Received: 17 January 2023 | Revised: 8 October 2023 | Accepted: 14 October 2023

DOI: 10.1002/jgc4.1830

ORIGINAL ARTICLE

National Society of Genetic Counselors WILEY

Research participants' perspectives regarding the feedback of secondary findings–A cohort from the DDD-Africa study, South Africa

Barry Shingwenyana[1] | Bianca Rossouw[1] | Jamey Thom[1,2] | Nadja Louw[1] | Amanda Krause[1] | Zané Lombard[1] | for the DDD-Africa Research Group, as members of The H3Africa Consortium

[1]Division of Human Genetics, National Health Laboratory Service and School of Pathology, The University of the Witwatersrand, Johannesburg, South Africa

[2]Wessex Clinical Genetics Department, Princess Anne Hospital, Southampton, UK

Correspondence
Barry Shingwenyana, Division of Human Genetics, National Health Laboratory Service and School of Pathology, The University of the Witwatersrand, Johannesburg, South Africa.
Email: barry.shingwenyana@nhls.ac.za

Funding information
National Institute of Mental Health of the National Institutes of Health, Grant/Award Number: U01MH115483

Abstract

Genomic researchers face an ethical dilemma regarding feedback of individual results generated from genomic studies. In the African setting, genomic research is still not widely implemented and, coupled with this, the limited African-specific guidelines on how to feedback on individual research findings. A qualitative study was performed to assess participants' expectations and preferences regarding the feedback of secondary findings from genomic research. Participants were parents of children with a developmental disorder, enrolled in the Deciphering Developmental Disorders in Africa (DDD-Africa) research project, and were purposefully selected. Three deliberative focus group discussions were conducted with 14 participants. Each deliberative focus group consisted of two separate audio-recorded interviews and presented different case scenarios for different types of secondary findings that could be theoretically detected during genomic research. We aimed to explore participants' preferences for the extent, nature, timing, and methods for receiving individual study results, specifically pertaining to secondary findings. Thematic content analysis was done, with a deductive approach to coding. Four themes emerged which included participants' perception of readiness to receive secondary findings, queries raised around who has access to research findings and feedback of findings consent, responsibilities of the researcher, and reasons for not wanting/wanting secondary findings. Overall, participants expressed that they want to receive feedback on secondary findings irrespective of disease severity and treatment availability. Lifestyle changes, early prevention or treatment, impact on future generations, and preparedness were strong motivations for wanting feedback on results. Participants felt that when the research involved minors, it was the parents' right to receive results on behalf of their children. This study provides new insights into participants' preferences around feedback on genomic research results and could serve as an important basis for creating guidelines and recommendations for feedback on genomic results in the African context.

Barry Shingwenyana and Bianca Rossouw should be considered the joint first author.

KEYWORDS
exome sequencing, feedback, genetic counseling, genome sequencing, genomics research, policy, secondary findings

1 | INTRODUCTION

1.1 | The need for more diverse African genomic research to enrich global health knowledge

Research should be conducted in diverse populations to allow for findings to be applicable globally and to address global health disparities (Bentley et al., 2017). Africa provides a crucial framework to understand modern human origins and the basis of phenotypic adaptation and complex disease, due to the unprecedented genetic variation in African genomes. It is known that modern humans originated from Africa and spread across the globe, thus, studying African genomes may result in the discovery of genetic variants that are not found in other populations which can aid in new approaches to diagnose, treat, and prevent diseases globally. Despite this, Africa remains under-represented in human genetic and genomic studies (Campbell & Tishkoff, 2008; WHO, 2022).

Lack of diversity in these studies impedes the ability to translate genomic research into clinical practice or public health policies in populations with African ancestry (Sirugo et al., 2019). However, the Human Heredity and Health in Africa (H3Africa) consortium, which is an initiative funded by the National Institute of Health and Wellcome Trust in partnership with the African Society of Human Genetics to revolutionize genomics in Africa is trying to combat this (H3Africa Consortium, 2014).

1.2 | Genomics research is increasingly using technologies that produce data beyond the primary request

The H3Africa consortium utilizes genomic technologies with the main goal of conducting population-based genomic studies of common communicable and non-communicable diseases; that could be beneficial to research participants' clinical and personal utility. The utility of a test is defined as the degree to which a test in healthcare is associated with changing health outcomes in a patient, such as preventing death and restoring or maintaining health (Bossuyt et al., 2012). The concept of clinical utility is not only confined to the potential benefits of subsequent or directed treatment, but it also evaluates the effects that tests may have on patients. These effects include emotional, social, cognitive as well as behavioral effects (Bossuyt & McCaffery, 2009). The personal utility can be defined as a broad set of outcomes that are inclusive of subjective, non-health-related uses of genome sequencing to increase feelings of altruism and control, enhance self-knowledge, and enable planning for the future (Kohler et al., 2017).

What is known about the topic

There is limited research to inform the appropriate development of guidelines regarding the return of individual genetic findings from genomic research in African populations. As genomics becomes widely implemented in the African setting, the need for guidelines will become inevitable. Such guidelines will be vital to guide and inform the best practice of returning genomic sequencing findings, including secondary findings.

What this paper adds to the topic

Results from this study will add to the founding body of work by other African genomic researchers in exploring what African participants deem important to feedback from genomic research. In addition, they may provide insights to help establish African-specific guidelines and recommendations on the return of individual genetic results from genomic research.

Given the nature of these genomic technologies, extensive amounts of individual genetic data, including secondary findings are bound to be generated (Ralefala et al., 2021; Wonkam & de Vries, 2020). These are results that are unrelated to the initial indication of ordering the sequencing test, which may be of health benefit or utility to the requesting clinician and patient (Green et al., 2013).

Secondary findings are common in the medical field, but they are increasingly becoming a frequent issue in medical genetics due to the extensive use of exome and genome sequencing. It is approximated that each human genome contains about 100 genuine loss-of-function variants (MacArthur et al., 2012). Gordon et al. (2020) found that in a diverse cohort, 3.02% of individuals had secondary findings, and 2.54% of these were in genes recommended for reporting according to the American College of Medical Genetics and Genomics (ACMG) version 2 guidelines. In the context of research, secondary findings are defined as findings "discovered in the course of conducting research but [are] beyond the aims of the study" (Wolf et al., 2008).

1.3 | International recommendations on feeding back secondary findings may not be suitable in an African setting

There has been much debate within the community of medical genetics regarding whether clinicians should identify, interpret, or

communicate secondary findings to patients. Full disclosure of such findings to stakeholders is economically and logistically impractical, however, there are arguments that complete nondisclosure in instances where there are potential benefits of medical intervention is unethical (Lohn et al., 2014; Mackley et al., 2017).

In 2013, the ACMG put forward recommendations concerning secondary findings detected by exome or genome sequencing. These recommendations include reporting variants detected from a defined list of genes as they are of medical relevance and may be utilized in clinical decision-making. These variants should be interpreted in the context of a patient's family and personal history (Miller et al., 2021). In opposition, the European Society of Human Genetics (ESHG) and The Canadian College of Medical Geneticists (CCMG) recommend that for the time being, there should be a cautious analysis of the genome, restricting it to the original health indication (de Wert et al., 2021). There is limited evidence of the appropriateness of proposed guidelines in an African setting (Chimusa et al., 2022; Wonkam & de Vries, 2020). As genomic research is conducted more widely on the African continent, a need arises for African-specific guidelines and recommendations on feedback of secondary findings.

1.4 | Bridging the existing gap in knowledge for feeding back findings in African populations

Given the scarcity and lack of consensus on the feedback of genetic results to African research participants, genomic research projects often have to utilize an ad-hoc approach to deliver such findings. In 2016, a task force composed of members from the H3Africa Ethics and Community Engagement working group was tasked with developing a set of guiding principles to inform decisions about the feedback of individual genetic findings, including secondary findings, in African-based research projects. A decision tree was developed as a summary guide for consideration by researchers which takes into account variant pathogenicity, clinical utility and validity, actionability, and participant volition (Matimba et al., 2022).

However, the development of these guidelines did not take the patient/research participant's perspective into account. They were formulated based on expert opinion and comparison to guidelines published in other countries.

Studies on parental or participant perspectives on the return of genomic findings are lacking in Africa but have been conducted in other countries, including Canada, the United Kingdom, the United States of America, and others. In Canada, a study by Fernandez et al. (2014) exploring parental attitudes around receiving targeted findings as well as secondary findings reported that there was a strong desire to receive a broader range of genomic results. In addition, parents expressed the desire to engage with clinically relevant findings of genetic research including secondary findings.

Similarly, another Canadian study by Rego et al. (2022) regarding parental perspective and preferences concerning genomic findings in a prenatal and pediatric setting, revealed that the majority of the parents had a general interest in receiving secondary findings along with those that are hypothetical, with a notable minority expressing less interest in receiving such findings.

A United Kingdom qualitative study by Mackley et al. (2018), revealed that interviewees showed high levels of understanding of genetic testing and that they were pragmatic; many were content not to know about secondary findings. Some expressed their trust in the system and healthcare providers while appreciating the limited resources in their setting and acknowledging the disease burden, and some chose to focus on their primary condition. In addition, several other interviewees reported an expectation to be recontacted with the assumption of possibly having access to the initially declined secondary finding.

Many participants indicated a preference to learn about all results offered in genomic research while a significant subset preferred to exclude some results. This suggests that an all-or-none policy would not be ideal for all participants in a given study. Issues such as privacy and religion play a role in influencing preferences to receive secondary findings or not, thus demonstrating the need for culturally sensitive counseling and educational materials to empower participants make the best choices for themselves. This was done in the United States of America (Wynn et al., 2017).

These studies do not specifically mention how parents perceive their children's ability to receive these results themselves. In Africa, there is limited information regarding parents' perspectives of their children's ability to receive findings from genomic studies. A study by Ralefala et al. (2021) in Botswana reported that parents and caregivers of children enrolled in genomic research want to receive genetic test results across all types of genetic conditions irrespective of their severity or preventability. This contradicts with the international guidelines (de Wert et al., 2021; Miller et al., 2021 and the proposed guidelines by H3Africa (Matimba et al., 2022). It is clear a research gap still exists in certain contexts, including vulnerable populations, such as children with developmental disorders, where caregivers are consenting on children's behalf. African medical geneticists, genetic counselors, and researchers will be faced with the dilemma of what type of results to feedback to research participants/parents enrolled in genomic studies. With limited research done to inform appropriate development on the return of secondary findings in an African context, it is important to conduct research within this context to ensure that appropriate African-specific guidelines are created while taking into account patient or participant perspectives.

Therefore, to start to inform the best practice, our study aimed to explore participants' preferences for the extent, nature, timing, and methods for receiving individual secondary results in a South African population group.

2 | METHODOLOGY

2.1 | Study sample

The participants included parents of children enrolled in the genomic research study, Deciphering Developmental Disorders in Africa (DDD-Africa) (Ethical Clearance: M180678). DDD-Africa is

an H3Africa research study (https://h3africa.org/). This study was designed to advance clinical genetic practice for children with rare developmental disorders in Africa through the application of exome sequencing. Participants of the DDD-Africa study were recruited from Genetic Clinics at three academic hospitals in the public healthcare system: Charlotte Maxeke Johannesburg Academic Hospital, Chris Hani Baragwanath Academic Hospital, and Rahima Moosa Mother and Child Hospital. The current study was reviewed and approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand (Ethical Clearance: M191058). All the participants provided written informed consent for their participation in the study. Written consent for audiotaping was also obtained. All participants were offered a snack and reimbursement for transport. Unique identifiers were used to protect participants' identities during deliberative focus group discussions (dFGDs). Focus groups are a unique and effective modality for capturing in-depth data about a topic of interest to the researcher (Morgan, 1996).

The DDD-Africa study consent form allows caregivers to opt in or out of receiving additional genetic information that may be detected from the research study, which may be of health benefit to the study participants (proband and/or biological parents). At first, a focus will be placed on feeding back results that inform the cause of the primary condition (developmental disorders) and any secondary findings that may inform health may be reported at a later stage (see Data S1 for the DDD-Africa consent form).

At the time at which the current study was conducted, parents had not yet received their research results from the DDD-Africa study. Participants of the DDD-Africa study were chosen to participate in the current study due to the unique focus on a vulnerable population group (children who cannot assent) with rare disorders that are likely to have a genetic cause.

Potential participants were purposefully selected from the DDD-Africa study and informed telephonically about the study. Initially, the researchers attempted to reach 30 potential participants, only 18/30 (60%) were reached by telephone; 15/18 (83%) that were reached expressed an interest and were invited to join two in-person dFGDs. A total of 14 out of the 15 (93%) individuals arrived for the in-person interviews and agreed to participate in the study. One individual was unable to attend the interview. Those who attended the in-person interviews were provided with a study information sheet and joined a study information session. All participants provided informed consent to participate in the study. In total, 14 participants (11 mothers and 3 fathers) agreed to participate in the study. Participants were carefully selected to obtain diversity in terms of their ethnicity, age, sex, or level of education. However, this was difficult to achieve in a small sample. Data were collected from April 2021 up to August 2021.

2.2 | Study design

This study was a qualitative study using a dFGD approach to assess participants' perspectives of receiving feedback of secondary findings from genomic research studies. These were supplemented with in-depth interviews to explore a broad range of issues that may arise related to feedback on genetic research results. These included participants' stances on receiving research results, as well as their preferences and motivations for wanting certain results. For this study, a dFGD manual guide providing a step-by-step guide for data collection was adopted from Ralefala et al. (2020), please see Additional File 1 and Additional File 2 in this publication for a detailed outline of the interview. There were three focus groups each consisting of four or five participants. Each group was interviewed twice, with the second dFGD occurring 1 week after the first. There was no dropout rate from the dFGDs. All interviews were conducted in English by two genetic counselors and were audio-recorded.

The first session with the participants included an information session where genetic principles and the implications of hereditary diseases were discussed as outlined in Additional File 1 from Ralefala et al. (2020). The dFGDs followed this with interview questions based on two hypothetical scenarios to elicit views from the participants regarding ethical issues related to returning research findings. The scenarios explored several issues including the returning of findings to adults and children, the return of adult-onset and early-onset conditions, and roles and responsibilities for the identification and return of these results.

Discussions during the first dFGD were based on a case scenario that involved a mother who had participated in genomic research with the aim of looking at psychiatric problems but was discovered to have a variant in the *BRCA1* gene thus increasing her chances of developing breast cancer. The second dFGD (conducted one week later) aimed to explore the concepts in more detail and challenge the views raised during the first dFGD. The second case scenario used during the second focus group session involved a discussion around a child who was enrolled in a genetic research study investigating the progression of HIV and TB. Exome sequencing identified a *BRCA1* variant predisposing her to hereditary breast and ovarian cancer syndrome. Last, to facilitate an understanding of preventability and severity, participants were given printout tables taken from Holm et al. (2015) entitled "Hypothetical Result Report" which demonstrated four types of conditions that may be reported in genomic research in terms of their preventability or severity: conditions that are not severe and preventable (for example, lactose intolerance or iron deficiency), not severe and non-preventable (for example, poor vision or seasonal allergies), severe and preventable (for example, malignant hyperthermia or peanut allergy), severe and non-preventable (for example, Duchenne Mascular Dystrophy or Rett syndrome).

The two dFGDs were planned in two stages to foster reflection and allow the participants enough time for information sharing on the topics that were discussed during the information session as well as the first round of dFGDs. In addition, this was done to allow participants to go home and think about these issues that were raised, perhaps to talk to others, before returning for the second dFGDs as new ideas/insight may occur because of this.

2.3 | Data analysis

All audio-recordings of the dFGDs were transcribed verbatim for data analysis. Unique identifying codes were used to describe each participant and what focus group they belonged to. For instance, F1P1 denotes Participant 1 from Focus Group 1. Thematic content analysis was done, with a deductive approach to coding. MAXQDA Analytics Pro 2020 (VERBI Software, 2021) was used to aid data analysis and interpretation. All transcribed data from the dFGDs and IDIs were verified by authors BS and JT. This was achieved by actively listening to the recordings while reading the transcripts. Misquoted texts and typographical errors were corrected if and when identified. Once data cleaning and verification were completed coding of the data was conducted.

Authors BS, BR, and JT independently used a deductive approach to coding for the first two transcripts guided by the codebook that was initially developed by Ralefala et al. (2021). Thereafter, BS and BR independently coded the remaining transcripts. Codes were reviewed and agreed upon by BS and BR. BS and BR assigned themes independently. Themes were discussed until a consensus was reached on the final themes.

3 | RESULTS

3.1 | Participant demographics

Fourteen participants were included in this study. The demographic data is summarized in Table 1. The majority were female (79%) and all participants were between the ages of 28 and 50 years. By self-report, the included participants were Black (86%) and of Mixed Ancestry (14%) and were from diverse ethnolinguistic groups, which are representative of the diversity found in South Africa. The largest ethnic groups in South Africa are the Zulu and Xhosa; together these groups represented 42% of the research participants. The highest level of education achieved for most participants was secondary education (71%), which is consistent with what has been reported in the South African population (Statistics South Africa, 2020). All the participants reported that this was their first time participating in a research study.

TABLE 1 Self-reported patient demographic information.

	n (%)
Males	3 (21)
Females	11 (79)
Age	
20–29	1 (7)
30–39	6 (43)
40–49	6 (43)
50–59	1 (7)
Self-reported ethnicity	
Mixed ancestry	2 (14)
isiXhosa	3 (21)
isiZulu	3 (21)
Ndebele	2 (14)
Setswana	3 (21)
Northern Sotho	1 (7)
Highest level of education	
Secondary education	10 (71)
Tertiary education	4 (29)
Previous experience with research[a]	
Yes	0 (0)
No	14 (100)
Participant who consented to receiving secondary findings in the DDD-Africa study	14 (100)

[a]Previous research means that participants were not enrolled in any other research studies.

3.2 | Study themes

Four themes were identified in the data which include participants' perception of readiness to receive secondary findings, queries raised around who has access to research findings and feedback of findings consent, the responsibilities of the researcher, and reasons for not wanting/wanting secondary findings.

3.2.1 | Theme 1: Participants perception of readiness to receive secondary findings

Overall, participants felt that simply consenting and agreeing to take part in research implies that they should be ready to receive results, even if it was not the results that they were anticipating. Participants explained how it is important to participate in research studies without any expectations and to remain open-minded, with some saying:

> You know what I am saying, if you go looking for something, make sure you are ready to know the answers. Don't go looking for something if you can't ignore the answers, because you never know what you are going to- don't go looking for something and think this is going to be the outcome, no. Make sure that you're flexible and that is how I feel.
>
> (F1P1)

> Uh, that would stress, it would give me a big stress but I will live with it. As we know we live once, can't run away so I have to deal with it
>
> (F3P1)

> And you know that is why I am saying I feel as researchers, what you guys find, needs to be shared. Doesn't matter how we are going to criticise it but it

> is we will take it in although we don't like the answers … inaudible… we as people, we want to hear the answers in our minds, but not the reality of it.
>
> (F1P1)

Participants acknowledged that it would be disappointing to receive results that may have more serious implications for their health or the health of their families, particularly when they were not expecting it. Participants described how difficult it is having a child with medical problems, and to discover that there could be a separate and additional health concern would be difficult, but they would prefer to know about it.

> It's kind of uhm, depressing cause when you are into a situation it worries you much and then if they tell you something more serious, then you get worries again.
>
> (F2P1)

> It's disappointing, but it helps in the future, there's a, there's, they knew that it can disappoint you for that moment, but leading to a better future.
>
> (F2P3)

Participants acknowledged that different individuals might react differently, and even though they felt they would be prepared and open to receiving secondary findings, others may not be. They explored how some individuals may become angry, but they did not think that this would be particularly useful. It is also important to consider that some individuals may not be emotionally equipped to deal with secondary findings, with some participants explaining that difficult news may lead to suicide:

> She shouldn't be angry, because even you didn't know what you going to find out. I don't think… to be angry. But people react differently, so somebody can hear the news and then next day, she kill themselves.
>
> (F3P1)

> And you know that is why I am saying I feel as researchers, what you guys find, needs to be shared. Doesn't matter how we are going to criticise it but it is we will take it in although we don't like the answers … inaudible… we as people, we want to hear the answers in our minds, but not the reality of it.
>
> (F1P1)

3.2.2 | Theme 2: Who has access to research findings and feedback of findings consent

The focus groups were presented with hypothetical case scenarios involving the feedback of findings for adult-onset conditions, such as a hereditary cancer syndrome, for their minor children enrolled in genomic research.

Importance of consent

Participants felt that it was important to discuss the return of these secondary findings during the consenting process of the research study, rather than at the point of result delivery. They felt that this would help them feel prepared and would make them aware that this is a possibility and could then make an informed decision about whether they wanted to participate in the study, and if they want to know about these types of secondary findings. Although these participants felt they wanted all research findings to be returned, they acknowledged that other research participants may feel differently and should have an option to choose what results are returned:

> Yes, it is okay to tell them… provided the patient or participant agrees… That's why I said for me it's fine if you tell me everything what to expect the advantages and disadvantages of what I am doing, not finding out later … don't come and tell me that okay you are not dealing with brain only, there's something else, I will be more depressed, I'm like I will tell you now, okay this is what to expect – we might find something new that's not linked to brain and so on.
>
> (F2P4)

> I think they should tell the patient before that we could find something else besides what we are looking for.
>
> (F3P2)

Parents/caregivers have the right to receive secondary findings for minors

All the groups felt strongly that secondary findings pertaining to adult-onset conditions in minors should be returned to the parents and that it should be the parents' decision about when, or if, the results get returned to their children and how the results are returned:

> Because I am that child's advocate it is imperative that you tell me this. Remember that the relationship you have with your children is not the researcher's responsibility. They are giving you the information, it's up to you as a parent to decide how to play around with that information.
>
> (F1P4)

> Because she's a minor, she can't take decisions. Sometimes she can take, that is why she is under our guidance. We are the one who decides for her to some strong decisions. She can't decide herself,

even if you are hear from us then tell her, as a minor, she doesn't, sometimes she doesn't understand about it, breast cancer, because it is something that she doesn't know.

(F2P2)

Results should be returned to parents/caregivers for management purposes

Participants felt that when parents receive results of secondary findings, it may provide protection for the child. They felt it was important that the parent or guardian is informed about the genetic risk to make decisions about how to manage that risk. They felt that it may not always be appropriate to inform the child of the risk, but it is important to at least inform the parents of that child, especially when the condition may be prevented or treated:

Only that the parents must know because they can't wait for her to be an adult. Some, we kept the researchers when she is fourteen, maybe if you don't tell me and keep it secret and say wait for her to be more mature, then she will come, and that disease affects her before she come to the researchers. I think, I thought you come as a parent when she is a minor, it's hundred percent correct if you tell us the results.

(F2P2)

Look at the end of the day you should tell the parents so that they can sit down together and discuss how they are going to tell them. Do we as parents wanna speak to this child and inform this child? It's easier to find out earlier and to say, my child this is what you got but we are gonna go down this road, and we get that sorted, and this is the treatment.

(F1P3)

I can say that, as parents we have a limitation of what we tell our children, like some other things we don't tell them. We wait for a certain age to explain what is actually happening.

(F3P3)

It is the parent's/caregiver's choice, not the researcher's, to disclose results to children

The participants all agreed that if the results are identified when the child is still a minor, it is the parental right to receive those results (provided they have consented to this). They all agreed that the parents then have a responsibility to inform their children about the results when the child is old enough, rather than the researcher. However, even though the majority agreed that the parents *ought* to disclose those results to their children, it remained the parents' choice. They also agreed that the researchers do not have the right to disclose those results to their children at a later stage without their permission:

Researcher: And if the mother says absolutely not, I am not telling her?
Then it is her prerogative.

(F1P2)

I think I agree, because for me to bring that child to the researchers, I want to know something about her life, so if they find something, they must tell me because she is under age. I am the one who must take the decision to know or not even to get treatment I must be the one that decides that she gets the treatment for such a disease or something in her body.

(F2P2)

Children should be informed by parents/caregivers about their risks

There were some differing opinions about how much information to give the child when they are old enough to receive the results. Most of the debate was around balancing that child's autonomy regarding whether they would want to receive the result and would want to know their risks, versus telling them regardless to be able to put appropriate medical management in place to the benefit of that child. In the end, most participants felt that it was important to inform the child about their risks and that it would then be the child's responsibility to seek further information and guidance.

This participant explains how for them; it would be important to tell her child what they may be at risk of:

I think for me as a parent, I would like to know. But then if the child grows up, if she doesn't want to test or to do anything, that's not my fault. She can do whatever she wants to do, but I will let her know that she might develop something like this. That's her choice, that's her decision.

(F3P2)

This participant explains how they cannot be expected to tell their child that they should just go for genetic testing when they are older. For them, if the child decided not to test, the parent would know information that could be of benefit to that child's health. Some participants felt that they would feel obligated to disclose the result as they would be aware of potential implications, even if the child does not want to know:

But if I turn around and say, I respect my child and his decisions, I must wait for him to make that decision, does he want to know about it or not. It's not fair

on that child because you as a parent can prevent it, while he is of age to deal with it.

(F1P3)

Timing of result disclosure to children depends on age and maturity

The participants also felt it was important to take both age and maturity into consideration when making decisions about feeding back findings. Sometimes, a minor may be mature enough to receive findings. However, they all agreed that ultimately it remained the parent's decision:

Because she's a minor, she can't take decisions. Sometimes she can take, that is why she is under our guidance. We are the one who decides for her to some strong decisions. She can't decide herself.

(F2P2)

I can say that, as parents we have a limitation of what we tell our children, like some other things we don't tell them. We wait for a certain age to explain what is actually happening.

(F3P3)

What I am saying is that some things are hard for a child to process whether normal or not. At the end of the day a disease is something that is difficult to process.

(F1P4)

3.2.3 | Theme 3: Responsibilities of the researchers to deliver findings

The participants felt that first and foremost the researchers have an obligation and duty to inform participants of their genetic test results, even if those results are only identified years later:

Oh, because I would rather have those answers, those twenty years of research and it's pointless me coming here, sitting here and not getting a result at the end of the day. Even if the answers come after twenty years. I would not been part of a twenty-year information we want to know.

(F1P1)

Yes, they have an obligation. They brought, remember, she went in-my understanding is, with research – there are no benefits, right? But, they already started the journey for her and I am not saying they brought this up to her but I mean, they are there to assist, to help her – she wanted to know why is A in her life and then they brought her B life. Of it, She didn't know anything about. But I think they have a responsibility to say- okay, we came out to tell you that B is there. We can help you to know if B's does really exist. I think that they have an obligation.

(F1P3)

They also felt that it is the responsibility of the researcher, as opposed to another healthcare practitioner, to deliver the research results, and that the results should be delivered face-to-face. In addition, they felt it important that a counselor is present when the results are delivered. This was largely influenced by the relationship built between the researcher and participants. They felt that other healthcare professionals that had not been involved in the research process may not have the same insight as the researchers:

I think the best is counseling. They can do counseling to make her understand the situation. Maybe that will be better, then they will try and find something that is better for her... there should be counseling first so that if said news comes, you will be prepared for that.

(F3P3)

I think um, before they can tell the person, they have to, give her, what do you call it? They have to sit down with her, maybe, give her counselling

(F3P1)

There was a strong focus on the researchers being transparent when they deliver results and not leaving out any important information. Participants felt that researchers are obligated to disclose results completely and should not make suggestions that a secondary finding was identified and then not communicate what that finding was:

As a parent if someone says to you, here are the results, this is what we found. I just think that in 10 years' time you should take your child for this test. As a parent you are going to say 'why', and I think you will Intuitively know that there must be something, if that is what the researcher is saying. So rather be upfront with the information.

(F1P2)

For me, it would be stressful because I would be curious, what are they hiding. When it is my child, what are they are hiding?

(F2P5)

The participants felt that the researchers have a responsibility to offer further advice if a secondary finding was identified. They felt that at the very least the researcher should refer the family to an appropriate clinic or healthcare professional that would be able to further explain the implications of the results and would be able to manage the family going forward. They felt that if they were given some guidance on where to seek further help, that would be sufficient, and the research group would not have any further responsibilities related to the implications of the secondary findings:

> Because if you don't give us the direction it feels like we'll be starting over again and search, where do I find help.
>
> (F1P3)

> It is pointless you are going to try and fix me, but you don't have the proper tools to fix me, so I would rather prefer you to send me to the person that has the proper tools to fix me.
>
> (F1P1)

> Because if they can't help that person it's just like the research has damaged the life of that person. I think if you tell the person you have to make sure they get some help.
>
> (F3P1)

The participants spoke about the importance of referring to someone who would be able to help them within their financial means. The participants eventually concluded that the researchers did not have a responsibility to assist participants financially in seeking help but did have an obligation to refer them to affordable and accessible care:

> No, they have to refer somewhere where they can do the test for free.
>
> (F3P3)

3.2.4 | Theme 4: Reasons for not wanting/wanting secondary findings

Theme 4.1: Reasons for not wanting feedback

Participants felt that the only reason they would not want secondary findings from research is to avoid unwarranted anxiety, particularly if the results pertained to something that is not considered severe or clinically significant:

> That is what I am saying, if we look and see that it is nothing to worry about then you can keep it to yourself, because it might make me panic and start getting another disease now.
>
> (F1P3)

> Yeah, I think the reason why they didn't tell the patient about the… that they could find something else besides what they are looking for, it's because of avoiding stress.
>
> (F3P2)

They also felt that it could be stressful if there is no medical intervention that could be put in place to alleviate the risk and that a lot of anxiety may occur anticipating the onset of symptoms:

> You can imagine if they tell you and you are not going to get it. So, we like I said the last time, we are different. If I know that I might, if I can see one little symptom then I'll feel like I'm having that condition
>
> (F3P3).

Theme 4.2: Reasons for wanting feedback

Feedback of all findings irrespective of severity. The participants felt that even though avoiding unwarranted anxiety was important, they felt that receiving feedback on all results was more important. This extended to severe and non-severe conditions, as well as treatable and untreatable conditions. For most, knowing was the most important aspect, even if they did not know what they would do with that information. As long as they were given the information:

> It is important to know about your health, whether it is bad or good, but you have to know.
>
> (F2P5)

> Yes, I think I would like to know. What is going to happen, what is killing me. Definitely. I would like to know.
>
> (F3P3)

> I want all the information
>
> (F2P3)

Having accurate information regarding disease causation. Participants explained that an advantage of receiving secondary findings was that if they were subsequently diagnosed with the condition, they would understand what caused it. This could avoid unnecessary investigations and would also save time on them trying to seek answers. They would also be able to explain to others what is going on and what has caused the condition:

> I agree with them. Knowing what is happening instead of blaming yourself, you're brainstorming or you're trying to look for answers and questions. At least you've got a path now that you can follow, that you've got some sort of answers, but you've also got an understanding of what is happening.
>
> (F1P3)

> Research is there to relieve uncertainty and at the end of the day it helps you to be grounded. At least now I know.
>
> (F1P4)

An important aspect that participants raised was being able to disprove misinformation about disease onset:

> That's what I'm saying, let me rather have those results from the research. I'll be sitting back and seeing that I've exhausted all avenues. And even if someone comes in and says "maybe it's because of …" I'll have a leg to stand on that there's no maybe.
>
> (F1P4)

Excluding witchcraft accusations was also an important consideration by the groups. In African culture, there is a strong belief in witchcraft and the belief that curses can be placed on family members. Members of the community also turn to traditional healers for medical advice and intervention. Understanding that there is an underlying genetic cause for disease onset would exclude witchcraft accusations where this may have been one of the first potential causes investigated in the community (Anizoba, 2021):

> You end up turning to witchcraft. You end up looking at this and that and you get confused yourself about what to do and that.
>
> (F1P5)

> Now, usually in the black culture the reason why research should come back to people, it's to help people not to end up falling for anything that's going to make them suffer or end up into a loss. Let me say it bluntly, we end up going to either a Sangoma (traditional healer), or to an iziNyanya (ancestral spirit) or to a Prophet.
>
> (F1P4)

> I said as an example that maybe your daughter or mother go blind, you know us as African people, if something happens, we thought it is witchcraft, but when you know that at this stage I am expecting this, it won't surprise you.
>
> (F2P2)

Information important to future generations. Receiving secondary findings from genomic research is important as it may have implications for future generations. Even if there is no immediate health benefit for the participants, if it has any benefit to the next generation, it is important to know. Sharing information in a family about health risks is viewed as important:

> So that we are informed and as we were talking earlier. Even if it moves from one generation to the other, we will let them know what happened to this one and if you are facing the same situation, you tell them that I dealt with it, this way.
>
> (F1P5)

Empowered to take precautionary action. Knowing that you are at risk of developing a particular condition allows one to put measures in place to manage the risk. Changing one's lifestyle was seen as an easy intervention to reduce the risk of developing certain conditions:

> I also think it is good to be specific. Because with some diseases as you are growing you can change the lifestyle and the food you are eating to get better. So, from an early age you can start maybe exercising and eating healthy and avoiding certain things to get better. I think it's good to be specific.
>
> (F2P2)

> It raises awareness and like cancer you can check the lifestyle, the way you eat, the way you live so I think it is important to tell.
>
> (F2P3)

Returning findings for a condition that is preventable with appropriate intervention was seen as highly advantageous to the groups. Participants could be given information that would enable them to make decisions about their health, so that they could actively manage their risks:

> To me it's more about informing them, so that you can turn to me, and I can turn to you and say this is how you can prevent it from happening. So, I would like to be informed, so that I can be able to answer questions like "what is this and what could prevent that?". So, I will be sure that the person doesn't go to "Z" but rather goes to "A". I got the direction which I could follow, and I can give.
>
> (F1P3)

For conditions that cannot be prevented, participants felt that there may still be some benefit if early diagnosis was possible. This is

because there may be additional management and treatment options available that are more effective when implemented early:

> I think the first one, to know early. Because you know cancer there are stages, maybe if they didn't tell me I am already in a bad stage. If they told me early, maybe I still have got a chance to do something.
>
> (F3P4)

Participants acknowledged that sometimes there might be nothing that you can do to eliminate the risk and that disease onset would be inevitable. To them, knowing would still be important so that one could be prepared for what is to come:

> There is nothing I can do about it, but I can prepare
>
> (F1P3)

4 | DISCUSSION

There is limited knowledge and a lack of consensus regarding feedback of secondary findings from genomic studies in African populations. This study aimed to investigate participants' expectations and preferences regarding feedback of findings from genomic studies that their children are enrolled in, that may produce pertinent secondary findings. It is important to note that in the parent study, caregivers were asked during the consenting phase of the study whether they would like to receive additional results identified in their child or in themselves, which may be of health benefit. This cohort may have agreed on receiving such findings thus the emerging themes seen here. Decisions around feedback on genomic findings should not be generalized across different contexts (Beskow & Burke, 2010). This highlights the importance of conducting this kind of research in different population groups and research contexts to develop guidelines that are clinically and culturally appropriate. Overall, participants in this study expressed the importance of receiving all results generated by genomic research, irrespective of severity or actionability. There is very little research that has been done regarding feedback of genomic findings including secondary findings in an African context. As a result, making decisions about the feedback of results from African genomic sequencing data is challenging. It is important to understand what findings should be returned to participants while also maintaining standards of patient care.

4.1 | Access to research findings and readiness to receive feedback on findings

Providing genetic test results for adult-onset conditions of minors to parents and caregivers may pose an ethical dilemma (reviewed in Mand et al., 2012). The autonomy of the child has to be taken into consideration, as they have the right to decide whether or not they would want to receive this information. However, at the time of research enrolment, participants who are minors might not be mature enough to make these decisions, and in the context of this study, may not have the intellectual or cognitive ability to make appropriate decisions. In addition, clinical actionability at that stage may be minimal, and recontacting these participants years after the conclusion of the study for feedback on secondary findings may not be practical or possible. The participants of this study felt that as the parents of the minors it is their right to receive all results pertaining to their children, and that they are the ones who should bear the responsibility of having that information. The motivation for parents wanting these results back was largely attributed to parents' perceptions that having this information would in some way benefit the child. In addition, they felt that as parents, it is their right to have access to this information and that it is the obligation of the researcher to share this information with the parents.

4.2 | Reasons for wanting feedback on findings

Participants wanted to receive all genomic findings, irrespective of severity, preventability, and actionability. This finding is consistent with a study performed in Africa by Ralefala et al. (2021), as well as studies performed in high-income countries (Fernandez et al., 2009; Miller et al., 2010; Murphy et al., 2008). Our study found that participants' main reason for not wanting feedback on results was due to the subsequent psychological implications, particularly for conditions that are not severe or those that are not preventable or treatable despite the potential anxiety that may be induced by receiving these results, participants felt that their need to have this information outweighed the potential psychological harm. Participants also expressed that this could vary for different people and would need to be reviewed on an individual basis. Improved lifestyle and being prepared for the future were strong motivators for participants in our study. Lifestyle changes and preventative measures have also been reported in other studies (Bijlsma et al., 2018; Facio et al., 2013; Sanderson et al., 2016) as well as being able to prepare for the future (Holm et al., 2015; Sanderson et al., 2016).

When taking into consideration the cultural context of our participant group, receiving feedback on findings to avoid misconceptions about disease onset was expressed by the participants in our study. The traditional African philosophy of illness encompasses relations between God, ancestors, and the universe. In African culture, traditional healers (of which there are many different types) play an important role in all spheres of life and may serve the role of educator, spiritual guide, counselor, psychotherapist, leader, and medical healer (Mokgobi, 2014). In times of illness, it is common practice to seek guidance and answers from a traditional healer. This provides an example in the context of an African population on how returning findings from genomic research can

contribute to the personal utility of an individual by preventing misconceptions of disease causation and avoiding unnecessary investigations and interventions.

The expectation by participants in this study to receive all results contradict the recommendations of guidelines to only report genetic test results associated with clinical actionability. The ACMG has published guidelines for reporting secondary findings in the context of clinical exome and genome sequencing. In addition, the ACMG has published a gene list to guide clinical laboratories as to which genes unrelated to the indication of testing should be analyzed and reported on based on medical actionability (Miller et al., 2021). Matimba et al. (2022) recently published guidelines for feedback on individual genetic research findings for genomics research in Africa. These guidelines stipulate that only results with clinical utility, are medically actionable, or have personal utility (mostly related to confirming a diagnosis of a condition that the patient currently presents with or carrier status that could inform reproductive decisions) should be reported back to participants. In the present study and the study by Ralefala et al. (2020), participants clearly expressed their preferences and expectation to receive feedback on broader findings. While this needs to be balanced with maintaining a standard of clinical care, as Ralefala et al. (2020) suggest, perhaps solidarity and reciprocity obligations should be considered, and this could be seen as adding to the personal validity of feedback of findings described by Matimba et al. (2022).

4.3 | The responsibilities of the researcher

The participants in our study felt that researchers had a duty to refer participants for appropriate management and care following the feedback of results. It was also highlighted that participants should be referred to clinics and healthcare practitioners who are accessible and within an individual's financial means. This highlights an important comment by Wonkam and de Vries (2020) who argue that the clinical actionability of genomic results should also take into consideration the availability of resources. This might suggest that the guidelines proposed by the ACMG are not necessarily applicable or appropriate in low-resource settings, as what is considered clinically actionable in one setting may not be clinically actionable in another setting, based on the availability of resources. In this context, Wonkam and de Vries (2020) suggest that results where there is no clinical intervention or treatment available in low-resource settings should perhaps not be reported. Matimba et al. (2022) argue that it would be inappropriate to adopt different feedback policies based on participants' access to healthcare as this could unfairly prevent participants from receiving feedback just because they do not have the resources to act on the information. In addition, it is difficult trying to make decisions about providing results that may be relevant to future care when you cannot predict what medical care may be available in the future. These complexities highlight the importance of further research and engagement from multiple stakeholders to begin to address this ethical conundrum.

The guidelines put forward by Matimba et al. (2022) highlight that feedback on findings should be done preferably by genetic counselors or medical geneticists. However, the authors note a shortage of these professionals in most African countries, making it unrealistic to recommend that results should only be delivered by these professionals, and recommend the training of other healthcare professionals to execute these duties. South Africa has an estimated population of ~57 million individuals; in 2019, there were approximately 20 registered, practicing genetic counselors in South Africa (Abacan et al., 2019). The situation in the rest of Africa is even more dire, with no formal genetic counseling services available (Abacan et al., 2019; Ormond et al., 2018).

In our study, participants stated that they preferred research findings to be delivered by the researchers, in addition to a counselor. Both genetic counselors and medical geneticists were involved in the DDD-Africa study recruitment, exposing study participants to these individuals. As many of the participants were patients of our Genetics Clinics and had received genetic counseling as part of routine clinical services, we assume that when they say they would prefer if a "counselor" was involved in result delivery, they are referring to a genetic counselor. The participants in this study had developed strong relationships with the team over many years (before and during the research study) and this likely influenced their responses. Ideally, genomic research studies should include the involvement of genetic counselors and medical geneticists, thus, we should be focusing on training more genetic counselors, medical geneticists and employing these individuals in both clinical and research capacities. In addition, African research scientists and other healthcare workers in genomic research should also receive basic genetic counseling training. Participants build a relationship of trust with the researchers and want these individuals to remain involved. Equipping researchers with the necessary skills to do this should be prioritized.

4.4 | Limitations

Most of the participants in this study were female, and all agreed to participate, which could bias the opinions presented here. The scenarios presented to the focus groups were all hypothetical, and none of these participants have received any feedback on results linked to the DDD-Africa study that they are enrolled in yet. Once they start receiving feedback, their viewpoints regarding the type of findings they want to receive, and their motivations may change. As the participants were all parents of children with a suspected genetic disease, they understand the diagnostic process differently compared to parents of healthy individuals which may have also influenced responses. All the interviews were conducted in English and not in the participants' first language. This may have led to misinterpretation of some of the questions asked, and participants may not have been able to clearly express their opinions. There may also be a potential bias in the responses from participants, as these participants have children with developmental and learning disabilities,

and these children may never be in a position to provide appropriate informed consent. Participants' responses to wanting feedback done by genetic counselors or medical geneticists may have been influenced by the fact they had exposure to this group of individuals as part of the research team thus resulting in them being overly positive about their roles. At last, in this current study, the initial consent forms were not assessed to check whether this group of individuals had consented to receiving secondary findings or not, as such there may have been a selection bias. Current research is underway investigating individuals' reasons for enrolling in genomic research studies, and their perceived clinical utility of genomic studies pre- and post-result delivery. These results may provide further insight and add to the results obtained from this study.

5 | CONCLUSION

Our findings show that this group of research participants want to receive findings from genomic studies, irrespective of severity, actionability, or preventability. Participants feel it is their right to receive back findings, including findings of their minor children. Knowledge about the cause of disease onset and being able to actively manage their health risks are important motivators for receiving feedback on findings. Due to the complexity of results obtained from genomic studies and the implications thereof, genetic counselors and medical geneticists should be involved in the feedback of results. Research of this nature should continue on the African continent so that we can better understand the needs of this diverse population and work on updating and establishing guidelines for the feedback of genomic findings that remain inclusive, just, and clinically sound.

AUTHOR CONTRIBUTIONS

Authors Barry Shingwenyana and Bianca Rossouw confirm that they had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. All of the authors gave final approval of this version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

ACKNOWLEDGMENTS

The authors would like to thank Jantina de Vries from the H3Africa ELSI Collaborative Centre Individual Findings in Genetic Research in Africa (IFGeneRA) for initial discussions about the study design and for sharing access to the research tool used for the dFGD sessions. The research reported in this publication was supported by the National Institute Of Mental Health of the National Institutes of Health under Award Number U01MH115483. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. The authors would also like to thank the participants of the DDD-Africa study for providing their time and sharing their stories.

CONFLICT OF INTEREST STATEMENT

Barry Shingwenyana, Bianca Rossouw, Jamey Thom, Nadja Louw, Amanda Krause, and Zane Lombard declare that they have no conflict of interest.

DATA AVAILABILITY STATEMENT

The data used for this study is not publicly available.

ETHICS STATEMENT

Human studies and informed consent: Approval to conduct this human subjects research was obtained by the University of the Witwatersrand Human Research Ethics Committee (Medical). All the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

Animal studies: No non-human animal studies were carried out by the authors of this article.

ORCID

Barry Shingwenyana https://orcid.org/0000-0002-8593-4042
Bianca Rossouw https://orcid.org/0000-0003-0600-155X

REFERENCES

Abacan, M., Alsubaie, L., Barlow-Stewart, K., Caanen, B., Cordier, C., Courtney, E., Davoine, E., Edwards, J., Elackatt, N. J., Gardiner, K., Guan, Y., Huang, L. H., Malmgren, C. I., Kejriwal, S., Kim, H. J., Lambert, D., Lantigua-Cruz, P. A., Lee, J. M. H., Lodahl, M., … Wicklund, C. (2019). The global state of the genetic counseling profession. *European Journal of Human Genetics*, *27*(2), 183–197. https://doi.org/10.1038/s41431-018-0252-x

Anizoba, E. C. (2021). The place of African belief and germ theory on the causes of human diseases.

Bentley, A. R., Callier, S., & Rotimi, C. N. (2017). Diversity and inclusion in genomic research: Why the uneven progress? *Journal of Community Genetics*, *8*(4), 255–266. https://doi.org/10.1007/s12687-017-0316-6

Beskow, L. M., & Burke, W. (2010). Offering individual genetic research results: Context matters. *Science Translational Medicine*, *2*(38), 38cm20. https://doi.org/10.1126/scitranslmed.3000952

Bijlsma, R. M., Wessels, H., Wouters, R. H., May, A. M., Ausems, M. G., Voest, E. E., & Bredenoord, A. L. (2018). Cancer patients' intentions towards receiving unsolicited genetic information obtained using next-generation sequencing. *Familial Cancer*, *17*(2), 309–316. https://doi.org/10.1007/s10689-017-0033-7

Bossuyt, P. M., & McCaffery, K. (2009). Additional patient outcomes and pathways in evaluations of testing. *Medical Decision Making*, *29*(5), E30–E38. https://doi.org/10.1177/0272989X09347013

Bossuyt, P. M., Reitsma, J. B., Linnet, K., & Moons, K. G. (2012). Beyond diagnostic accuracy: The clinical utility of diagnostic tests. *Clinical Chemistry*, *58*(12), 1636–1643. https://doi.org/10.1373/clinchem.2012.182576

Campbell, M. C., & Tishkoff, S. A. (2008). African genetic diversity: Implications for human demographic history, modern human origins, and complex disease mapping. *Annual Review of Genomics and Human Genetics*, *9*, 403–433. https://doi.org/10.1146/annurev.genom.9.081307.164258

Chimusa, E. R., Alosaimi, S., & Bope, C. D. (2022). Dissecting generalizability and Actionability of disease-associated genes from 20 worldwide ethnolinguistic cultural groups. *Frontiers in Genetics*, *13*, 835713. https://doi.org/10.3389/fgene.2022.835713

de Wert, G., Dondorp, W., Clarke, A., Dequeker, E. M., Cordier, C., Deans, Z., van El, C. G., Fellmann, F., Hastings, R., Hentze, S., Howard, H., Macek, M., Mendes, A., Patch, C., Rial-Sebbag, E., Stefansdottir, V., Cornel, M. C., Forzano, F., & European Society of Human Genetics. (2021). Opportunistic genomic screening. Recommendations of the European Society of Human Genetics. *European Journal of Human Genetics*, *29*(3), 365–377. https://doi.org/10.1038/s41431-020-00758-w

Facio, F. M., Eidem, H., Fisher, T., Brooks, S., Linn, A., Kaphingst, K. A., Biesecker, L. G., & Biesecker, B. B. (2013). Intentions to receive individual results from whole-genome sequencing among participants in the ClinSeq study. *European Journal of Human Genetics*, *21*(3), 261–265. https://doi.org/10.1038/ejhg.2012.179

Fernandez, C. V., Bouffet, E., Malkin, D., Jabado, N., O'Connell, C., Avard, D., Knoppers, B. M., Ferguson, M., Boycott, K. M., Sorensen, P. H., Orr, A. C., Robitaille, J. M., & McMaster, C. R. (2014). Attitudes of parents toward the return of targeted and incidental genomic research findings in children. *Genetics in Medicine*, *16*(8), 633–640. https://doi.org/10.1038/gim.2013.201

Fernandez, C. V., Gao, J., Strahlendorf, C., Moghrabi, A., Pentz, R. D., Barfield, R. C., Baker, J. N., Santor, D., Weijer, C., & Kodish, E. (2009). Providing research results to participants: Attitudes and needs of adolescents and parents of children with cancer. *Journal of Clinical Oncology*, *27*(6), 878–883. https://doi.org/10.1200/JCO.2008.18.5223

Gordon, A. S., Zouk, H., Venner, E., Eng, C. M., Funke, B. H., Amendola, L. M., Carrell, D. S., Chisholm, R. L., Chung, W. K., Denny, J. C., Fedotov, A., Hakonarson, H., Kullo, I. J., Larson, E. B., Leduc, M. S., Leppig, K. A., Lennon, N. J., Linder, J. E., Muzny, D. M., … Jarvik, G. P. (2020). Frequency of genomic secondary findings among 21,915 eMERGE network participants. *Genetics in Medicine*, *22*(9), 1470–1477. https://doi.org/10.1038/s41436-020-0810-9

Green, R. C., Berg, J. S., Grody, W. W., Kalia, S. S., Korf, B. R., Martin, C. L., McGuire, A. L., Nussbaum, R. L., O'Daniel, J. M., Ormond, K. E., Rehm, H. L., Watson, M. S., Williams, M. S., & Biesecker, L. G. (2013). ACMG recommendations for reporting of incidental findings in clinical exome and genome sequencing. *Genetics in Medicine*, *15*(7), 565–574. https://doi.org/10.1038/gim.2013.73

H3Africa Consortium, Rotimi, C., Abayomi, A., Abimiku, A., Adabayeri, V. M., Adebamowo, C., Adebiyi, E., Ademola, A. D., Adeyemo, A., Adu, D., Affolabi, D., Agongo, G., Ajayi, S., Akarolo-Anthony, S., Akinyemi, R., Akpalu, A., Alberts, M., Betancourt, O. A., Alzohairy, A. M., … Zar, H. (2014). Enabling the genomic revolution in Africa. *Science*, *344*(6190), 1346–1348. https://doi.org/10.1126/science.1251546

Holm, I. A., Iles, B. R., Ziniel, S. I., Bacon, P. L., Savage, S. K., Christensen, K. D., Weitzman, E. R., Green, R. C., & Huntington, N. L. (2015). Participant satisfaction with a preference-setting tool for the return of individual research results in pediatric genomic research. *Journal of Empirical Research on Human Research Ethics*, *10*(4), 414–426. https://doi.org/10.1177/1556264615599620

Kohler, J. N., Turbitt, E., Lewis, K. L., Wilfond, B. S., Jamal, L., Peay, H. L., Biesecker, L. G., & Biesecker, B. B. (2017). Defining personal utility in genomics: A Delphi study. *Clinical Genetics*, *92*(3), 290–297. https://doi.org/10.1111/cge.12998

Lohn, Z., Adam, S., Birch, P. H., & Friedman, J. M. (2014). Incidental findings from clinical genome-wide sequencing: A review. *Journal of Genetic Counseling*, *23*, 463–473. https://doi.org/10.1007/s10897-013-9604-4

MacArthur, D. G., Balasubramanian, S., Frankish, A., Huang, N., Morris, J., Walter, K., Jostins, L., Habegger, L., Pickrell, J. K., Montgomery, S. B., Albers, C. A., Zhang, Z. D., Conrad, D. F., Lunter, G., Zheng, H., Ayub, Q., DePristo, M. A., Banks, E., Hu, M., … Tyler-Smith, C. (2012). A systematic survey of loss-of-function variants in human protein-coding genes. *Science*, *335*(6070), 823–828. https://doi.org/10.1126/science.1215040

Mackley, M. P., Blair, E., Parker, M., Taylor, J. C., Watkins, H., & Ormondroyd, E. (2018). Views of rare disease participants in a UK whole-genome sequencing study towards secondary findings: A qualitative study. *European Journal of Human Genetics*, *26*(5), 652–659. https://doi.org/10.1038/s41431-018-0106-6

Mackley, M. P., Fletcher, B., Parker, M., Watkins, H., & Ormondroyd, E. (2017). Stakeholder views on secondary findings in whole-genome and whole-exome sequencing: A systematic review of quantitative and qualitative studies. *Genetics in Medicine*, *19*(3), 283–293. https://doi.org/10.1038/gim.2016.109

Mand, C., Gillam, L., Delatycki, M. B., & Duncan, R. E. (2012). Predictive genetic testing in minors for late-onset conditions: A chronological and analytical review of the ethical arguments. *Journal of Medical Ethics*, *38*(9), 519–524. https://doi.org/10.1136/medethics-2011-100055

Matimba, A., Ali, S., Littler, K., Madden, E., Marshall, P., McCurdy, S., Nembaware, V., Rodriguez, L., Seeley, J., Tindana, P., Yakubu, A., & de Vries, J. (2022). Guideline for feedback of individual genetic research findings for genomics research in Africa. *BMJ Global Health*, *7*(1), e007184. https://doi.org/10.1136/bmjgh-2021-007184

Miller, D. T., Lee, K., Chung, W. K., Gordon, A. S., Herman, G. E., Klein, T. E., Stewart, D. R., Amendola, L. M., Adelman, K., Bale, S. J., Gollob, M. H., Harrison, S. M., Hershberger, R. E., McKelvey, K., Richards, C. S., Vlangos, C. N., Watson, M. S., & Martin, C. L. (2021). ACMG SF v3. 0 list for reporting of secondary findings in clinical exome and genome sequencing: A policy statement of the American College of Medical Genetics and Genomics (ACMG). *Genetics in Medicine*, *23*(8), 1381–1390. https://doi.org/10.1038/s41436-021-01172-3

Miller, F. A., Hayeems, R. Z., & Bytautas, J. P. (2010). What is a meaningful result? Disclosing the results of genomic research in autism to research participants. *European Journal of Human Genetics*, *18*(8), 867–871. https://doi.org/10.1038/ejhg.2010.34

Mokgobi, M. G. (2014). Understanding traditional African healing. *African Journal for Physical Health Education, Recreation and Dance*, *20*(sup-2), 24–34.

Morgan, D. L. (1996). *Focus groups as qualitative research* (Vol. *16*). Sage publications.

Murphy, J., Scott, J., Kaufman, D., Geller, G., LeRoy, L., & Hudson, K. (2008). Public expectations for return of results from large-cohort genetic research. *The American Journal of Bioethics*, *8*(11), 36–43. https://doi.org/10.1080/15265160802513093

Ormond, K. E., Laurino, M. Y., Barlow-Stewart, K., Wessels, T. M., Macaulay, S., Austin, J., & Middleton, A. (2018). Genetic counseling globally: Where are we now? *American Journal of Medical Genetics. Part C, Seminars in Medical Genetics*, *178*(1), 98–107. https://doi.org/10.1002/ajmg.c.31607

Ralefala, D., Kasule, M., Matshabane, O. P., Wonkam, A., Matshaba, M., & de Vries, J. (2021). Participants' preferences and reasons for wanting feedback of individual genetic research results from an HIV-TB genomic study: A case study from Botswana. *Journal of Empirical Research on Human Research Ethics*, *16*(5), 525–536. https://doi.org/10.1177/15562646211043985

Ralefala, D., Kasule, M., Wonkam, A., Matshaba, M., & de Vries, J. (2020). Do solidarity and reciprocity obligations compel African researchers to feedback individual genetic results in genomics research? *BMC Medical Ethics*, *21*(1), 1–11. https://doi.org/10.1186/s12910-020-00549-4

Rego, S., Hoban, H., Outram, S., Zamora, A. N., Chen, F., Sahin-Hodoglugil, N., Anguiano, B., Norstad, M., Yip, T., Lianoglou, B., Sparks, T. N., Norton, M. E., Koenig, B. A., Slavotinek, A. M., & Ackerman, S. L. (2022). Perspectives and preferences regarding genomic secondary

findings in underrepresented prenatal and pediatric populations: A mixed-methods approach. *Genetics in Medicine*, *24*(6), 1206–1216. https://doi.org/10.1016/j.gim.2022.02.004

Sanderson, S. C., Linderman, M. D., Suckiel, S. A., Diaz, G. A., Zinberg, R. E., Ferryman, K., Wasserstein, M., Kasarskis, A., & Schadt, E. E. (2016). Motivations, concerns and preferences of personal genome sequencing research participants: Baseline findings from the HealthSeq project. *European Journal of Human Genetics*, *24*(1), 14–20. https://doi.org/10.1038/ejhg.2015.118

Sirugo, G., Williams, S. M., & Tishkoff, S. A. (2019). The missing diversity in human genetic studies. *Cell*, *177*(1), 26–31. https://doi.org/10.1016/j.cell.2019.02.048

Statistics South Africa. (2020). Quarterly Labour Force Survey 2010–2020 (Quarter 4). http://www.statssa.gov.za/publications/P0211/P02114thQuarter2020.pdf [Accessed 23rd November 2022].

VERBI Software. (2021). *MAXQDA 2022 [computer software]*. VERBI Software. maxqda.com

Wolf, S. M., Lawrenz, F. P., Nelson, C. A., Kahn, J. P., Cho, M. K., Clayton, E. W., Fletcher, J. G., Georgieff, M. K., Hammerschmidt, D., Hudson, K., Illes, J., Kapur, V., Keane, M. A., Koenig, B. A., Leroy, B. S., McFarland, E. G., Paradise, J., Parker, L. S., Terry, S. F., … Wilfond, B. S. (2008). Managing incidental findings in human subjects research: Analysis and recommendations. *Journal of Law, Medicine and Ethics*, *36*(2), 219–248. https://doi.org/10.1111/j.1748-720X.2008.00266.x

Wonkam, A., & de Vries, J. (2020). Returning incidental findings in African genomics research. *Nature Genetics*, *52*(1), 17–20. https://doi.org/10.1038/s41588-019-0542-4

World Health Organization. (2022). *Accelerating access to genomics for global health: Promotion, implementation, collaboration, and ethical, legal, and social issues: A report of the WHO science council*. World Health Organization.

Wynn, J., Martinez, J., Duong, J., Chiuzan, C., Phelan, J. C., Fyer, A., Klitzman, R. L., Appelbaum, P. S., & Chung, W. K. (2017). Research Participants' preferences for hypothetical secondary results from genomic research. *Journal of Genetic Counseling*, *26*(4), 841–851. https://doi.org/10.1007/s10897-016-0059-2

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Shingwenyana, B., Rossouw, B., Thom, J., Louw, N., Krause, A., Lombard, Z., & (2024). Research participants' perspectives regarding the feedback of secondary findings–A cohort from the DDD-Africa study, South Africa. *Journal of Genetic Counseling*, *33*, 1176–1190. https://doi.org/10.1002/jgc4.1830