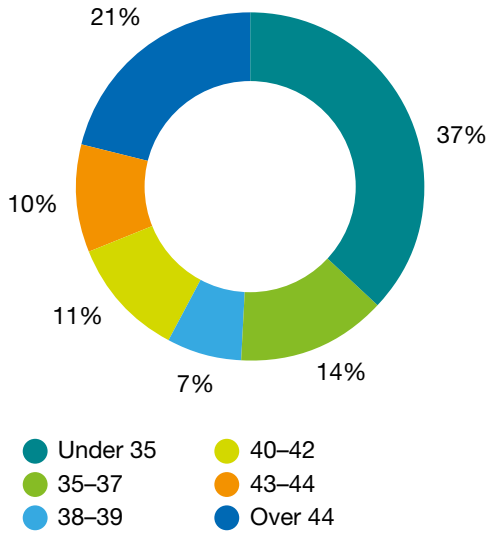
The total number of DEDS treatment cycles remained steady at around 300 cycles per year until 2009. Since then there has been a 261% increase in DEDS treatment cycles.

Figure 25: DEDS treatment cycles



The age breakdown of DEDS treatment cycles shows that the age profile tends to be older than for all IVF treatment cycles. The proportion of patients under 35 is 37% which is five percentage points less than IVF overall and nine percentage points less for the 35–37 age group (14% vs. 23%). However, for the 43–44 age group the proportion is six percentage points higher (10% vs. 4%) and for the over 44s the proportion is 18 percentage points higher (21% vs. 3%). The smallest age category for DEDS cycles is the 38–39 age group, who make up just 7% of all DEDS treatment cycles.

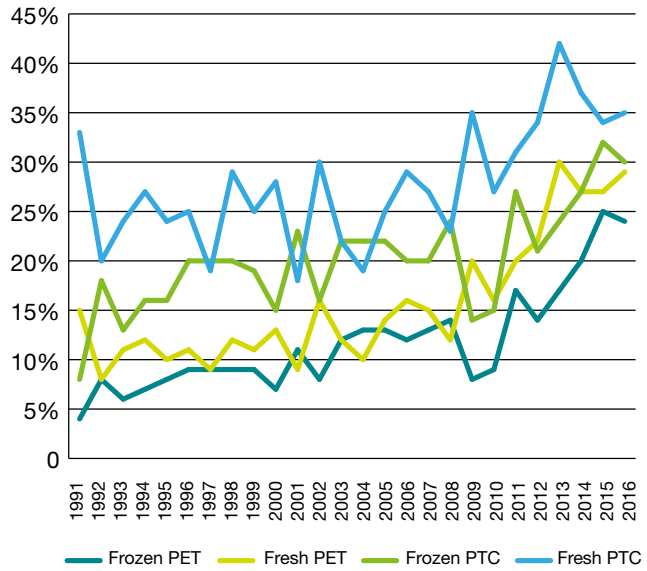
Figure 26: DEDS treatment cycles by age, 2016



In 2016, the birth rate PET for DEDS treatment cycles was 24% for frozen, and 29% for fresh. These were both higher than the overall IVF fresh and frozen birth rates PET (22% frozen, 21% fresh).

As the numbers for DEDS cycles were smaller, the birth rate has fluctuated heavily over time. However, in recent years, where treatment numbers have increased, birth rates have been increasing more steadily. Over the last five years there has been a seven percentage point increase in the frozen birth rate PET, up from 17% to 24% in 2011, and a nine percentage point increase for fresh cycles, up from 20% to 29%.

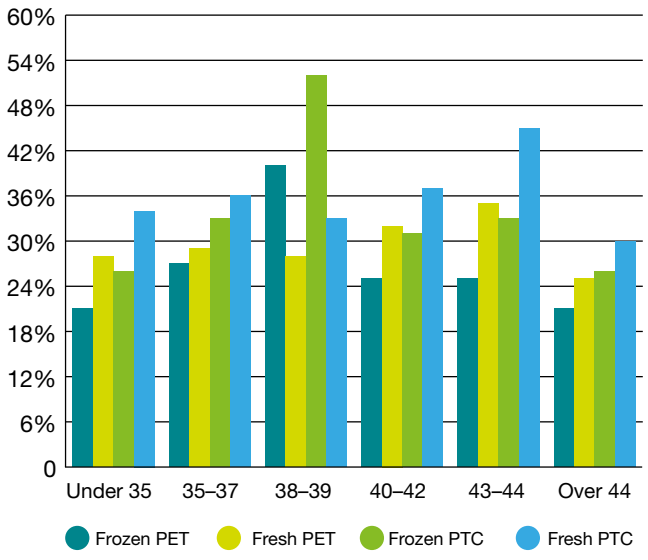
Figure 27: DEDS birth rates



When broken down by age, DEDS treatment cycles show more similarity with DEPS cycles than the overall IVF birth rate, as the birth rates remained relatively steady across all age categories, with a few exceptions. Fresh birth rates were higher in all age groups except the 38–39 group, but it is important to note that this group is small, with only 64 treatment cycles in 2016.

Birth rates tend to be higher for DEDS cycles than for IVF overall, particularly for the older age categories. For the 40–42 age category, the frozen birth rate PET is 10 percentage points higher than IVF overall (25% DEDS vs. 15% overall). For 43–44s the gap is 11 percentage points, (25% DEDS vs. 14% overall), and for over 44s it is six percentage points (21% DEDS vs. 15% overall). For fresh cycles, the gap becomes even more pronounced, at 22 percentage points for 40–42s, 28 percentage points for 43–44 year olds, and 10 percentage points for over 44s.

Figure 28: DEDS birth rates by age, 2016

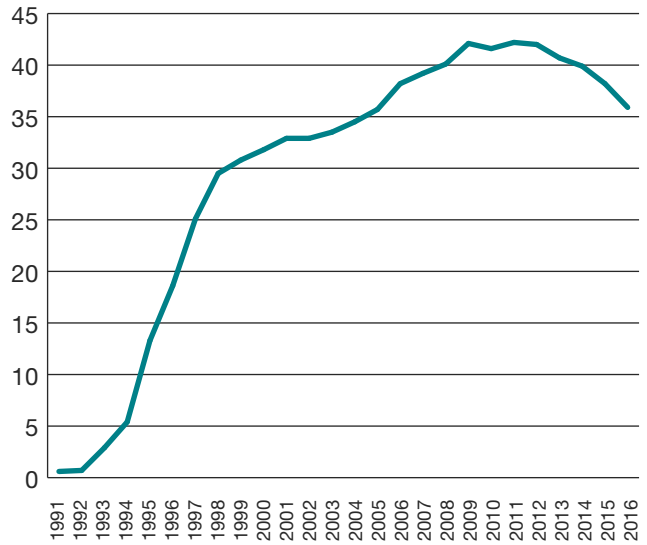


ICSI

Intracytoplasmic sperm injection (ICSI) is a treatment for men with infertility and is performed as part of IVF. It involves the sperm being injected directly into the egg.

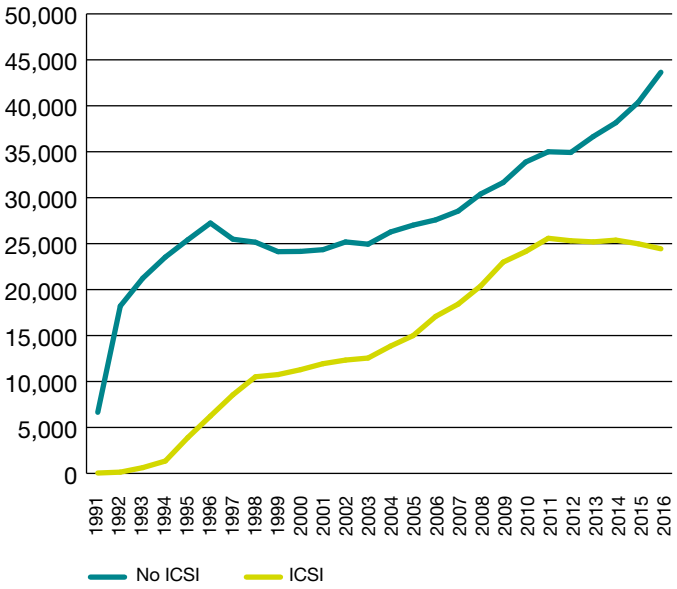
For the past five years, the number of ICSI treatment cycles has remained broadly the same, whilst the number of non-ICSI treatment cycles has continued to increase. In 2016, the proportion of IVF treatment cycles using ICSI was 36%, which is the lowest it has been since 2005. The proportion has gradually decreased over the past five years since the peak in 2011 when 42% of treatment cycles used ICSI.

Figure 29: Proportion of IVF treatment cycles that used ICSI



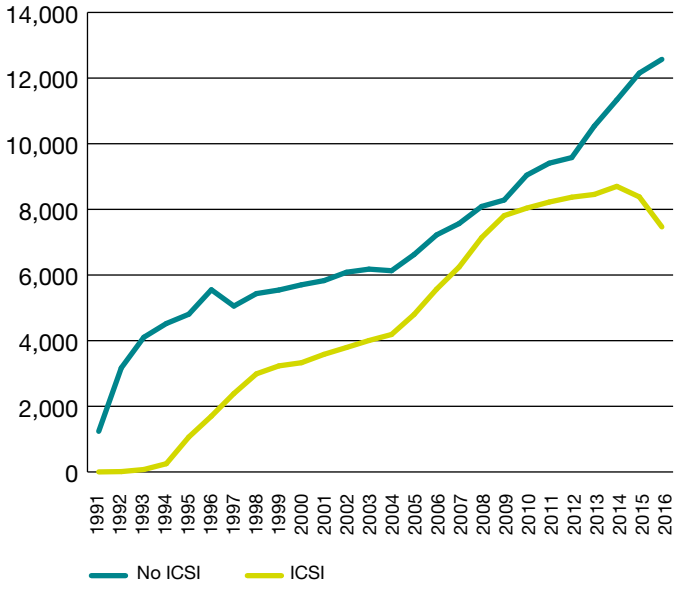
Changes in the uptake of ICSI over time could be influenced by the NICE clinical guidance which states evidence that couples should be informed that ICSI improves fertilisation rates compared to IVF alone, but once fertilisation is achieved the pregnancy rate is no better than with IVF. As a result, the guideline suggests ICSI should only be used in patients with certain types of infertility or for couples in whom a previous IVF treatment cycle has resulted in failed or very poor fertilisation.

Figure 30: ICSI treatment cycles



Since 1991, 119,804 babies have been born through an ICSI IVF treatment cycle and 181,754 babies have been born through a non-ICSI IVF treatment cycles.

Figure 31: ICSI live births



Donor insemination

Donor insemination (DI) is a treatment where donor sperm is placed directly into the womb. It is used by patients for several reasons, such as by single women or same sex couples who do not have fertility problems but need to use donated sperm in treatment, or couples with unexplained or male infertility. During DI, some women receive fertility drugs to boost egg production before the sperm is transferred, which is called a stimulated cycle, whilst others do not take fertility drugs, which is called an unstimulated cycle.

Key statistics

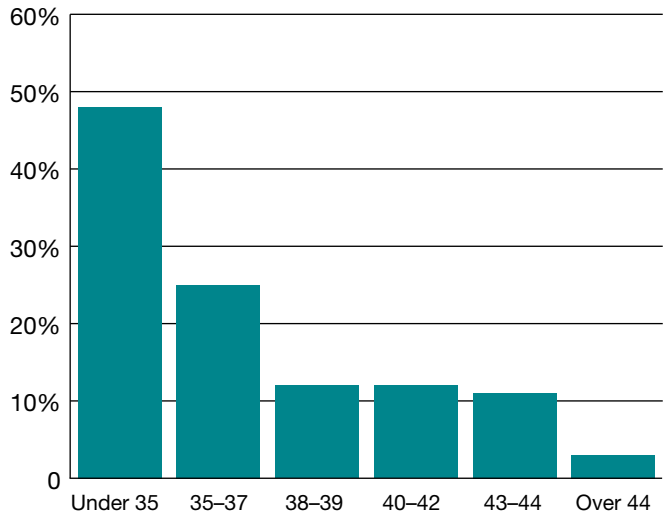
- In 2016 there were 5,447 DI treatment cycles in the UK, a 10% increase on 2015.
- In 2016 the DI birth rate was 12%.
- The birth rate was two percentage points higher for stimulated DI treatment cycles than unstimulated cycles (13% vs. 11%).
- Over the last five years, the proportion of NHS-funded DI treatment cycles has increased in Scotland, Wales and Northern Ireland, and decreased in England.

Patient characteristics

Age

In 2016, 48% of DI patients were under 35, around 25% were aged 35–37, 12% were 38–39, 12% aged 40–42, 11% were 43–44 and 3% over 44. The average (mean) age of a DI patient was 34.6, which is one year younger than the average age of an IVF patient.

Figure 32: DI births by age

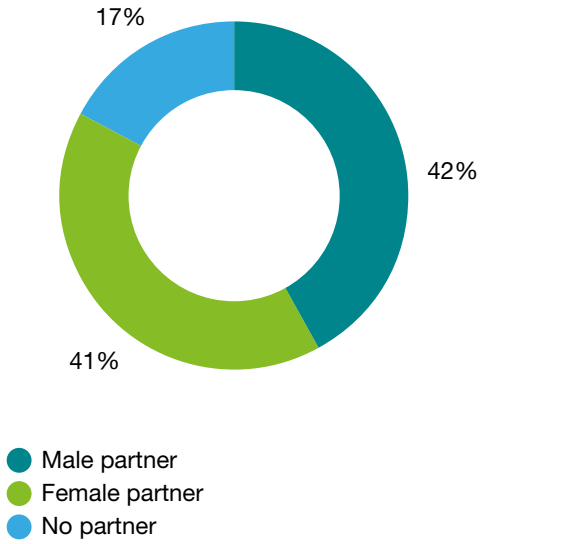


There were variations in the average age of patients by nation/region where treatment was sought. The highest average age for a DI patient, as with IVF overall, was in London.

Partner status

In 2016, 2,273 DI treatment cycles were for women who registered with a male partner (42%), 2,246 for women who registered with a female partner (41%) and 928 for women who registered with no partner (17%).

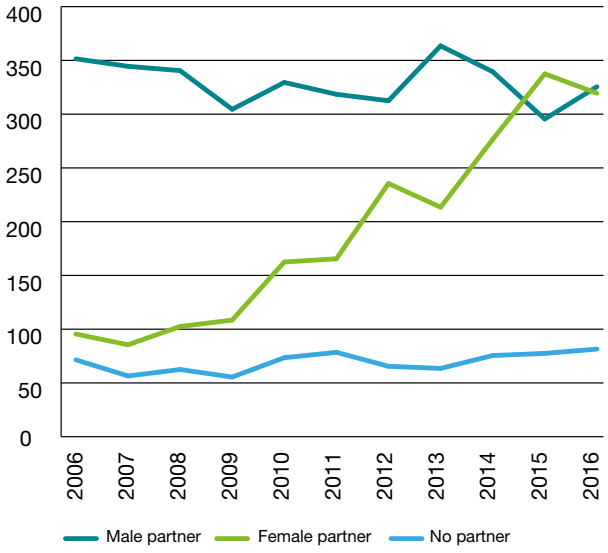
Figure 33: DI births by partner status



Since 2014, the number of DI treatment cycles for patients with a male partner increased by 13%, the number of patients with a female partner increased by 23%, and the number of patients with no partner increased by 8%.

In 2016, there were 324 DI births for patients with a male partner, 318 births for patients with a female partner, and 80 births for patients with no partner.

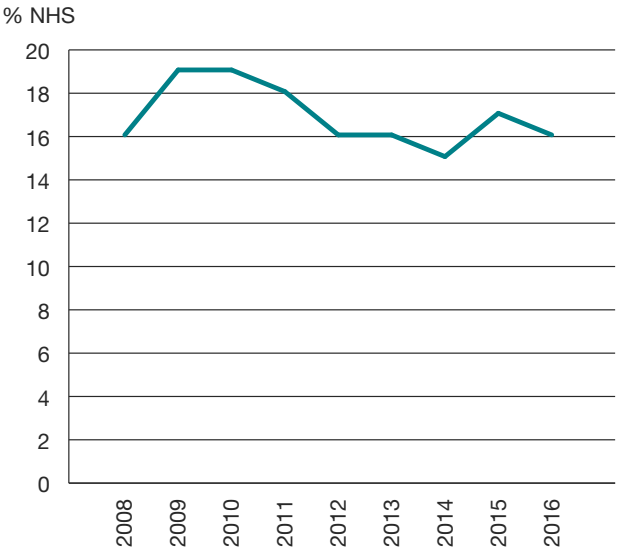
Figure 34: DI births by partner status



Funding status

In 2016, 16%[7] of DI treatment cycles were funded by the NHS. This is broadly in line with the proportion in 2008, and from 2011 to 2015.

Figure 35: Proportion of DI funded by the NHS



[7] Where funding status was known.

The number of DI treatment cycles has increased over time for both NHS-funded and privately funded cycles. In 2016, there were around 870 NHS-funded, and around 4,580 privately-funded DI treatment cycles. Since 2008, there have been 1,059 babies born through NHS-funded DI treatment cycles.

Between 2011 and 2016, there has been an increase in the proportion of NHS-funded DI treatment cycles in Scotland, Wales and Northern Ireland, and a decrease in every region of England. This is likely to be due to differences in commissioning decisions between the different regions/nations.

Figure 36: DI by funding type

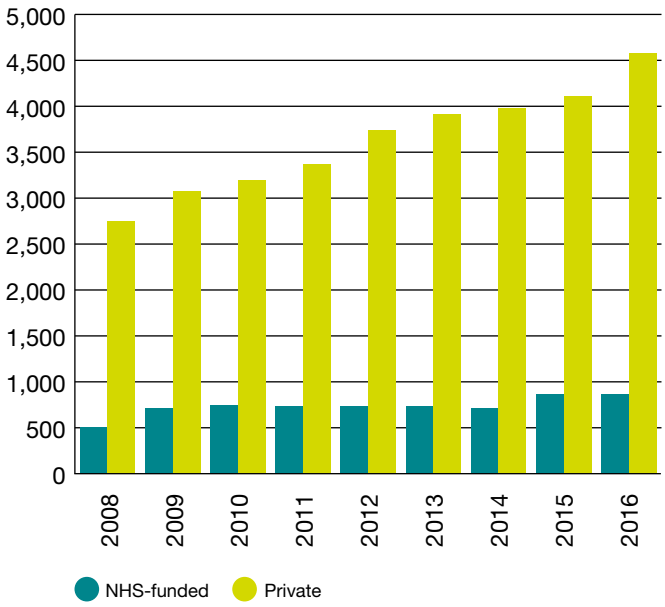


Figure 37: Proportion of NHS-funded DI by nation

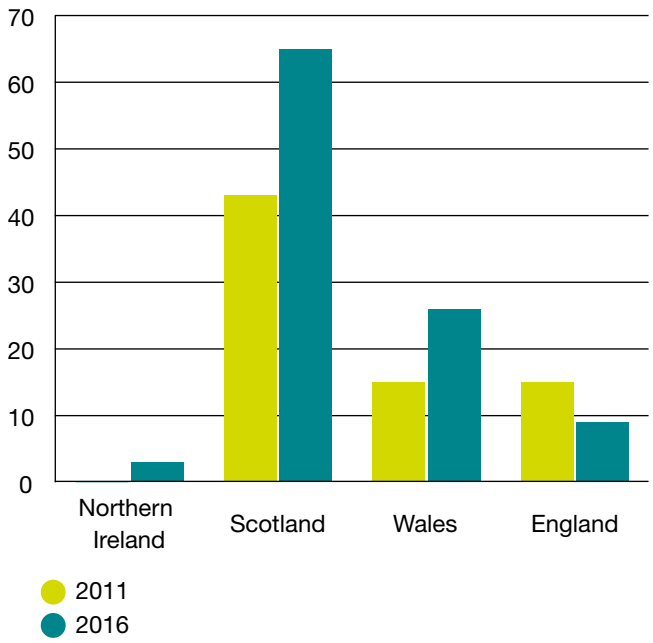
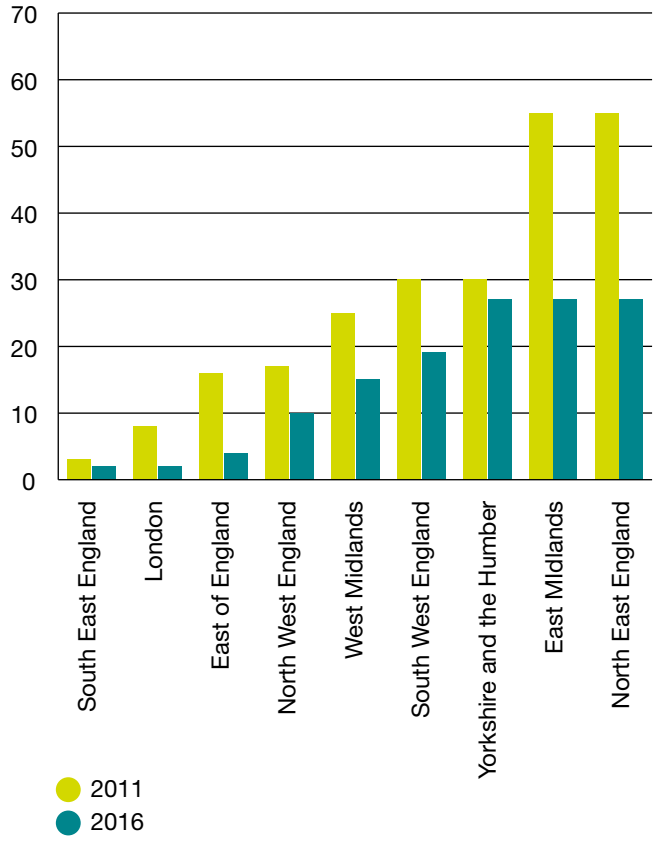


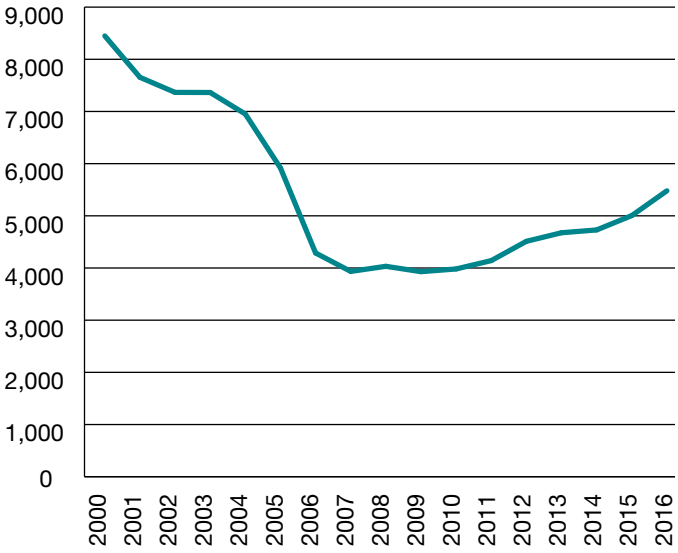
Figure 38: Proportion of NHS-funded DI by English region



Treatment numbers

In 2016, there were 5,447 DI treatment cycles, 475 more than 2015 (+10%). The number of DI treatment cycles has increased each year since 2011.

Figure 39: DI treatment cycles



In 2016, there were 83 clinics licensed to carry out DI treatment in the UK, which is a small reduction from 2015. Most clinics are in England, with the highest concentration in London and the South East.

Clinics carrying out DI

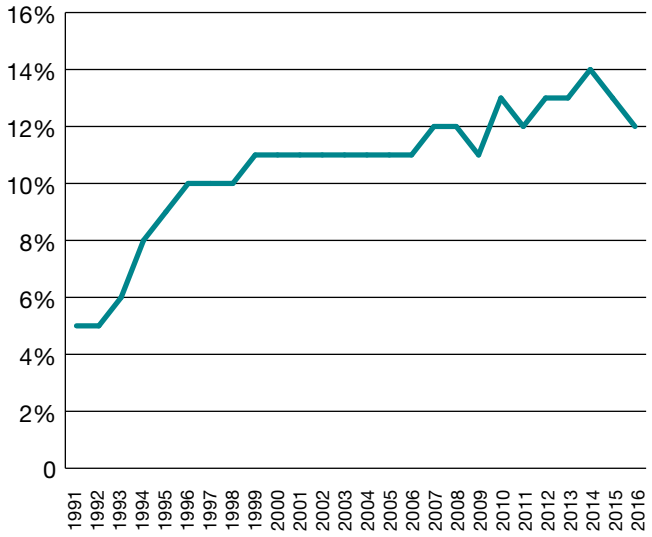
Nation/region	2014	2015	2016
Northern Ireland	**3**	**3**	**3**
Scotland	**7**	**7**	**6**
Wales	**4**	**4**	**4**
England	**71**	**72**	**70**
East Midlands	5	5	5
East of England	7	7	7
London	22	24	22
North East	5	5	5
North West	5	5	6
South East	11	11	9
South West	6	6	5
West Midlands	7	6	7
Yorkshire and the Humber	3	3	4
Total	**85**	**86**	**83**

Birth rates

In 2016, the birth rate per DI treatment was 12%, broadly in line with the 2015 birth rate of 13%.

When looking at long-term trends, birth rates for DI increased steadily during the 90s but have plateaued for the last 17 years at around 12%, with only small variations.

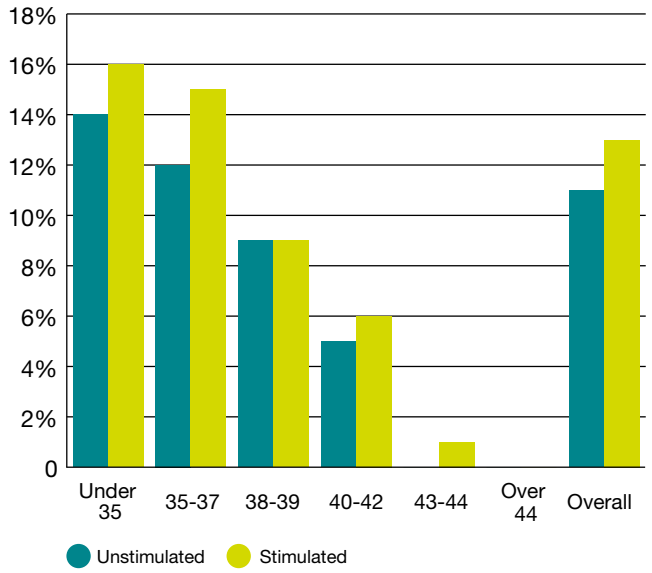
Figure 40: DI birth rates



As expected, the birth rate per DI treatment is highest for patients aged under 35, and decreases to near zero for patients over 43.

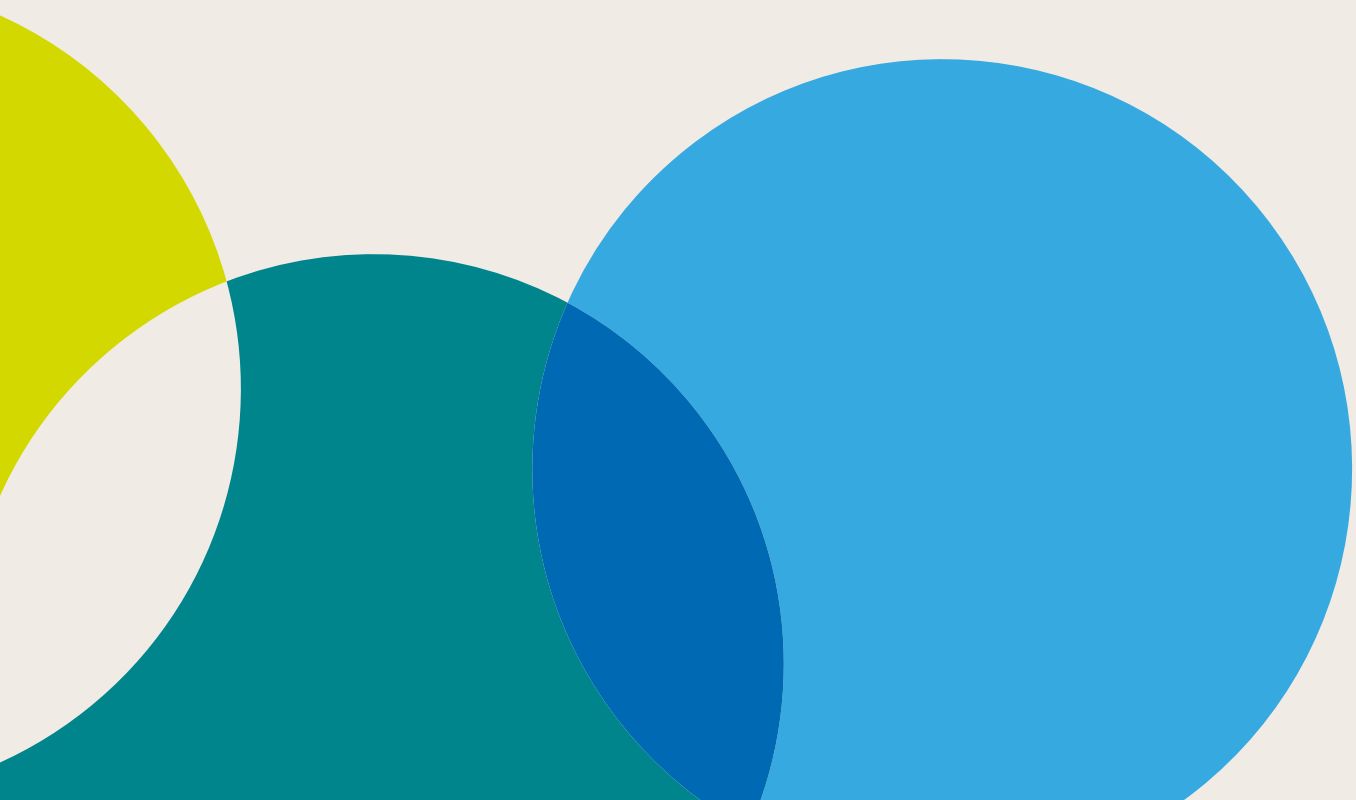
During DI, some women receive fertility drugs to boost egg production before the sperm is transferred, which is called a stimulated cycle, whilst others do not take fertility drugs, which is called an unstimulated cycle. We have broken down the DI birth rate to stimulated and unstimulated cycles. This shows the overall live birth rates were 13% for stimulated DI and 11% for unstimulated DI in 2016. These birth rates are similar to previous years.

Figure 41: DI birth rates by age, 2016



Pre-implantation genetic diagnosis

Pre-implantation genetic diagnosis (PGD) is a treatment which allows people with a serious inheritable genetic condition in their family to avoid passing it on to any children they might have. It involves a patient's embryos being tested for the condition. Embryos which have been tested and are free of the condition are placed back in the womb and allowed to develop just as they would in conventional IVF.



Key statistics

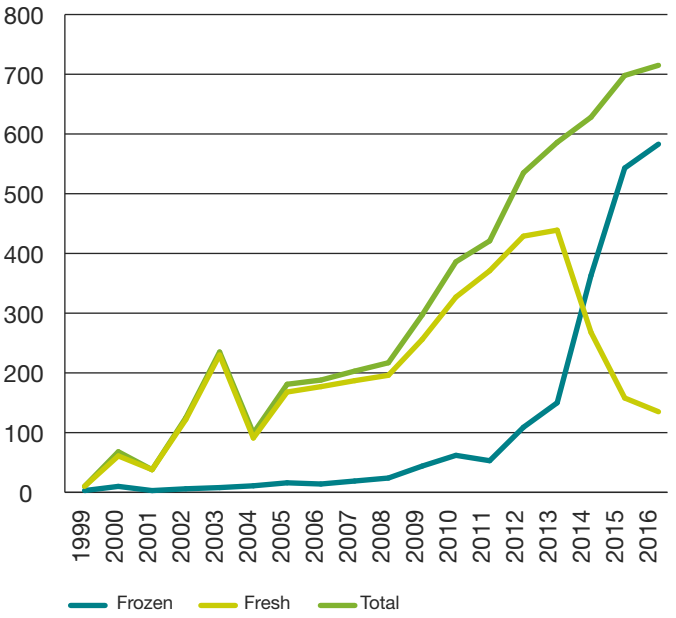
- Over the last five years there has been a 70% increase in PGD, with 712 treatments in 2016.
- In 2016, 81% of PGD treatment cycles were frozen, compared with only 12% in 2011.
- In 2016, 60% of PGD patients were aged under 35.
- In 2016, the birth rates PET for PGD treatment cycles were 30% for fresh and 36% for frozen cycles.

Treatment numbers

In 2016, there were 712 treatment cycles of PGD: 132 fresh and 580 frozen. The steady increase in PGD treatment cycles may be partly explained by the NHS England funding policy which came into effect in 2013, whereby eligible couples were funded for up to three PGD attempts.

Historically, frozen PGD cycles were very rare, but increased in frequency from 2012, and in 2014, the number of frozen cycles overtook the number fresh cycles[8]. The gap between fresh and frozen cycles continued to widen in 2016.

Figure 42: PGD treatment numbers



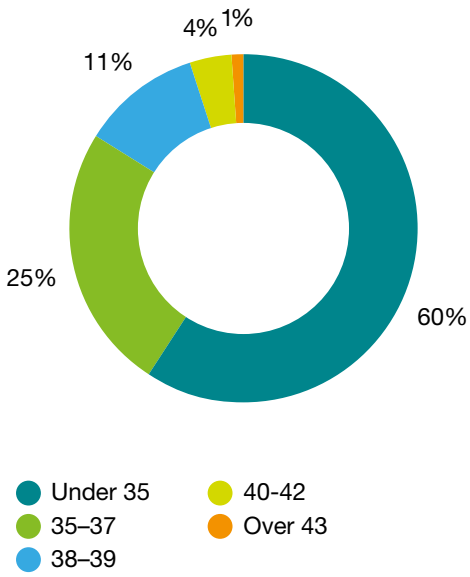
Frozen cycles as a proportion of all PGD treatment cycles

2011	2012	2013	2014	2015	2016
12%	20%	25%	58%	78%	81%

The age profile of PGD treatment cycles is younger than for all IVF patients (75% aged below 38, compared to 65% of all known IVF treatment cycles), with a much higher proportion of treatments being carried out on patients aged below 35 (60% compared to 42%).

[8] The increase in the proportion of frozen cycles is likely due to changes in clinical practices, with increased use of blastocyst biopsy for PGD testing, which requires embryo freezing.

Figure 43: PGD treatments by age, 2016

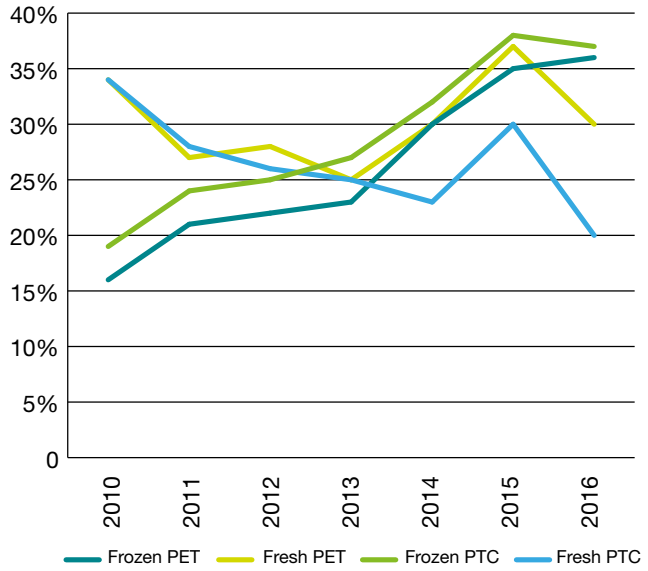


We expect this to be the case as patients seeking PGD treatment are less likely to have fertility problems but are seeking PGD treatment for known genetic diseases in their family.

Birth rates

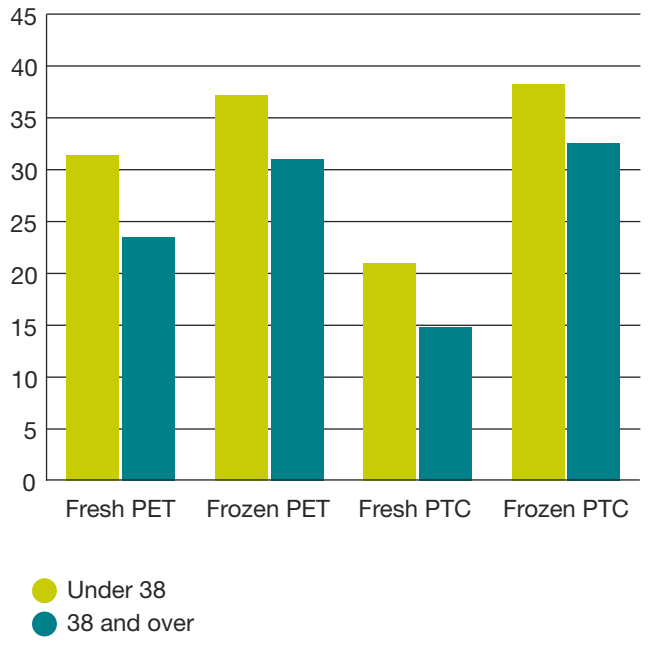
In 2016, the fresh PET birth rate for PGD treatment cycles was 30%, compared to 21% for IVF overall, and 36% for frozen rate PET, compared to 22% for IVF overall. The birth rates PET and PTC for PGD treatment cycles were higher than rates for all IVF treatment cycles. This again reflects the fact that PGD patients are less likely to have infertility problems, but are seeking treatment for an associated genetic condition.

Figure 44: PGD birth rates



Due to small patient numbers, rates by age have been presented for below 38 and 38 and over. As expected, birth rates vary by age with both fresh and frozen treatments for patients under 38 being more successful. In 2016, frozen cycles resulted in higher birth rates for patients in both age groups.

Figure 45: PGD birth rates by age, 2016



Egg freezing

A freeze cycle is a treatment where a patient has their eggs collected and frozen for future use. We call this a 'cycle' rather than a 'treatment cycle' because the patient is not intending to immediately use the resulting eggs for an embryo transfer. There are a variety of reasons why someone may choose to freeze their eggs, most typically women who may want to have a child later in life when the quality of their eggs has depleted. Egg freezing can also be used by cancer patients and transgender people for fertility preservation.

A thaw cycle is when patients use previously frozen eggs, either their own or donor eggs, in an IVF treatment cycle.

Key statistics

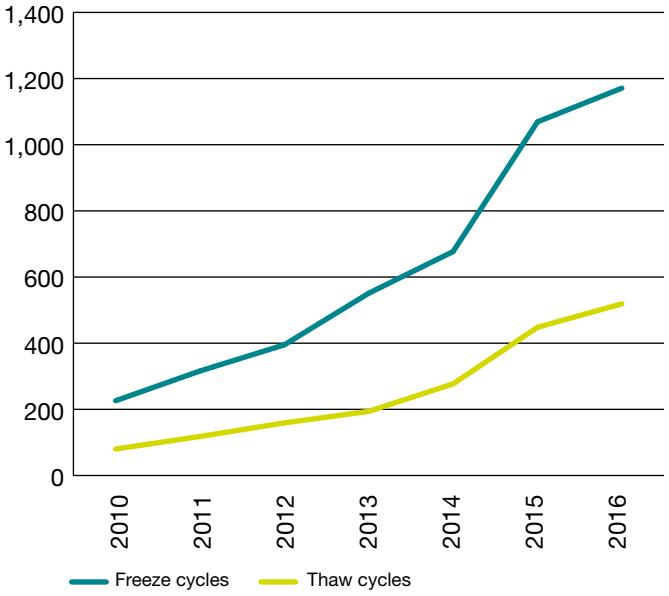
- In 2016, there were 1,173 egg freezing cycles, representing just 1.5% of the total number of cycles.
- There was a 10% increase in the number of egg freezing cycles from 2015 to 2016.
- In 2016, there were 519 thaw treatment cycles, a 16% increase from 2015.
- The birth rate PET for thaw treatment cycles was 19% in 2016.
- Since 2011, the birth rate PET for thaw treatment cycles has increased by eight percentage points.

Treatment numbers

In 2016, there were 1,173 egg freezing cycles, a 10% increase from 2015, continuing the increase seen each year since 2010.

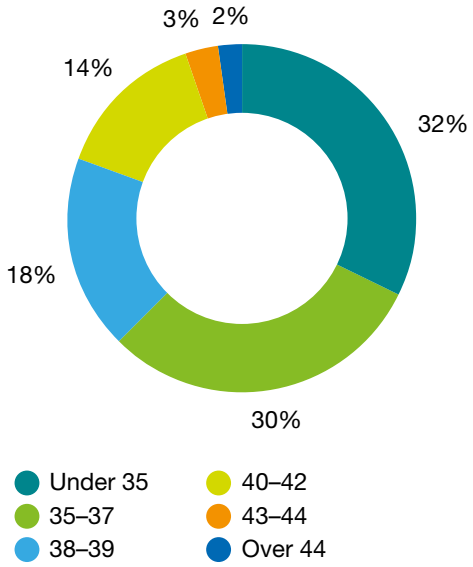
In 2016, there were 519 thaw treatment cycles. Between 2015 and 2016, the number of thaw treatment cycles increased by 16%, continuing the upwards trend since 2010.

Figure 46: Treatment cycles for egg freezing and egg thawing



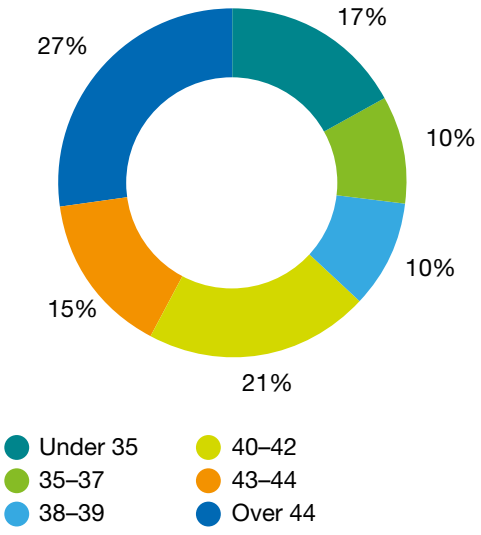
In 2016, 32% of patients freezing their eggs were under 35. Of all patients, 62% were below the age of 38. Only 2% of patients freezing eggs were aged above 44.

Figure 47: Egg freezing by age, 2016



As expected, the age profile for thaw treatment cycles is very different, with the largest number of patients having a thaw treatment cycle aged over 44 (27%). Only 17% of patients having a thaw treatment cycle were under 35.

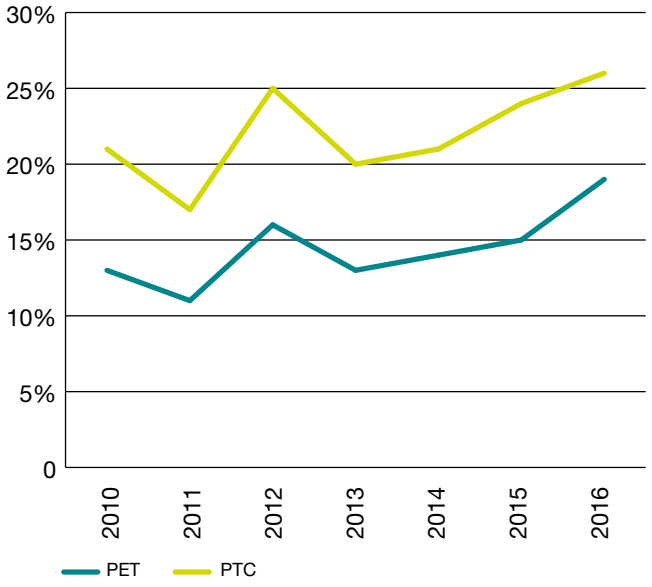
Figure 48: Egg thawing by age, 2016



Birth rates

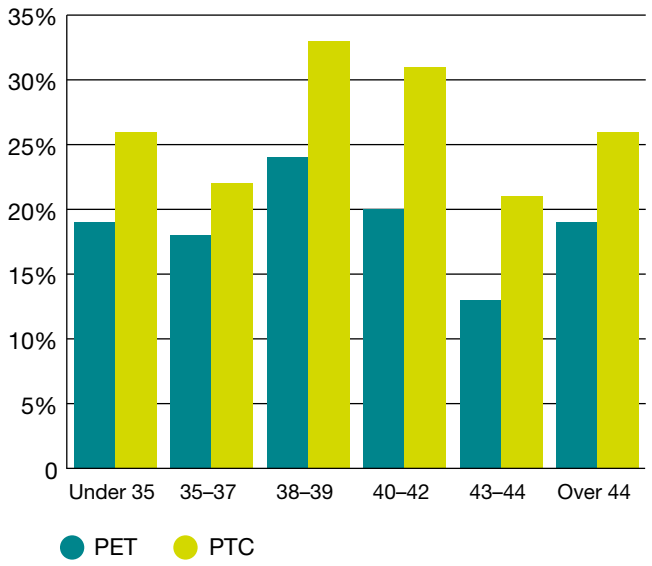
In 2016, the birth rate PET for thaw cycles was 19%, continuing a general upward trend in birth rates. This is only two percentage points lower than the overall IVF birth rate PET in 2016 (21%). Since 2011, the birth rate PET has increased by eight percentage points from 11%, demonstrating a generally upwards trend. The birth rate PTC for thaw cycles was 26% in 2016, which is the same as IVF overall. However, we should be cautious about drawing conclusions due to the small number of thaw cycles taking place.

Figure 49: Egg thaw birth rates



When we break down birth rates by the age patients were when they used previously frozen eggs, we do not see a downwards trend. In 2016, the birth rates for both under 35s and over 44s were the same, at 19% PET and 26% PTC. The age category with the highest birth rates was 38–39. However, it is important to note the small number of patients in each age category.

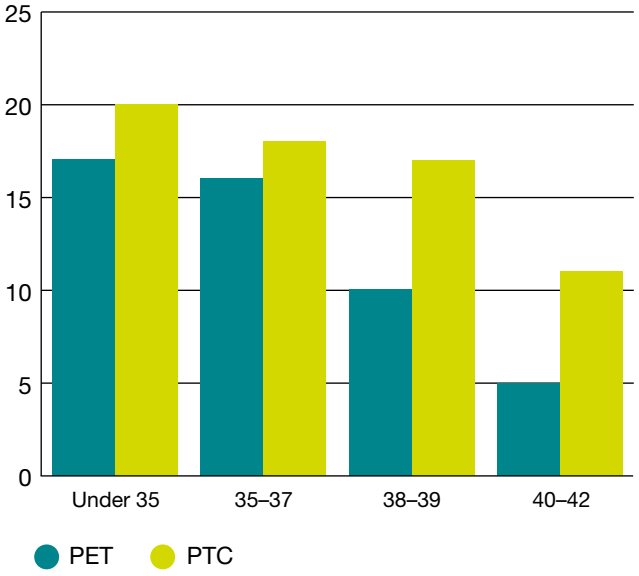
Figure 50: Egg thaw rates by age at thaw, 2016



Our data is more limited when looking at birth rates broken down by the age of patients when their eggs were frozen, because our data does not automatically link freeze cycles with thaw treatment cycles[9]. Therefore, we should be cautious about drawing conclusions from these numbers as they are small. However, it is still important to look at birth rates by age at freeze because it can tell us important information about the factors affecting thaw treatment cycle birth rates.

There is a notable variation in birth rates by age at freeze, and a minimal variation in birth rates by age at thaw. The highest birth rates are seen in cycles which used eggs frozen by patients aged below 35, for both PET (17%) and PTC (20%). This reduces to 5% and 11% for cycles which used eggs frozen by patients aged 40–42.

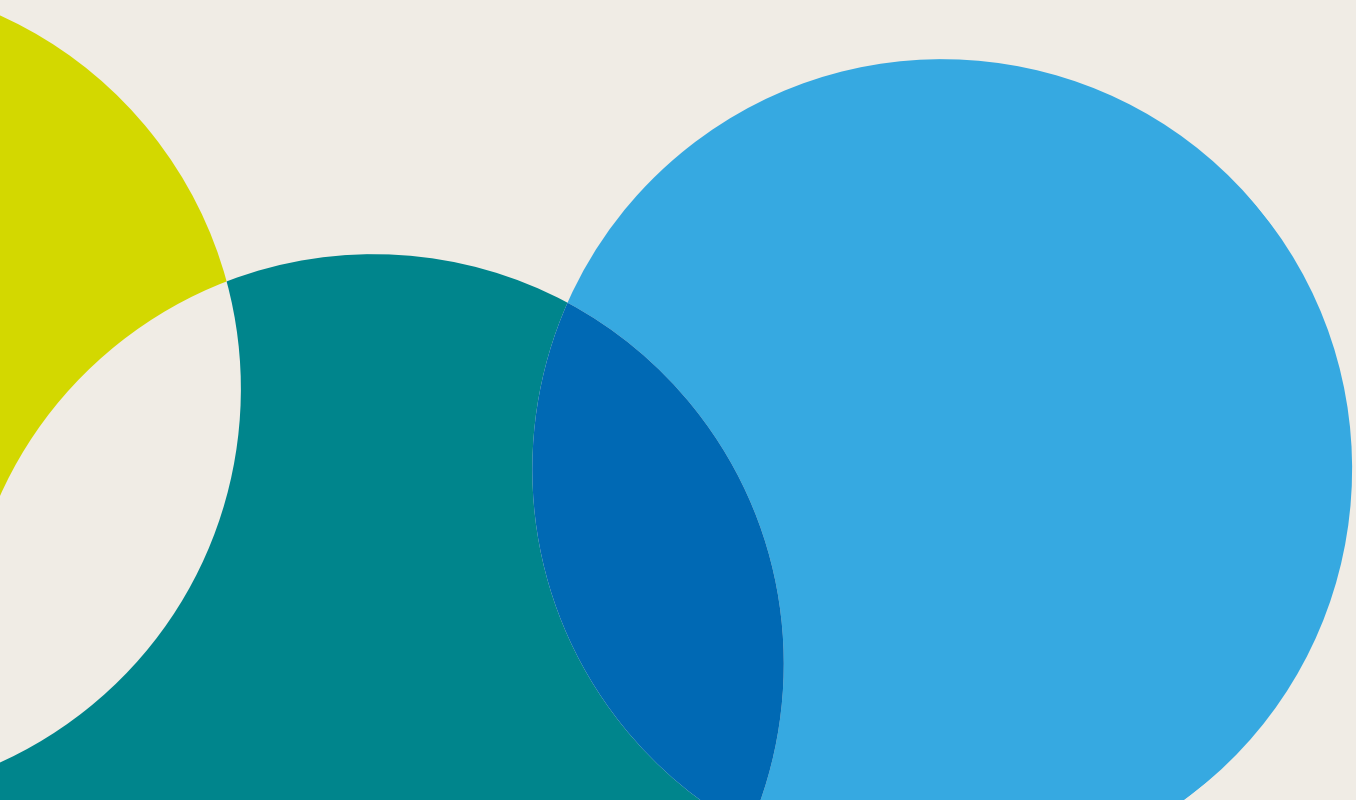
Figure 51: Birth rates by age at freeze cycle, 2016



[9] We have been able to link 385 freeze cycles with thaw treatment cycles, however 209 (54%) of these linked cycles do not have the age at freeze recorded.

Egg sharing

Egg sharing is when a woman who is already having IVF donates some of her eggs to the clinic where she's having treatment. Generally, to be an egg sharer, women need to be 35 or under and have no transmittable diseases or serious, inheritable medical conditions.



Key statistics

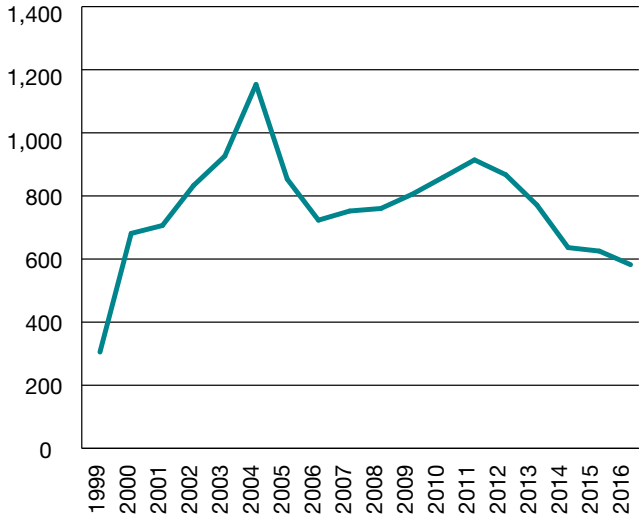
- Egg sharing cycles are declining since their peak in 2004.
- In 2016 there were 577 egg sharing cycles.
- There was a 7% decline in egg sharing cycles between 2015 and 2016.
- In 2016, the birth rate for egg sharing cycles was 30% PET and 34% PTC.

Treatment numbers

Egg sharers may need to undergo further health tests before being able to donate eggs, and some clinics set additional eligibility criteria, including minimum and maximum body mass index (BMI) and ovarian reserve levels. Therefore, egg sharing treatment cycles have a younger age profile and tend to have higher chances of success. In 2016, 84% of all egg sharing cycles were carried out with patients below 35. Only 1% of egg sharing cycles were carried out for patients aged above 37.

In 2016 there were 577 egg sharing cycles, a decline of 7% from 2015. The number of egg share cycles peaked at 1,148 in 2004, and declined rapidly to 718 in 2006. Although there was a small increase over the next few years, the number of egg sharing cycles have generally declined from their peak in 2004.

Figure 52: Egg sharing cycles



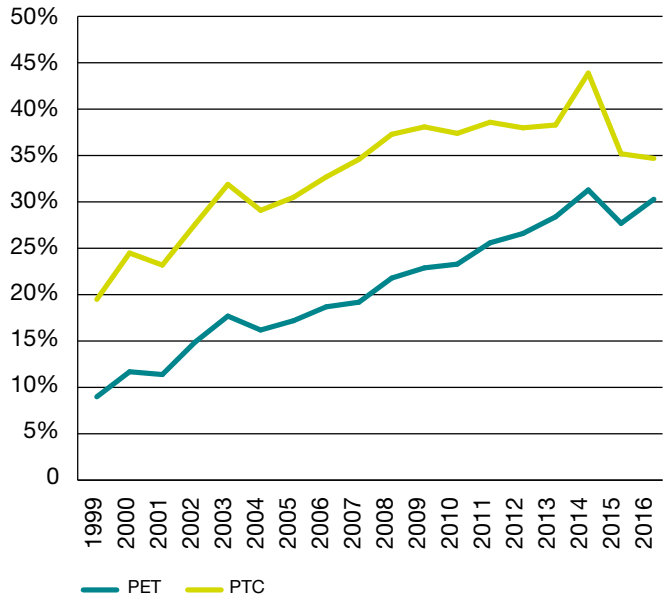
Between 1999 and 2016, fewer than 0.2% of egg share treatment cycles were frozen cycles. We have therefore combined both fresh and frozen treatment cycles in our analysis.

Birth rates

Between 2014 and 2015, the birth rate PTC declined, and it is likely that there is an impact of changing demographics on the birth rate over time. In 2014, 88% of patients entering egg sharing arrangements were under 35; whereas in 2016 84% were under 35. Although this is a relatively small decrease, there may be other compounding factors. For example, poorer prognosis patients who have already used NHS funding or their own private funding on previous unsuccessful cycles.

In 2016, the birth rate PET for egg sharing cycles was 30%, and 34% PTC, which is significantly higher than the overall IVF birth rate PET (21%). This is likely due to the eligibility requirements for patients entering egg sharing arrangements.

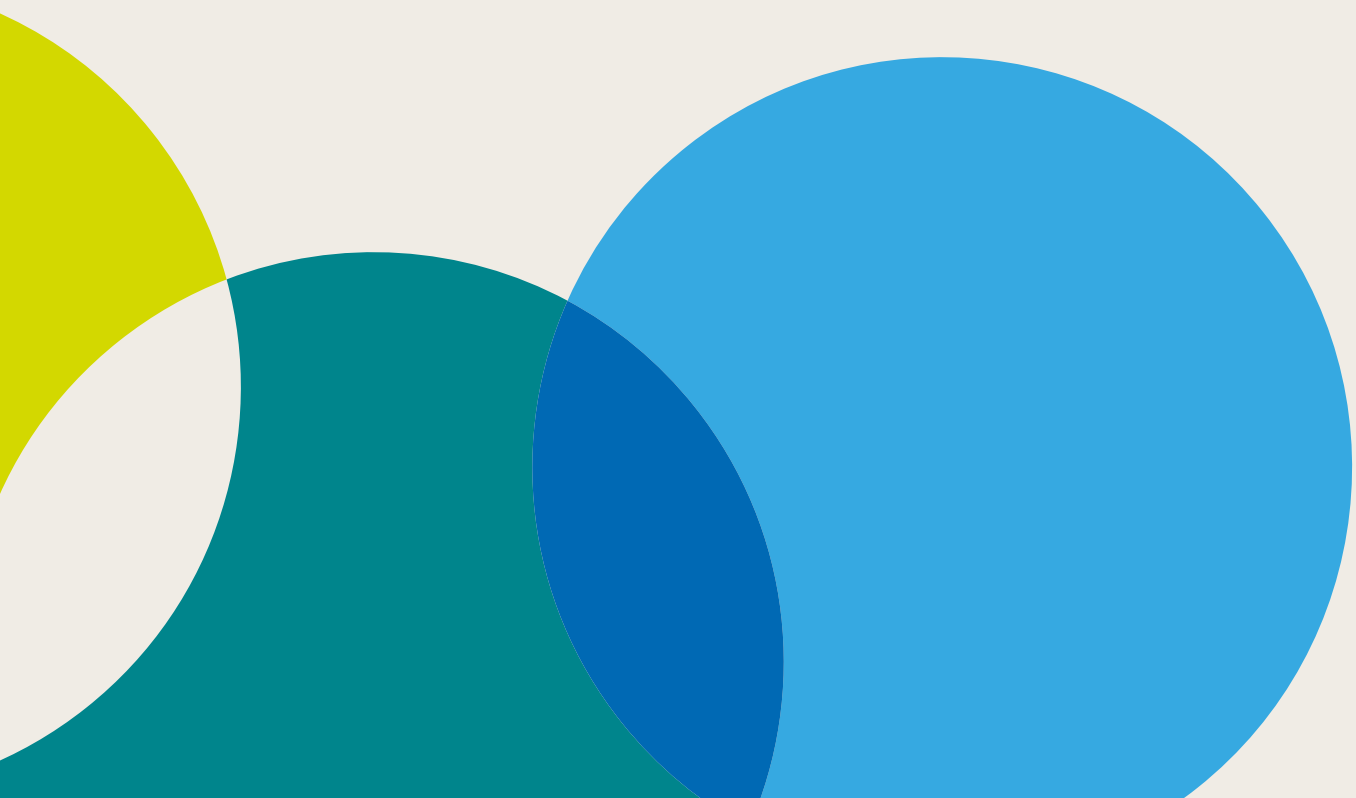
Figure 53: Egg sharing birth rates



As very few egg sharing patients were aged over 38, we have not provided birth rates by age band due to concern that proportions will not be reliable for age groups with smaller numbers.

Surrogacy

Surrogacy is when a patient carries a baby on behalf of another person or couple. Surrogacy may be appropriate for women with a medical condition that makes it impossible or risky for them to get pregnant and give birth. It's also a popular option for male same-sex couples who want to have a family. It is important to note that we do not regulate surrogacy, however we do collect data from clinics when a patient is registered as a surrogate and undergoes IVF or DI treatment.



Key statistics

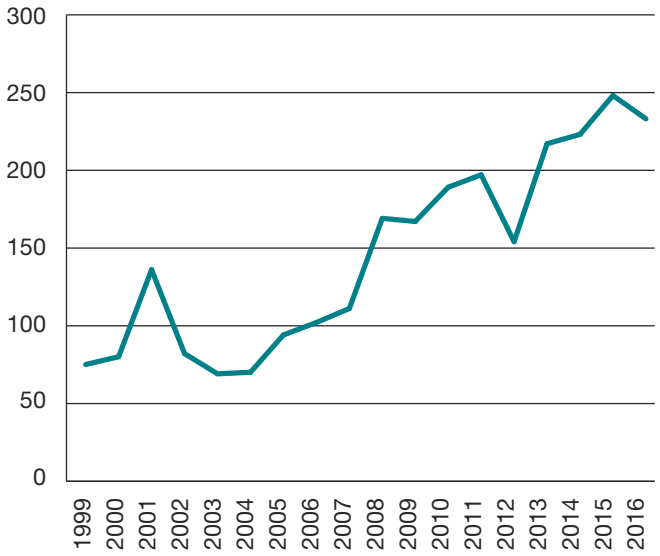
- In 2016, there were 232 cycles where the patient was registered as a surrogate.
- The number of patients registered as a surrogate has more than doubled in the past 10 years.
- In 2016, the birth rate for surrogates was 26% PET and 31% PTC for fresh cycles.

Treatment numbers

In 2016, there were 232 IVF treatment cycles where the patient was registered as a surrogate. This is a small reduction from the peak in 2015 when there were 247. Broadly there is an upwards trend in the number of treatment cycles involving a surrogate, however treatment numbers are still small.

There were just six DI cycles where the patient was acting as a surrogate in 2016.

Figure 54: Treatment cycles where the patient was registered as a surrogate



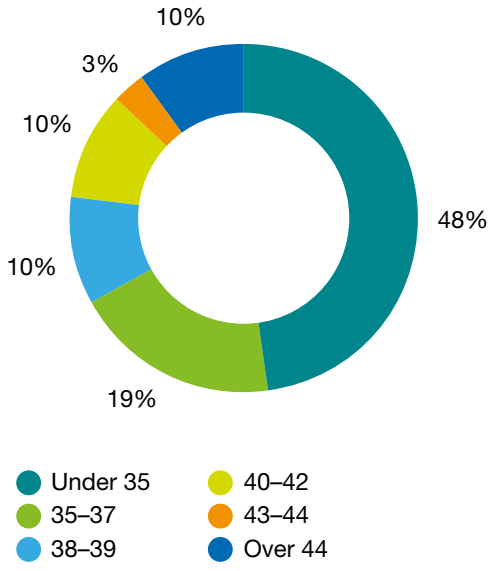
Most of the cycles performed in 2016 were frozen cycles (71%). The rate of frozen cycles for surrogate patients has increased each year since 2012.

Frozen cycles as a proportion of all cycles where the patient was a surrogate

2011	2012	2013	2014	2015	2016
57%	53%	57%	61%	68%	71%

In 2016, 48% of surrogates were aged under 35, which is a higher proportion than IVF overall, which is at 42%.

Figure 55: Surrogacy patients by age, 2016

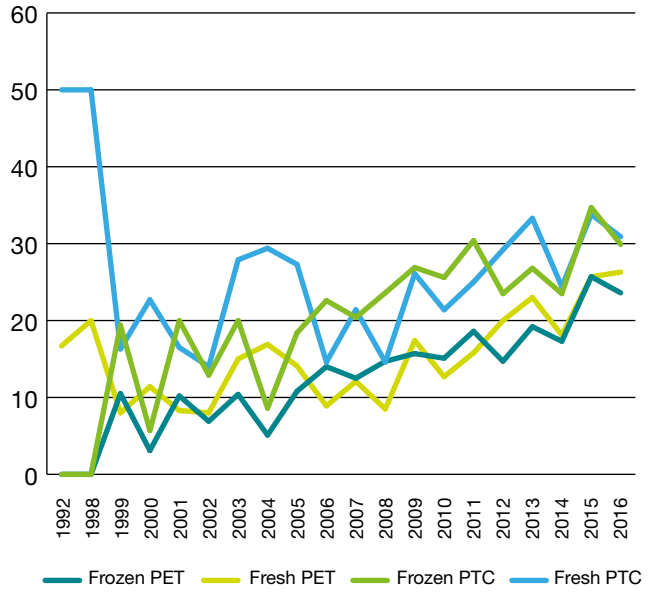


Birth rates

Since 2014, there has been very little difference in birth rates between fresh and frozen cycles for surrogate patients. Birth rates across both fresh and frozen cycles have generally increased over time, with some variation due to smaller patient cohort sizes.

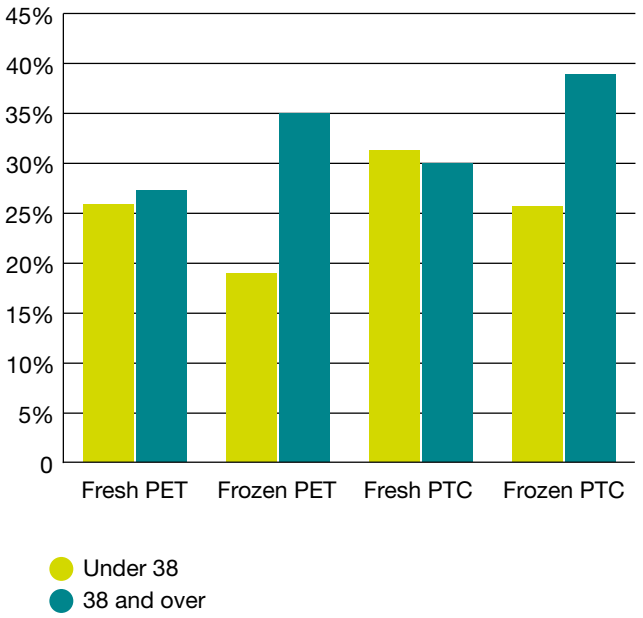
There were no live births recorded from DI treatment cycles in 2016 where the patient was registered as a surrogate.

Figure 56: Birth rates for patients registered as a surrogate



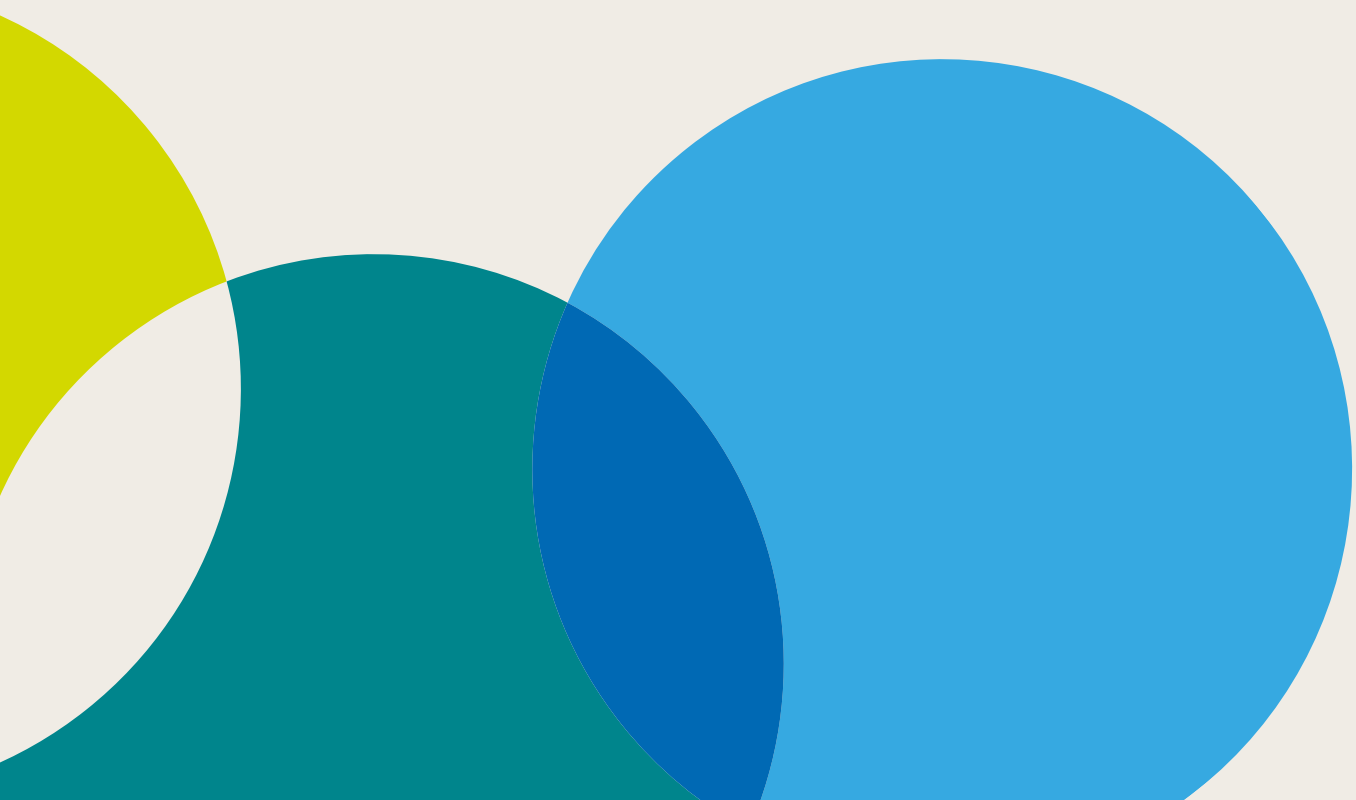
Due to relatively small cohort sizes for surrogacy, rates by age band have been presented for below 38 and 38 and over. In 2016, fresh cycles had higher birth rates for under 38s, and frozen cycles resulted in higher birth rates for patients over 38.

Figure 57: Birth rates for surrogacy patients by age, 2016



Intrauterine insemination

Intrauterine insemination (IUI) is a type of fertility treatment in which high quality sperm are separated from sperm that's sluggish or non-moving. This sperm is then placed directly into the womb. We do not collect as comprehensive information on this type of treatment as the information we collect on IVF and DI treatment cycles.



Key statistics

- The number of IUI treatments in the UK has decreased by around 50% since 2013.
- In 2016 there were 8,102 IUI cycles.
- The birth rate for IUI cycles has remained constant over the last few years at around 12%.

Treatment numbers

In 2016, there were 8,102 IUI treatments, a 16% decrease from 2015.

There was also a decrease in the number of clinics licensed to perform IUI, with 81 in 2015 and 65 in 2016 (-20%).

The number of clinics and number of IUI treatments has decreased each year since 2014[10].

Nation/region	2012	2013	2014	2015	2016
Northern Ireland	**0**	**3**	**4**	**4**	**4**
Scotland	**7**	**7**	**8**	**7**	**6**
Wales	**4**	**6**	**5**	**4**	**1**
England	**71**	**78**	**80**	**66**	**54**
London	17	23	23	21	20
North West	7	6	6	5	4
North East	6	7	7	6	2
South West	10	10	11	7	6
South East	10	10	9	8	5
West Midlands	9	9	9	6	8
East of England	6	4	6	6	3
East Midlands	3	5	5	3	2
Yorkshire and the Humber	3	4	4	4	4
Total	**82**	**94**	**97**	**81**	**65**

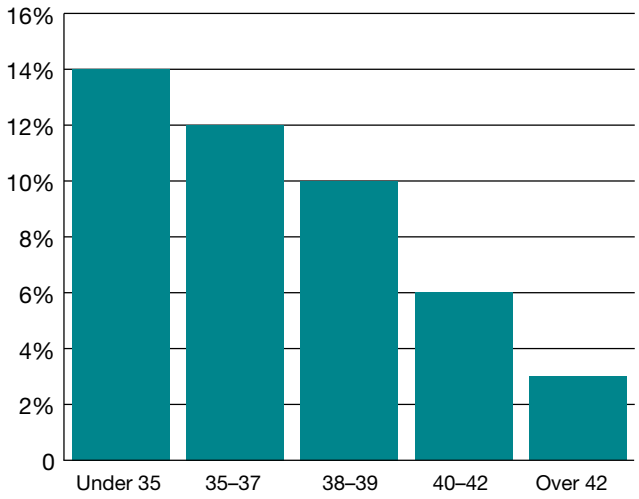
[10]This may be in response to the NICE guidance which concluded that IUI was not found to increase a couple's chances of getting pregnant in cases of unexplained infertility, a low sperm count, poor-quality sperm, or mild endometriosis.

Birth rates

In 2016, the IUI birth rate per treatment cycle was 12%.

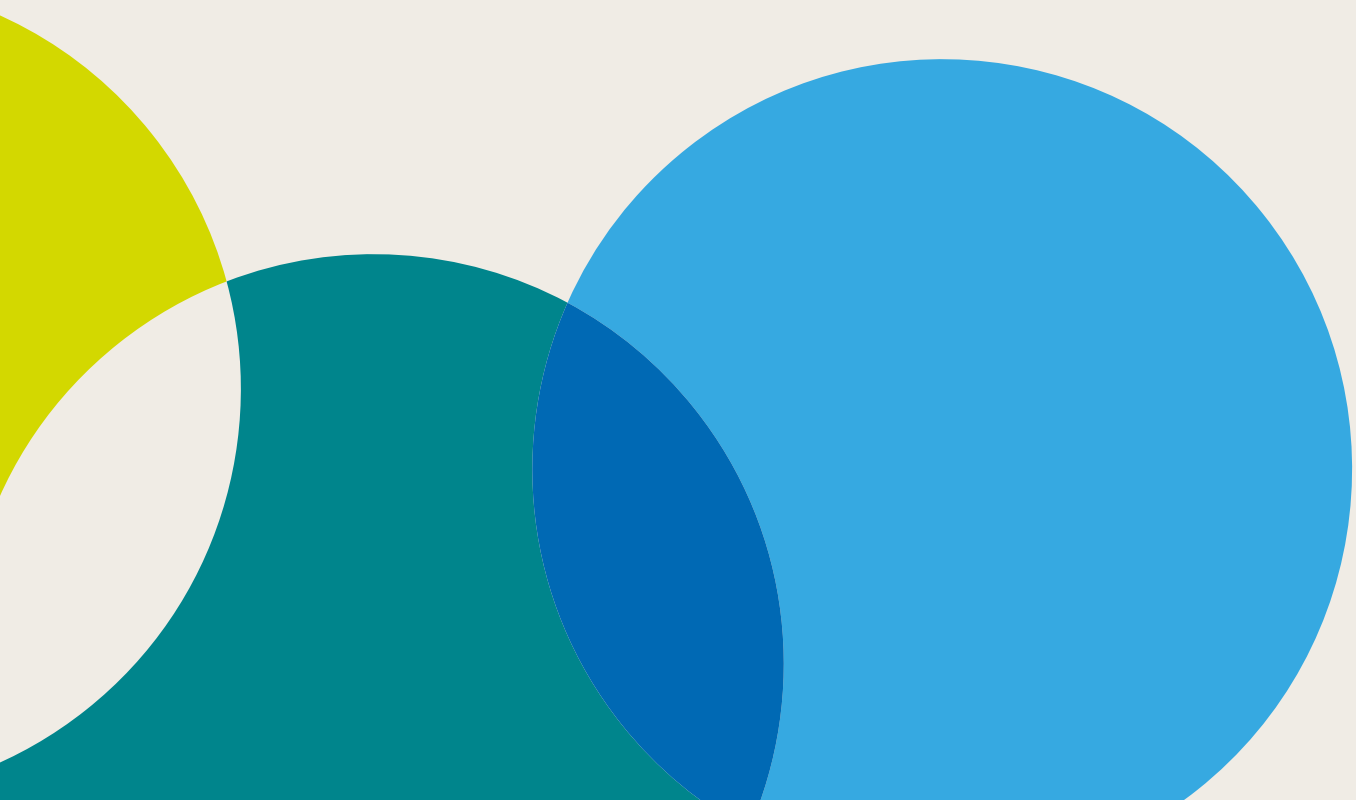
The rates of successful treatment cycles reduce for patients with increasing age and the birth rates across all age groups have remained broadly stable over time. The highest birth rates were in patients under 38 years of age (14% for under 35s, and 12% for patients aged 35–37). The rates of successful treatments reduce for patients over 42 years of age.

Figure 58: IUI birth rate by age, 2016



Multiple births

Multiple births are the single biggest risk to the health of women and babies undergoing IVF. In 2008, around one in four IVF births were multiples, compared to about 2% from natural conception. Over the last decade, we have worked with patients and professionals to reduce multiple birth rates with the goal of reaching 10%. For more information, see 'Our campaign to reduce multiple births'.

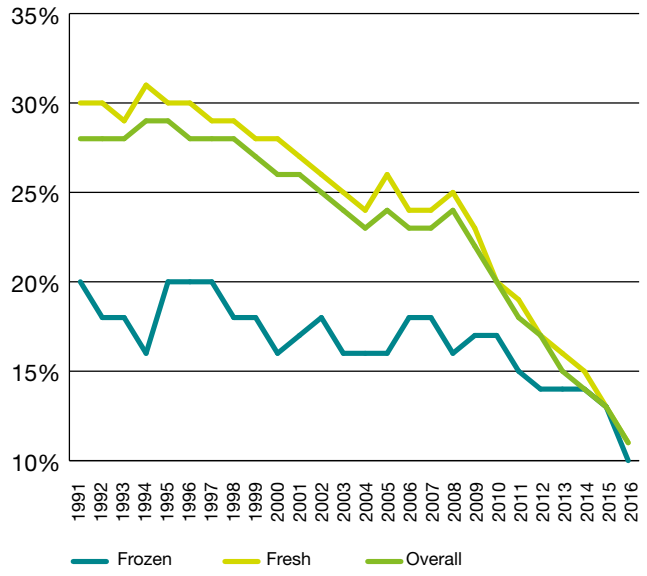


IVF

In 2016, 11% of births from IVF treatment cycles were multiple births. The multiple birth rate has decreased substantially since 2008 for both fresh and frozen cycles, with no reduction in the pregnancy rate. Even since 2015 the overall multiple birth rate has reduced from 13% to 11%. Since 1991, the multiple birth rate has decreased from 28% to 11%.

Historically, multiple births have been more common in fresh cycles, however 2015 was the first year that the multiple birth rate was equal for fresh and frozen cycles at 13%. In 2016, the multiple birth rate was 11% for fresh cycles and 10% for frozen cycles.

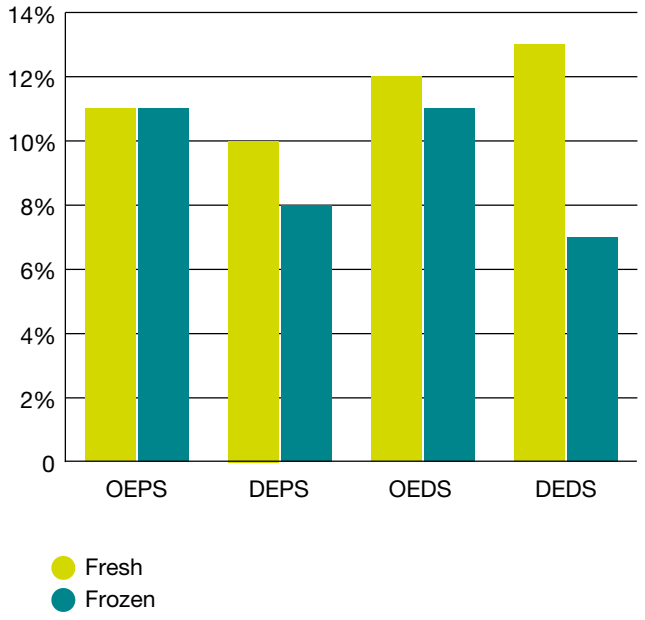
Figure 59: Multiple birth rate for all IVF treatment cycles



There has been a significant decrease in the multiple birth rate across all IVF treatment types. In 2016, the multiple birth rates when split by patient/donor eggs and sperm were as follows:

- OEPS: fresh 11%, frozen 11%
- DEPS: fresh 10%, frozen 8%
- OEDS: fresh 12%, frozen 11%
- DEDS: fresh 13%, frozen 7%.

Figure 60: Multiple birth rate by IVF type



There is a demographic split in the multiple birth rate when broken down by funding type. For fresh IVF, the multiple birth rate for NHS-funded treatment cycles was 8%, and for privately-funded treatment it was six percentage points higher at 14%. For frozen treatment cycles, the multiple birth rate was one percentage point higher for NHS-funded treatment cycles at 11%, compared with 10% for privately-funded treatment.

DI and IUI

In 2016, the multiple birth rate for DI treatment cycles was 8% and for IUI treatment cycles it was also 8%.

Background information

We aim to provide as much background information as possible to the data contained in this report, including information on definitions, methodology and data quality. Our underlying datasheets can be found on the publications page of our website.

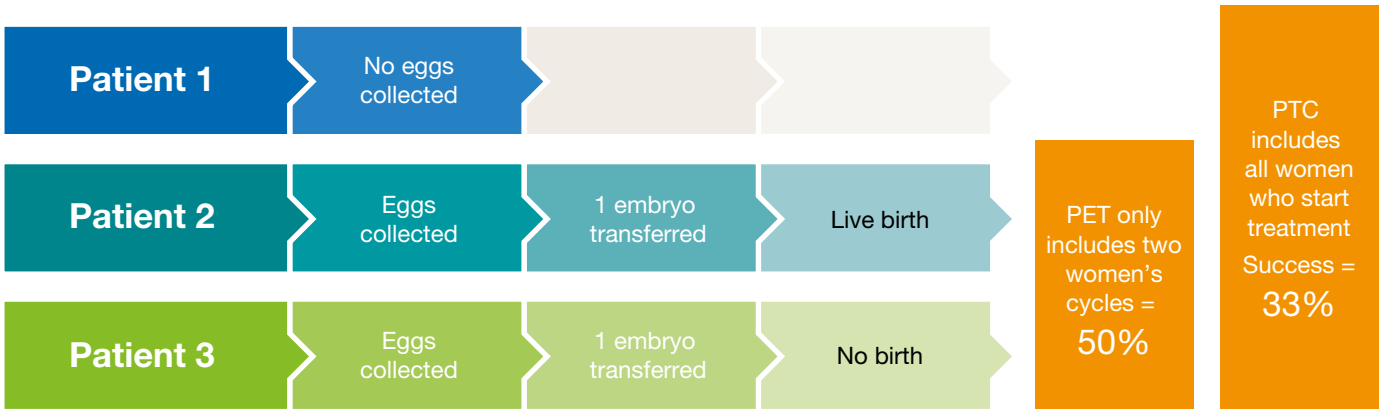
Why do we report on two birth measures?

There are several different ways of presenting success rates – births per cycle of treatment, births per embryo transferred, births per egg collection and so on. We report on two headline birth rates, both of which provide valuable information to the public, patients and professionals about the success of a set of treatments.

- Birth rate per embryo transferred (PET): number of births[11] divided by the total number of embryos transferred.
- Birth rate per treatment cycle (PTC): number of births divided by the number of treatment cycles started.

Birth rates per embryo transferred (PET) is increasingly viewed by professionals as the best measure of clinical practice, which is why the HFEA recently adopted this as its headline measure for clinic performance in its Choose a Fertility Clinic function on its website. PET helps patients and clinics to recognise that whilst transferring more than one embryo at a time is thought to raise success rates, it also raises the chance of twins, which can carry health risks for the babies and mother. However, this measure does not incorporate the outcomes of patients who do not reach the embryo transfer stage, therefore masking some outcomes that can be seen only by looking at the birth rate per treatment cycle (PTC) measure.

When considering birth rates per treatment cycle (PTC), there are many reasons why patients may stop treatment before the embryo transfer stage: for example, over or under reaction to the stimulation drugs, a failure to successfully fertilise any collected eggs, or other external factors in the patient's life.



[11]Births is the number of live birth events ie, twin births count as one live birth event.

Why do we use 'cycles' and 'treatment cycles'?

Patients undergo fertility treatment for a range of reasons:

- with the intention of becoming pregnant as soon as possible (most patients)
- fertility preservation (a growing number of patients)
- altruistic reasons, such as donation.

The term 'cycle' covers all of the interventions that are conducted at a fertility clinic, regardless of whether the patient intended to become pregnant as soon as possible. This includes fertility preservation, donation, and treatment.

The term 'treatment cycle' includes only those cycles where the patient recorded on their registration form that they intended to become pregnant as part of their treatment (IVF, DI and egg share cycles are always treatment cycles).

If we consider the below example of three patients, we can see that all three are undergoing 'cycles', but only two are undergoing 'treatment cycles' (patient five and patient six).

This distinction is important because it has an impact on the birth rates we report.

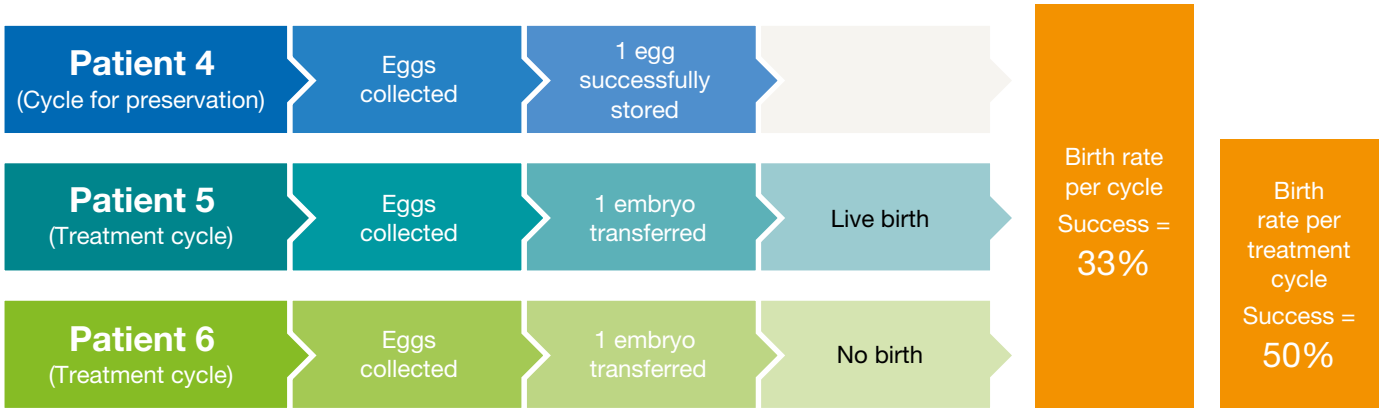
The birth rate per embryo transferred remains the same, because there are only two embryos transferred.

However, we could consider either:

- The birth rate per cycle: there was one birth out of three cycles started = 33%.
- The birth rate per treatment cycle: there was one birth out of two treatment cycles (those started with the intention of the patient becoming pregnant) = 50%.

It only really makes sense to calculate birth rates for those patients that intended to become pregnant, otherwise we risk drawing inaccurate conclusions about the data (ie, a lower birth rate).

Therefore, throughout the report, we tend to use 'treatment cycles' in most cases when discussing the outcomes (birth rates) of fertility treatment.



Live birth rate and multiple birth rates

All the birth rates we quote in this report are for one full calendar year. They are calculated as follows:

1. Birth rates per embryo transferred: the number of live births divided by the sum of embryos transferred for treatment cycles starting in that year.
2. Birth rates per treatment cycle started: the percentage of treatment cycles started in that year which resulted in a live birth.
3. Multiple birth rate: the percentage of all live births resulting from treatment cycles started in that year which resulted in the birth of more than one live baby.

Understanding differences in birth outcomes

Our data is presented by the year the treatment cycle started, not the year a birth was reported in. Other data providers, such as the Office for National Statistics (ONS), publish birth rates according to the year the child was born.

There are different ways to account for the outcomes of treatment. Our live birth data counts all births where one or more babies were born showing some sign of life, including those who go on to die within the first month of life (neonatal deaths). Our multiple birth data counts only births where two or more babies were born alive, including those where one or more of the babies died within the first month of life.

Still births – where a baby is born after 24 weeks gestation showing no signs of life – are not included in either live birth or multiple birth counts in the period covered by this report due to the way clinic success rates are currently reported. This means that a multiple pregnancy which results in the birth of one live baby and one stillborn baby is not counted within our data as a multiple birth. The ONS, however, classes a multiple birth as a pregnancy resulting in the birth of more than one baby, whether alive or stillborn.

Age bandings and percentages

We have broken down most of the results presented here into standard age groups. The majority of cycles performed are in women under 40 years of age and as the age increases, the number of women in each group decreases.

In groups where the numbers are less than five, identification of patients becomes a risk and so we aggregate age groups to make their size larger.

If there is only a small number of women in an age group, it can make results appear to be very changeable when expressed as a percentage. For instance, one year we may see that from 1,000 cycles performed in the youngest age group, there were 300 live births. This would give a live birth rate of 30%. We may see in the same time period that only 10 cycles were performed in the oldest age group, three of which resulted in live births. This also results in a live birth rate of 30%. If the number of cycles stayed the same in the subsequent year, but one less woman in each age group had a live birth, the percentages would change to 29.9% for the younger women (barely changing), and to 20% for the older age group (it appears the rate has dropped dramatically). As larger groups are less affected by small changes (possibly caused by chance occurrences), they tend to remain steadier. We have provided commentary in the report where birth rates for small cohorts may not provide reliable evidence.

How we responded to feedback from researchers and the public

We have incorporated feedback into this publication to improve the quality by:

- making a greater range of statistics available in as much detail as is reliable and practicable
- providing commentary and analysis that aid interpretation – particularly with regards to our new definitions
- ensuring more information about the data we collect is available on our website
- providing IVF treatment rates for all combinations of donor/own egg, donor/partner sperm and fresh/frozen treatment cycles.

How we gather the data

Clinics in the UK are required by law to provide information to the HFEA about all licensed fertility treatments they carry out. We hold this information on the Register, which contains information about fertility patients, the treatment they received and its outcomes.

Results are published according to the year in which the cycle was started.

The information that we publish is a snapshot of data provided to us by licensed clinics at a particular time. The figures supplied in this report are from the data warehouse containing Register data as at 22/01/2018. By this date, clinics were legally required to have submitted all 2016 births. However, at the time of running this report, there were c1,000 outcomes not yet reported. Therefore, 2016 data may yet be subject to change, but is expected to be correct to within one percentage point for large numbers of treatments (>c500).

As our database consists of a live Register and we rely on accurate reporting from clinics, there can always missing outcomes and information may be subject to change.

As clinics may submit data at any time, the figures published here may differ slightly to those published before or in the future.

Clinic-specific data is published on our clinic search tool, Choose a Fertility Clinic on our website.

How we quality assure our data

HFEA Direction 005 sets out the legal basis and requirements which govern our interaction with licensed clinics and third party providers. We work closely with clinics and third-party systems to ensure the importance and guidance around submission of Register data is understood through stakeholder groups, workshops and sharing good practice.

We use additional quality assurance processes:

- We manually validate data submissions.
- We carry out regular quality assurance checks on data through the inspection process.
- We publish non compliance with data quality issues in inspection reports on our website.
- Where relevant, we review quality (validation) reports and we may audit clinics where irregular data has been submitted.

Changes to data verification

Historically, we have undertaken a verification exercise in addition to the validation and quality assurance processes we undertake on an ongoing basis. This verification exercise requires clinics to review and sign off their submission confirming its accuracy.

In this 2014–2016 fertility trends report, we have not verified data from July 2015 to December 2016. This is to ensure that we are able to provide relevant, timely and useful information to the public, professionals and patients. We have judged that the quality of our validation processes and legal basis upon which we collect data will result in accurate national level statistics.

How to access further data

The data in this publication has, in most cases, been presented as percentages to draw comparisons and maintain understanding for lay readers. If you would like to access the absolute figures, these are available to download as an Excel file from our website.

We are keen to engage with researchers and research organisations to gain the maximum benefit from the data we hold. We publish an anonymised Register on our website which can be used to answer most types of research questions. If you are a researcher at a UK institution, you may be able to apply for access to identifiable data for a specific project. Please contact our Intelligence team (intelligenceteam@hfea.gov.uk) if you would like further information.

Revisions policy

Slight amendments were made to this publication in April 2018. No further revisions are planned unless errors are found, which will be corrected.

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