



**Genetic Alliance UK**  
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# What do patients with rare genetic conditions think about whole genome sequencing in the NHS?

Research Findings for the 100,000 Genomes Project

November 2014

## Genetic Alliance UK

Genetic Alliance UK is the national charity working to improve the lives of patients and families affected by all types of genetic conditions. We are an alliance of over 160 patient organisations. Our aim is to ensure that high quality services, information and support are provided to all who need them. We actively support research and innovation across the field of genetic medicine.

Genetic Alliance UK undertakes various projects and programmes that add evidence and knowledge to improve health service provision, research and support for families. These initiatives include:

- Rare Disease UK, a stakeholder coalition brought together to work with Government to develop the UK Strategy for Rare Diseases.  
[www.raredisease.org.uk](http://www.raredisease.org.uk)
- SWAN UK (Syndromes Without A Name), a UK-wide network providing information and support to families of children without a diagnosis.  
[www.undiagnosed.org.uk](http://www.undiagnosed.org.uk)

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### 1. Introduction

In 2012, the Prime Minister committed £100 million to sequencing 100,000 genomes. The 100,000 Genomes Project, delivered by Genomics England, aims to help the NHS become one of the first health systems in the world to use whole genome information in mainstream clinical practice. It will allow approved researchers worldwide to access information from the sequenced genomes in order to generate more knowledge to help patients. Initially one area of focus for the 100,000 Genomes Project will be rare diseases. It is important that the perspectives of potential beneficiaries should have a key role in shaping the project and the delivery of whole genome sequencing in UK healthcare.

Genomics England commissioned Genetic Alliance UK to seek the views of individuals with a rare genetic disease in the family. Views were sought on some of the issues raised by the 100,000 Genomes Project in order to help guide policies and the development of patient and participant literature. This report summarises the key findings from this work.

### 2. Method

Genetic Alliance UK developed and hosted an online survey (with input from Genomics England) in July 2014. The survey was sent to members of Genetic Alliance UK and SWAN UK via email, inviting patients and family members affected by suspected or confirmed rare genetic conditions to take part. The survey was live for a total of 17 days and received 231 responses. In addition 8 telephone interviews were conducted with survey respondents to explore some of the issues in greater depth. The survey and interviews explored patients' and families' views around three key areas:

- What findings should be fed back to participants of the 100,000 Genomes Project? (See section 4.2)
- How should personal information about participants of the 100,000 Genomes Project be shared with others? (See section 4.3)
- How should participants of the 100,000 Genomes Project be contacted about their involvement in future research studies? (See section 4.4)

Participants were also asked if they had any other comments in relation to whole genome sequencing or the 100,000 Genomes Project. These findings are reported in section 4.5.

### 3. A summary of key points

- Patients and families hope that the 100,000 Genomes Project will offer participants greater certainty in relation to their diagnosis, information about their carrier status, and improvements in the way their condition is managed or treated.
- Patients and families would prefer to receive both pertinent *and* additional findings if they had their whole genome sequenced, even if it was unclear if the findings were important to their/their child's health.
- Over half of patients and families stated that they would still take part in a study that didn't give them the choice about the type of information that was given back to them.
- Patients and families reported their concerns about the feedback of findings including: participants' access to future support (both emotional and medical) following the feedback, implications of the information on insurance, the impact of findings on other non-participating family members, and the possibility of finding out about an unexpected serious condition.
- In the main, patients and families stated that they would be happy to share their personal information in the ways proposed by the 100,000 Genomes Project - for their information to be shared with other organisations for research purposes, including general medical research, throughout their lifetime and even after their death.
- Those with reservations about how the information would be shared were unsure about how anonymous their information would be and had concerns about how the information would be shared with profit making companies.
- Patients and families were happy that volunteers of the 100,000 Genomes Project must agree to be re-contacted to be told about further studies that they may be eligible for.
- Survey respondents felt that volunteers for the 100,000 Genomes Project should be offered support to make an informed decision about whether to take part or not.

### 4. Findings

#### 4.1 Who responded to the survey?

The 100,000 Genomes Project will sequence whole genomes from patients with confirmed or suspected rare genetic diseases, and where appropriate, the parents and other blood relatives of those patients will also be invited to take part. Therefore, it was important to capture the views of a range of potential participants – not just patients. A total of 231 individuals responded to the online survey including patients (68.9%), parents (36%) and blood relatives (10.7%) of patients.

The majority of survey respondents had a diagnosis for their/their relative's condition. In total, over 60 different conditions were reported. The most frequently reported conditions were: Prader Willi Syndrome, Fragile X Syndrome, Vasculitis, Dilated Cardiomyopathy, Charcot Marie Tooth disease, Behçet's Syndrome and Hypertrophic Cardiomyopathy. 32 respondents reported having (or having a child with) a suspected genetic condition which had not yet been confirmed or given a name.

Almost 80% of survey respondents were female, but they ranged in age<sup>1</sup>. Over 95% of survey respondents described their ethnic group or background as white. Respondents were from across the UK, although the majority (86%) were from England.

60.2% of survey respondents (133) had heard of whole genome sequencing. Those that had heard of whole genome sequencing were asked to indicate their level of understanding on a scale from 1 to 5. As shown in the chart below, the majority felt that they had a moderate level of understanding of whole genome sequencing. Only ten respondents reported to know 'a lot' about whole genome sequencing.

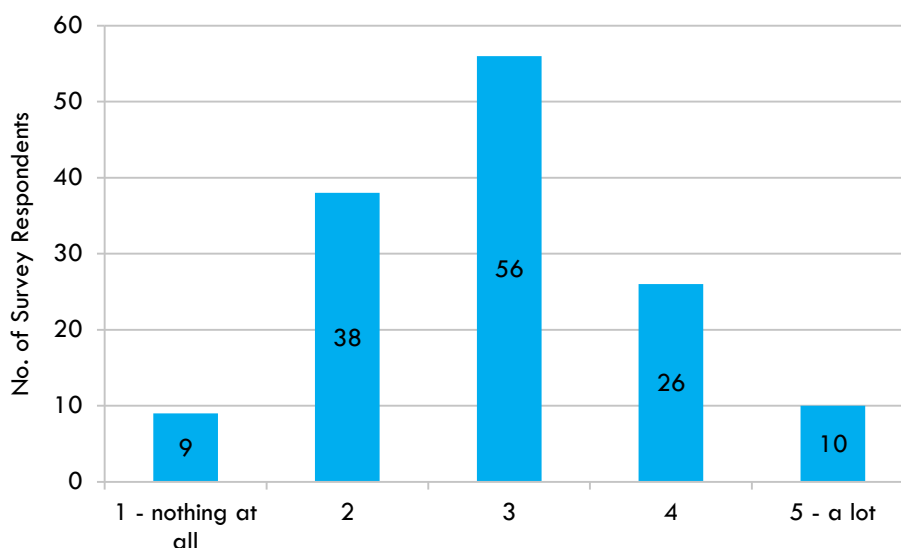


Figure 1 - How much do you feel you know or understand about whole genome sequencing?

## 4.2 What findings should be fed back to participants of the 100,000 Genomes Project?

Whole genome sequencing might discover information about the participant's suspected or confirmed rare genetic condition (for example, a diagnosis, or carrier status). These are called primary or pertinent findings. However, it also has the potential to discover things about health other than the rare condition participants are aware of. These are called secondary or additional findings. In rare cases, this information might be a definite diagnosis of something serious. However, in many cases of additional findings, it will be unclear if the information is important to health at all. One aim of the survey was to explore what types of information participants would want fed back to them if they had their whole genome sequenced, and what types of feedback might motivate them to take part in the first place.

**Finding: Patients and families hope that the 100,000 Genomes Project will offer participants greater certainty in relation to their diagnosis, information about their carrier status, and improvements in the way their condition is managed or treated.**

Survey respondents were asked to imagine they were eligible and chose to take part in the 100,000 Genomes Project. They were asked to describe the type of information they would hope to get about their health or the health of their family. Many participants stated that they would want a greater understanding of the cause of the condition including a diagnosis or greater certainty of a diagnosis.

<sup>1</sup> The research carried out by Genetic Alliance UK did not include the views of individuals under the age of 16.

Others hoped that the project would offer them an opportunity to get more information about the potential to pass on the condition to future children and grandchildren. Participants also hoped that the information generated by whole genome sequencing might lead to improvements in the way their conditions were treated and managed.

“Whether I might pass my condition on to any children I have. The likely pattern and future development of my condition and how severe it might be. Whether anyone else in my family might have genes for the condition.” [Survey Response]

Although many survey respondents reported having a diagnosed condition (confirmed either through clinical tests or genetic tests), some individuals were undiagnosed. Follow-up interviews explored the importance of a diagnosis for parents and families with children who have an undiagnosed rare genetic condition:

“Having a special needs child is quite frightening. Having a child with special needs when no one can give you any answers is much more frightening... the more understanding, the more reassured you are and the more in control you feel. I think whole genome sequencing offers people a better understanding of why their children are the way they are and what they can do to support, if they are going to grow up to be fine, if they aren't going to grow up to be fine, then at least knowing about provision that needs to be in place for them.” [Interview Participant]

Finding: Many patients and families would prefer to receive both pertinent *and* additional findings if they had their whole genome sequenced, even if it was unclear whether the findings were important to their health or their child's health.

Survey respondents were asked specifically about the types of findings (pertinent and additional) they would want fed back to them about their own health. Parents were also asked the same question but in relation to findings about their child's health. Responses from all survey respondents (patients, parents and blood relatives) were collated and are reported below. What is evident from the survey data is that patients, parents and blood relatives would prefer to receive both pertinent *and* additional findings if they had their whole genome sequenced. A very small proportion of survey respondents would *only* want pertinent findings. Over half of respondents would want to know additional findings, even if it was unclear if they were important to their/their child's health.

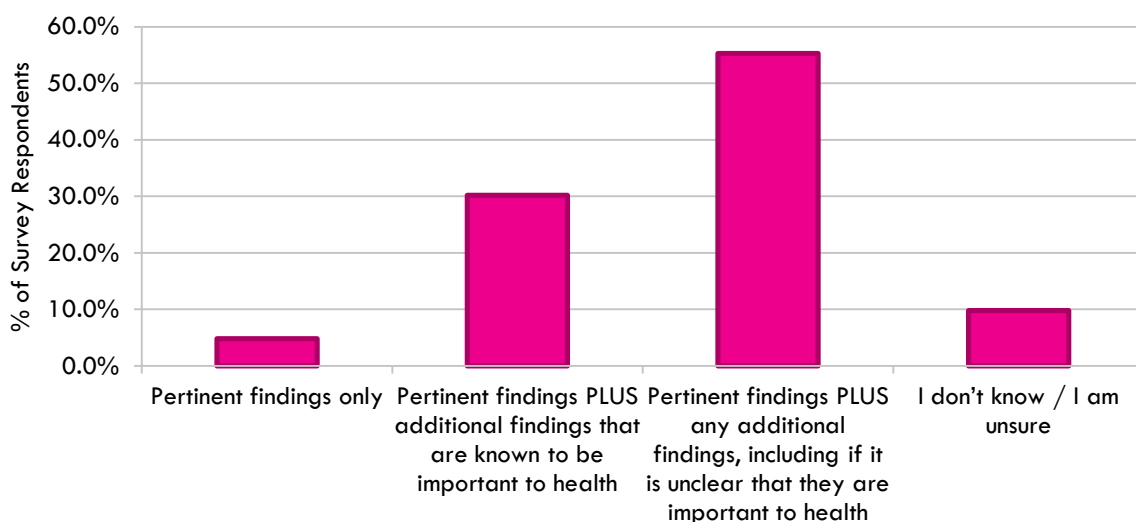


Figure 2 - What feedback would you prefer to receive if you took part in the 100,000 Genomes Project?

Finding: Over half of patients and families stated that they would still take part in a study that didn't given them a choice about the type of information that was given back to them.

Despite respondents' preferences in relation to the feedback they would receive (shown in the chart above), over half stated that they would still take part in a study that didn't given them the choice about the type of information that was given back to them (see chart below).

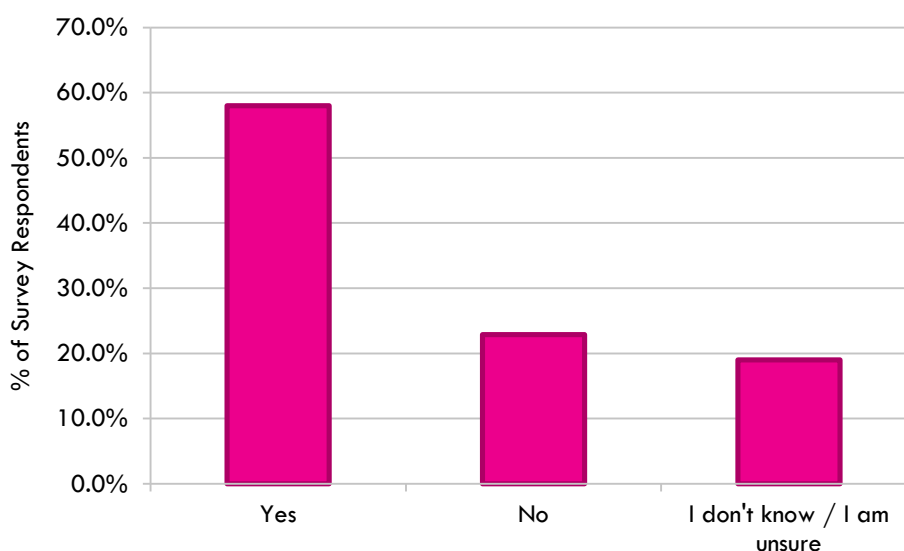


Figure 3 - Would you agree to take part in any research study if you did not have any choice about the type of information that was given back to you?

As stated above, survey respondents expressed their interest in receiving additional findings from whole genome sequencing. This issue was explored during interviews, where interviewees were asked to explain why they would want this type of information fed back to them. Some responses are shown below:

“Me and my wife have talked about this – and we have said we would certainly be very keen that if we had the potential to develop something and you could affect that outcome by lifestyle changes, which we are all trying to do, then we would want to know about it... If the mapping process threw up information about a particular condition, especially if you can do something about it, then that is very valuable... I personally would want the bigger picture.” [Interview Participant]

“Knowledge is power, so I would say it was a good thing. I can only guess it would be a good thing if you know you were at risk of X and you could plan accordingly. I would want to know. This would be an added benefit but wouldn't stop me taking part if I couldn't get this information.” [Interview Participant]

“You might not be able to do anything about it with your health but you can certainly do something about it with your life, like making a will and sorting your house out, and helping your family come to terms with it when it happens. If you are forewarned it is not so much of a shock... I am not one for putting my head in the sand. I would want to know because I think you can come to terms with what you know.” [Interview Participant]

As described, the 100,000 Genomes Project may sequence and retain information from the blood relatives of patients. Their sample would be given for the health benefit of their affected child or relative (e.g. to help seek a diagnosis). All survey respondents were asked whether additional findings discovered in the relative's genetic results (that are known to be important to the health of the

relative) should be fed back to the relative. The majority of survey respondents (80.3%) answered 'yes'.

Finding: Patients and families reported concerns about the feedback of findings including participants' access to emotional and medical support, the implications for insurance, and the impact of findings on other family members.

Survey respondents and interviewees were invited to state any concerns they had about the findings they might receive as part of the study, both pertinent and additional findings. Although many had no concerns about the feedback of findings, of those that did, the following were the most commonly reported:

- Access to future support (emotional and medical)
- Insurance implications
- Impact of information on family members
- Finding out about a fatal condition (*in relation to additional findings*)

The quotes below (taken from survey responses and interviews) further illustrate the views of participants in relation to the feedback of findings:

"I don't have any concerns if the research is for the benefit of others." [Survey Response]

"[My concern is] that there is provision of this information without any back-up/support/advice regarding practical steps to be taken to mitigate or manage actual or potential implications for future health and well-being." [Survey Response]

"It is my condition, my right....I would want to know everything but would be worried if other family members were diagnosed as a result....If they were to get diagnosed or a different condition was found I don't know how I would react. I care more for everyone around me." [Interview Participant]

"Part of me would want to know everything. But after a certain point you have to accept that some people do know better than you do. And, maybe you are better off not knowing some things. I could understand if some of the data had to be held back." [Interview Participant]

"[My concern is] being diagnosed with something worse than I have that will shorten my life span considerably or that can affect my children's lives considerably." [Survey Response]

"Once the genie is out of the bottle it's completely impossible to put it back in – so there is a high degree of gambling in deciding whether or not to have sight of such information and there is NO going back once you've seen it.... It's quite a minefield and every individual is so unique in their approach." [Survey Response]

### 4.3 How should personal information about participants of the 100,000 Genomes Project be shared with others?

The survey went on to explore respondents' views in relation to the sharing of personal information. It was explained that people who take part in the 100,000 Genomes Project would be asked to give a DNA sample for sequencing and access to their medical records for their whole lifetime (and possibly after their death). Such information might be shared with other organisations for research purposes. For example, with academic researchers, medical research charities and with commercial ('profit-making') companies. Access would be under strict controls; with only approved medical researchers with a valid research reason allowed access. Researchers will have to apply for access, in line with



NHS Research Ethics Committee processes. Applications for access will be considered using carefully developed guidelines (the 'Data Access Protocol', which has been approved by an NHS Research Ethics Committee).

Finding: In the main, patients and families stated that they would be happy to share their personal information with other organisations for research purposes, including general medical research, throughout their lifetime and after their death.

Survey respondents were asked if they would be put off taking part in the 100,000 Genomes Project, knowing how their personal information would be shared. 74.6% of respondents would not be put off and only 11% would. Participants gave reasons for their answers. Many felt that they would want to help others and they recognised that sharing information is essential to do this:

"The only way we are going to cure/prevent some condition is by taking bold steps in to the unknown." [Survey Response].

"I support the principle of open sharing of information for scientific purposes, to increase knowledge and work towards developing treatments. This is more important to me than any concerns about privacy." [Survey Response]

Almost 90% of survey respondents stated that they would be happy for their information to be used for medical research on conditions beyond those that are relevant to them or their family members. Similarly, 82.8% of survey respondents were happy to share their information for the whole of their lifetime and after their death.

Finding: Some patients and family members had reservations about how anonymous their information would be and how the information would be shared with profit making companies.

Those with reservations about how the information would be shared were unsure about how anonymous their information would be and had concerns about how the information would be shared with profit making companies.

"It's fine when you are looking at large population, but the smaller and more specific the population is there are issues.... Yes, you have to be careful." [Interview Participant]

"If you are going to do this kind of study you need to handle the anonymisation very carefully...The process needs to be very rigorous. And there could well be clues in the medical records. If it included the name of the hospital, then you could probably narrow it down very rapidly." [Interview Participant]

"Especially with rare diseases, it is inevitable that the data can be traced back to individuals if those with access try hard enough." [Survey Response]

There was also some concern about the long term security of the data: "I think the huge issue here is that once information is shared widely it becomes public property and so those initially involved with safe-guarding the information would have little or no control over it." [Survey Response]

Similarly, parents completing the survey were then asked to consider the question in relation to their child's information. Almost 70% would not be put off taking part knowing how their child's information might be shared: "There are far too many children undiagnosed, if being part of this study and sharing information would benefit other children I would see this as a positive." [Survey Response]. However, as demonstrated above, there were concerns for the protection of personal data: "I would be nervous that any failure to protect their personal data would adversely affect their future security, well-being, and equality of opportunity (e.g. medical, financial)" [Survey Response].

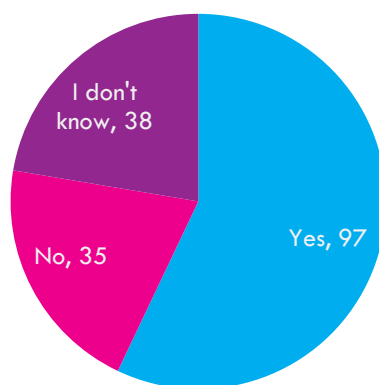


Figure 4 - Would you be happy that the 100,000 Genomes Project will share your information with commercial companies?

Survey respondents were asked about their willingness to share information with commercial companies. This question led to more 'no' and 'I don't know' answers than the previous questions on sharing of personal information. The results are outlined above in figure 4.

"Would need a lot of convincing that there is any long term value in sharing with private companies. Would they share the results openly with others? Would they share the financial gain with others?" [Survey Response]

#### 4.4 How should participants of the 100,000 Genomes Project be contacted about their involvement in future research studies?

The final section of the survey addressed the issue of re-contacting people who take part in the 100,000 Genomes Project. Volunteers joining the 100,000 Genomes Project would need to agree to be told about further studies that they are eligible for. These studies could, for example, be drug trials that require genomic information, or surveys of patient views about how the NHS will use genomic information. Volunteers would be contacted about further studies by their clinical team. There is no obligation for volunteers to take part in these studies.

**Finding: Patients and families were happy that volunteers of the 100,000 Genomes Project must agree to be re-contacted to be told about further studies that they are eligible for.**

Almost 80% of survey respondents were happy that volunteers must agree to be re-contacted. However, some participants felt that it should be an option *not* to be re-contacted in this way and others highlighted the importance of being able to change their mind in the future: "I think it should be an option to NOT be re-contacted...I think if I did not want to be hassled by lots of emails or simply was not interested in more studies then I could opt out of being re-contacted." [Survey Response]

The issue of re-contacting was explored further during interviews: “It depends what is happening in your life. It changes. You might get a sick partner and you can’t cope with being involved in anything else. You have got to look at these types of things. Life doesn’t just go along on one level. I think, for me, you can contact me as much as I like. But what I am saying is as people get older and their lifestyles change they might not be willing. I don’t know really. Maybe there should be a review each year asking you if you are still willing to be re-contacted.” [Interview Participant]

## 4.5 Final comments

Finally, the survey asked if people wanted to say anything more about their views, hopes or concerns in relation to taking part in research around whole genome sequencing. The main concerns and issues reported were as follows:

- Whole genome sequencing should be available in the devolved nations of the UK and other countries
- Ethics and issues of confidentiality should be carefully considered, especially with research conducted on this scale
- Training and education is required across NHS specialities
- Effort is required to gather public support for the 100,000 Genomes Project and whole genome sequencing in the NHS

**Finding:** Survey respondents felt that volunteers for the 100,000 Genomes Project should be offered support to make an informed decision about whether to take part or not.

The issue of support and further information for potential volunteers emerged during the interviews:

“I would need to read a lot more about it. But, in principle I am all for it.” [Interview Participant]

“I am thinking if you have questions, worries, there ought to be someone on hand you could contact. Someone you can relate to. A key person.” [Interview Participant]

“As long as these things are properly controlled and people are given the opportunity to ask questions, then it all seems reasonable. It would be wise in some way to make sure that people fully understand before they embark upon it then you don’t have half used information that is more trouble than it is worth. If people are encouraged to think it through before they embark on it – then bring it on!” [Interview Participant]

However, generally, survey respondents were very positive about the potential of the 100,000 Genomes Project and whole genome sequencing for individuals and for the field of genomics (as demonstrated in the quotes below):

“I believe it is for the greater good, knowledge is power. There will be no cure for my daughter but I live in hope of drugs to control it, I cannot live without hope. This research is vital for so many families.” [Survey Response]

“I am delighted that the government and NHS is taking a global lead in this sector.” [Survey Response]

“I think the...project is amazing. Hopefully it will identify treatments/medicines that will enable people with rare genetic conditions to lead better lives and for medical professionals to be able to better understand and be able to treat these conditions.” [Survey Response]



# Genetic Alliance UK

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