RESEARCH ARTICLE

Preferences and expectations of feedback of individual genetic research results in African genomics: Views of South African parents of children with neurodevelopmental disorders [version 1; peer review: awaiting peer review]

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Abstract

Background: Genomic research is expanding at an exponential pace across the globe and increased access to genome analysis has led to greater generations of genetic results with specific relevance to individuals. This study aims to explore preferences and expectations of feedback of individually relevant genetic research results among parents of children with neurodevelopmental conditions.

Methods: Following a qualitative approach, we conducted four deliberative focus group discussions with (n=27) South African parents of children involved in genomics research on neurodevelopmental disorders.

Results: Most participants expressed a strong interest in receiving genetic results regardless of severity, actionability and preventability. These results were viewed as valuable because they could empower or emancipate individuals, families, and communities. Receiving risk information was also believed to motivate healthier lifestyle choices. However, some participants were uncertain or articulated a desire not to receive results due to fears of anxiety or psychological distress. In addition, participants expected to receive results as a demonstration of respect from researchers and articulated it as an act to build trust between researchers and participants.

Conclusions: Internationally, a debate continues around whether

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individually relevant genetic results should or should not be fed back to participants of genomic research studies. In Africa, there is scant literature which has investigated this question and no policies to guide researchers. This study provides a basis of empirical data on perspectives of African participants which could inform work on the development of a consolidated approach to the feedback of genetic research results in the continent.

**Keywords**
- African Genomics
- Individual Genetic Research Results
- Feedback of Findings
- Neurodevelopmental Disorders
- Neurogenetics Research
- South Africa

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NeuroDev: Phenotypic and genetic characterization of neurodevelopmental disorders in Kenya and South Africa

Abbreviations
ACMG: American College of Medical Genetics and Genomics
ADHD: Attention deficit/hyperactivity disorder
ASD: Autism spectrum disorder
DFGD: Deliberative focus group discussion
H3Africa: Human Heredity and Health in Africa
IF: Incidental findings
IGR: Individual genetic research results
NeuroDev: Phenotypic and genetic characterization of neurodevelopmental disorders in Kenya and South Africa
NDD: Neurodevelopmental disorder

Background
Genomic research is expanding at a rapid pace across the globe. The aim of genomic research is to significantly improve therapeutic approaches and interventions in order to efficiently understand disease mechanisms and to develop more effective disease treatments. Genomic studies have the potential to identify genomic research results that are relevant to individuals – including both individual genetic results (IGR) and incidental findings (IF). IGR are genetic findings relevant to the primary research study and are linked to the health and reproductive status of individual participants; Incidental findings (IF) are unforeseen genetic results related to disease-causing mutations for diseases other than the condition studied in the primary investigation (Klitzman et al., 2013). With the increasing use of whole-genome sequencing methods, projects are more likely to discover participants’ IGR and IF, which calls for researchers to carefully consider the ethical obligations regarding the feedback of genetic findings in the context of genomics research. More so, with the rise of genomic research on the African continent, important discussions are ongoing about what genomics researchers ought to think about when contending with the return of individually relevant genetic research results to study participants (Wonkam & de Vries, 2020). Given that the main purpose of genomics research is to usually obtain generalisable information, which is relevant to populations and not individuals, returning such results can be perceived as going beyond that mandate. Despite such concerns, scholars from high income countries have agreed on specific results which must, should, may or must not be fed back for adults in precision medicine research varied significantly (Thorogood et al., 2019). In the context of clinical care, results that ought to be fed back are listed in the American College of Medical Genetics and Genomics (ACMG) reported list which currently contains mutations in 73 actionable genes that are associated with diseases, for which preventative or curative measures may be possible (Miller et al., 2021). These variants are known to be clinically actionable. Actionability refers to the extent to which a genetic result can be used to guide clinical decision-making on a possible intervention (Thorogood et al., 2019). In contexts with limited resources, it is often debated whether these variants are truly actionable, given that individuals may not have access to the relevant therapies.

Considering the strong bias in the racial and the geographical locations of genomic data which recommendations such as those of the ACMG are based on (i.e. European populations from North America and Europe) (Miller et al., 2021; Popejoy & Fullerton, 2016), African scholars have suggested that there would likely need to be additional variants included in an Africa-specific list (Wonkam & de Vries, 2020). Other scholars have suggested that despite this list not yet existing, it is important for African researchers to address the question of feeding back genomic results which are currently being uncovered and developing consensus guidelines to advise the process of return of genomic results in Africa (Rutakumwa et al., 2019). As such, on the basis of collaborative efforts, the Human Heredity and Health in Africa (H3Africa) Consortium has developed an evolving document on recommendations for the feedback of individual genetic research results (H3Africa, 2018). Currently, the document emphasises the return of pertinent findings – which includes results relevant to the disease or condition being investigated in the primary research project (H3Africa, 2018).

Globally, the dominant view is for the return of medically actionable genetic results (Klitzman et al., 2013; Middleton et al., 2016; O’Daniel & Haga, 2011) . For example, a study led by scholars in the UK which investigated the attitudes of nearly 7000 health professionals, genomics researchers and members of the public from 75 different countries on the return of IFs, found that a great majority of stakeholders felt that genomic research participants should receive their individual results. More specifically, 98% of their participants were personally interested in receiving results for conditions that may be preventable and/or life-threatening (Middleton et al., 2016). This finding coincides with genomics research participants who have voiced an interest in being informed about their individual genetic risk (Sanderson et al., 2016; Shalowitz & Miller, 2008), especially results that reveal an increased risk of preventable or treatable diseases, adverse medication reactions and carrier status for conditions with reproductive implications. In research conducted in Europe, 95% of genomics research participants indicated a strong preference to learning all their individual genetic risk results, particularly results which are medically actionable or which signal carrier status (Facio et al., 2013). In Canada, Fernandez et al. (2014) found that 86% of parents of children enrolled in cancer genomics research emphasised a right to receiving IFs (Fernandez et al., 2014). A majority of parents in their study also wanted results predicting an increased risk of untreatable fatal conditions (83%), multiple conditions (87%) and conditions with uncertain impact (70%) (Fernandez et al., 2014).

Limited literature documents the views of marginalised groups in research, however there is some evidence suggesting that marginalised groups from the global north have differing views. For instance, in the US, Sabatello, Zhang, Chen and Appelbaum (2020) found that interest in receiving biological and health-related IGR from precision medicine research varied significantly...
across gender and race/ethnicity (Sabatello et al., 2020). In relation to genetic results, participants identifying as Hispanic, Black/ African American, other racial minorities or people who identify with non-binary sex, were less interested in receiving genetic results in comparison to non-Hispanic, White and binary sex participants (Sabatello et al., 2020). Lower interest in minority groups in the US may be related to the realities of poor access to healthcare, which may be a barrier for following-up on actionable results (Yu et al., 2013), and/or to distrust in scientific research (Allen et al., 2014). Overall, in Sabatello et al.’s study, most participants reported an interest in receiving genetic risk results about ‘a treatable disease’, like asthma (68%) and ‘an untreatable disease’ like Alzheimer’s (61%) (Sabatello et al., 2020). Also in the US, Lakes and colleagues emphasised that context, cultural background, timing and differing vulnerabilities are important to consider when addressing the issue of feedback of genetic results (Lakes et al., 2013).

For instance, people who are predisposed to anxiety or those who lack adequate resources (including financial, emotional, educational, and healthcare) may be at risk for greater psychosocial harms due to receiving a genetic result, therefore special precautions may need to be considered in those cases. In their focus group with people of Latina ancestry, women were viewed as more vulnerable to negative emotional outcomes from receiving IF about their baby during pregnancy, particularly if they are members of a cultural group which does not accept termination of a pregnancy as an option. Overall, they emphasise that different individuals view return of results as a complex issue which is compounded by individual and cultural differences. To accommodate this complexity, they recommend that researchers should consider a dynamic, flexible process that accommodates individual and contextual factors in relation to returning of genetic results (Lakes et al., 2013).

Currently, there is sparse empirical evidence from the African continent investigating the views of genomic research participants and scientists on the return of IGR and IFs (Marsh et al., 2013; Mwaka et al., 2021; Wonkam & de Vries, 2020), whilst there is arguably a strong imperative to return such results (Ewuoso, 2020; Ewuoso et al., 2022). For instance, some have argued that the African ethical system of Ubuntu – which is a communal way of being – translates into at least a partial obligation to return individually relevant results (Ewuoso, 2020; Ewuoso et al., 2022). Researchers, ethics committee members and policy makers in Botswana have also found the principal of autonomy is one reason why researchers ought to have a partial obligation to returning IGR (Kasule et al., 2022). Furthermore, Ralelfa et al. found that Setswana research participants in a Botswana genomics research project expected some feedback on genetic results because of expectations of reciprocity (Ralelfa et al., 2020). Notwithstanding Ralelfa et al.’s research on adolescents with HIV and their parents/caregivers (Ralelfa et al., 2021), no studies have investigated this question in the South African context, and none focussed on neurogenetics. In this study, we set out to explore the preferences and expectations regarding the feedback of individually relevant genetic results among South African parents of children with neurodevelopmental disorders involved in genomics research.

Methods
Study setting and population
We conducted our research in the context of a genomics study called NeuroDev (De Menil et al., 2019), which focuses on the genetic basis of neurodevelopmental disorders (NDDs).

The NeuroDev study enrolled children – and sometimes their parents – with NDDs. NDDs are an etiologically heterogeneous group of childhood-onset disorders which are characterised by significant impairment in cognition, communication, behaviour, and motor functioning resulting from atypical brain development (Moreno-De-Luca et al., 2013). The NeuroDev study recruited children aged 2–17 years, controls, and biological parents – with a target of 3000 participants in South Africa. Children enrolled in that study meet one of the following clinical diagnosis: 1) global developmental delay, 2) Intellectual Disability (ID), 3) autism spectrum disorder (ASD), 4) attention deficit/hyperactivity disorder (ADHD), 5) communication disorders, and 6) specific learning disorders (De Menil et al., 2019). In this study we included parents of children with any of these conditions and we did not consider the severity of the child’s condition as a criterion for inclusion.

During enrolment, parents in the NeuroDev study were informed that the genomics study may identify IGRs relating to their child’s condition. They were asked whether, should such findings be identified, would they like to receive them. Most parents consented to receiving pertinent IGRs. For parents who consented, and in cases where mutations were identified in the research study that could have caused the child’s condition, then parents were re-consented and a second sample obtained for confirmatory clinical diagnostic testing (De Menil et al., 2019). IFs were not returned in the NeuroDev study. We considered the NeuroDev cohort to be an appropriate cohort for our research because these parents had already been informed of the possibility that genomics research could lead to the identification of genetic results relevant to the health of their children.

In South Africa, the NeuroDev study is conducted at a public children’s hospital in the Western Cape Province. This children’s hospital mostly serves people from the Xhosa and mixed-ancestry populations. In South Africa, Xhosa people constitute the second largest population group (14%) and people of mixed-ancestry constitute 8.8% of the country’s population (The World Factbook, 2021). Xhosa people are Bantu-speakers and isiXhosa is a Nguni language. The Mixed-ancestry population consists of individuals of ‘mixed race’, stemming from an admixture of European ancestors, slaves and immigrants from South-East Asia, Bantu-speakers, the Khoikhoi, and the San people. Most people in this group are bilingual English and Afrikaans speakers, although their first language tends to be Afrikaans (Erasmus et al., 1999).

Study sample
Using convenience sampling, we enrolled n=27 parents (cases) from the Xhosa and Mixed-ancestry population groups in four deliberative focus group discussions (dFGDs) held between July and October 2019 at a public children’s hospital in
South Africa. We did not split the sample by gender because we were interested in obtaining views from both men and women (i.e., parents) simultaneously within this study. Two dFGDs involved only Xhosa parents and were facilitated in isiXhosa by the lead author (OPM) with support from MCF. She is a first-language isiXhosa-speaker. Two dFGDs were facilitated in English by OPM and co-facilitated by the third author (MCF). He is from the Mixed-ancestry population. During the aforementioned dFGDs, participants had an opportunity to express themselves in Afrikaans – which is the first language of MCF – if they wished to do so, however most were comfortable speaking in English. Each dFGD group consisted of 4 - 8 participants varying in age, gender, level of education and experience of engaging with genetic research.

Fourteen participants were from the Xhosa population and thirteen from the Mixed-ancestry population. Among the Xhosa parents, we enrolled 12 (82%) mothers and 2 (18%) fathers, 7 (50%) of them married and with a mean age of 39 years. Eleven (79%) had secondary schooling and 12 (86%) were unemployed or employed in low-paid jobs. Among the Mixed-ancestry parents, we enrolled 7 (54%) (fathers) and 6 (46%) mothers, 11 (85%) were married and they had a mean age of 38 years. Nine (69%) had secondary schooling and 9 (69%) were unemployed or employed in low-paid jobs. Overall, we had an 89% return rate for the second dFGDs. Reasons provided for not returning for the second dFGD included: participants had appointments, emergency situations with their children or difficulty getting transport to the public hospital on the day of the session. In this study participants received a reimbursement for transport of roughly $17 following each individual dFGD session (roughly $34 for two sessions). Participants were drawn from databases of the NeuroDev study, and we specifically recruited participants who agreed to be re-contacted for future research to invite them to participate in our dFGDs. Demographics of participants in each dFGD are depicted in Table 1, below.

**Data collection**

The data collection procedure included two stages and was guided by a manual developed for this study. The first stage involved a consent and information session (which took roughly 1 hour 45 minutes) to: 1.) provide an introduction and rationale for why the research study is being undertaken followed by a consenting process, and 2.) using a brochure and an animated video we presented participants with some basic information about genetics and genomics research and the link between genetics and health. Following a short break, a second session (which lasted about 1 hour) was held with each group to: 3.) present a case study scenario and embedded questions prompting participants to deliberate on when and how genetic results should be feedback and 4.) provide a debrief and closing. During the data collection events, we spent considerable time emphasising the difference between IGRs, which would be fed back in the NeuroDev study if found, and IFs which would not. We discussed both IGR and IF in this study. Following discussions and upon reminders by the facilitators, it seemed participants did have an appreciation of the

<table>
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difference between the two. The case study scenario used to facilitate discussion in this research is based on a mother who participates in study that is looking at psychiatric problems when it is discovered that she has a mutation in the BRCA1 gene which increases her risk of getting breast cancer. The themes probed in the discussions included ethical issues such as: research vs diagnostic results, clinical actionability, feedback of findings, solidarity, findings unrelated to what is being studied, concerns about privacy and practicalities of returning results. In this paper we only present data related to this scenario from our manual.

The following week participants returned for stage 2 which involved another 1-hour session where we began by recalling and further discussing some of the responses and questions provided by participants during the stage 1.

Following this, we delved deeper into different types or categories of conditions for which the participants would like to receive results in general. The types of conditions discussed considered severity and preventability in accordance with a table developed by Holm and colleagues (Holm et al., 2015). The table includes examples of conditions that are not severe and preventable like an iron deficiency, severe and preventable like asthma, not severe and non-preventable like poor vision and severe and non-preventable like Alzheimer's disease. During this stage 2 session the facilitator and co-facilitator continued to engage participants in a deliberation of which categories of results they would like to receive for themselves from research as well as why they would like those results. Overall, each dFGD process was approximately 4-hours over the duration of two events, see Figure 1 for a schematic depiction of the process. Some parents attended sessions with their neurodiverse children and due to support from a hospital NGO, when parents were busy within the study, children played with and were stimulated by supervised special needs trainees volunteering through the NGO during the sessions.

In this paper we focus on data related to participants views on feedback of IGR and IF for adults, including their preferences and expectations as well as their reasons for those views. See, Figure 1: Deliberative Focus Group Discussion Process.

Data management and analysis
DFGDs were recorded and the audiotapes were transcribed with the texts stored in a password protected computer. The participants’ names were not used, instead they were given numbers to identify themselves. Recordings of dFGDs conducted in isiXhosa were transcribed and translated into English by a professional transcriber and translator. DFGD data were analysed using a Framework Approach to data analysis, which uses matrices to organise data, and which allows for the concurrent analysis of themes in the data (Gale et al., 2013). The framework analysis approach combines conventional inductive thematic analysis of qualitative data with a systematic approach to visualising and analysing the data (Braun & Clarke, 2012; Gale et al., 2013). Inductive thematic analysis was conducted by OPM and CAA (each coding transcripts for 2 dFGDs). The initial codes were discussed between the two of them and the senior author, JDV. An analytical framework was then developed by OPM, CAA and JDV. Throughout data analysis, emerging insights were discussed primarily between OPM, CAA, MCF and JDV. We used the NVivo12 software package which fully supports the framework analysis (Siccama & Penna, 2008). The entire analytical process involved transcription, data familiarisation, so-called ‘open coding’ followed by more hierarchical or thematic codes, developing a working analytical framework, applying the analytical framework, charting data into framework matrix and interpreting the data (Gale et al., 2013).

Ethics review
Ethics approval was obtained from UCT’s Faculty of Health Sciences Human Research Ethics Committee prior to commencement of the study (FHS: 782/2018). Research took place...
in accordance with UCT’s Research Ethics Policies, the Declaration of Helsinki (Version 2013) and Good Clinical Practice guidelines. All participants in this study provided written informed consent.

Results
Preferences for feedback of findings
In this study we found that most participants wanted to receive individual and incidental genetic results in relation to adults across all four of Holms et al.’s categories, regardless of severity, actionability and preventability. Only a few participants expressed uncertainty or a desire not to receive results and indicated their concern that receiving results may cause anxiety, particularly if the results were not medically actionable. There were no differences noted in perspectives based on participants’ gender. Reasons for participants preferences are presented below. Notably, in their responses, participants reflect on receiving both IGR and IF:

Reasons for wanting feedback
Empowerment and emancipation. Most participants in this study expressed that they would like to receive genetic risk results because it would empower them with information and emancipate them. In general, participants wanted to receive these results for a range of reasons, including for: “peace of mind”, because receiving results would allow for an “ability to share findings with family and close people”, to “reduce self-blame”, to “prepare oneself financially and emotionally” and to “resolve uncertainty”. All participants spoke about the value of receiving health information from genomics research. For example, in response to the question “In the broad categories we looked at… do you think that they should tell you the genetic result?”, one participant said:

“I would also want to know because sometimes you deal with this mental health and learning disabilities… they [person with mental illness or learning disability] can get so frustrated and they can become violent you know… and even if it’s not severe or non-preventable, just so you can have that peace of mind that you know what’s …happening to that person” (P.3. DFGD 1: Mixed-ancestry parent)

Genetic risk information was generally seen as valuable for the parents themselves, their current children, potential future children, and future generations. There was great value placed on sharing genetic risk information with family members in order for them to ‘be alert’ of any symptoms that may arise which are related to the condition they may be at increased risk of developing. See for instance,

“…those results are very important. If there is a gene that they picked up, maybe in me … which means that someone in the family can have that autism. Or if it could skip a generation, just keep the family alert, something like this could happen again. So, that is important.” (P.1 DFGD 3: Xhosa parent)

In addition to the family being aware of the possibility for disease onset, some Xhosa participants expressed that knowing that result would also alleviate any misconceptions of the person being accused in their community of practicing witchcraft due to behaviours resulting from possible late-onset symptoms of a neurodegenerative condition such as Alzheimer’s. More specifically, having that information and sharing it with their family members ahead of time would allow their family to be well positioned to defend them or enlighten those who may be misinformed about the condition. For example,

Interviewer: “What if it is something serious like Alzheimer’s, a condition that you will have in your late years. Now you are going to live all your life anticipating this potential disease…”

Participant 2: “I still would like to know so that people may know that there is a chance of me going crazy at age 60. Considering our culture and superstitions as Africans, people might say that I am a witch. So, it’s better to be open about this. People are ignorant, they will say that I practice witchcraft. In a case where one is transparent, at least your family will know your condition.” (P.2 DFGD 4: Xhosa parent)

In some African cultures, some people accuse older women above the age of 50 who engage in unusual unexplainable behaviours of practicing witchcraft. These accusations can have a range of negative consequences for the victim and her family, inducing for instance social isolation, being ostracized or having their houses burnt down by community members (Meel, 2009). It is these anticipated negative experiences which prompted some participants to want their results for an increased risk of a neurodegenerative condition to be known by those around them. Similar sentiments were echoed by participants in a genomics project in Botswana (Ralefala et al., 2021).

Furthermore, some participants shared that the information may reduce their self-blame for the onset of the condition. Some highlighted that receiving that information may help them to prepare emotionally and instrumentally by prompting them to invest in insurance policies and savings which could help them financially if/when the disease manifests.

Motivation for healthy lifestyle. Lifestyle choices, regular screening and alternative preventative therapies were the sub-themes which emerged under the overarching theme of motivation for a healthy lifestyle. Many participants framed their reason for wanting their genetic results returned to be because the results may encourage them to make healthier “lifestyle choices”, go for “regular screening”, go for “counselling” and seek “alternative preventative therapies” such as herbal medicine. For instance, one participant described how one could lead a healthier lifestyle after receiving genetic risk information. She said,

“Like if you know that in your family, there’s cancer. So, eat differently. There are a lot of foods that causes cancer. Stop eating this food. You can always prevent it, so, ja. Definitely would want to know.” (P.7 DFGD 2: Mixed-ancestry parent)

Another participant supported that view and alluded that having their genetic risk information may put them in a position where they can prevent the disease from manifesting or at
least prepare themselves emotionally to cope with the disease should it manifest. She said,

“Perhaps she will go to counselling and do her own study on the matter. They must be told what it is that they have. Knowing early allows for preventative measures to be adopted.” (P.4 DFDG 4: Xhosa)

A few participants suggested that early knowledge of genetic risk information on conditions that may be considered untreatable through Western medicine may allow them to seek alternative healing or medicines which may help prevent or reduce the symptoms of the disease.

“The same with me. I would rather want to know, then maybe I can try and find alternative healing, or alternative way of medicine.” (P.3 DFDG 2: Mixed-ancestry parent)

In addition, some participants also expressed the view that receiving genetic risk information may allow for early Western medicine intervention, such as having a prophylactic mastectomy in the case of an increased risk of developing breast cancer. Overall, most participants talked about wanting to receive their genetic results in order to encourage and promote a healthier lifestyle which could be preventative or lead to a delayed or less severe disease onset.

Reasons for not wanting feedback

Whilst most participants indicated a strong preference for receiving individually relevant genetic research results, a small number of participants were uncertain or expressed a desire not to know their results. Three participants indicated concerns and anxieties about the return of results. These participants expressed worry that receiving genetic results may cause psychological distress for the individual and possibly their family. For example, one participant said,

“No knowing what to do to remedy the situation, a person could go on stressing unnecessarily.”

(P.2 DFDG 4: Xhosa parent)

Another participant recalled how receiving a label of depression from her mental health practitioner increased her anxiety. Reflecting on that experience, this participant highlighted that for her, getting the name of a condition, even if it is just an increased risk of getting it and not a diagnosis, would similarly cause overthinking and increase her anxiety which is what prompted her to later decide that she does not want to know anymore. See,

“I will find out eventually, when I get there. For now, I just want to live my life. Like, if he didn’t give the label, I would have still carried on like I did, before I knew… So, my mind works like that. It will just play too much on my mind... Just live. I think now I don’t want to know any more.”

(P.2 DFDG 2: Mixed-ancestry parent)

Relatedly, another participant said:

“I am not sure what is best... But I think the researchers do need to do a background check on the participant. If the participant’s emotional state is not in good standing, they may not want to deliver the genetic result because it could deeply trouble the person, which could make them sicker.”

(P.4 DFDG 4: Xhosa parent)

Another was concerned that receiving the result may initiate self-alienation, therefore this participant was unsure of whether or not it is best to receive the result. See,

“If not knowing, I would just go on with my life. Because at the end of the day, when you have that actual news, your whole life changes completely... then maybe sometimes people will shut their whole life from the whole world. So, that’s why I’m saying, yes and no. That’s what I think, I’m just going to go with that. Not knowing...”

(P.6 DFDG 2: Mixed-ancestry parent)

Next, we were interested in exploring participants’ expectations from researchers for the return of genetic results.

Participants’ expectations towards researchers concerning the return of results

Participants described three overarching reasons why they expected researchers to share results, namely because this is a sign of respect, because they have a moral obligation to do so, and because feedback could promote long-term trust between participants and researchers.

Respect and a moral obligation to return results. Many participants emphasised that they consider a return of genetic results a demonstration of respect from researchers towards participants. Some even elaborated that it should be considered a moral or ethical obligation for researchers to return genetic results which may empower participants. See,

“Yes, I do, because I think ethically, I think it’s the right thing to do. Because if I think, if I have the information, and I can better someone’s life, or something that I can apply that works for me and someone else can learn, why not. You see? So regardless of the long process of going down all those numbers and going back to the root of it, I think you should still make that effort... They should have a moral obligation to let the patients know.”

(P.3 DFDG 2: Mixed-ancestry parent)

A few participants suggested that researchers ought to also assist individuals in getting more information about the condition which they may be predisposed to getting and/or provide recommendations about specific resources which may be helpful for them. For example,

Interviewer: What you are saying is that they should call that person in and give them advice?
Many participants also alluded that receiving their genetic result may build trust between research participants and researchers.

“The NeuroDev researchers did explain to us, there is a part, like that lady said, it’s not like a must for them to let us know... but I think they should use their own initiative at that time, if they find something else and just, you know, not act like a doctor or a researcher, but act like a person and just tell that person.” (P.3 DFGD 1: Mixed-ancestry parent)

One participant suggested that in the event that researchers do not share a genetic result and the individual learns that that information may have allowed them to prevent or reduce the risk of getting the disease, they may end up blaming the researchers which could undermine the trust between researchers and participants. For example,

“As researchers you have to keep such a person in the loop because you will never know at the end if they will blame you or not. They might say that you knew about their condition and did nothing. The blame will be on you as researchers. Let the person be the one that has the responsibility to take action.” (P.2 DFGD 4: Xhosa parent)

Another person specified that it would be important for researchers to feedback genetic information that is helpful for the individual. Even if the genetic information is about an untreatable, preventable disease, these participants emphasised that researchers should have an obligation to return that information and not doing so could threaten the trust between the two parties.

“Only if they have information that can help you. I think that they should have an obligation then, and also ethically they should do what is right, if they have that information. But if it cannot help you, and there’s nothing that they can do about it, they should still give you that information and let the person decide for themselves. That is what I think.” (P.3 DFDG 2: Mixed-ancestry parent)

In addition to providing participants with information, another participant emphasised that researchers also should ensure that individuals receive counselling. The importance of counselling when genetic results are fed back was mentioned by many participants. When asked whether it was the researcher’s responsibility to organise that, one person said: “Yes, they should prepare you for bad news.” (P.1 DFGD 4: Xhosa parent)

Discussion

Our findings suggest that most participants would prefer to receive pertinent individual and incidental genetic results concerning adults across all four categories investigated in this study, regardless of severity, actionability and preventability. There were a few exceptions however, with a few participants indicating uncertainty about wanting to receive results or a desire not to know due to concerns about possible psychological distress such as increased anxiety. Reasons for wanting genetic risk information included, 1) genetic information could empower or emancipate individuals and 2) it could improve lifestyle and behavioural decisions. We found that the reasons for expecting researchers to feedback genetic results to be, 1) receiving results would be a demonstration of respect from researchers and it is their moral obligation, and 2) it would build trust between genomics research participants and researchers.

Our results are consistent with those from international research which found potential or enrolled genomic research participants to have a high interest in receiving genetic results for medical, familial, reproductive and/or personal reasons (Allen et al., 2014; Kaphingst et al., 2018; Murphy et al., 2008; O’Daniel & Haga, 2011; Sabatello et al., 2020; Sanderson et al., 2016; Wynn et al., 2017). For example, in Sanderson and colleagues’ study, most individuals from the general public wanted to receive genetic results for reasons such as, ‘to motivate changes in lifestyle, to seek medical intervention, to prepare for the future, for curiosity, interest in genetics, to provide risk information to other family members, as well as for their future potential children and family planning’ (Sanderson et al., 2016). Similarly, participants in their study also expressed concern for possible psychological impacts due to receiving genetic results. With regards to expectations of participants, previous research has also found that the majority of participants expect to receive results from genetic studies (Facio et al., 2013) and researchers have suggested that considering participants’ expectations is important for cultivating lasting trust-building between research participants and researchers (Kraft et al., 2018).

Possible reasons for the overwhelming interest in receiving genetic results among our participants may be, first, that parents may have a particularly strong interest in understanding the influence of genetics in their children’s neurodevelopmental disorder. This may be fuelled by the physical manifestation of these conditions, which often results in accusations of ‘bad parenting’. Finding a genetic cause for their child’s condition could end an often-tortuous diagnostic odyssey and bring diagnostic closure. Furthermore, it could equip parents against stigma associated with their child’s condition. Finally, the South African public healthcare system currently only offers limited genetic testing for neurodevelopmental conditions and participation in the NeuroDev study would have constituted a rare opportunity to access a broader panel of genetic tests for neurodevelopmental conditions than the participants would normally have not been able to access. More broadly many participants may be interested in receiving any health-related...
information which they are unlikely to get otherwise, given the limited capacity and resources in South Africa’s public healthcare system. This is particularly relevant to social inequality in South Africa. The realities of living in low-resource poverty-stricken environments, where it is difficult to access healthcare, may inform our participants’ desire to receive genetic information.

Overall, findings from our study suggest the question about whether to return pertinent individual and incidental results from a research context needs to be addressed openly and swiftly with participants at all stages of the research process, from the consent process onwards. We found that despite knowing that the genomics research project our participants had participated in, would only return pertinent findings, participants generally indicated high expectations of receiving all their genetic results (including IF) from genomics studies. Addressing this question early in the research process may manage participant’s expectations. It is equally important that during the consent stage, researchers explain the limitations of clinical and personal utility of genetic research results.

Based on the low-levels of formal education and limited genetic literacy among many African participants (Faure et al., 2019; Matshabane et al., 2020; Tindana et al., 2012), our study found it important for African researchers to first educate participants on genomics research, particularly in cases where they have to consent to either be re-contacted or not for IGR and/or IFs (Appelbaum et al., 2014) and encourage realistic expectations of the clinical and personal utility of any individual results prior to asking for their views on this ethically important question.

Taken together, our study suggests that in the context of African genomics research it may be important to consider participants’ views on feedback of genomic results which would likely empower or emancipate individuals, families, and communities. Where participants report not wanting to receive genetic results, in first instance, researchers should carefully consider whether this decision is an informed decision that is made after receiving adequate information and should consider what to do in the event that participants change their mind. For instance, 50% of participants in a study in the US who had initially opted not to receive IFs, changed their mind following an informational intervention (Schupmann et al., 2021). In the African context, where there is clear evidence of genetic illiteracy (Marshall et al., 2014), that is an important factor to consider. From this study, we found that educating participants about genetics and genomics research is an important step to ethically engaging with them on important topics such as return of results. Additionally, the deliberative focus group methodology is a useful way of fostering nuanced deliberations between research participants and the researchers which challenge participants to think deeply about these issues.

Strengths and limitations
This study has some limitations and strengths. First, in this paper we focus on parents’ views on feedback of IGR and IF concerning adults. We do not discuss the question in relation to children, although we believe feedback of findings in paediatrics is important to explore and is even more complex (Hens et al., 2011) therefore meriting deep discussion in a separate paper, which considers issues such as: early or late onset of a disease, whether it is treatable or preventable, whether parents should have the option of opting in or out to receive their child’s genetic results, and when or how to return genetic results to children.

Second, this study utilised a small sample from a specific population (parents of children with NDDs) and it is possible that their views on wanting to receive feedback may be impacted by their desire for any personal genetic information due to uncertainties about their children’s conditions. This implication may have been better understood had we been able to recruit controls in this study. Unfortunately, while controls were enrolled in the larger NeuroDev study, because of the COVID-19 pandemic and lockdown measures during the time of data collection, we were unable to recruit persons from that sample group. Third, the qualitative nature of the research means that results cannot be generalised across contexts. Specifically, with our sample only based on people from the Xhosa and Mixed-ancestry population groups – which together represent approximately 23% of South Africa’s population – our data may not be reflective of other South African or African cultural groups. Fourth, the use of hypothetical case studies could be a limitation in that it may yield unrealistic responses as participants could be uncertain of what they would do in a hypothetical situation and not be able to relate. However, it could also be a strength in that the use of hypothetical scenarios means participants were exposed to other genomic research situations which they could respond in relation to – as opposed to thinking only about their own situations. Fifth, the deliberative method chosen for conducting of the study, is another contributing strength because it allows researchers to educate participants about complex concepts such as genetics and genomics before asking them their opinions and in this study, this provided a learning platform that many parents of children with NDDs were seeking. Obviously, there is a risk that the learning platform could be a source of bias. To reduce this risk, when developing the materials, we used for the dFGDs (brochures, a video and a manual containing all explanations) we drew on our links with genetic counsellors and medical genetic professionals, both of whom have great expertise in providing information about genetics and health risks in a non-directional manner.

Conclusion
Our study provides some initial empirical evidence on the views of South African participants regarding the return of individual and incidental genetic research results for adult participants in genomics research. These views may be important for African genomics researchers who are grappling with the inevitability of uncovering individually relevant genomic findings and considering whether these results should be fed back to participants. It would be particularly important to consider these findings in the development of best practices for the return
of genetic results, not only for the ethical return of results, but also for the development of contextually relevant Africa-specific feedback policies.

**Data availability**

**Underlying data**

The datasets used and/or analysed are not publicly available for the preservation of participants’ privacy. Consent documents provided to participants indicated that deliberative focus group discussion transcripts would only be shared among study researchers. Individuals interested in accessing the transcripts will need to contact the corresponding (preciousmatshabane@gmail.com) and senior authors to initiate the process of 1) obtaining consent from the study participants and 2) permission from the UCT’s Faculty of Health Sciences Human Research Ethics Committee. Reasonable requests will be considered.

**Extended data**

This project contains extended data which includes a manual for deliberative focus group discussions, available here: https://elsiuhb.org/index.php/research-tool/manual-deliberative-focus-group-discussions-dfgds-feedback-individual-findings.

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**References**


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