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How successful is commercial DNA testing in resolving British & Irish cases of unknown parentage?

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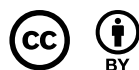
Abstract: This study is the first to characterise the type of people trying to resolve unknown parentage cases in the UK and Ireland, and how successful their efforts are, using commercial DTC (direct-to-consumer) DNA tests. A survey was conducted of individuals born in the UK or Ireland, or with a biological parent from the UK or Ireland, who had used genetic genealogy as a part of their search for one or both biological parents. Success rates were high, with DNA assisting the identification of a birth parent in 48% and 55% of cases (48% for those with unknown fathers and 55% for those with unknown mothers). In an additional 20% and 21% of cases (unknown fathers and unknown mothers respectively), DNA identified grandparents or more distant ancestors. The majority of those identifying a biological parent did so within six months of receiving their DNA results (39% and 55% of cases), and within two years, 78% and 87% had identified a biological parent. The survey also attempted to assess the likelihood of success of the combined use of GEDmatch and FamilyTreeDNA in IGG (investigative genetic genealogy) cases in Britain and Ireland and found that potentially IGG-suitable matches were present in about 60% of cases. These results complement those of earlier studies and have important implications for social policy in the UK and Ireland.

Introduction

Commercial direct-to-consumer (DTC) DNA testing has shown itself to be a useful genealogical tool. It helps confirm the accuracy of previous documentary-based research, and suggests future research directions, which frequently results in people breaking through brick walls in their family trees.¹ It has also become an essential tool for those engaged with adoptee and unknown parentage research.²

Numerous success stories of how DNA has helped individuals identify their biological family have been publicised over the last ten years³ on social media⁴, in news stories⁵, and on prime-time television programmes and series such as *Finding Your Roots*, *Who Do You Think You Are?*, and *Long Lost Family*, many sponsored by Ancestry^{6,7} (the DTC DNA testing company with the largest database). One company (MyHeritage) established a *pro bono* initiative⁸ supplying free DNA tests to help reunite adoptees with their biological families and have published many of the associated success stories on their website.⁹ No doubt these success stories have helped fuel the sales of DTC DNA test kits and the exponential growth of the autosomal DNA¹⁰ databases, which as of late 2021 include close to 40 million sets of results worldwide.¹¹

In January 2017, genetic genealogist Blaine Bettinger published the preliminary results of a 2015/2016 survey of 700 adoptees and this revealed a 50% success rate (i.e. 50% of the adoptees surveyed had identified one or both of their biological parents) through the use of DNA testing.¹² Subsequent analyses of the 2017 data showed an increase in the success rate (from 48% to 58%).¹³ However, the majority of



respondents in the 2015/2016 survey were from the US (80%) and there was no separate analysis of success rates in the UK and Ireland. The small proportion of respondents from outside the US was not unexpected because AncestryDNA, the company with by far the largest database, launched their test in the US in 2012, but it was not until 2015 that it became available in the UK, Ireland, Australia, Canada, and New Zealand. In 2016 the AncestryDNA test became available in a further 29 countries.¹⁴

There were other limitations associated with the 2015/2016 survey. It focused exclusively on adoptees, and other types of unknown parentage cases were not included (e.g. people with unknown fathers, donor-conceived individuals, etc.). Also, the results did not indicate the average time between taking the test and identifying at least one biological parent.

Four years on from the 2015/2016 study, a survey was undertaken to assess the current success rate in a British and Irish population. AncestryDNA have promoted their test heavily in Britain and Ireland during this intervening period. By 2019 it was estimated that almost five million British people had taken a DTC DNA test.¹⁵ These numbers are a little higher than the total size of the combined databases at the time of Bettinger’s 2015/2016 survey.¹⁶

The survey was extended beyond adoptees to include other types of unknown parentage. Supplementary questions were asked that were designed to 1) characterise the different types of unknown parentage case, 2) assess how long it took to achieve success, and 3) assess how successful the combined use of GEDmatch and FamilyTreeDNA (FTDNA) might be in cases of unknown parentage in Britain and Ireland. This latter research question aimed to explore the technical feasibility of using investigative genetic genealogy (IGG)¹⁷ to identify unknown human remains or solve violent crimes in a British or Irish setting. Currently GEDmatch and FTDNA are the only companies that allow law enforcement agencies to access their databases in order to attempt to solve such cases.

Methods

The survey was set up on Google Forms and people were invited to fill out a self-reported questionnaire (Appendix 1). No identifying information was requested (e.g. name, email address) thus optimising the anonymity of respondents. The intention was to include a broad target audience, including adoptees, foundlings, people with unknown fathers, donor-conceived individuals, and anyone with any other type of unknown parentage. To this end, a variety of Facebook groups, forums, and mailing lists were identified whose membership belonged to these specific categories, as well as genealogy-related Facebook groups with a large proportion of British or Irish members. The key groups are summarised in Table 1. Many of these have a large number of members, for example, *DNA Help for Genealogy (UK)* has over 12,000 members and *Genetic Genealogy Ireland* has over 7,700 members (as of December 2021).

Table 1. The key Facebook groups and pages in which the survey was publicised.

<ul style="list-style-type: none"> • DNA Help for Genealogy (UK) • ISOGG UK • Ancestry UK • AncestryHour • Scottish Indexes • Borders Ancestry • Scottish Genealogy Network • Glasgow West of Scotland FHS 	<ul style="list-style-type: none"> • Genetic Genealogy Ireland • Irish Genealogy • The Irish Surname Registry • Irish DNA • IGP's County Dublin Ireland Genealogy Group • Irish Genealogical Research Society 	<ul style="list-style-type: none"> • DNA Detectives Social Group • Genetic Genealogy Tips & Techniques • Donor Conceived People, Siblings, Parents, and Donors • We are Donor Conceived • Adoption Voices - UK & Ireland • Adopted Illegally Ireland • Beyond Adoption Ireland • Adoption Rights Alliance
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The following message was posted on the various Facebook groups and pages:

SURVEY: Unknown Parentage
 How successful is DNA in helping British & Irish adoptees (and other people of unknown parentage) find their biological family?
That's what this survey aims to find out.
 If you or one (or both) of your parents are **British or Irish** and you have taken a DNA test, then please complete the 14 questions in this brief survey. It takes about 2 minutes to complete and the results will help inform future research. (Please note that NO identifying information is stored - it is completely anonymous).
 Please feel free to share the link with friends & family and other Facebook groups (with the Admin's permission). If you have any questions, please leave a comment below and we will endeavour to answer it as quickly as possible.

Following feedback, it was subsequently clarified that people could complete the survey on behalf of someone whom they had helped find their biological parent. The survey was actively publicised from late December 2020 to end February 2021 and remained open until October 2021.

The explicitly stated aim of the survey was to assess if DNA had helped respondents to find an unknown parent or other biological family. A further requirement was that respondents (or at least one of their biological parents) must have been born in Britain or Ireland. In all, 293 people responded, but 16 were excluded from the analysis for the following reasons:

- Neither the respondent nor their biological parents were born in Britain or Ireland (8 people)
- The respondent already knew who both their biological parents were prior to doing the DNA test (7 people)
- The respondent had not done a DNA test (1 person)

Consequently, 277 respondents were deemed suitable for inclusion in the final dataset. Twenty-four people gave incorrect or contradictory answers to some of the questions and their data was not used for the analysis of those specific questions. The results were analysed using descriptive statistics. Some comparisons between different subgroups were tested for statistical significance using a chi-squared test. All p-values described below are the result of a chi-squared test.

Characteristics of the Sample

Where were respondents (and their parents) born?

Just over a quarter of respondents were born in Ireland (27%, $n = 74$ out of 277), 68% (188) in the UK, and the remaining 5.4% (15) were born in the US (7), Canada (2), or Australia (3), with a single representative from each of France, Germany, and "Rhodesia". A single respondent reported being born in Scotland and he was included in the UK category. Two respondents specified Northern Ireland as their country of birth, and these were included under the Ireland category for the purposes of subsequent subgroup analysis as any genealogical research that would have been undertaken for these cases would have involved mainly Irish record sets. In retrospect, in questions 3, 4, and 5, it would have been better to use the term "Britain" (i.e. England, Scotland, Wales) instead of "UK", and in the discussion that follows the term "UK" should be taken to mean "Britain" or "British".

Although only 27% of respondents were born in Ireland, 37% of the entire sample (101/277) reported an Irish mother and 33% (92/277) an Irish father (see [Figure 1](#)). In contrast, although 68% reported being born in the UK, only 56% (156/277) reported a UK mother and even fewer reported a UK father (35%; 98/277).

All but one respondent knew where their mother was born (272/273), but only 91% of respondents (216/238) knew where their father was born. This percentage may be as low as 78% (216/277) because 39 respondents did not provide an answer to question 5: where was your biological father born (if known)?

Assessing just those respondents who knew where their parents were born, 96% of respondents born in Ireland had an Ireland-born mother, and 4% had a UK-born mother (see [Figure 2](#)); and similarly, 89% reported an Ireland-born father, 5% a UK-born father, and 7% a father born elsewhere (but not USA or Canada).

Turning to those respondents born in the UK, 82% had a UK-born mother, 14% an Ireland-born mother, and 5% a mother born elsewhere; similarly, 65% reported a UK-born father, 21% an Ireland-born father, 8% a father born in the USA or Canada, and 6% a father born elsewhere.

The significant proportion of Irish parents among UK-born respondents could be explained in part by the frequent migration of Irish people to the UK in search of work during the latter half of the 20th century¹⁸ but may also be a reflection of the long history of unmarried Irish mothers travelling to the UK to conceal their pregnancies from their communities, and then adopting out their children there and returning home without anyone knowing that they were pregnant.¹⁹ Adoption became legalised in England and Wales in 1926, but not until 1954 in Ireland.²⁰

For those respondents born in the UK, there was a notable excess of biological fathers from North America (USA: 8, Canada: 4; 8% in total). The fact that this was absent from the Ireland-born cohort suggests that this may be explained (at least in part) by the presence of American GIs in the UK during WWII. Relatively fewer American GIs were stationed in Ireland, and those that were (some 300,000) were concentrated in Northern Ireland.²¹ It is estimated that between 1942 and 1945, American GIs in Britain fathered over 22,000 children.²² In recent years, DNA has helped uncover the identities of some of these men.²³

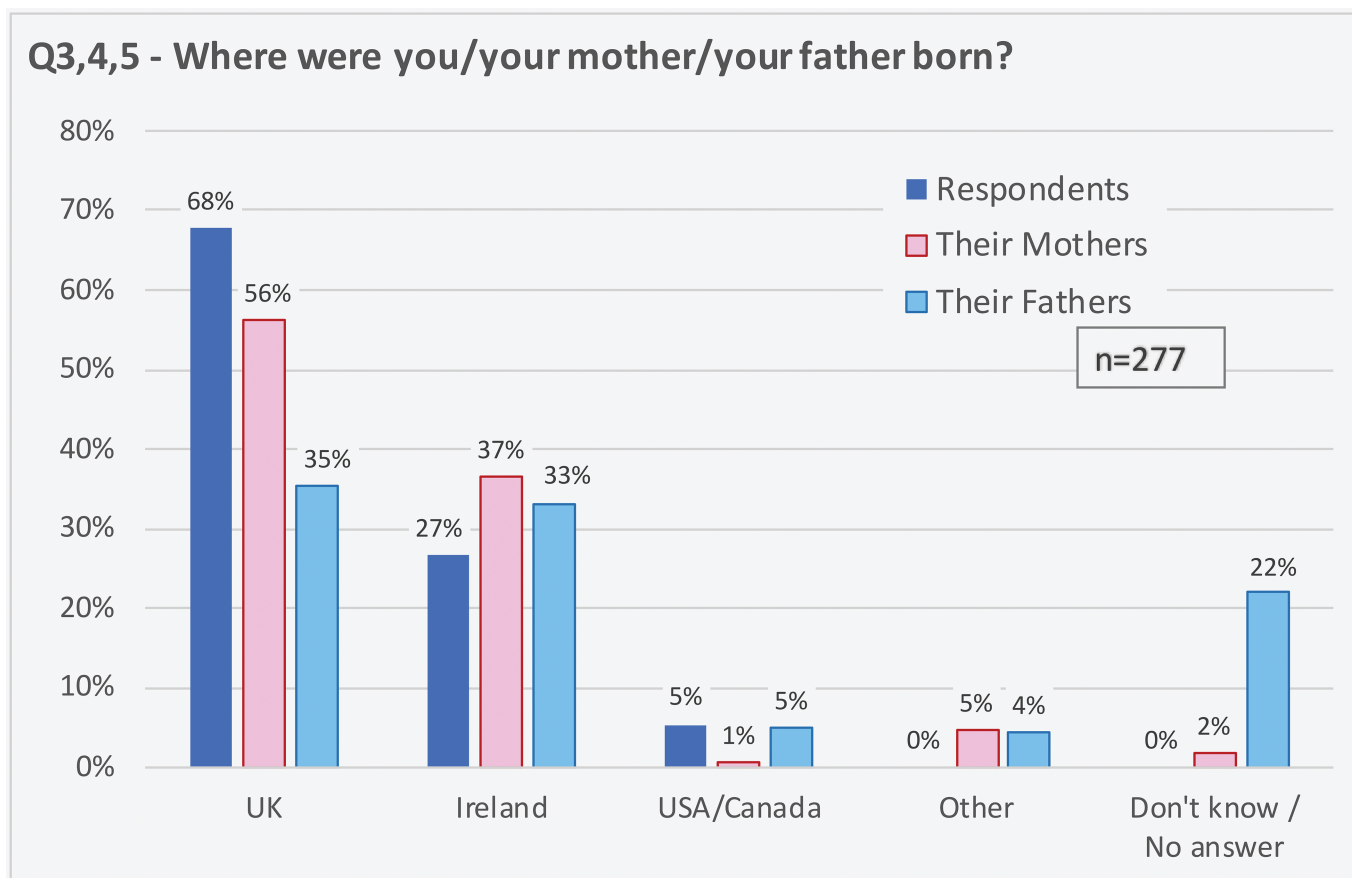


Figure 1. Place of birth of respondents and their parents (all respondents; n=277).

Who were they looking for?

At the time of taking the DNA test, a single respondent was looking for only their mother, 68% (187) were looking for only their father, and 32% (88) were looking for both parents. In summary, almost everyone had an unknown father, but only 32% had an unknown mother (see Figure 3).

In the case of adoptees, the focus is very much on the search for their mother, at least initially, and in many cases, identifying the father is not even considered.²⁴ In our sample, most people (68%) already knew who their biological mother was. Some of these may have been raised by their mother in a single parent family, and in fact, 29% of the total sample reported that they grew up not knowing the identity of their biological father (see below). However, this leaves 39% unaccounted for. Some of these may have already identified who their biological mother was and were primarily using DNA to try to locate her or their maternal half-siblings. Others may have already established contact with her through DNA and may have had a reunion. These would be interesting questions to explore in future research.

In summary, the data suggests that for many people their reason for undertaking the DNA test was to identify their unknown father.

Another interesting observation was a significant disparity between the UK-born group and the Ireland-born group. In the UK-born group, only 22% (42/187) of respondents did not know who their mother was, but in contrast, 53% (39/74) of Ireland-born respondents did not know who their mother was ($p < 0.00001$).

The lower percentage in the UK-born group is probably due to the fact that the UK legal system gives adoptees the right to apply for access to their birth records,²⁵ which, in the majority of cases, would allow them to easily identify their biological mother (the name of the biological father is frequently absent from the birth record). No such system currently exists in Ireland and adoptees only have the right to see their original birth certificate if the birth mother consents to it or if she is deceased.^{26,27} Thus, to date, identifying one's biological mother has been

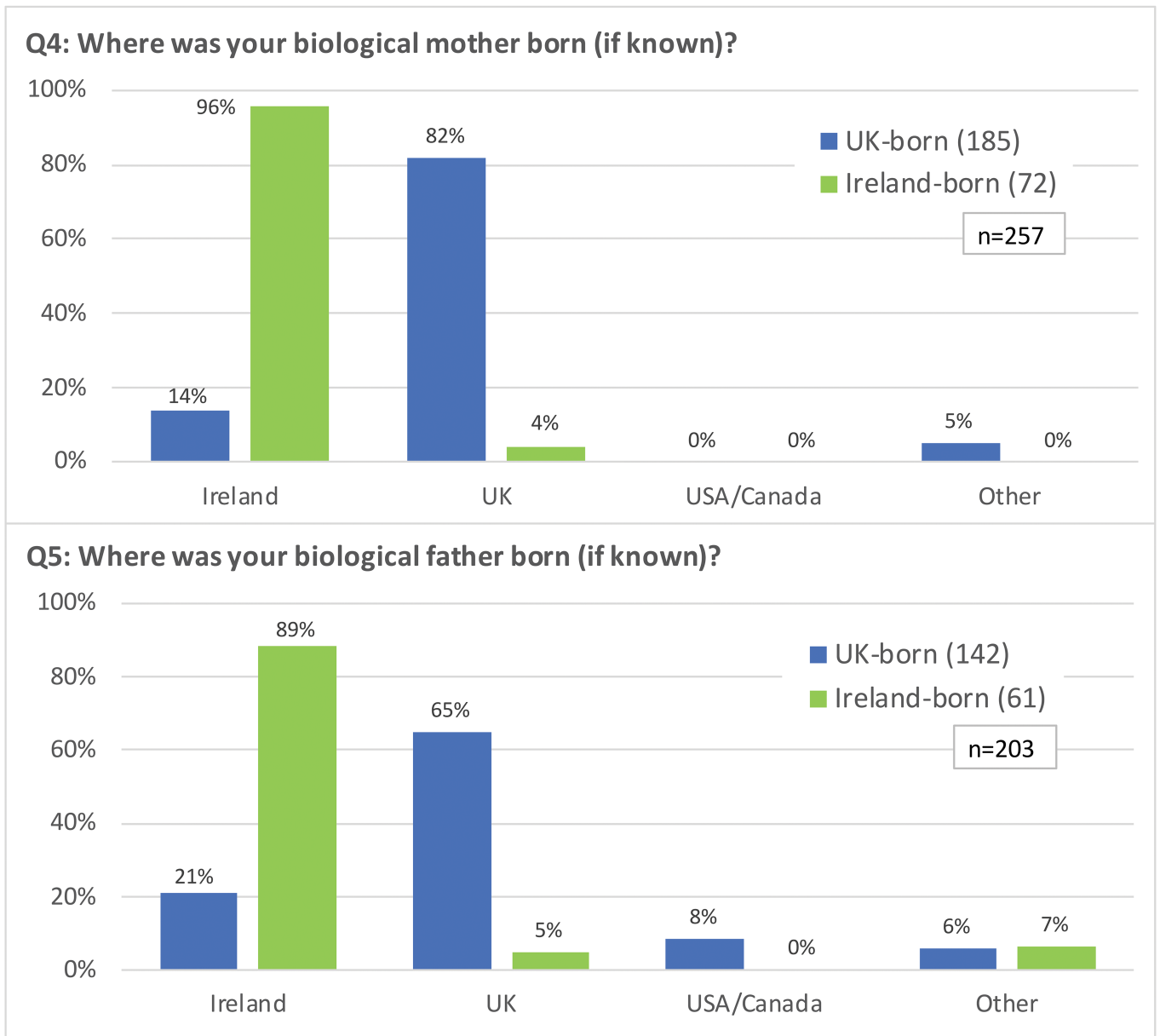


Figure 2. Reported birthplace of parents among those respondents who knew where their parents were born (comparing UK-born vs Ireland-born respondents).

much more difficult in Ireland. This situation may change in the near future because a proposed revision to the law is currently undergoing review.^{28,29} However, DNA is likely to continue to play a part in helping Irish adoptees find their biological families as up to 20,000 birth records may be “illegal adoptions” (i.e. the birth records may have been deliberately falsified, with the names of the adoptive parents being entered instead of the names of the biological parents).³⁰

How did respondents classify themselves?

Respondents were offered a forced-choice selection of 8 categories to describe the nature of their unknown parentage, and these are summarised in Figure 4. The largest category was adoptees, representing 46% of the total sample. The next largest category (29%) was people who grew up not knowing the identity of their biological father. This is consistent with our finding that 68% of the total sample were only looking for their biological father (as discussed above).

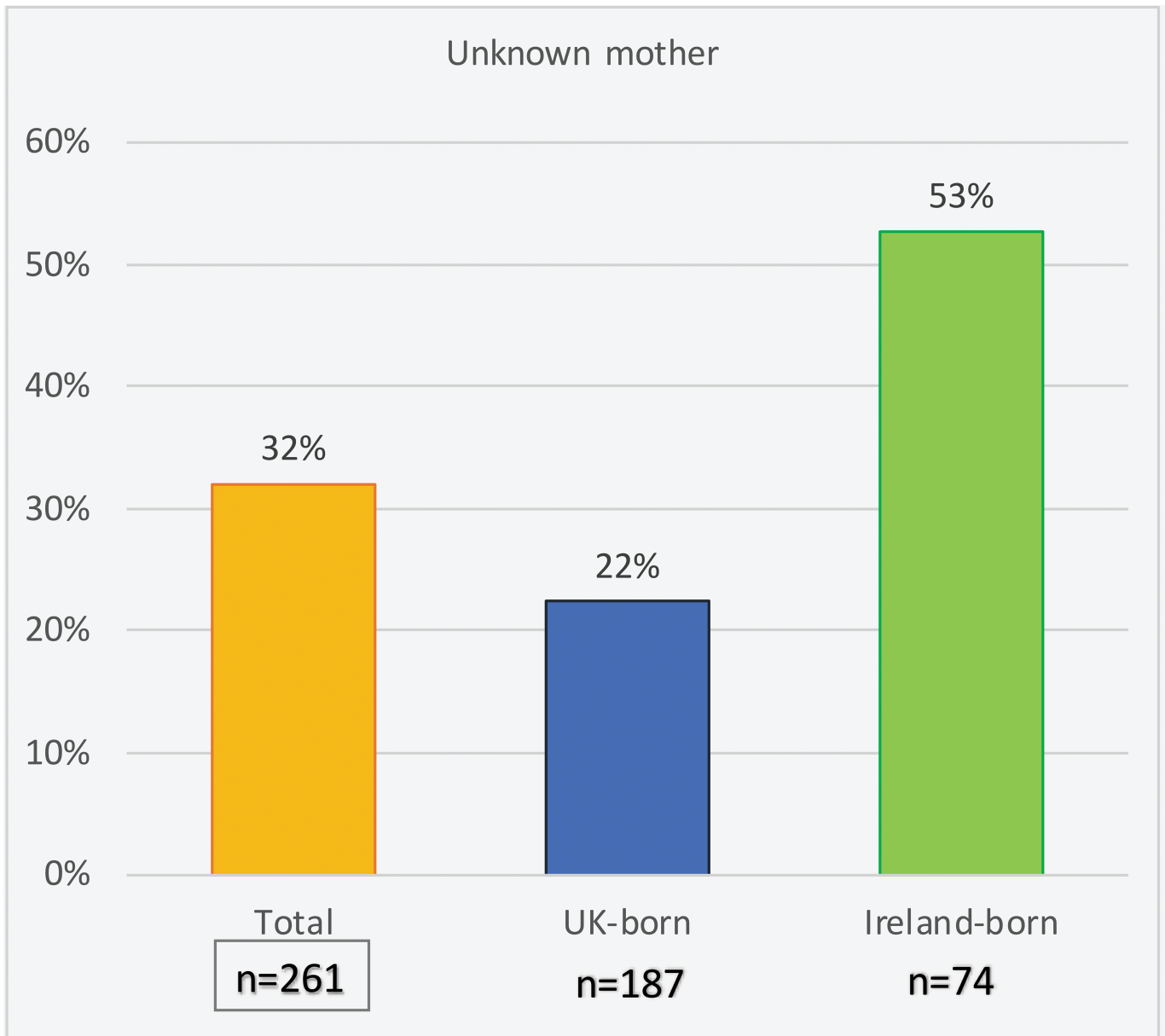


Figure 3. Percentage of respondents having an unknown mother (Total vs UK-born vs Ireland-born respondents; data sourced from responses to Q6).

The third largest category comprised 10% of respondents, who discovered through DNA that one or both of their parents were not their biological parents. In 85% of these cases (23/27), it was revealed that their father was not their biological father, but in four cases (15%) both parents were discovered to be non-biological parents. This finding is consistent with a 2020 survey of donor-conceived individuals, 34% of whom only discovered that they were donor-conceived through commercial DNA testing.³¹ As most DNA testers are adults, this would mean that this group of respondents spent their childhoods ignorant of the fact that their father was not their biological father, or (in four cases) that their parents were not their biological parents. Such revelations may be completely unexpected and for some people, they may be associated with a significant degree of distress. This serves to remind us that DNA can reveal secrets that some people may want to keep buried, and thus people should give careful thought to the possible consequences before taking a DNA test or giving one as a Christmas gift.³² There is even an instance where DNA testing resulted in the loss of a Scottish baronetcy³³ and questions were subsequently raised about the risks that it could present of other legal challenges to inheritance of titles.³⁴

Only seven of the respondents (3%) identified as foundlings. Some may have decided to choose a different category, such as the 6% (16/277) who selected “never knew parents”, but nevertheless, this specific category is uncommon. Indeed a 2009 study suggested between 1998 and 2005 there was “an average of 16 babies abandoned yearly” in the UK.³⁵

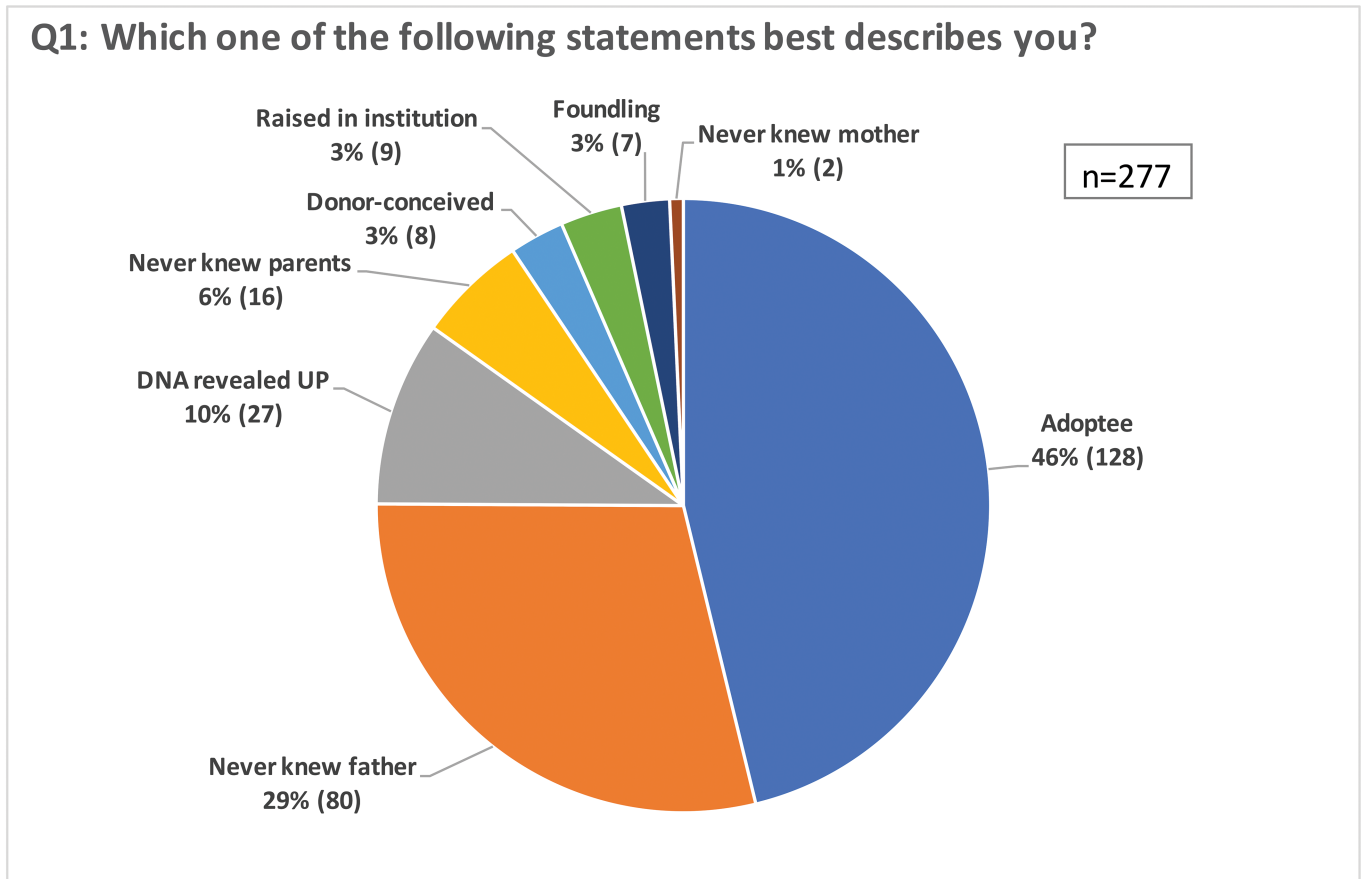


Figure 4. Self-selected categories of unknown parentage (%; n; all respondents; data sourced from responses to Q1; UP, unknown parentage).

Only eight respondents chose donor-conceived (3%) as their self-selected category. However, some donor-conceived individuals may have chosen the “never knew father” category or the “DNA revealed UP” category instead. Donor conception in the UK was anonymous prior to 2005,³⁶ and even after the change in the law, many recipient parents have opted not to tell their children, so there are likely to be many thousands of children who have yet to make this discovery and who may stumble upon it as a result of a casual DNA test. In such cases, they may subsequently use their DNA results to identify their biological father.^{37,38}

Nine people reported that they were raised in an institution (3%), and only two people (1%) chose the “never knew mother” category (although one of these reported that they had found their father via DNA, so they may have been better placed in the “never knew parents” category).

To gain more nuanced data in future research, some revision of the categorisation could provide greater clarity, as many of the categories were not mutually exclusive. The question (*which one of the following statements best describes you?*) could be split into two parts: the first part asking if they grew up not knowing their a) biological father, b) biological mother, c) both biological parents, or d) if they only found out through DNA that they had an unknown parentage case; the second part could then ask if they were adopted, fostered, raised in an institution, a foundling, donor-conceived, or other.

There were some notable differences between those respondents born in Ireland and those born in the UK (see Figure 5). There was a higher proportion of adoptees in the Irish sample (59%, 44/74) than in the UK sample (39%, 74/188). This finding was statistically significant

($p = 0.003245$). The proportion in the “never knew father” category was significantly higher in the UK sample (37%, 70/188) compared to the Irish sample (11%, 8/74; $p = 0.000025$). This reflects our finding that 78% of UK-born people already knew their biological mother when they tested, compared to only 47% of people born in Ireland.

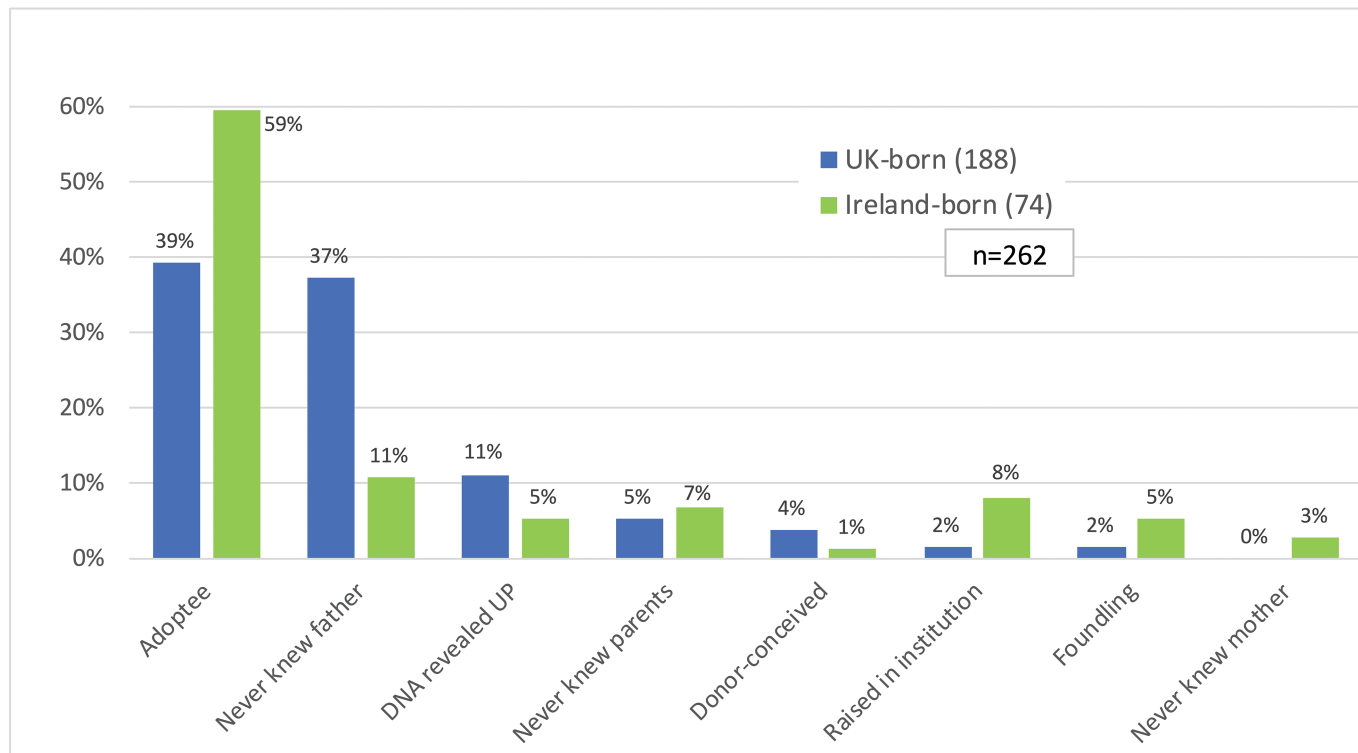


Figure 5. Categories of Unknown Parentage - UK-born vs Ireland-born respondents.

There was a higher percentage of donor-conceived individuals in the UK-born sample, and a higher percentage of foundlings and people raised in institutions in the Ireland-born sample. However, the numbers were small and the only differences that reached statistical significance were those in the “raised in institution” category (3/188 UK-born vs 6/74 Ireland-born; $p = 0.009172$).

Success Rates

Overall, 48% of the total sample reported that they had found their biological father through DNA (46% in the UK-born group and 48% in the Ireland-born group; $p = 0.83251$: not significant). Furthermore, an additional 21% reported they had been able to identify paternal grandparents or other more distant paternal ancestors. Taken together, 69% of respondents had either identified their father or were close to identifying who he might be (see Figure 6).

Similarly, 17% reported that DNA had helped identify their biological mother.

Excluding the 68% who already knew their mother’s identity, 55% (48/88) of the remaining respondents had identified their mother, and an additional 20% had identified maternal grandparents or other more distant maternal ancestors. Altogether, 75% of those who did not know who their biological mother was when they took the DNA test subsequently had either identified her or were close to doing so.

Table 2 presents the success rates for the entire sample as well as several subgroup analyses (i.e. success rates by country of birth, and by self-selected categories). There were no notable differences in these success rates among the various subgroups.

How long did it take?

Among the 48% who had identified their biological father through DNA testing, identification was achieved within 6 months in 39% of cases; 6-12 months in 21%; 12-24 months in 18%; and >24 months in 22%. There were no notable differences between UK-born and Ireland-born subgroups.

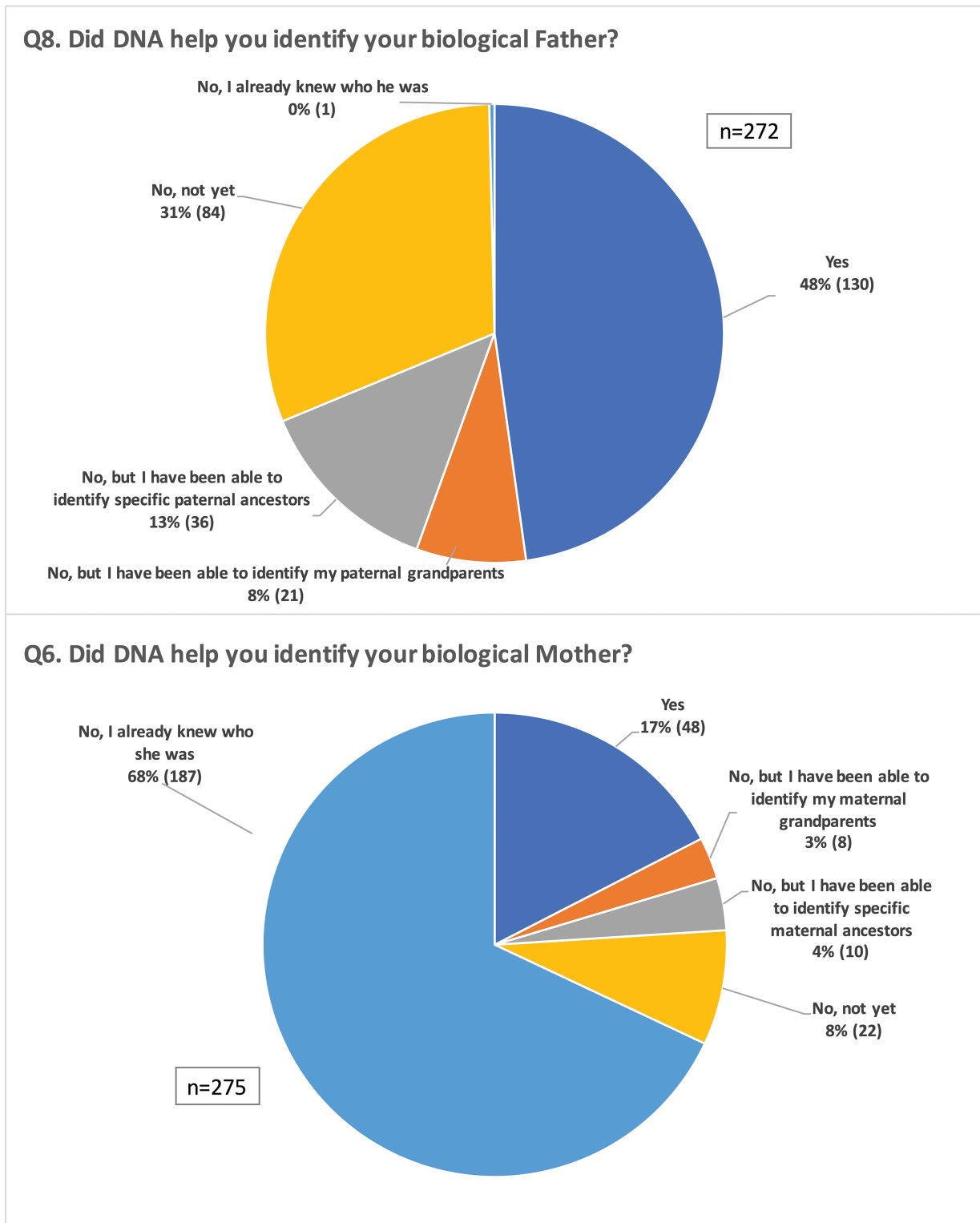


Figure 6. Success rates (% , n) for the identification of biological parents (all respondents).

Table 2. Success rates (% , n) for identification of biological parents among those for whom they were initially unknown – total sample & subgroup analyses. Notes: “unknown mother” excluded; several categories amalgamated into “Other (2 UP?)” (2 possible unknown parents) including institutions, founding, never knew parents; numbers are small in many of the subgroups; there is more father-related data than mother-related data.

Q8. Did DNA help you identify your biological Father?		Total Sample (% , n)	UK-born (% , n)	Ireland-born (% , n)	Other-born (% , n)	Adoptees (% , n)	Unknown fathers (% , n)	DNA revealed UP (% , n)	Other (2 UP?) (% , n)	Donor-conceived (% , n)
Yes		48% 130	46% 86	49% 35	64% 9	49% 62	49% 38	41% 11	48% 15	38% 3
No, but identified paternal grandparents		8% 21	9% 17	6% 4	0% 0	6% 7	8% 6	15% 4	13% 4	0% 0
No, but identified specific paternal ancestors		13% 36	15% 28	11% 8	0% 0	13% 16	12% 9	22% 6	13% 4	13% 1
No, not yet		31% 84	29% 54	35% 25	36% 5	33% 41	32% 25	22% 6	26% 8	50% 4
Total		100.0% 271	100% 185	100% 72	100% 14	100% 126	100% 78	100% 27	100% 31	100% 8
Q9. If yes, how long did it take?		Total Sample (% , n)	UK-born (% , n)	Ireland-born (% , n)	Other-born (% , n)	Adoptees (% , n)	Unknown fathers (% , n)	DNA revealed UP (% , n)	Other (2 UP?) (% , n)	Donor-conceived (% , n)
<6 months		39% 51	36% 31	51% 18	22% 2	44% 27	37% 14	27% 3	40% 6	25% 1
6-12 months		21% 27	21% 18	17% 6	33% 3	26% 16	16% 6	36% 4	0% 0	25% 1
12-24 months		18% 24	20% 17	17% 6	11% 1	13% 8	24% 9	18% 2	27% 4	0% 0
>24 months		22% 28	23% 20	14% 5	33% 3	18% 11	24% 9	18% 2	33% 5	25% 1
Total		100% 130	100% 86	100% 35	100% 9	100% 62	100% 38	100% 11	100% 15	100% 3
Total										Total 129
Q6. Did DNA help you identify your biological Mother?		Total Sample (% , n)	UK-born (% , n)	Ireland-born (% , n)	Other-born (% , n)	Adoptees (% , n)	Unknown fathers (% , n)	DNA revealed UP (% , n)	Other (2 UP?) (% , n)	Donor-conceived (% , n)
Yes		55% 48	60% 25	46% 18	71% 5	52% 30	100% 2	75% 3	59% 13	0% 0
No, but identified maternal grandparents		9% 8	7% 3	13% 5	0% 0	9% 5	0% 0	25% 1	9% 2	0% 0
No, but identified specific maternal ancestors		11% 10	14% 6	10% 4	0% 0	14% 8	0% 0	0% 0	5% 1	0% 0
No, not yet		25% 22	19% 8	31% 12	29% 2	26% 15	0% 0	0% 0	27% 6	0% 0
Total		100% 88	100% 42	100% 39	100% 7	100% 58	100% 2	100% 4	100% 22	0% 0
Q7. If yes, how long did it take?		Total Sample (% , n)	UK-born (% , n)	Ireland-born (% , n)	Other-born (% , n)	Adoptees (% , n)	Unknown fathers (% , n)	DNA revealed UP (% , n)	Other (2 UP?) (% , n)	Donor-conceived (% , n)
<6 months		43% 20	50% 12	39% 7	20% 1	53% 16	100% 1	67% 2	15% 2	0% 0
6-12 months		26% 12	21% 5	28% 5	40% 2	27% 8	0% 0	33% 1	15% 2	0% 0
12-24 months		19% 9	13% 3	28% 5	20% 1	7% 2	0% 0	0% 0	54% 7	0% 0
>24 months		13% 6	17% 4	6% 1	20% 1	13% 4	0% 0	0% 0	15% 2	0% 0
Total		100% 47	100% 24	100% 18	100% 5	100% 30	100% 1	100% 3	100% 13	0% 0
Total										Total 86
Total										Total 47

Among the 55% who had identified their previously unknown biological mother through DNA testing, identification was achieved within 6 months in 43% of cases; 6-12 months in 26%; 12-24 months in 19%; and >24 months in 13% - see Table 2 and Figure 7.

Taking both sets of results together, a successful search took 6 months or less in approximately 40% of cases, and less than a year in about 60%. Thus, for the majority of those who found a biological parent, the search was relatively quick, and for most people (78% and 87%) it lasted less than 2 years.

These success rates could be explained in part by a high frequency of close matches when respondents first received their test results (Figure 8), and in fact, 8% discovered a parent or sibling among their matches, thus immediately identifying their biological family. It is important to note that the converse may also have been true – that the DNA test may have inadvertently revealed the existence of the test-taker to the biological family. This underscores the importance of adequately protecting the privacy of the test-taker as their DNA results may unintentionally “out” them to half-siblings or other close family who may be totally unaware of their existence.

A further 11% had an avuncular relative (aunt, uncle, nephew, or niece), and 21% had a match in the first cousin range (indicating shared grandparents). Therefore, 40% of respondents had matches who were half-first cousins or closer). An additional 33% had second cousin or half-second cousin matches. Thus, 73% of respondents had matches of sufficient closeness that could lead to identification of their biological family with a relatively small amount of subsequent genealogical research.

In addition, the proportions reported here are similar to the ones reported in Bettinger’s 2015/2016 survey.³⁹ These are included in Figure 8 for the purposes of (indirect) comparison.

However, there was no apparent correlation in our data between closeness of initial matches and subsequent success rates. Among those who had identified their biological father using DNA, the success rates were 46%, 48%, and 51% for those with first cousin matches or closer, matches in the second cousin range, and third cousins or greater, respectively (for simplicity, referred to as very close, close and more distant

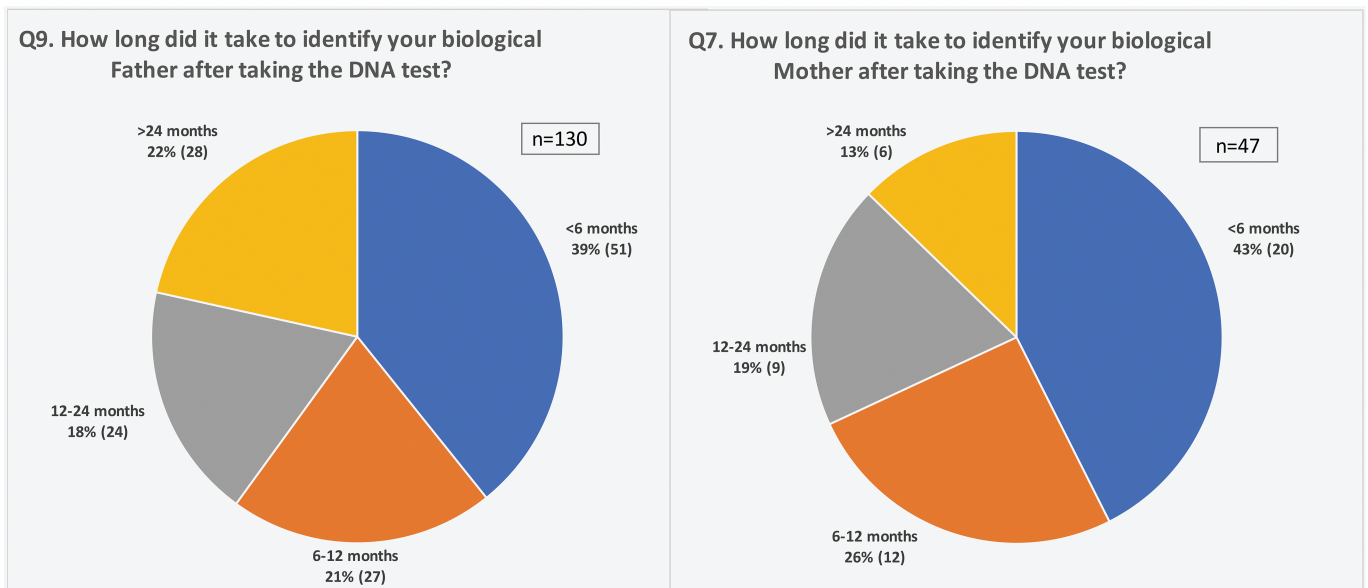


Figure 7. Duration of searching (% , n) among those who successfully identified their biological father or mother through DNA testing (all respondents).

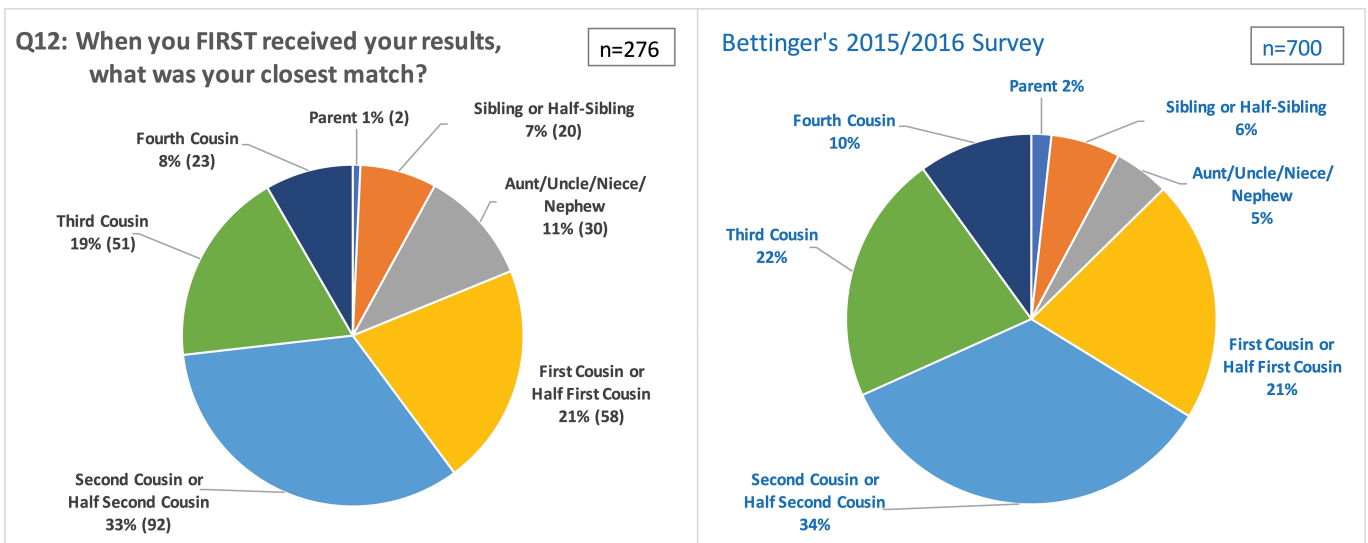


Figure 8. Closest matches (% , n) on initial receipt of DNA results (all respondents) with Bettinger's 2015/2016 survey results for comparison.

matches respectively). The corresponding success rates for those who had identified their biological mother were 50%, 58% and 59% (see Table 3). This suggests that there are other factors determining success rates than closeness of initial matches.

Databases Used

The most frequently used company database among respondents was AncestryDNA (Figure 9). It has the largest database (over 20 million in late 2021) and 91% of respondents tested there. 65% of respondents tested with MyHeritage, 50% with FTDNA, 32% with 23andMe, and 31% with LivingDNA. In addition, 80% had uploaded their results to GEDmatch, and four people had uploaded to Geneanet.

Having one's DNA in multiple company databases may identify a greater number of useful matches and may thus increase the chances of successfully identifying an unknown parent. In this regard, 68% had their DNA data on two or more company databases (Figure 10).

Table 3. Success rates (% , n) among those with very close, close & more distant matches.

Q8. Did DNA help you identify your biological Father?	1C or closer	2C range	3C or greater
Yes	46% 50	48% 43	51% 37
No, but I have been able to identify my paternal grandparents	7% 8	8% 7	8% 6
No, but I have been able to identify specific paternal ancestors	19% 21	13% 12	4% 3
No, not yet	28% 30	31% 28	36% 26
	100% 109	100% 90	100% 72
			Total 271
Q6. Did DNA help you identify your biological Mother?	1C or closer	2C range	3C or greater
Yes	50% 20	58% 15	59% 13
No, but I have been able to identify my maternal grandparents	13% 5	4% 1	9% 2
No, but I have been able to identify specific maternal ancestors	13% 5	15% 4	5% 1
No, not yet	25% 10	23% 6	27% 6
	100% 40	100% 26	100% 22
			Total 88

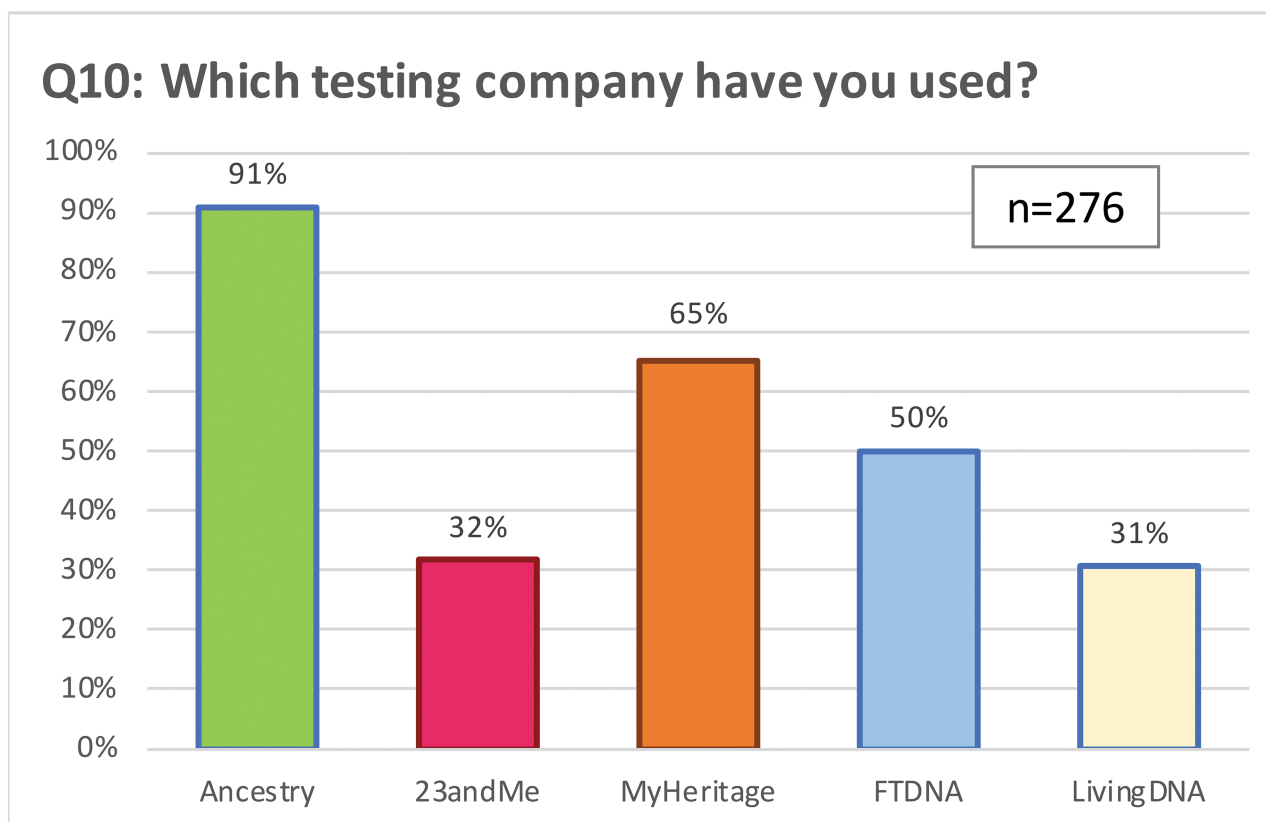


Figure 9. Testing companies used (all respondents).

Each of the DTC DNA testing companies has its advantages and disadvantages.⁴⁰ AncestryDNA’s database is about 20 million strong, they have some useful tools (e.g. the coloured dots system for identifying clusters of Shared Matches, and ThruLines), but most importantly, they have user-supplied family trees, and this is essential for solving cases of unknown parentage. MyHeritage was the last company to bring a DNA test to the market, but this company has become popular with testers because their website has good tools, a large European component to its database, and many users have family trees. FTDNA is the only company to have consistently sponsored genetic genealogy conferences in the

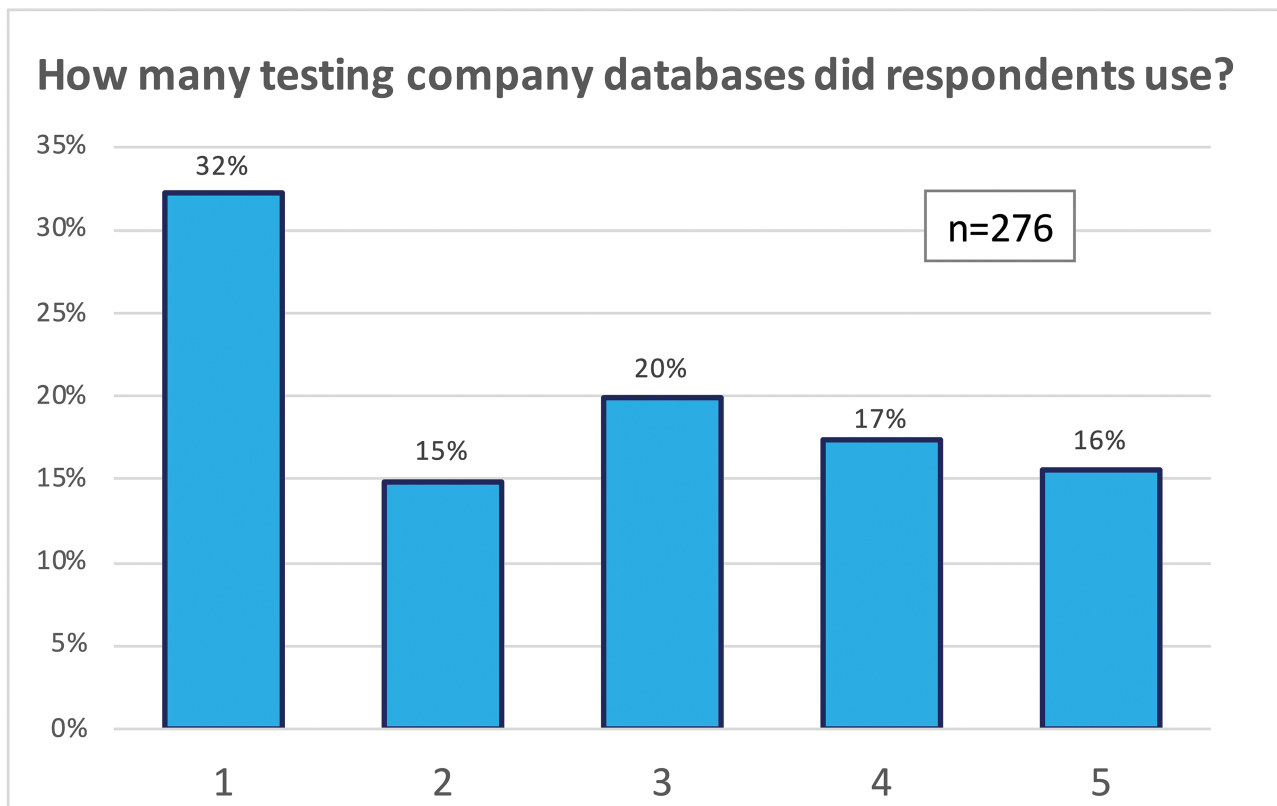


Figure 10. Number of testing company databases used by respondents (all respondents).

UK and Ireland (e.g. *Who Do You Think You Are? Live*, *Family History Live*, *Genetic Genealogy Ireland*) and has a particularly large representation from Northern Ireland – the North of Ireland DNA Project (run by the North of Ireland Family History Society) has over 6,700 members. Also, FTDNA hosts over 10,000 surname projects, with many of the surnames originating in Britain or Ireland. 23andMe have the second largest database but were only the fourth most frequently used database among respondents (see Figure 9). There are several possible reasons for this: their focus is on medical risk assessment; they have a smaller representation from the UK (just 250,000 people out of 10 million as of May 2020);⁴¹ very few users have easily accessible family trees on the website; and 23andMe does not allow uploads from other companies (whereas MyHeritage, FTDNA and LivingDNA do). LivingDNA is the least used of the companies among the respondents, probably in large part because it has the smallest database (estimated to be only 300,000).⁴²

GEDmatch is a third-party comparison site founded in 2010 by members of the genetic genealogy community and was acquired by forensic genetics company Verogen in 2019.⁴³ As mentioned above, 80% of respondents had uploaded their results to GEDmatch. There was no difference in this regard between UK-born and Ireland-born groups.

Potential for investigative genetic genealogy (IGG)

GEDmatch and FTDNA are the only two companies that currently allow law enforcement agencies access to their databases for the purposes of "Law Enforcement Matching" (LEM) i.e. identifying people therein who match DNA profiles from unidentified human remains or the perpetrators of violent crime. LEM is an early step in the process of investigative genetic genealogy (IGG). This is discussed further below.

Question 13 of the survey was included to specifically assess the potential for the successful application of investigative genetic genealogy (IGG) in Britain and Ireland. It asked: *when you FIRST received your results on FTDNA or GEDmatch, did you have any matches that were 3rd cousins or closer, or matches >100 cM?* Such matches would be considered potentially IGG-suitable.⁴⁴

Among those respondents who could remember, 61% (127/209) answered Yes and 39% (82/209) answered No. However, there were many incorrect or conflicting answers to this particular question, so caution is needed when interpreting these results. For example, 3 people who stated that they had uploaded to GEDmatch (Q11) and 2 people who stated they had uploaded to FTDNA (Q10) subsequently reported that

they had never used FTDNA or GEDmatch (Q13). Conversely, 13 people who had never used FTDNA or GEDmatch (according to their responses to Q10 and Q11), gave contradictory answers to Q13. Instead of answering “I never used FTDNA or GEDmatch”, 9 answered Yes, 3 answered No, and 1 person answered “I don’t remember”.

For this reason, a second approach to this question was taken. According to the responses to Question 11, 220 people had uploaded to GEDmatch and an additional 6 people had uploaded to FTDNA but not GEDmatch. Of these 226 people, 118 answered Yes to Q13 and 78 answered No, giving percentages of 60% (118/196) and 40% (78/196), so this alternative approach produced approximately the same results. Note: of the 30 people excluded from this latter analysis, 24 did not remember, 5 gave the contradictory response that they had never used FTDNA or GEDmatch, and 1 gave no response.

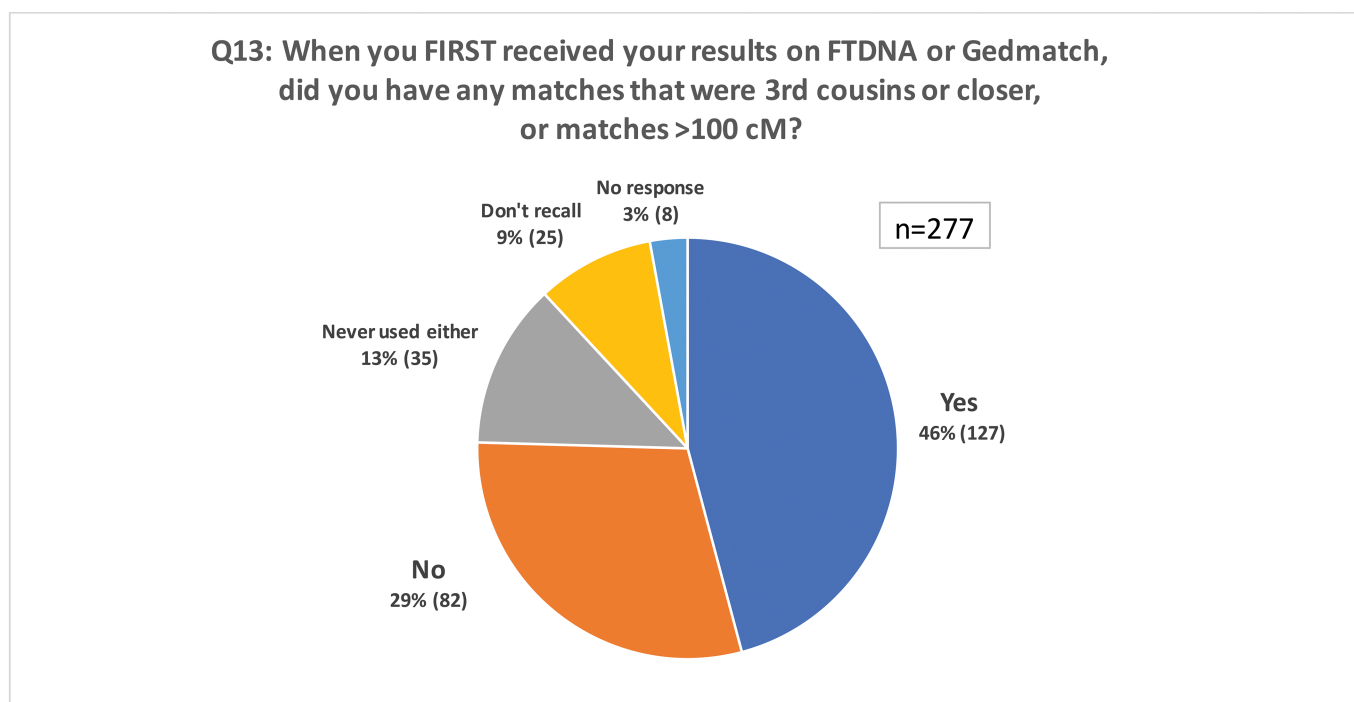


Figure 11. Proportion of respondents (% , n) with potentially IGG-suitable matches on FTDNA, GEDmatch or both (all respondents).

From these results, one can tentatively conclude that about 60% of people on FTDNA or GEDmatch had potentially IGG-suitable results.

Discussion and Conclusions

General Findings

This is the first study of its kind that seeks to characterise the type of people who use DNA to help resolve British and Irish cases of unknown parentage, and the associated success rates. Almost all cases involve an unknown father, whereas only one third of cases involve an unknown mother. Most respondents (46%) categorised themselves as adoptees, and 29% said they were searching for an unknown father; however, there was a notable disparity between the UK-born and Ireland-born subgroups in this regard – more Ireland-born people had unknown mothers (53% vs 22%) and categorised themselves as adoptees (59% vs 39%). In contrast, more people in the UK-born group classified themselves as being in search of unknown fathers (37% vs 11%). These differences can probably be explained (at least in part) by the differing legal systems between the UK and Ireland in relation to access for adoptees to their birth records and suggest that there is more need in Ireland than in the UK for the use of DNA testing to help resolve unknown parentage cases involving adoptees.

The third largest category was people whose unknown parentage was revealed by their DNA results (10%). Such revelations can be quite distressing and may have far-reaching consequences. The survey did not assess if any people sought some form of counselling or psychotherapy following such revelations, but this would be an interesting topic for further enquiry. The genetic genealogy community offers resources for unknown parentage cases, but these tend to focus on the discovery process rather than the aftermath (e.g. various

Facebook and internet groups offer voluntary “search angel” help and guidance, including *Unknown Fathers*⁴⁵, *DNA Detectives UK*⁴⁶, *Search Squad*⁴⁷, and *DNA Adoption*⁴⁸). However, some groups have been established to specifically address the emotional consequences of discovering a case of unknown parentage, NPE (non-paternal event/non-parental event/not the parent expected), or a “misattributed parentage experience” (MPE). These groups include the *MPE Counseling Collective* and the *DNA NPE Gateway*.^{49,50}

The present survey is the first to provide a quantification of the success rates associated with unknown parentage cases in Britain and Ireland. Approximately 50% reported that they had identified at least one biological parent and these figures are very similar to the success rates that were seen in the US in 2016,⁵¹ when the combined size of the available databases was less than 5 million⁵² – at least 8 times smaller than the approximately 40 million in 2021.⁵³ Furthermore, this study is the first to provide some indication of how quickly DNA led to the resolution of unknown parentage cases, with the search process taking less than 6 months in about 40% of solved cases, and less than 2 years in about 80% of solved cases.

The percentage of people with close matches (second cousin range) and very close matches (first cousins or closer) was similar to what Bettinger found in his 2015/2016 survey. However, the lack of a correlation between closeness of match and success rates is noteworthy and warrants further investigation. Other factors that might influence the success rates could include the skill of the test-taker at processing and interpreting their results; the number of close/very close matches associated with extensive family trees; and the use of external expert help (either formal or informal). The present study did not explore these factors, but Bettinger’s 2015/2016 survey asked the question: “Did you receive assistance from a search angel?” – 41% responded that they had, and 59% responded that they had not. From this one can surmise that for some people, no external help is necessary; however, it would be interesting to determine whether, and to what extent, external expert help increases the success rates.

The company databases continue to grow in size by about 10% per year⁵⁴ and as they do, the success rates for solving unknown parentage cases are likely to increase. Adoption and intermediary agencies need to know about these success rates and be prepared to refer their clients for DTC DNA testing if the paper trail turns cold. They also need to access and utilise resources that will help them and their clients to interpret the results and take appropriate action (e.g. instructional videos on genealogy YouTube channels, genetic genealogy blogs, genetic genealogy Facebook groups, etc.).^{55,56} Funding should be allocated for the appropriate training of social workers and other employees of adoption and intermediary agencies.

Findings relating to investigative genetic genealogy

Another topic explored by this study was the feasibility of conducting investigative genetic genealogy (IGG) in Britain or Ireland. IGG uses the techniques developed by the genetic genealogy community in unknown parentage cases to investigate unknown human remains and identify the perpetrators of violent crime. Both categories can be considered a type of unknown parentage, but in these cases, as well as the parents being unknown, the subject is also unknown; however, identifying the parents will lead on to the identification of the subject.

The first of these IGG cases were Buckskin Girl⁵⁷ and the Golden State Killer.^{58,59} These attracted substantial media attention and the subsequent months saw growing public awareness of investigative genetic genealogy.^{60,61} This is largely US-based currently, and IGG teams have been established by the FBI, several US law enforcement agencies, and various commercial companies (e.g. Parabon Nanolabs, Gene by Gene, and Othram).⁶² Subsequently, IGG has led to the identification of over 50 unidentified human remains⁶³ and over 200 perpetrators of violent crime.⁶⁴

One UK pilot study investigated the potential effectiveness of IGG in the UK using the GEDmatch database.⁶⁵ Four of ten anonymised DNA profiles were successfully identified. However, the FTDNA database was not used in that pilot study and thus the present survey (which incorporates FTDNA data) expands on those previous results.

Initially, the entire FTDNA database was opted in to “law enforcement matching” (LEM). This first came to public attention in January 2019.⁶⁶ Following this, the company’s terms and conditions were changed in March 2019 such that all identifiable EU users (which at that time included UK users) were opted out of LEM, and all future users (including EU users) would automatically be opted in to LEM, but could subsequently choose to opt out of LEM at any time.^{67,68} The currently available pool of people for LEM matching at FTDNA is therefore likely to be smaller than pre-2019.

Similarly, GEDmatch changed their terms and conditions in May 2019,⁶⁹ universally opting out everyone from their database and requiring those that were open to “law enforcement matching” to opt in. Then, in January 2021, they automatically opted-in the entire database for

cases involving unidentified human remains.^{70,71,72} An amendment to their Terms of Service and Privacy Policy, dated 30 December 2021, clarified this change.⁷³

Thus, the portion of both the FTDNA and GEDmatch databases that is available for LEM has varied in size over time and depending on whether the person of interest is a set of unidentified human remains or the perpetrator of a violent crime. Currently, the combined FTDNA and GEDmatch databases may be more effective at solving cases involving unidentified human remains.

Furthermore, although 80% of respondents had uploaded their DNA to GEDmatch, the survey did not assess whether these people had privatised their kits by making them "Research Only", so it is not known how many of them were opted in to (and therefore available for) LEM.

It is important to bear these limitations in mind when considering the results of the survey. About 60% of those respondents who had used GEDmatch, FTDNA or both reported having initial matches that would be considered potentially IGG-suitable (i.e. third cousins or closer, or who shared >100 cM); however, it is not known when these results were accessed by the respondents (i.e. it could have been before or after the policy changes discussed above) and whether or not their GEDmatch kits were privatised (i.e. "Research only") and therefore unavailable for LEM.

Nevertheless, these results suggest that a substantial number of IGG cases in Britain or Ireland could potentially have been resolved using IGG, prior to the policy changes, and this may still be true for cases of unidentified human remains, such as those in the National Databases (there are currently over 500 such cases in the UK⁷⁴ and 22 in Ireland⁷⁵); in mass grave scenarios (such as that on the site of the former Mother and Baby Home at Tuam, Co. Galway⁷⁶) or the approximately 50 sets of remains of WWI soldiers that are recovered each year from France and Belgium.^{77,78}

IGG will only be a third line approach after standard forensic techniques have failed and can only become part of social policy after the resolution of currently existing ethical, legal, regulatory, and funding considerations.⁷⁹

Limitations

This study used a self-selected sample rather than a random sample. Therefore, selection bias may have favoured those with a positive outcome. The survey was also self-reported, and the risk of recall bias may be high. Some people gave incorrect or contradictory responses, and consequently, 16 respondents were excluded entirely, and the answers of 24 participants to some questions were omitted from the analysis. This was a quantitative survey and did not explore the experiential aspects of the responses. Further qualitative research would help illuminate some of the questions raised by this study.

Disclosures

The authors formed the informal ARUKI (Ancestry Research in UK & Ireland) group for this study. The term "ARUKI" appears in the header on the survey form. This research was undertaken independently of the authors' academic affiliations.

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Supplementary Information

An Excel spreadsheet containing the raw data generated from the results of this research is provided, and can be accessed from the article landing page on The Journal of Genealogy and Family History website. Use the button titled 'Excel datafile' located beneath the article 'pdf' button.

APPENDIX 1. ARUKI Unknown Parentage Survey UKI December 2020

This survey is for people who have done a DNA test to help them find an unknown parent. If you were born in Britain or Ireland (or one or both of your biological parents were born there), then please take this survey. No identifying data is collected.

Acknowledgements

Blaine Bettinger started surveying adoptees back in 2016 and this questionnaire is based on his original concept but is specific to people of unknown parentage in the UK and Ireland.

Thank YOU for taking part in this survey. Please answer the questions below and then click on the SUBMIT button at the end of the page.

Q1: Which one of the following statements best describes you?

- I am an adoptee
- I was raised in an institution
- I am a foundling
- I am donor-conceived
- I grew up not knowing who my biological PARENTS were
- I grew up not knowing who my biological FATHER was
- I grew up not knowing who my biological MOTHER was
- I discovered through DNA that one or both of my parents were not my biological parents

Q2: Are you, or is one or both of your biological parents, British or Irish?

- Yes/No

Q3: Where were you born? (If "Other" please add country)

- UK
- Ireland
- USA
- Canada
- Australia
- New Zealand
- if "Other", please enter details below ...

Q4: Where was your biological mother born (if known)?

(Same categories as Q3)

Q5: Where was your biological father born (if known)?

(Same categories as Q3)

Q6: Did DNA help you identify your biological mother?

- Yes
- No, but I have been able to identify my maternal grandparents
- No, but I have been able to identify specific maternal ancestors
- No, not yet
- No, I already knew who she was

Q7: If Yes to previous question - how long did it take to identify your biological mother after taking the DNA test?

- <6 months
- 6-12 months

- 12-24 months
- >24 months

Q8: Did DNA help you identify your biological father?
(Same categories as Q6, only paternal instead of maternal)

Q9: If Yes to previous question - how long did it take to identify your biological father after taking the DNA test?
(Same categories as Q7)

Q10: Which testing company have you used (tested at or uploaded to)? tick all that apply

- Ancestry
- 23andMe
- MyHeritage
- FTDNA (FamilyTreeDNA)
- LivingDNA (FindMyPast)
- if "Other", please enter details below ...

Q11: Has your DNA data been uploaded to GEDmatch?

- Yes/No

Q12: When you FIRST received your results, what was your closest match? (If you don't yet know the exact relationship, please provide the approximate company prediction, or the most likely relationship based on total shared cM).

- Parent(s)
- Sibling(s) or Half-Sibling(s)
- Aunt/Uncle/Niece/Nephew
- First Cousin(s) or Half First Cousin
- Second Cousin(s) or Half Second Cousin
- Third Cousins
- Fourth Cousins
- if "Other", please enter details below ...

Q13: When you FIRST received your results on FTDNA or GEDmatch, did you have any matches that were 3rd cousins or closer, or matches >100 cM?

- Yes
- No
- I don't remember
- I never used FTDNA or GEDmatch

Q14: Are there any additional details you would like to add? Please remember to click on the Submit button below when you are finished ...

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