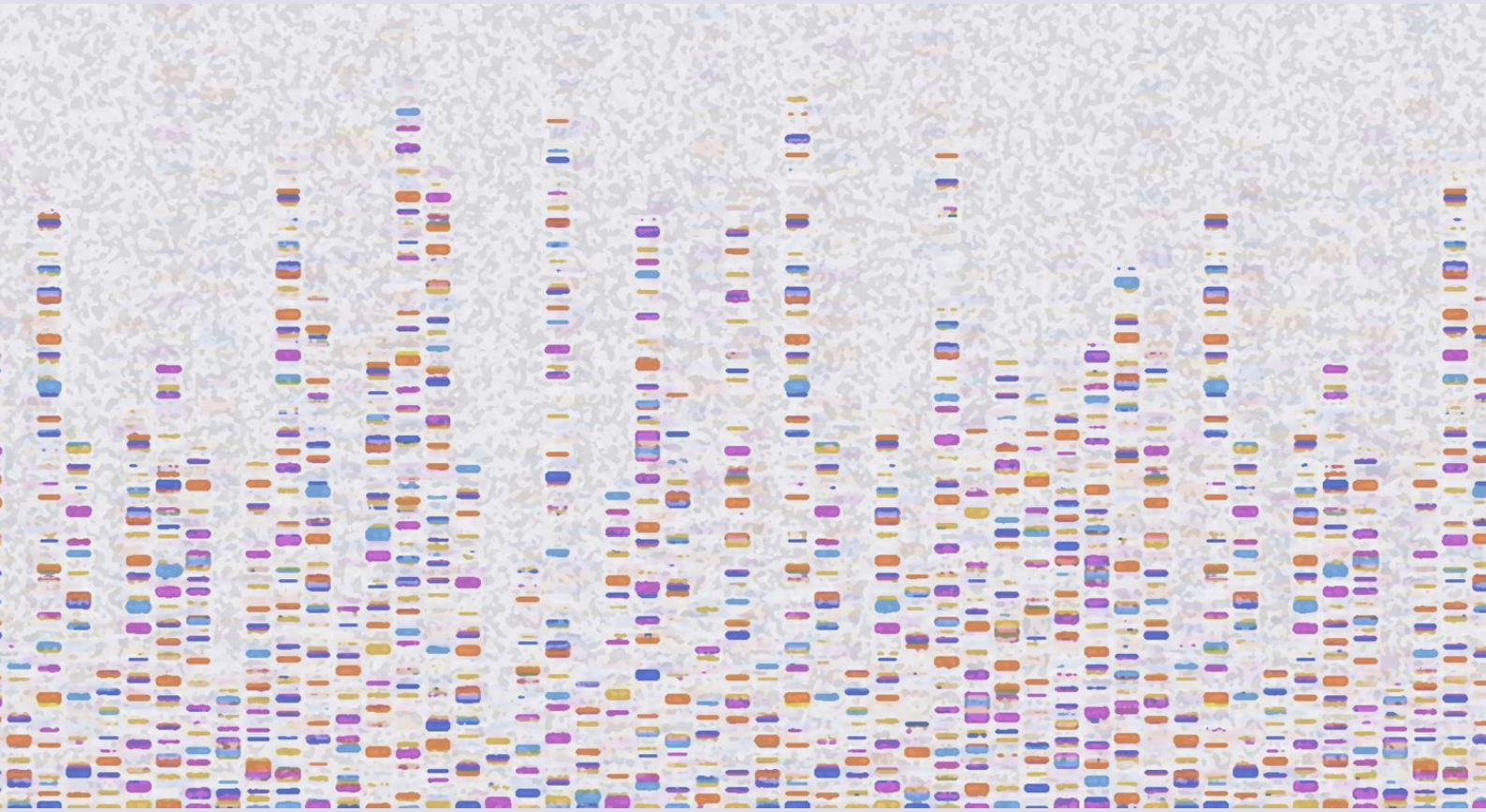
Implications of whole genome sequencing for newborn screening

A public dialogue



Report Annex
Hopkins Van Mil
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Creating Connections
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Genomics england

UK National Screening Committee

sciencewise

UK Research and Innovation

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Annex 1: Workshop plans

Webinar process plan

Time	Agenda	Process	Expected Outcomes
6:00-6:10	Introductions & webinar purpose Menti.com	Lead Facilitator: Warmly welcomes participants. Explanation that this is an introductory webinar to get us in the space to discuss topics related to the newborn screening programmes. It will **not** run in the same way as a public dialogue session as these are more interactive and give lots of space for discussion in small groups and time to listen to specialists in the room. This session provides you with the **initial information** you need to get us thinking about the issues. • Asks UKNSC/ GEL and HVM team members to introduce themselves: Name, organisation, role, passing the baton to the next team member • Shows visual of whole programme and all the groups that will run • Shares timings for the session. Invite questions/comments: as many of these as possible will be put to the commissioning team, some may need to be followed up for the first online workshop. Reminder that everyone can see the comments when shared. • Speaks about the participant pack – what's in it and how we are using it. To end: **1: Share what comes to your mind when we say "NHS health screening programmes"**	Participants know the purpose and format of the webinar Baseline understanding of screening
6:10-6:25 (15 mins)	 What is public dialogue +	Comments throughout collected in the chat and encouraged. LF: Make it clear we'll have a discussion after this drawing on all the questions in the chat. So please add questions you have there as we go along. 1. LF summary of what public dialogue is: • Time to reflect in/ in-between workshops	Stresses the importance of what participants are doing & taking part in all of it.

Time	Agenda	Process	Expected Outcomes
	Aims and objectives of this dialogue	• Interaction with specialists in the area under discussion • Working towards a policy impact– in this case a pilot programme for WGS in newborns. **Share the research question:** What are the implications for the NHS and society of using whole genome sequencing (WGS) for newborn screening? LF to share the aim, objective visual on the screen and point to it in the participant packs (introducing the commissioning bodies p. 2 and aims/ objectives p. 5). Encourage questions in the Chat. Explain we'll be dealing with all of them after an introductory film. **Show vox pop film introducing the dialogue, its purpose, and how the findings will be used**. Explaining why it is important to hear the views of citizens on this issue, make it clear what the findings from the dialogue will feed into – including the pilot screening programme: Anne-Marie Slowther; Vivienne Parry; Bob Steele; Kerry Leeson-Beevers; Suzannah Lansdell.	Stressing the purpose of this dialogue, who has commissioned it and why, what the findings will feed into
6:25-6:35 (15 mins)	Reflections, comments, questions	Drawing on the questions/ comments in the Chat. Facilitated session in which UKNSC and Genomics England representatives are invited to answer the questions put forward in the Chat. **Southern England:** Vivienne Parry, Head of Engagement, Genomics England Catherine Joynson, Ethics & Stakeholder Engagement Consultant PHE Screening / UK National Screening Committee LF explains how the answers to others which can't be answered this evening will be provided or form part of our discussions over the course of round 2.	Clarity on purpose for all participants. Initial questions answered.
6:35-6:45 (10 mins)	Introduction to elements of the dialogue: screening & newborn	As you are watching these two short films please put your comments/ questions in the chat. What is screening? Play full video clip to show information about screening at other points in life.	Making it clear what the practical purpose of this dialogue is De-mystifying terms and ideas.

Time	Agenda	Process	Expected Outcomes
	screening (this eve) & WGS (W1)	This next clip is about Katie and her newborn baby Thomas. Newborn screening and the blood spot test Our focus is on Whole Genome Sequencing in newborn screening. We'll describe what WGS means in more detail in workshop 1. More information in the webinar section of packs and on Recollective: • Signpost the jargon buster • Note the 'What do we need to know about whole genome sequencing document?' Which you'll find along with all our other stimulus materials on Recollective when you go there before our first workshop	
6:45-6:55 (10 mins)	How UK NSC decisions are made about screening	Reminder – again, put your questions/ comments in the chat for us to pick up after you have seen the film. How decisions on what should be screened for have been reached. **Newborn screening currently tests for nine conditions.** How they are screened for using blood spot test. **Voxpop video** includes: UK National Screening Committee/ PHE reps: Anne Mackie: Director of Screening for Public Health England Phil Booth: medConfidential Lorna Allen: CF Trust, patient voice **The nine conditions:** Sickle cell disease Cystic fibrosis Congenital hypothyroidism And for 6 inherited metabolic diseases Plus the difference between **screening tests** and **diagnostic tests**	Give clarity on what the newborn screening programme currently does and how screening differs from diagnostic tests

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		This is mentioned by Anne Mackie in the voxpop: a screening test can find out if you, or your baby, have a high or low chance of having a health problem. But it cannot usually tell you for certain, so people found to have a high chance of a problem will often be offered another kind of test. This is called a diagnostic test and gives a more definite 'yes' or 'no' answer. Making it clear that theoretically, a screening test (offered to a population of apparently healthy people) could be so accurate as to be considered diagnostic.	
6:55-7:10 (15 mins)	Reflections, comments, questions	Opportunity for questions drawn from the chat. Answered where possible by: **Southern England:** Vivienne Parry, Head of Engagement, Genomics England Catherine Joynson, Ethics & Stakeholder Engagement Consultant PHE Screening / UK National Screening Committee LF explains how the answers to others which can't be answered this evening will be provided or form part of our discussions over the course of the following four workshops.	Clarity on purpose for all participants. Initial questions answered.
7:10-7:15	Recollective/ participant pack & menti	www.menti.com **Q1: One question you have from this evening** **Q2: One point you will take from this evening into our first workshop** LF introduces the online space for individual tasks, demonstrating that the materials from tonight's webinar are there and can be reviewed again whenever participants wish to. Explaining the participants' pack and that should have arrived, or will do so shortly in hard copy to them so it can be used to make notes, as a prompt to their own thinking and as a resource for keeping all the materials used in the sessions. If it hasn't arrived yet you can find the whole Participant Pack for download on Recollective	Gathering reflections/ questions from the webinar Understanding that all these elements are important for a successful public dialogue.

Time	Agenda	Process	Expected Outcomes
		LF One final stress on the importance of attending all workshops & completing homework tasks – emphasise that the incentive payments are tied to completion. Our first workshop is on **Saturday 13th February 2-4:30pm**. Please come prepared to talk about this subject and the issues it raises. Arrive at 1:45 for the first workshop for a prompt 2pm start.	
Reflective task in own time	• Review all the webinar materials again including the two videos on screening and the vox pop films (optional) • Check the Jargon buster – any terms that you heard this evening that you'd like to add/ have further explanation on? • Look at the Fact Sheets clearly labelled 'What do we need to know about whole genome sequencing document?' • Add any further questions you have as a result of this evening (answers will go up on Recollective) • Prepare your thoughts on science and technology in healthcare – we're going to discuss this at the beginning of our next workshop.		

Workshop 1 process plan

Time	Agenda	Process	Expected Outcomes
2:00-2:15	Introductions & workshop purpose	Warm welcome to the first workshop, setting the tone for the session: LF: Hello and welcome to this first of four online public dialogue sessions exploring the implications of whole genome sequencing for newborn screening. Reminder of the information in the participant packs. In a moment we will look at what to expect for the next two weeks, but first, let's introduce the team who'll be with you: We'll use the 'pass the baton' approach: • Our name, our organisation and why we are here tonight. • Then pass the baton to the next person to introduce themselves. • You'll get a chance to introduce yourself when we go into our small groups. Asks UKNSC/ GEL, HVM team members and all observers to introduce themselves: • Name, organisation, role, passing the baton to the next team member • Shares this afternoon's programme • Shares the points to help the discussion previously shared with the participants in their packs • A reminder of the research question (will happen at each workshop)	Participants know the purpose and format of the workshop
	Menti.com	**Q1: What's the one main thing you remember from what was shared at the webinar?** And as we are going to be spending some time together, and it's good to know a bit about who we are talking to, please: **Q2: Write one short sentence about yourself** Just a few words with something you feel you can share with us about you, and/ or what you are interested in. Remember we'll be sharing our screen in a minute so make the sentence appropriate.	Get participants back into the space with reminders and information. Learn a bit about the people we're talking to.

Time	Agenda	Process	Expected Outcomes
2:15	Move to small groups – 3 groups of 7 participants each with a facilitator.		
2:15-2:35 (20 mins) 2:15-2:20 (5 mins) 2:20-2:35 (15 mins)	Warm-up discussion	**Recorder on** This afternoon is about explanations. Focus: WGS for newborn screening. But to start thinking about this more broadly we're going to talk about science and technology in health. Let's start with introductions: **1. Say hello to the group and briefly share one thing you are thinking about having reviewed our webinar materials in your homework.** **2. What are your views on where developments in science and technology in healthcare could take us as a society?** *Prompts* • Share examples of where you have felt science and technology in healthcare is developing in a way that gives you hope/ causes you concern ○ Prompt for wider tech/ science technologies ○ Prompt for genetic technologies ● • How hopeful are you about where science and technology in healthcare could take us? • What concerns do you have about where science and technology in healthcare could take us? *Note: Observe (but don't prompt) if knowledge of services such as ancestry or 23andme comes up (if so, provide comparison analogy e.g. Ctrl F search approach of these commercial operators vs full proof read of WGS)* This is an initial conversation – there will be more… **Recorder off**	Participants to get to know each other Build on what we learnt about people's views in the recruitment process. Facilitators scoping where participants are starting the process from in terms of sci/tech developments

Time	Agenda	Process	Expected Outcomes
2:35-3:05 (30 mins) 2:35-2:37 (2 mins) Speakers 8 mins + 1 min flexi per slot & per session 2:37-2:46 (9 mins) 2:46-2:55 (9 mins) 2:55-3:04 (9 mins)	Introductory presentations on WGS	**LF introduces more background on the project:** **Media slide:** Our discussions will help influence plans for a pilot of WGS for newborns, as covered in the press November 2019. **Your work here is important in shaping the thinking around this pilot.** **Genetics NHS timeline:** It's worth noting though that genetics and genomics isn't new to the NHS, as this timeline shows, it's been part of the NHS since its start in the 1940s... **LF introduces speakers & Records all presentations for playing at future sessions/ uploading to Recollective:** **Speaker 1:** Contextual information on what genetic information can and can't tell us at the moment, including information on diagnosing/ predicting single gene conditions, but not polygenic conditions and traits. **Southern England** Angus Clarke, Clinical Geneticist: Professor in the Division of Cancer & Genetics & (honorary) consultant in the All Wales Medical Genomics Service **Speaker 2:** Why are we discussing WGS in the context of newborn screening programmes? **Southern England** Professor Jim Bonham Director - Pharmacy, Diagnostics and Genetics, Newborn Screening Team, Sheffield Children's NHS Foundation Trust **Speaker 3:** 100,000 Genomes Project Participant Panel who has undergone a genome sequence/ or is the parent of someone who has - live as an example of how WGS can be used (it's not being used in newborn screening now) to diagnose someone who is ill. **Southern England** Dave McCormick, 100,000 Genomes Project Participant Panel Speakers briefed to refer to issues of consent and uncertainty which will come up in workshops 2 and 3.	Being clear what genetic information can/ can't do. Builds on the myth busting shared in the webinar. Initial understanding of the technology and the context of discussions.
3:05	Move to small groups		

Time	Agenda	Process	Expected Outcomes
3:05-3:15 (10 mins)	Gathering our questions	**Recorder on** **Q2: What questions do you want to ask at this point to clarify your understanding?** *Prompts:* • What's news to you? • What do you want to know more about? • Was anything unclear: language/terminology? (We'll add new terms to the jargon buster) • What did you find most interesting or relevant? • What did you find least interesting or relevant? What are the 2 main questions we want to explore with the whole group after the break? **Recorder off**	Questions generated around WGS, quick factual questions answered in group.
3:15	Return to main space to receive instructions about the break		
3:15 – 3:25 (10 mins)	Break		
3:25-3:50 (25 mins) 6 questions = just over 4 mins per response	Speaker panel	**Recorder on** LF go round each group. Ask one question first, then do a second round with the second question. Pick up questions that can be answered. Questions that can't be answered either for time/ content reasons will be responded to before the next workshop and answers shared on Recollective. Speaker panel respond to the questions **Recorder off**	Key questions answered, others to be answered in Recollective
3:50	Move to small groups		
3:50-4:25 (35 mins)	Testing initial views on screening use for population	**Recorder on**	Useful reminders that this is about whole population

Time	Agenda	Process	Expected Outcomes
	health and WGS sequencing in a screening programme to provide a diagnosis.	Exploring further the difference between population health screening – every newborn is offered the screening; and screening only those with an identified medical need e.g. displaying symptoms or family trait. When you think of what you've heard today, and knowing that WGS is not used in newborn screening at the moment: **Q: What do you feel are the important factors when you think about:** **1. Population health screening in general?** • What have you heard this afternoon that feels particularly significant about health screening? • What would you like to hear more about/ understand better? **2. Newborn screening in particular?** • What have you heard this afternoon that feels particularly significant about health screening in newborns? • What would you like to hear more about/ understand better? **3. Using whole genome sequencing for diagnosing illnesses or as a screening for population health?** • What have you heard this afternoon that feels particularly significant in the discussion about WGS for newborn screening? • What are your first thoughts on WGS as a tool? • First thoughts on advantages/ disadvantages. Facilitator to create a summary sheet of 3 main points to be shared on Recollective highlighting the advantages/ disadvantages of WGS for newborns as participants see them at this stage. To be shared on Recollective after the session. **Recorder off**	screening & differences between screening and testing. Looking at differences between screening for population health and screening for diagnosis. Surfacing initial thoughts.
3:50-4:00 (10 mins) 4:00-4:10 (10 mins) 4:10-4:20 (10 mins) 4:20-4:25 (5 mins)			

Time	Agenda	Process	Expected Outcomes
4:25	Recollective/ participant pack & menti	www.menti.com **Q1: One point you will take from this afternoon into our next workshop**	Understanding that all these elements are important for a successful public dialogue.
Reflective task in own time	Recollective	• Review the materials from this afternoon's discussion (optional) • Review the key points from each of the small group discussions • This video explains the genome and avoids the blueprint/instruction manual analogies: https://www.genomicseducation.hee.nhs.uk/education/videos/what-is-a-genome/ • Vivienne Parry video • A video to demonstrate that different countries have different approaches – Nick Meade summary of the international differences/ similarities to the UK with clear visual slide to accompany it. More contextual information on European data • Review the case studies (CF/ DMD/ FH) • Evaluation	

Workshop 2 process plan

Time	Agenda	Process	Expected Outcomes
6:00-6:10	Introductions & workshop purpose Menti.com	Warm welcome to the second workshop, setting the tone for the session: LF: Hello and welcome to this second of four online public dialogue sessions exploring the implications of whole genome sequencing for newborn screening. Reminder of the information in the participant packs and what we've seen so far. In a moment we will look at what to expect this evening and future workshops, but first, let's anyone new to the workshop: • Name, organisation and why they are here tonight. • Then pass the baton to the next person to introduce themselves. • Shares this evening's programme • Shares the point to help the discussion previously shared with the participants in their packs • A reminder of the research question (will happen at each workshop) **Q1: One point you took from the video on international examples of newborn screening.**	Participants know the purpose and format of the webinar Understand what participants took from their homework
6:10-6:15	Reminder of the current screening test	Quick catch up on what's been reviewed in the homework. Clear and consistent reminder of differences of WGS as a potential tool for newborn screening, and what newborn screening currently involves. This evening our workshop is focused on WGS as an addition to/ replacement for newborn screening.	Reminders of where we are and what's in the pack to help.
6:15-7.10 (55 mins) 6:15-6:20 (5 mins)	Implications Live speaker presentations	LF introduces speakers. Reminder to use packs to note down questions/ comments you have as speakers are presenting. **Speaker 1 Cystic Fibrosis:** Case study: What could be the implications of using WGS for cystic fibrosis screening? **Southern England**	Understanding of what happens in newborn screening – diseases in/ not in the current screening programme. Clarity on the fact that its not as simple as

Time	Agenda	Process	Expected Outcomes
6:20-6:29 (9 mins) 6:29-6:36 (7 mins) 6:36-6:45 (9 mins) 6:45-6:52 (7 mins) 6:52-7:10 (18 mins)		• Lorna Allen, PPI Co-ordinator CF Trust **(Film)** and Paula Sommer, Head of Research, CF Trust; • Professor Kevin Southern, Professor of Child Health, University of Liverpool **Speaker 2 Duchenne Muscular Dystrophy:** Should we use WGS to screen for a wider range of childhood diseases? The example of Duchenne Muscular Dystrophy **Southern England** • Alex Clarke, Duchenne UK, father of Ben; • Stuart Moat, Professor & Consultant Biochemist, Director Wales Newborn Screening Laboratory at Cardiff & Vale University Health Board **(Film)** **Speaker 3 – exploring uncertainty, understanding penetrance and consent.** Views on what WGS would do/ could not do for both these situations. **Southern England** • Sean James Film (6:51), Arden Tissue Bank Manager & Genomics Ambassador West Midlands South **(Film)** • Participants – take a moment. You've been writing questions/ comments in your packs. Now put one of those in the chat. We'll give you a moment to do that. Now drawing on the chat we'll pull out some key points made and ask our panel of speakers to respond.	whether you test for a gene for CF or not. Even with CF gene mutations, which are among the best understood, there is still a level of uncertainty and error in results.
7:10 – 7:20 (10 mins)	Break		
7:20	Move to small groups		
7:20-7:55 (35 mins)	Exploration of key questions on comparisons between WGS as a tool/ current screening	**Recorder on** Thinking over all we've heard so far we'd like to explore the implications for the child, family and NHS of using WGS in newborn screening. We've looked at how this might affect the current screening programme, and what it could mean for the kinds of conditions we screen for in future. We will look at this in the context of another example of a genetic condition - familial hypercholesterolemia – which we don't currently screen children for.	Understanding some of the implications of using WGS in newborn screening.

Time	Agenda	Process	Expected Outcomes

7:20-7:25
(5 mins)
 	
7:25-7:35
(10 mins)
 	
7:35-7:55
(20 mins)
		You were shown scenarios in your packs, and you looked at them in the homework. We aren't going to run through them in detail, but I'm just going to share my screen so you can be reminded of what you saw there – then we'll discuss them in relation to the speaker presentations we've just heard:
		Scenario 1: Cystic Fibrosis slides – identifying more gene glitches associated with CF, but creating more uncertainty for some people.
		
		1. **Scenario 2:** Duchenne Muscular Dystrophy – the pros and cons of getting a diagnosis early in life
		•
		2. **Scenario 3:** Familial hypercholesterolemia – screening children for the benefit of the whole family. **Note**: the point of this example is to test the concepts of a) testing a child and using the results to help others in the family, b) testing a child when not much can be done in terms of treatment until the child is older.
		
		Discussion on the implications of these scenarios.
		Q: What are the implications/ advantages/ disadvantages you've heard within the presentations and these scenarios?
		Group to create a list of points. Facilitator to pull out:
		• Implications
		• Advantages
		• Disadvantages
		
		Q: What could matter most when using WGS in newborn screening?
		Prompts – to be used as necessary – including why?:
		• Early diagnosis of illness
		  ○ To what extent would this help when there is no long term treatment?
		  ○ What uncertainties/ dilemmas could come from this?
		  ○ What does that mean for the baby, the family, society?
		• To have really certain results – why? What level of uncertainty would be acceptable?	

Time	Agenda	Process	Expected Outcomes
		• To not miss any cases of a disease at the newborn stage – why? • Ensuring people can make informed choices? Which is part of treating people with respect and honesty • Ensuring we have the skills and resources in the healthcare system to support people who get positive results? • Ensuring people benefit equally and fairly from this? • The benefits/ harms to the baby being screened • The benefits/ harms to the family • Implications to the NHS (capacity to support families who need it) **Recorder off**	
7:55	Move to main space		
7:55-8.02 (7 mins)	Introducing the carriers dilemma and cultural implications	LF to introduce the film **Filmed presentation:** Mavis Machirori, Research Fellow in health and genomics data (uses, governance, practices, societal impact) Kerry Leeson-Beevers, Breaking Down Barriers LF asks participants for questions and comments prompted by film on carrier status: Observers present answer where possible. Other questions noted for response on Recollective before next session.	Understanding of carrier status implications.
8:02	Move to small groups		
8:02-8:25 (23 mins) 8:02-8:15 (13 mins)	Exploration of the carriers dilemma and cultural implications	**Recorder on** **Q: What are the implications around ethnicity for WGS in newborns?** *Prompts – to be used as necessary – including why?:* • Concentration of genomics in predominantly European/global north countries? • Other ethnic backgrounds, less is known about mutations? Left in limbo? • Different certainty rates European vs Black African ethnicity • Pharmacogenetics less applicable?	Explored the implications of carrier status and cultural implications around using WGS in newborn screening

Time	Agenda	Process	Expected Outcomes
8:15-8:25 (10 mins)		• Stigma of being diagnosed? • Later in life, move to another country with different health service? **Q: What are the implications around carrier status for WGS in newborns?** • Carrier status: when to tell the child? • Child's reproductive status: right for parent's to know? • Support for family members with/without condition/carrier status? • Accuracy of test? • Paternity questions? • Information changes over time as more is learnt?	
8:25	Recollective/ participant pack & menti	www.menti.com **Q1: Share one important consideration that you heard this evening on using WGS in newborn screening.**	How this workshop feeds into the next
Reflective task in own time	Recollective	• Watch extended films from Mavis Machirori – make any additional comments • Review points made this evening in each of the groups, and compare with your own group notes • Look forward to workshop 3 by reviewing the case study material: pharmacogenomics/ life course • Continue to add to the jargon buster as needed	

Workshop 3 process plan

Time	Agenda	Process	Expected Outcomes
2:00-2:10	Introductions & workshop purpose Menti.com	Warm welcome to the third workshop, setting the tone for the session: LF: Hello and welcome to this third of four online public dialogue sessions exploring the implications of whole genome sequencing for newborn screening. Reminder of the information in the participant packs and what we've seen so far. In a moment we will look at what to expect for today/next workshop, but first, let's introduce any new people in the workshop: • Name, organisation and why we are here this afternoon. • Shares this afternoon's programme • Shares the point to help the discussion previously shared with the participants in their packs • A reminder of the research question (will happen at each workshop) **Q1: Fill the blank: Right now, I feel _____ about WGS for newborns** **Q2: One question I have about WGS for newborns is _____?**	Participants know the purpose and format of the webinar Understand where participants are in their thinking
2:10-2:15 (5 mins)	Reminder of the current screening test	**LF:** 1. Re-cap on what we've covered so far 2. Quick catch up on what's been reviewed in the homework. This afternoon our workshop is focused on the potential novel medical uses of WGS in newborns beyond traditional screening and for different purposes. Introduce the life course diagram. Also in the participant packs – building on the point discussed since workshop 1 that WGS in newborn screening will not only have implications for the newborn, but also the family and wider society. There are also implications throughout the life course.	Reminders of where we are and what's the in the pack to help.

Time	Agenda	Process	Expected Outcomes
2:15-3:00 (45 mins) 2:15-2:20 (5 mins) 2:20-2:30 (10 mins) 2:30-2:40 (10 mins) 2:40-3:00 (20 mins)	Implications – speaker presentations	LF to introduce speakers/ film clips. Reminder to use packs to note down questions/ comments you have as speakers are presenting Drawing on how data is currently secured in the 100k genomes project. We are talking about data security and storage because we are looking at examples which might access data collected using WGS at newborn screening throughout life. The data could be stored unanalysed until needed. **Film 1**: Intro to Data Security: Simon Wilde **Film 2:** 100,000 genomes project **LF introduces speakers & Records all presentations for playing at future sessions/ uploading to Recollective:** **Film 3:** A presentation on the life course diagram. The ethical dimensions raised by WGS (as we saw in context 1) when you think of the genome sequence being viewed as a resource accessed at particular times in life rather than disclosed all at once. Understanding that other factors are at play here and that genetics can't provide all the answers. **Southern England**: Film of Anneke Lucassen **Speaker 1:** Picking up the workshop 2 discussion on consent/informed choice. The variations on consent. The implications in newborn screening when the person being screened cannot consent. **Southern England**: Stephanie Hart, Genomics Councillor at Leeds Teaching Hospitals NHS Trust Participants – take a moment. You've been writing questions/ comments in your packs. Now put one of those in the chat. We'll give you a moment to do that. Now drawing on the chat we'll pull out some key points made and ask our panel of speakers to respond.	Exploring the dilemmas that arise from context 1 but lead us into context 2.

Time	Agenda	Process	Expected Outcomes
3:00	Move to small groups		
3:00-3:30 (30 mins)	Concluding context 1 discussion	**Recorder on** Given what you have heard in previous sessions and in today's presentations: **Q: What do you consider are the implications of using WGS in newborn screening versus screening at other stages in life?** Drawing out more on implications for newborn/ family and society at different life stages. 1. Summarise the advantages and disadvantages (list on screen) 2. Consideration of what genetics can/ can't do and the implications of WGS further 3. Exploring external/ environmental factors on our health and behaviour *Prompts:* • What are the specific implications in your view for newborn screening which will only be fully understood as the child grows up? • What about other family members? There might be implications for them in the screening information returned… • What approaches would work? • What feels acceptable? • What does not feel acceptable? • What are the trade-offs here e.g. maximising the health benefits of WGS at birth vs respecting a child's right to privacy and to make their own choices later in life? • **Main prompts** 'Why?' 'What makes you say that?' 'You said 'xxx' – can you tell me more?' **Recorder off**	Thinking about WGS over a life course.
3:30 – 3:45	Break		
3:45-4:05 (20 mins)	Introduction to the scenarios	Presentation on the scenarios that are drawn from novel uses of WGS. Participants have read these in the homework, so this is not a detailed run-through. Please use the Chat to highlight any questions/ comments you have.	Understanding that there are uses for WGS which have implications beyond indicating potential

Time	Agenda	Process	Expected Outcomes
		We've discussed how WGS could be used in newborn screening to benefit the baby being screened. In principle, there are other ways that the information from a baby's genome could be used for good once it has been sequenced. For example, the information could be used to personalise any medicines the child might need throughout his or her life (pharmacogenomics), to identify and treat conditions that others in the baby's family have or may develop; to help families make choices about how they care for their child and choices around having more children; and for wider medical and scientific research into genetic conditions. These all have implications which we'll explore in our discussions. *Fs take turns to present each one – remembering not to read all of it, it's just the highlights.* **Case study 1: Reproductive choice/family planning:** Sickle Cell Break up with quick questions drawn from the chat. **Case study 2:** Pharmacogenomics and the life course which looks at examples for: • Reaction to aminoglycosides (newborn screening) • Psychotic reactions to cannabis (early teens) • No protective benefit from aspirin for blood clots (adults, early 60s) Break up with quick questions drawn from the chat. **Case study 3:** WGS and adult onset conditions: • Breast Cancer • Alzheimer's Disease **Case study 4:** Icelandic study - whole population genome sequencing to create a resource for research. Because of its relative isolation and the 'founder effect' (much of the population descending from a small number of people several hundreds of years ago) the population has similar genetic traits, so rare diseases show themselves more readily. Currently running studies on conditions such as Alzheimer's and heart disease.	illness. Implications for families and society as well as the individual.
4:05	Move to small groups		

Time	Agenda	Process	Expected Outcomes
4:05-4:55 (50 mins) 4:05-4:30 (25 mins) 4:30-4:50 (20 mins) 4:50-4:55 (5mins)	The implications and trade-offs	**Recorder on** Thinking across each of these four case studies – let's explore the implications for other uses of WGS from newborn screening: **Q: What benefits/ harms do you see here – for:** • The individual? (across the life course, including adult onset conditions such as Alzheimer's) • Parents/ families? Prompt for reproductive choices (parents/ child in the future) • Society? (research uses/ understanding disease/ planning for public health) **Q: What are the considerations for the individual in these contexts?** Draw up a list of 'considerations' in the views of participants. e.g. Privacy/ having control over your own life **Q: How do these compare with broader public health implications?** e.g. improved public health / cost / access / equality and fairness Create summary sheet: 1. Main benefits and harms 2. Balance and trade-offs between the individual and wider society needs, benefits and harms. We'll put these up on Recollective so you can review/ add to your own group's summary sheets as well as seeing what the other groups discussed. **Recorder off**	
4:55	Move to main space		
4:55-5:00 (5 mins)	Recollective/ participant pack & menti	www.menti.com **Q1: Share one thing you have found important about this afternoon's discussion**	Summary of participant understood implications

Time	Agenda	Process	Expected Outcomes

Reflective task in own time	Recollective	• Review the key points from the presentations and all the scenarios since workshop 2
		• Catch-up on any of the stimulus you'd like to revisit before the final session
		• Create a record (could be a video clip you record on your phone) of the points you think are important when considering WGS for newborn screening. Include your initial thoughts on:
		  ○ The potential benefits of WGS for newborn screening
		  ○ The potential harms
		  ○ Wider implications (participants may bring in questions of employment/ insurance/ industry involvement)	

Workshop 4 process plan

Time	Agenda	Process	Expected Outcomes
6:00-6:10	Welcome & workshop purpose Menti.com	Warm welcome to our fourth and final workshop, setting the tone for the session: LF: Hello and welcome to this final online public dialogue session exploring the implications of whole genome sequencing for newborn screening. Reminder of the information in the participant packs and what we've seen so far. Introduce NSC/GEL representatives who will listen to and respond to our final discussions on our aspirations/concerns/suggestions for WGS in newborn screening and other uses. • Shares this evening's programme • Shares the points to help the discussion previously shared with the participants in their packs • A reminder of the research question There are two questions in this Menti: one asks for your hope, the other for your fear. You can respond to both or either/or: **Q1: Share one hope you have right now for WGS in newborns** **Q2. Share one concern you have right now for WGS in newborns**	Participants know the purpose and format of the webinar Understand where participants are in their thinking
6:10-6:35	Reminder of topics covered in webinar & workshops 1-3 & recollective	**LF:** Reminder of our key facts document – in the pack, highlighting main differences of WGS from conventional screening. 1. Re-cap on what we've covered so far 2. Quick catch up on what's been reviewed in the homework As I give the next presentation please use the Chat to highlight things you'd like to discuss as a whole group before we go into detailed discussions in our small group. Presentation on what you've said to us so far in relation to WGS in for newborn screening - Summary of:	Reminders of where we are and what's the in the pack to help.

Time	Agenda	Process	Expected Outcomes
		• Advantages/ disadvantages • Trade-offs • Dilemmas As raised by participants. Stress this is not to limit or constrain what you do this evening – but please build on and develop these findings. Draw out comments in the chat and revisit as necessary, drawing on speakers as needed.	
6:35-6:40 (5 mins)	Briefing on considerations for pilot programme	LF: As you know our work together in these workshops will influence how a pilot for WGS in newborns is carried out. To help us draw together our thinking, in the next small group discussion we will be thinking about what you would say to those developing a pilot programme: • Our aspirations / concerns / expectations? • How to maximise the benefits? • How to minimise the harms? • What else is important e.g. informed choice, respect, equality, fairness? • Important to remember that different views are fine – important to show where we agree and where we differ.	Understand final task of aspirations/ concerns/ expectations
6:40	Move to small groups		
6:40-7:30 (50 mins) 6:40-6:50 (10 mins)	Small group discussion on aspirations, concerns and minimizing harms/ maximising benefits	**Recorder on** **F: Q1: What are our aspirations for WGS in newborns? And for other uses beyond birth?** • Group to create list of aspirations • Build on advantages presented back to the group from their earlier discussions *Prompts* – to be used as necessary: • What specific aspirations do you have for this as a population screening programme (rather than an individual diagnostic test) • for research • for early diagnosis	Long list of aspirations/ concerns/ expectations

Time	Agenda	Process	Expected Outcomes
6:50-7:00 (10mins) 7:00-7:15 (15mins) 7:15-7:30 (15mins)		• for enabling individuals and families to plan for the future • for reproductive choice decisions for parents based on the results? **Q2: What are our concerns for WGS in newborns? And for other uses beyond birth?** • Group to create list of concerns *Prompts* – to be used as necessary: • Are there any specific concerns for this as a population screening programme (rather than an individual diagnostic test) • For informed choice (parents and child, later) • For data privacy • for research • in terms of discrimination • In relation to uncertainty – what level of uncertainty is acceptable • Costs to the NHS • Not being able to support all the people who have a glitch identified from the WGS screening programme • Issue around employment • Issues around lifestyle choices • **Q3: Given our concerns: how can harms be minimised?** *Prompts* – to be used as necessary: • safeguards: regulations/ legislation/service provision/advice & guidance / communication & information/public engagement: individuals/families/wider society/NHS/government/others? • How to tackle uncertainty • Are there any red lines? **Q4: Given our aspirations: how can benefits be maximised?** • Prompts as above, plus e.g. access to research, national/international collaboration? **Recorder off**	

Time	Agenda	Process	Expected Outcomes
7:30 – 7:40 (10 mins)	Break		
7:40-8:05 (25mins) 7:40-7:50 (10mins) 7:50-8:05 (15mins)	Prioritise / Summarise aspirations/ concerns/ expectations	**Recorder on** F: Review notes from previous session with participants and and add any final comments. **Q5: Given what we have discussed this evening, what do those developing the pilot programme for WGS in newborn screening need to keep in their minds?** Create a PP slide to share. Ask for participant volunteers to feedback **Recorder off**	Three points to share with whole group
8:05	Move to main space		
8:05-8:25 (20 mins) 3-4mins for each group 5mins response GEL/NSC	Share three concluding points from each group & response from GEL/NSC	LF: Asks each group to feedback three concluding points from their discussions. PP Slides Briefly respond to the main themes heard from the presentations – how will this affect what GE/ UKNSC do next? **Southern England:** Vivienne Parry, Head of Engagement, Genomics England Catherine Joynson, Ethics & Stakeholder Engagement Consultant PHE Screening / UK National Screening Committee Describe what will happen next, when, who's involved and how participants can stay in touch with progress.	Clarity on what happens next
8:25-8:30 (5 mins)	Menti	www.menti.com **Q: A final message to Genomics England/UK National Screening Committee designing the WGS for newborn screening pilot…**	Final thoughts shared

Time	Agenda	Process	Expected Outcomes
8:30	Thank you & goodbye	Thank everyone for taking part. Staying on Zoom for a few minutes if participants have any final questions/comments.	

Annex 2: Stimulus materials

1. Jargon buster

- Here are some words and phrases that might come up in our discussions with a brief explanation of what they mean.
- You do not have to learn the words or work on them before taking part! You can refer to them as and when you need to.
- Underlined words are those that feature elsewhere in the jargon buster.
- We will have advisers to answer questions you raise in the workshops.
- We will add any other words or phrases that come up during the process that need a definition.

Carrier Some diseases involve inheriting a gene glitch from both parents. If you only inherit the glitch from one parent, you won't have the disease, and you are considered to be a 'carrier' of the glitch because you can pass it on to any children you might have.

Chromosomes Genes are arranged on structures called chromosomes. Humans have 23 pairs of chromosomes. Each parent contributes one chromosome to each pair so that offspring gets half of their chromosomes from their mother and half from their father. [1]

DNA The genetic instructions used in the development, functioning and reproduction of all known living organisms. [2]

Expressivity The degree to which a genetic glitch is 'expressed' or shown in a trait. For example, some people with the rare genetic condition Marfan Syndrome simply have long fingers and toes. Others with the condition have more serious problems with their bones, eyes, and heart and blood vessels. Expressivity means that even if a gene glitch has 100% penetrance - which means that everyone who has the glitch also has the trait - it can still be possible for people with the glitch to have different versions of the trait (some might have a mild version and some might have a severe version).

Gene A length of DNA that codes for a specific protein. So, for example, one gene will code for the protein insulin. Humans have around 20,000 to 30,000 genes. [1]

Genetics Of or related to genes. Genetics looks at a single gene: what it is and how it works. See also genomics, these words are often used interchangeably. [3]

Gene glitch A variation in a DNA sequence. Glitches are relatively common in our DNA, and many have no detectable effect. Some variations are responsible for inherited conditions such as cystic fibrosis. [3]

Genetic inheritance The process by which genes and characteristics are passed down from parent to offspring. [3]

Genetic pedigree A diagram, like a family tree, that shows the inheritance of a trait or disease though several generations. The pedigree shows the relationships between family members, and helps doctors decide whether some family members might be carrying a gene glitch even if those family members do not have the related trait (this can happen if the person is a carrier, or it can happen because of the penetrance or expressivity of the gene glitch). [1]

Genetic testing A general term used to describe tools for identifying a person's DNA, genes and chromosomes. [3]

Genome The complete set of genetic material that makes up a living organism. In humans this means all 23 pairs of chromosomes and the genetic material they contain. Only around 2% of the human genome is made up of genes that code for specific proteins. The rest is made up of non-coding DNA sequences. [4]

Genomics Looks at all genes and how they work together to identify their combined influence on the body. See also genetics, these words are often used interchangeably.

Genetic mutation see glitch

Genetic sequencing A tool for determining the pattern of a person's DNA. [3]

Newborn blood spot test Every baby is offered newborn blood spot screening, also known as the heel prick test, ideally when they're 5 days old. The test involves taking a blood sample to find out if the baby has any of 9 rare but serious health conditions. [5]

NHS health screening A way of identifying apparently healthy people who may have an increased risk of a particular condition. The NHS offers a range of screening tests to different sections of the population at different points in their lives. For example, newborn babies are offered a test for nine serious health conditions. Women aged 50 to 70 are offered screening to detect early signs of breast cancer. [6]

Penetrance Describes how likely a person with a particular gene glitch will show the trait it is associated with. Complete penetrance means everyone with the gene glitch will have the trait. The gene glitch that causes Huntington's disease has complete penetrance. A gene glitch with 50% penetrance means half of people with the glitch will show the trait (see expressivity).

Pharmacogenomics (also called pharmacogenetics) Personalised drug therapies – looking at the genetic factors which might make people react differently to medicines such as penicillin or aspirin and tailoring the treatment to the response they are likely to have. [3]

Proteins Are large, complex molecules that play many important roles in the body. They are required for the structure, function, and regulation of the body's tissues and organs. [1]

Trait A trait is a characteristic of a living organism, such as their appearance, health and personality. Traits can be determined by genes or the environment, or more commonly by interactions between the two. [1]

Whole genome sequencing (WGS) A type of genetic sequencing used to map out a person's entire genome. [4]

References

[1] National Human Genome Research Institute Talking Glossary
[2] Wellcome Trust emerging science and technologies
[3] yourgenome.org Glossary
[4] Genomics Education Programme
[5] NHS Newborn Blood Spot Test
[6] NHS Screening

2. What do we need to know about whole genome sequencing?

Here is some information that will find helpful in our discussions:

- You do not have to learn this before you take part. You can refer to this document in the homework space whenever you need to.
- We will have advisers to answer questions you raise in the workshops
- The words underlined here are explained in the Jargon Buster

1. What's a genome?

- Your genome is your complete set of genetic instructions. It contains some of the information needed to build 'you' and allow you to grow and develop, alongside environmental factors: for example diet, childhood experiences and lifestyle choices.
- You have a copy of your genome in almost every cell in your body.
- Your genome is made of DNA and is written in DNA's special code – 3 billion letters of it
- This code can be read, letter by letter, using a technique called sequencing

2. How do you sequence a genome?

- DNA can be extracted from a sample of blood or saliva
- Sequencing takes 2 days and costs less than £600
- It is getting faster and cheaper to do this all the time
- Sequencing is the first step, after that there is a lengthier process of understanding what the sequence tells us about implications for our bodies and our health.

3. Why use whole genome sequencing (WGS)

- In your genome you have about 20,000 genes which are specific instructions
- The sequence of genes, and their place on the genome, is known but we don't know what they all do
- Your genome is nearly the same as another person's – but every person has millions of differences
- Most differences are harmless – they are the reason we're all different from each other
- But some differences could cause a disease
- Understanding these differences or glitches can be important for individuals, families and society

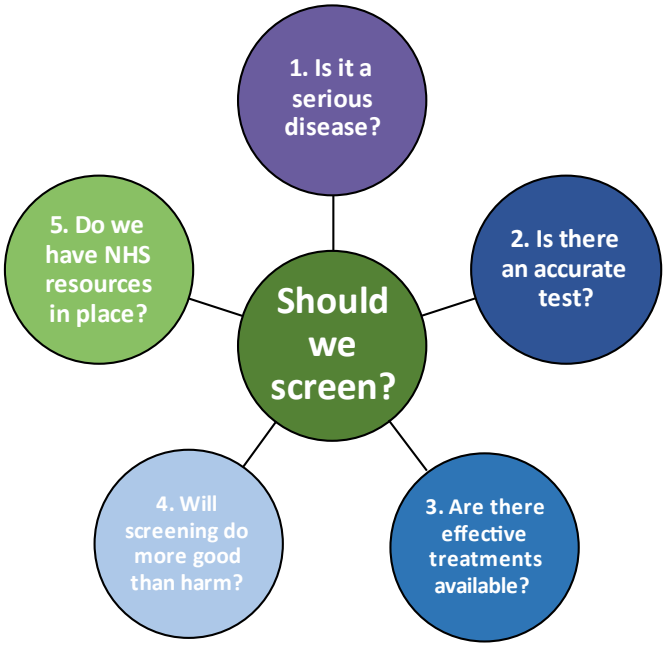
4. What's the potential for using WGS in newborn screening?

- There are advantages and disadvantages in the possibility of using WGS in newborn screening. This is why we are talking to you - to find out what you think.
- We also want to carry out a pilot programme of WGS screening in newborns to examine the scientific and medical impacts as well as the ethical, social and economic implications.
- We think the biggest potential is in finding children with rare genetic conditions so we can do something to help them now.

What diseases to screen for: how is that decided?

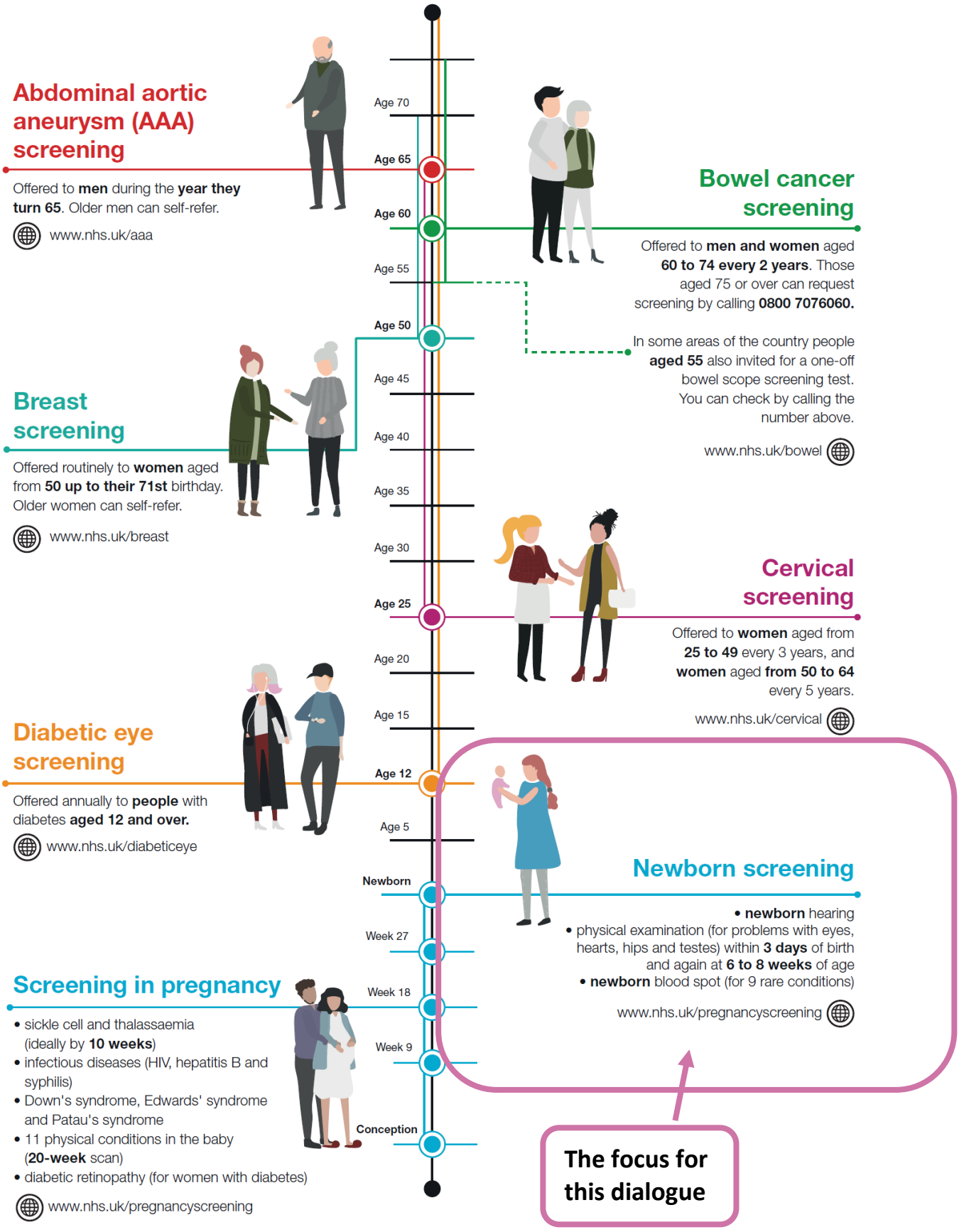
The UK National Screening Committee advises ministers on what diseases we should screen for and when.

Its advice is based on internationally recognised criteria and a thorough review of research evidence.



NSC UK National Screening Committee

Creating Connections Hopkins Van Mil


Abdominal aortic aneurysm (AAA) screening
Offered to men during the year they turn 65. Older men can self-refer.
www.nhs.uk/aaa
Age 70
Age 65
Age 60
Age 55
Age 50
Age 45
Age 40
Age 35
Age 30
Age 25
Age 20
Age 15
Age 12
Age 5
Newborn
Week 27
Week 18
Week 9
Conception
Bowel cancer screening
Offered to men and women aged 60 to 74 every 2 years. Those aged 75 or over can request screening by calling 0800 7076060.
In some areas of the country people aged 55 also invited for a one-off bowel scope screening test. You can check by calling the number above.
www.nhs.uk/bowel
Breast screening
Offered routinely to women aged from 50 up to their 71st birthday. Older women can self-refer.
www.nhs.uk/breast
Cervical screening
Offered to women aged from 25 to 49 every 3 years, and women aged from 50 to 64 every 5 years.
www.nhs.uk/cervical
Diabetic eye screening
Offered annually to people with diabetes aged 12 and over.
www.nhs.uk/diabeticeye
Newborn screening
• newborn hearing
• physical examination (for problems with eyes, hearts, hips and testes) within 3 days of birth and again at 6 to 8 weeks of age
• newborn blood spot (for 9 rare conditions)
www.nhs.uk/pregnancyscreening
Screening in pregnancy
• sickle cell and thalassaemia (ideally by 10 weeks)
• infectious diseases (HIV, hepatitis B and syphilis)
• Down's syndrome, Edwards' syndrome and Patau's syndrome
• 11 physical conditions in the baby (20-week scan)
• diabetic retinopathy (for women with diabetes)
www.nhs.uk/pregnancyscreening
The focus for this dialogue

The Blood Spot Test

Every baby born in the UK is offered newborn blood spot screening, otherwise known as the heel prick test, usually when they are 5 days old to find out if they have one of 9 rare health conditions.

When parents are offered newborn blood spot screening for their baby, they receive a pre-screening leaflet and discuss it with their midwife to help them make an informed choice. Parents are then asked to give consent to screening.

Blood spot cards can be **stored for at least 5 years**.

They may be used:

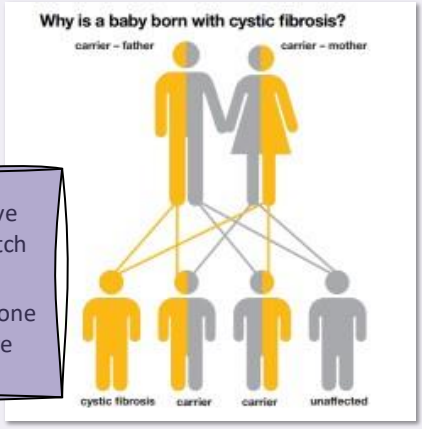
- to double check your baby's screening result
- to carry out other tests recommended by a doctor
- to investigate genetic diseases that run in your family
- to improve the newborn-screening programme
- for research to help improve the health of other babies and their families in the UK

- Steps are taken to keep personal information linked to the blood spot card private
- If blood spots are used anonymously in research, identifying info is removed
- Where blood spots are identifiable and used for research **that a parent or patient has given their consent to**, steps are taken to protect confidentiality
- Research must get **ethical approval** from a medical research ethics committee.
- Parents have the option of whether or not they want to receive invitations to take part in research in the future

What is **cystic fibrosis…?**

- Cystic fibrosis causes sticky mucus to build up in the lungs and digestive system
- Symptoms usually start in early childhood
- About half of people with cystic fibrosis will live past the age of 40

- People with cystic fibrosis have inherited a copy of a gene glitch from both of their parents
- 'Carriers' have inherited just one copy of the gene glitch and are unaffected



UK Facts & Figures…

- 1 in every 2,500 babies born has cystic fibrosis
- It's estimated around 1 in every 25 people in the UK are carriers of cystic fibrosis

How do we screen for cystic fibrosis in the UK at the moment…?

- All parents of newborn babies are offered screening for cystic fibrosis as part of the newborn blood spot test– this measures a chemical which is higher in babies with cystic fibrosis.
- If the results from that sample suggests a child may have cystic fibrosis, additional genetic tests are then carried out on the same sample Around 1 in 200 babies have this additional genetic testing.
- These follow-up tests involve looking at four gene glitches that most commonly cause cystic fibrosis. Depending upon these results, the sample is then tested for a further50 gene glitches if needed.

- Sometimes the midwife will need to visit the family's home to take a second blood test.
- Using these tests, each year:
  - 250 babies are identified as 'cystic fibrosis suspected' and referred to specialist doctors
  - 200 babies are identified as cystic fibrosis carriers – this is not an intention of screening, but a by-product of current tests
  - 20-30 babies have an 'inconclusive diagnosis' where it's very unlikely they will ever develop cystic fibrosis, but their test results mean this can't be ruled out completely.

What could genome sequencing mean for cystic fibrosis screening…?

Depending on how the test was set up, it could mean:

- A much larger number of gene glitches could be included in the follow-up tests
- We could avoid identifying carriers of cystic fibrosis
- We could reduce the number of babies given an 'inconclusive diagnosis' with an uncertain outcome
- Far fewer babies would need to have a second blood test
- But if we did all this, the screening programme might miss a few babies with cystic fibrosis

Genetic research and CF

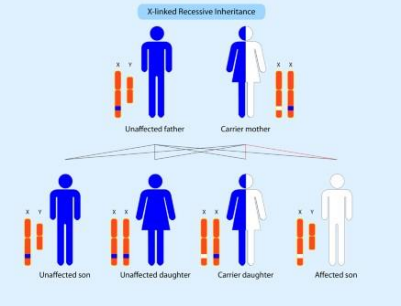
- We're learning more all the time about the health effects of different cystic fibrosis gene glitches. These can range from infertility to a severely affected child with reduced life expectancy.
- The ethnic origin of a person can influence which glitches are most common. Currently, we don't know enough about this to design a test that fully reflects the ethnic diversity of the UK population, but genome sequencing could help extend the range of glitches identified
- Treatments for different gene mutations are being developed– so the results of the genetic test could influence the treatment a person receives

NHS public health manager on using genome sequencing in cystic fibrosis screening…

- What is the effect of knowing you or your child is a carrier?
- Is reducing the number of babies being given an inconclusive diagnosis worth the trade off of missing some CF cases altogether?
- Do we have enough specialist healthcare professionals to talk parents through their results?
- We could avoid identifying carriers of CF: how will parents react to that?
- How can we ensure genetic screening works well for everyone in the population?
- How can we make sure parents make informed decisions about whether to have screening or not?
- Can we ask parents to consent to some information from their baby's genome being used in research?
- Reducing the number of times a blood sample has to be taken from a baby is better for everyone, right?
- New gene-based treatments and therapies can be expensive. How do we ensure fair access to them?
- What is the effect of having an inconclusive diagnosis on families?

What is **Duchenne Muscular Dystrophy…?**

- Muscular dystrophies (MD) are a group of genetic conditions that gradually cause muscles to weaken, leading to an increasing level of disability
- Duchenne MD (DMD) is one of the most common and severe forms of MD, it usually affects boys in early childhood
- People with the condition will usually only live into their 20s or 30s
- It is usually inherited through a carrier mother

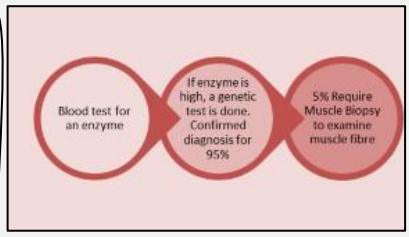


UK Facts & Figures…

- About 150 boys with DMD are born in the UK each year
- For the general population, the risk of having a child with Duchenne muscular dystrophy is about one in every 3,500-5,000 male births
- There is no cure for MD, but treatment can help to manage symptoms

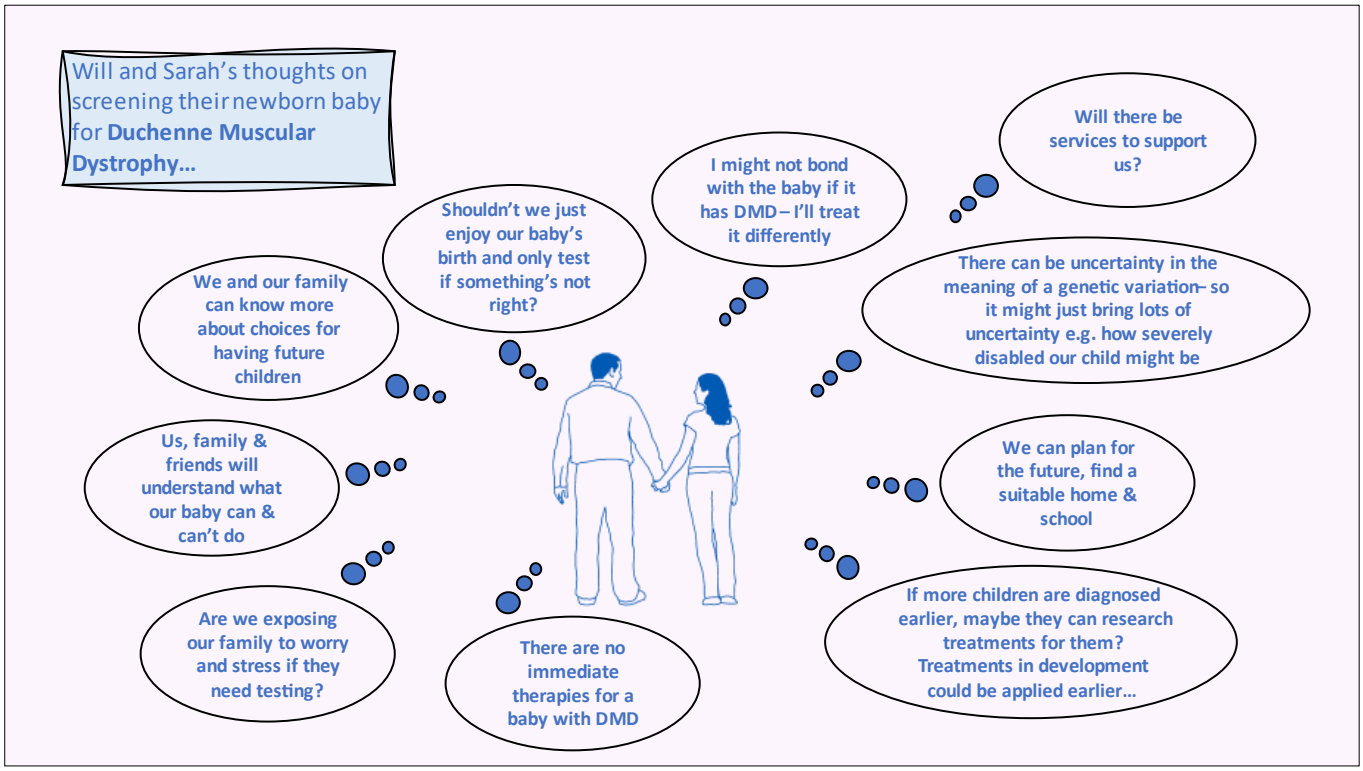
What is the current test for Duchenne Muscular Dystrophy..?

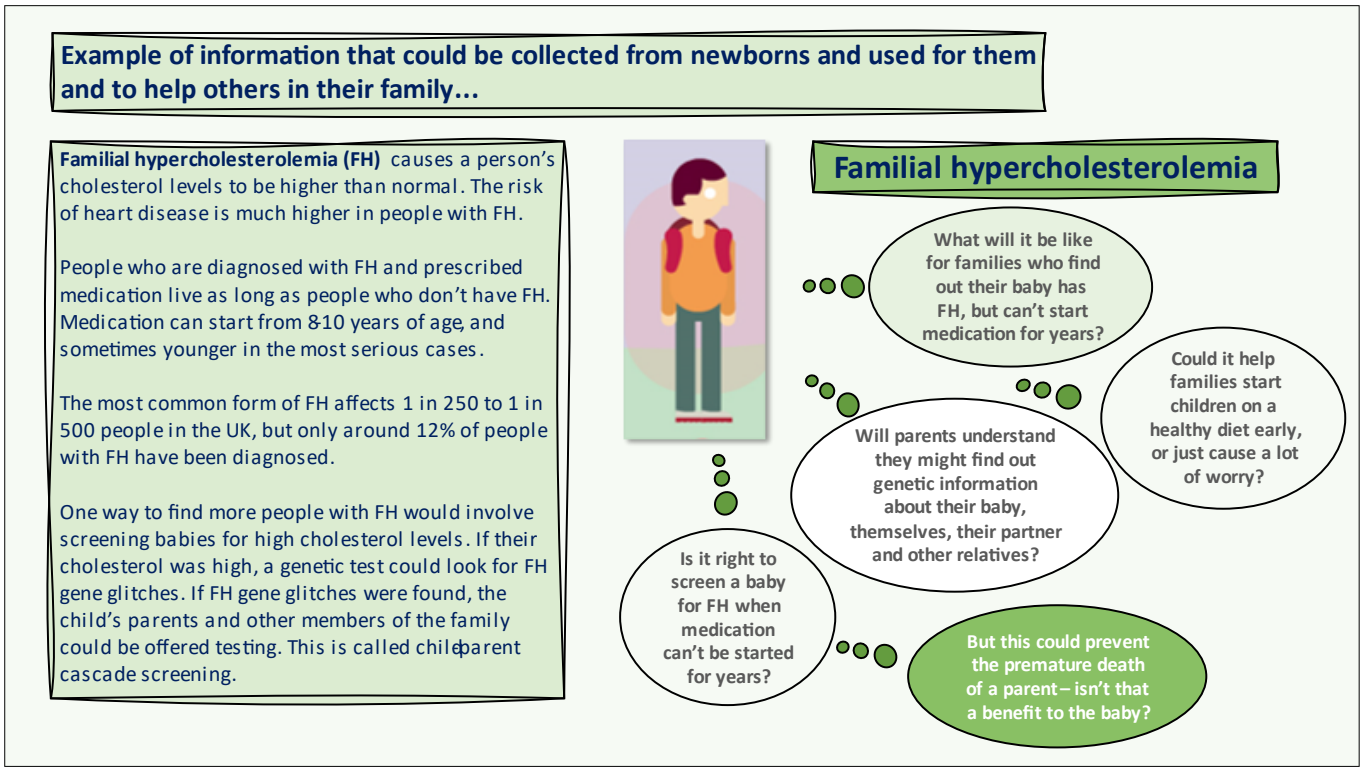
- DMD is not screened for at birth in the UK
- Average age of diagnosis is 3-5 years old
- Early signs are struggling to stand up and difficulty walking, but these can be assumed by parents/health professionals to be just slower than average physical development or laziness



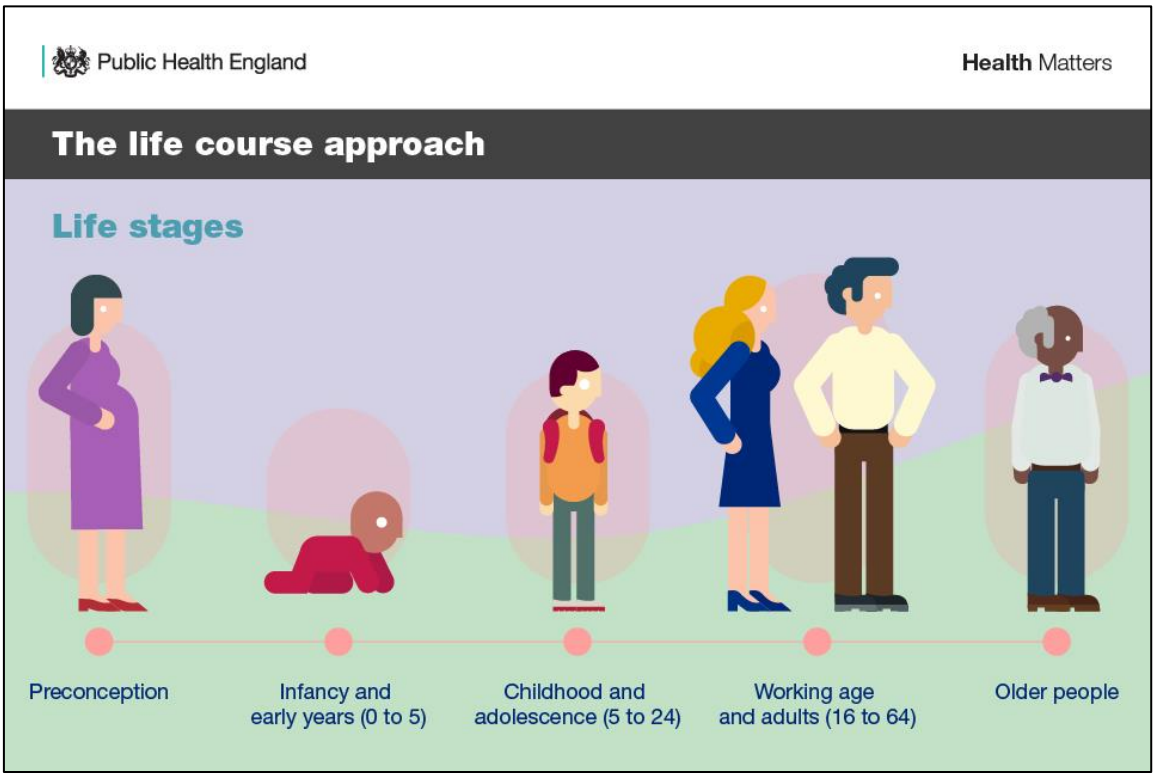
Whole genome sequencing & Duchenne Muscular Dystrophy..?

- There is one gene for Duchenne Muscular Dystrophy
- This gene also causes another MD variant: Becker MD – in this condition disability starts when the child is older than a child with Duchenne MD.



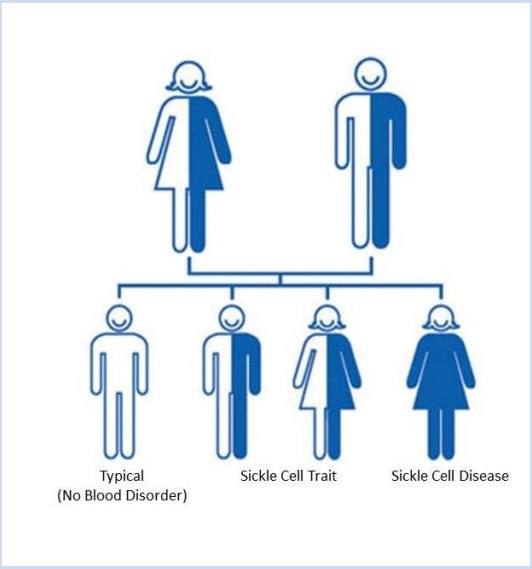


Workshop 3 Materials



What is **Sickle cell disease…?**

- Sickle cell disease is caused by a gene that affects how red blood cells develop.
- The disorder is particularly common in people with an African or Caribbean family background.
- The main features of sickle cell disease are:
  - An increased risk of serious infections
  - Anaemia which can cause tiredness and shortness of breath– so high altitudes can cause problems
  - Strokes and lung problems
- Treatments include:
  - Drinking fluids and staying warm to prevent painful episodes
  - Painkillers, such as paracetamol or ibuprofen
  - Antibiotics and regular vaccinations
  - Bone marrow transplant (rare because often not suitable)

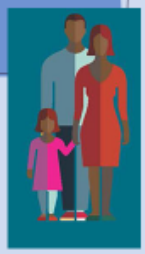


UK Facts & Figures…

- SCD is inherited from both parents; sickle cell trait is inherited from one parent
- 1 in 76 babies born in the UK carry sickle cell trait
- Approx. 15,000 people in the UK have sickle cell disease
- In England, about 240,000 people carry a sickle cell gene
- Approx. 270 babies with SCD are born in the UK every year

What is the current test for Sickle cell..?

- Pregnant women are offered screening to check if a baby is at risk of being born with sickle cell disease
- All newborn babies are screened for sickle cell trait and disease as part of the newborn blood spot test.
- If the screening suggests a likelihood of sickle cell, a second blood test checks for large numbers of sickled red blood cells - the hallmark sign of the disease.



The experiences of being a carrier of a sickle cell….

Will I be discriminated against because I'm a sickle cell carrier e.g. the type of job I can do?

How do a tell my partner, how will she take it?

Many people don't know the difference between a carrier and someone with the disease…

Being a carrier means I'll need to plan for any future kids, if I don't want to pass this on…

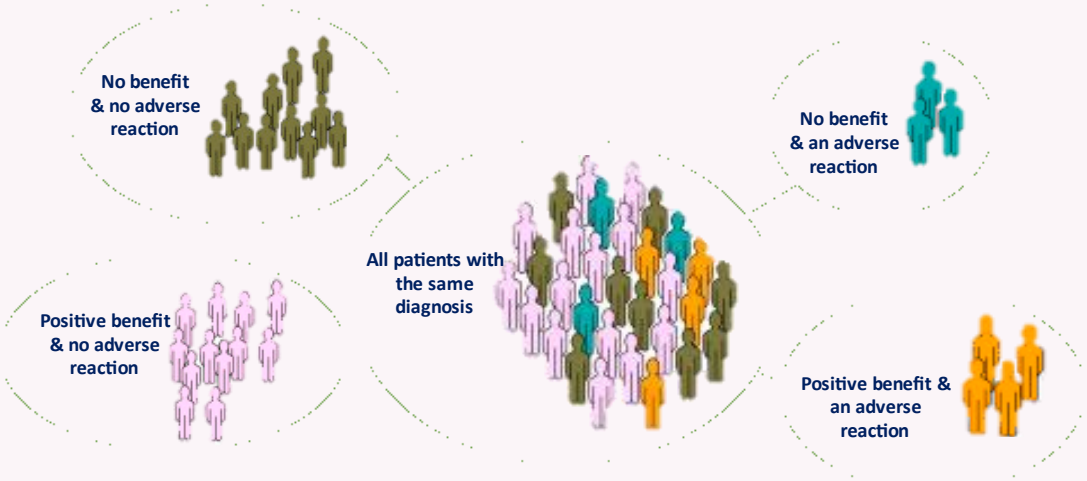
People don't know that carriers don't have the condition, just one of the genes that causes it

Will my family see me differently – someone with a genetic fault?

What is **pharmacogenomics**…?

Pharmacogenomics is about personalised medicines, tailored to an individual's genetic make-up.

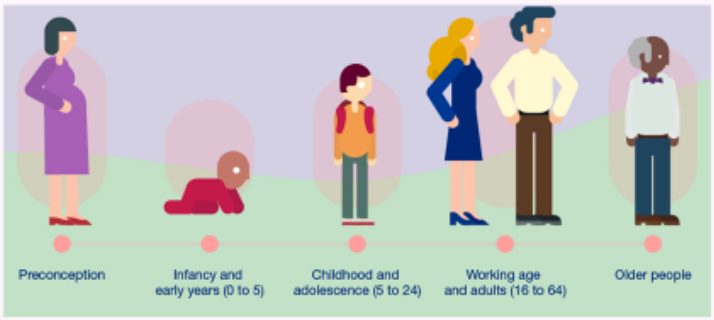
Many medicines have a standard dose – but people don't have a standard response to all medicines.



How does pharmacogenomics relate to **newborn screening programmes**…?

By analysing **whole genome sequencing (WGS) data** captured in the **newborn screening programme** an individual's reaction to certain medicines could be better understood.

This has the potential to indicate whether that person, or members of their family, could benefit or could have an adverse reaction to medicines such as penicillin or aspirin. Treatments are tailored to respond to the reaction their body is likely to have.



One suggested option is to use WGS to screen for reactions to therapeutic drugs at newborn stage.

The data is then stored and analysed for reactions at certain points in people's lives.

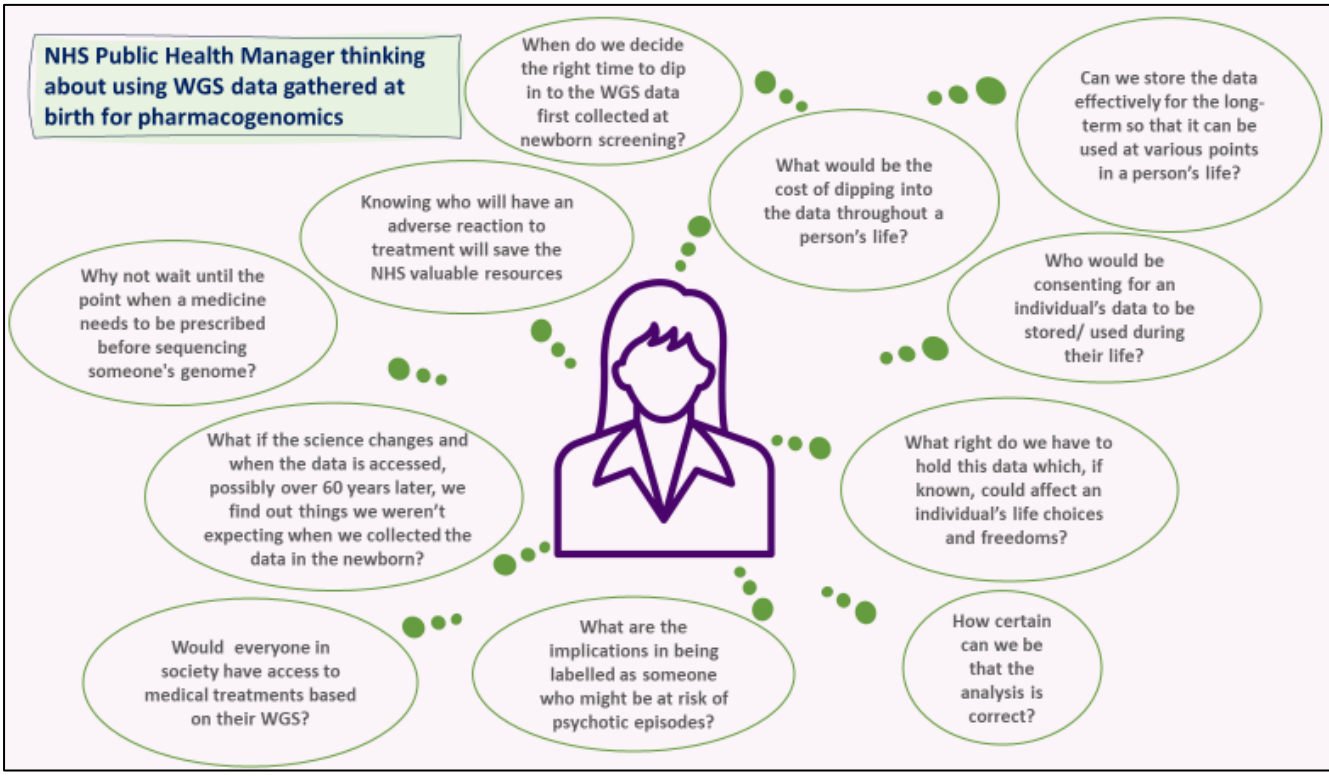
Some **examples – genomic information could be analysed at newborn screening stage, or at other life stages…**

There is a genetic glitch which indicates a reaction to a certain type of antibiotic (aminoglycosides).
This antibiotic is only used in very rare occasions when a newborn is very ill. There is a very small risk that taking this medication could cause hearing loss.
Should a prescription for these drugs be considered for a newborn, the data from their newborn screening could be analysed to check for this genetic glitch first.

Research indicates that cannabis use is associated with psychotic-like experiences. However, it is unclear whether this association results from genetic factors or from people's behaviour or other environmental factors.
What if data from WGS at birth could be analysed when children are in their early teens to understand which children are more likely to be harmed from exposure to cannabis?

Those with a risk of heart attack or stroke are often prescribed aspirin to make the blood less likely to form clots – a key cause of these conditions.
But aspirin doesn't work for everyone. Anywhere from 10% to 30% of people may not get any protective benefit from aspirin at all. Adults age 65 and older are more likely than younger people to suffer from cardiovascular disease.
This means that data from WGS at birth could be analysed when people reach 60, to see if prescribing aspirin will be beneficial for them.

NHS Public Health Manager thinking about using WGS data gathered at birth for pharmacogenomics

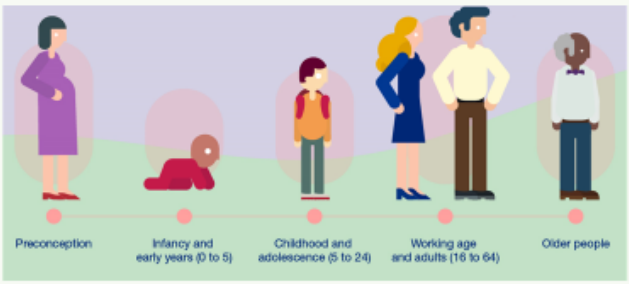


Whole Genome Sequencing: conditions at different stages of life

By analysing **whole genome sequencing (WGS) data** captured at birth, an individual's likelihood of developing different health conditions could be explored at different points in a lifetime.

The link between having a genetic glitch and actually going on to be affected by a health condition is stronger for some conditions than others, as we will see on the following pages.

All of the conditions could be screened for as part of WGS for newborns, but might be more useful at other stages of life…



Some examples - information that could be collected from newborns but might be used later in life or to help other people in the family...

Breast cancer affects 1 in 8 women. **Only 5-10% of breast cancer cases is caused by genetic glitches.** BRCA1 and BRCA2 are two examples of genes that raise your cancer risk if they have a glitch.

Testing positive for these genetic glitches **does not mean you are guaranteed to get cancer.** Other factors, e.g. your medical history, lifestyle and your environment, also play a role.

Risk of having breast cancer:

- Women in UK: 12% lifetime risk
- Women with BRCA1 60-90% lifetime risk
- Women with BRCA2 45-85% lifetime risk

If you have one of the faulty BRCA genes, there is a 50% chance you will pass this on to any children you have and a 50% chance that each of your siblings also has it.

Doctors are increasingly using information about a patients' BRCA status, together with lots of other information, to help determine which drugs to prescribe.

Breast Cancer

Familial breast cancer develops when you are in your 30s – so why check for this at birth?

If you have the BRCA gene glitch, you might never develop breast cancer, so why cause worry and stress by looking for it?

There is lots of research into cancer pharmacogenomics, so the more people with the gene glitch they identify, the better the research can be…

Some **examples - information that could be collected from newborns but might be used later in life or to help other people in the family...**

The risk of **Alzheimer's disease** increases with age, **affecting an estimated 1 in 14 people over the age of 65 and 1 in every 6 people over the age of 80.**

The most common form of Alzheimer's disease, which affects more than 520,000 people in the UK, **has not** been directly linked to a single genetic change.

However, there have been **almost 20 genes identified that might play a role in changing a person's likelihood of developing the condition**. APOE is the gene most strongly associated with the most common form of Alzheimer's.

About 1 in 5 people in the UK inherits one copy of APOE e4. This increases their lifetime risk of developing Alzheimer's disease by a little more than two times, on average.

About 2 in 100 people gets a 'double dose' of the APOE e4 gene – one from each parent. This increases their risk of developing Alzheimer's disease by about three to five times, on average. However, they are still not certain to develop Alzheimer's disease.

Alzheimer's Disease

There is no cure for Alzheimer's, so why would someone want to know if they had a genetic risk?

Even if you have the APOE e4 gene, you aren't certain to develop Alzheimer's, so why create worry and stress by knowing?

You can lower the risk of developing Alzheimer's by stopping smoking, drinking less alcohol, eating healthily and being active. Would you be more likely to do this if you knew you had the gene?

If they identify the gene in you, you could take part in research for treatments that might help slow down the progression of the disease?

Welcome Pack

Public Dialogue on the Implications of Whole Genome Sequencing for Newborn Screening

Location/ Group name

Monday 8th February
Webinar: 6 to 7:15pm

Saturday 13th February
Workshop 1: 2 to 4:30pm

Monday 22nd February
Workshop 2: 6 to 8:30pm

Sunday 28th February
Workshop 3: 2 to 5pm

Wednesday 3rd March
Workshop 4: 6 to 8:30pm

Thank you very much for agreeing to take part in these online workshops organised by Genomics England and the UK National Screening Committee, supported by Sciencewise and UKRI and delivered by Hopkins Van Mil.
This guide will help you prepare for, join and take part in the online workshops and reflection tasks. Please read through the guidance before the webinar and if you have any questions, contact Grace at Hopkins Van Mil: grace@hopkinsvanmil.co.uk

Genomics England was set up in 2013 by the Department of Health and Social Care to deliver the 100,000 Genomes Project which sequenced 100,000 whole genomes from NHS patients with rare diseases, and their families, as well as patients with common cancers.

The UK National Screening Committee (UK NSC) advises ministers and the NHS across the UK about all aspects of population screening and supports the implementation of screening programmes.

Sciencewise is an internationally recognised public engagement programme which enables policy makers to develop socially informed policy with a particular emphasis on science and technology. The programme is led and funded by **UK Research and Innovation (UKRI)**.

Hopkins Van Mil specialises in facilitating engagement and research projects. We create safe and trusted spaces for productive & engaging discussions on the issues that matter to us all.

What's Inside?

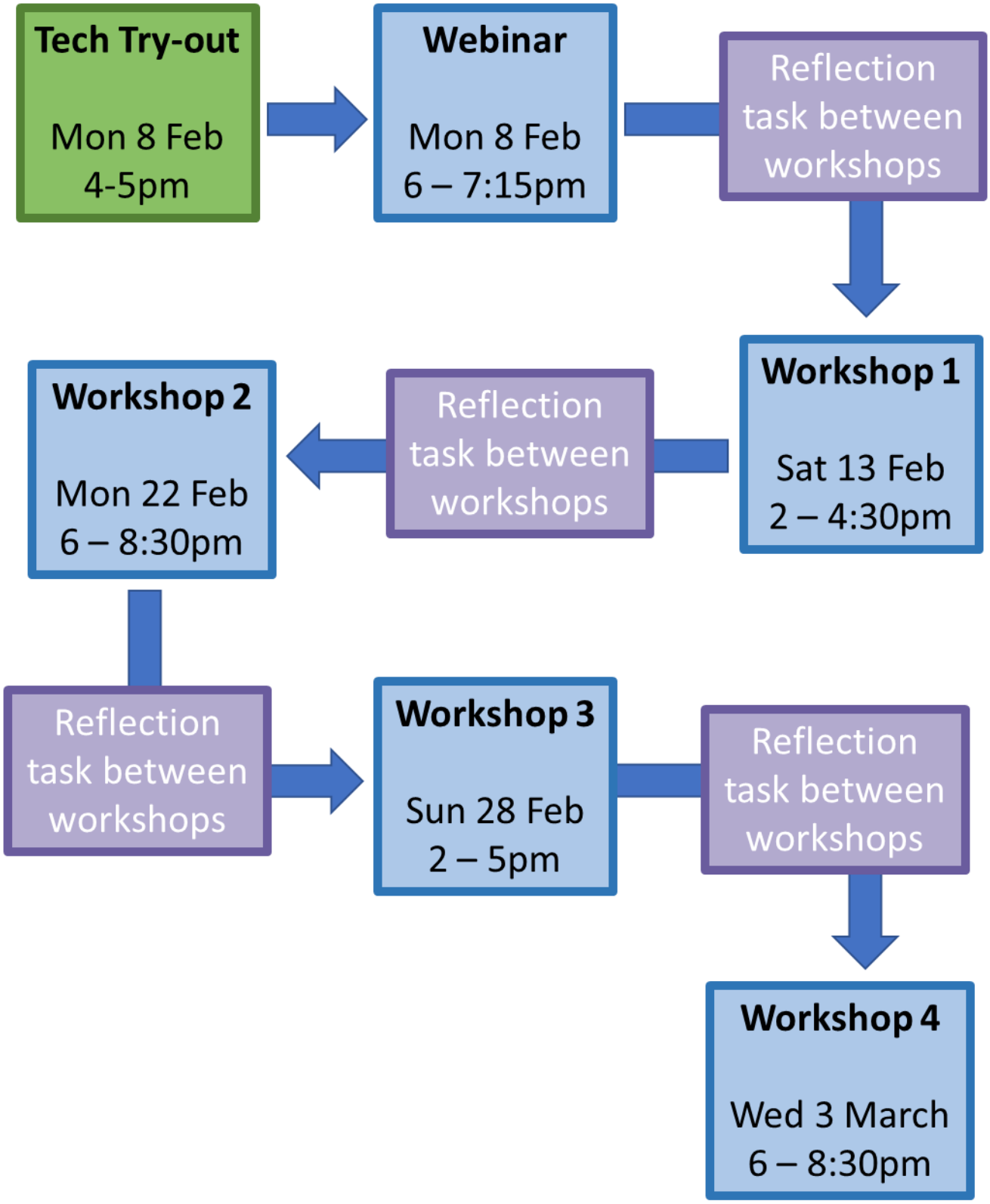
1. When are the workshops and reflection tasks?
2. What are the workshops for?
3. Who will be involved in the workshop?
4. What will I be doing at the workshops?
5. What will I be doing between the workshops?
6. What do I need to do to prepare for the workshop?
7. How do I join the workshops?
8. Tips for using Zoom
9. Points to help the online discussion
10. How will I receive my thank you payment?

PLUS

- **Workshop agenda, materials and notes pages**

Workshop preparation checklist	✓
Read through this guide	
Test out Zoom	
Find a suitable space where you can join the online workshop	
Register on the online space for Whole Genome Sequencing for Newborn Screening when you receive the invitation	
Join the tech try out session at 4pm on Monday 8th February if you have never used zoom before, you want to refresh your knowledge of using zoom or if you have any questions about the homework space	
Have your smart phone charged and with you to take part in online polling	
Have this workbook and a pen handy and ready to take notes during the workshops	

1. When are the workshops and reflection tasks?



2. What are the workshops for?

The purpose of the public dialogue is to gain an understanding of your views on the implications of whole genome sequencing (WGS) for newborn screening. Our discussions will help to plan for the future, including a proposed research programme, bearing in mind the views, hopes, concerns and aspirations of those taking part in these workshops.

The Research Question
What are the implications for the NHS and society of using whole genome sequencing (WGS) in newborn screening?

We have brought you together with others from across Wales and Northern Ireland to explore the potential use of whole genome sequencing (WGS) as a technology in addition to, or to replace some parts of the current NHS newborn screening programme. Online dialogue workshops are taking place in four areas of the UK: Scotland, North England, South England, and Wales & Northern Ireland. We are also convening focused dialogues with groups who have a specific interest in whole genome sequencing for newborn screening: pregnant women & new parents, people with and parents of those with genetic conditions, BAME groups and young adults.

We will be thinking about what the potential benefits and harms for the baby might be throughout their lifetime, for parents and the wider family, for others in society, and for the NHS in using these alternative technologies. We will also explore some possible purposes for WGS that go beyond traditional screening.

These words and phrases will be explained as we have our discussions over the next four workshops, but you can also find a jargon buster with a list of definitions on page 17 of this pack.

3. Who will be involved in the workshops?

There will be 21 people participating in the workshops. They have been recruited, as you were, to provide a range of ages and backgrounds from across Wales and Northern Ireland. Because of this, the invitation to join the workshops is specific to you. **Please do not share it with anyone else.**
It is important to remember that everyone will have different perspectives, and everyone's contribution should be valued equally.

A team from Hopkins Van Mil will run the workshop. Three facilitators will run the workshop: Henrietta, Mike and Chloe. Their job is to make sure that everyone is listened to and can share their thoughts. Jemima will help run the sessions and give technical support.
There may be a few other people observing the workshop from the commissioning partners and people who work in this area. They won't be taking part in the discussions but are interested in what you have to say.




4. What will I be doing at the workshops?

At the workshops, we want you to:

- talk about your experiences and opinions,
- listen to information about the use of whole genome sequencing for newborn screening,
- share your views on this with your fellow participants and
- listen to what they have to say too.

Most of your discussions will take place in small groups of 7 participants with a facilitator who will support you through your discussions and make sure you have a chance to have your say. Everyone at the workshop will have different views and ideas, and they are all valid and important. Everyone will be encouraged to share their views, but also to listen to each other.

During this dialogue we will be sharing information with you from people who have experience of living with disabilities caused by genetic conditions. The HVM team and specialists in the subject of genetics and newborn screening programmes will be present to support your discussions. Please read the support organisations guidance sheet on page 15 for further information.

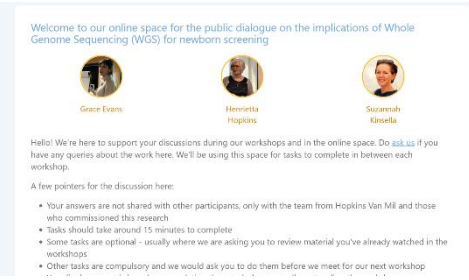
We will also ask you questions from time to time using this polling tool: www.menti.com We will ask you to use your smartphone to access the Menti website or app, so please have your phone charged and close to hand. If you don't have a smartphone you can also use a browser on your computer or tablet.

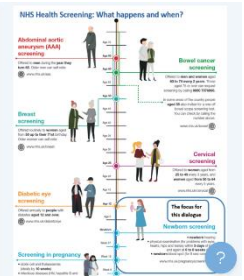
At the back of this pack, you will find some materials to help with discussions and blank pages for you to take your own notes throughout the workshops.

5. What will I be doing between the workshops?

We have set up an online space that only you, your fellow participants and the commissioning partners/HVM project team will have access to. Between workshops you will be asked to:

- **Look and comment on new materials, such as videos and presentations**
- **Review summaries of feedback from the workshops**
- **Ask questions about the materials you've seen and the information you've heard**





You will be briefed on your tasks at the end of each workshop. They should take no more than 15 minutes.

We will send you an invitation to join the online space, hosted by Recollective, on Monday 8th February. If you can't see the email, please check your spam folder. If for any reason you can't access the homework space, please contact Grace at grace@hopkinsvanmil.co.uk

6. What will I need to do to prepare?

There are a few things that we would like you to do to prepare for the workshop:

- **Read through this guide**
- As easy as that!
- **Test out Zoom**
- If you have not used Zoom before, please follow the instructions in section 7 and 8. If you have previously downloaded the Zoom app, make sure you have updated to version 5.0 or above
- **Find a suitable space where you can join the online workshop**
- Find somewhere **quiet and comfortable** to take part in the online workshop. You will need a reliable internet/Wi-Fi connection and somewhere to charge your computer, laptop or tablet. Don't worry if people or pets pass in view, many of us are working at home and are in the same boat! Please do not try to access Zoom on the move – particularly when driving!
- **Have your smart phone charged and with you**

  This is so you can take part in our online polling through menti.com – this is a quick, easy and instantly visual way of gathering your views during the workshop.

- **Have this pack handy to take notes**

  We will be showing you some videos during the workshops and you might find it helpful to take a few notes to help you remember what is said.
- **Respond to the invitation to join the online space on Recollective**
- Look out for an email and sign up to the space we have put together for you to prepare for the workshops, and to reflect on your own in between the workshops.

7. How do I join the workshop?

You will be **emailed the link** to the Zoom workshop on the day of the first workshop: the webinar on **Monday 8th February**. Please **do not share this with anyone else**. You will be emailed a new Zoom link the morning of each workshop.
We will be using the Zoom platform. This is a web-based platform and is free to join. Please download the app. You can also join via your browser to connect to the Zoom website, but this has more limited functions than the app (e.g. you won't be able to choose how you see other workshop participants).

Joining from a computer
To join a Zoom meeting click the link or go to zoom.com/join and Enter the Meeting ID and click 'Join'.
Some people prefer to download and use the Zoom app. This process is easy to complete on most browsers. When you click the meeting link, you will be prompted to download the file (Google Chrome should automatically download the file). Click on the Zoom_launcher.exe file to launch Zoom. In Google Chrome this should appear in a bar at the bottom of the screen, in other browsers you may need to click on your Downloads.
You will be prompted to enter a display name - this is the name other people will see during the workshop. Your first name is fine.

Joining from a tablet (e.g. iPad)

If you are joining from a tablet, click the link provided or go to zoom.com/join and Enter the Meeting ID and click 'Join'. Or if you prefer, you can download the Zoom Cloud Meetings app from the App/Play Store after you click the meeting link.

There are some useful video tutorials on the Zoom website www.zoom.us

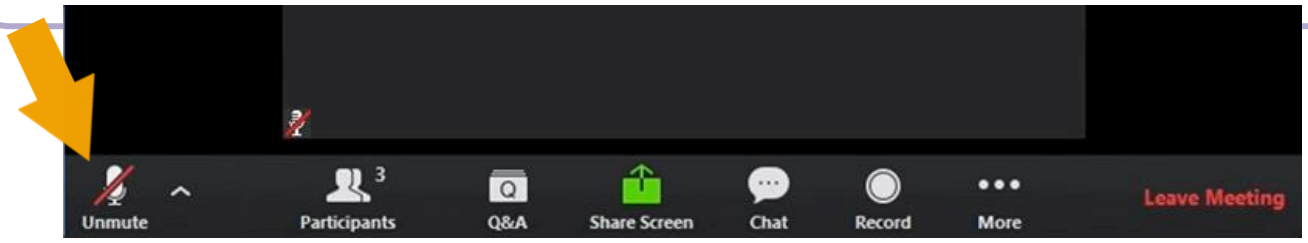
If you need technical support (for example if you are struggling to connect or use Zoom) someone from the research team will call you on the number you gave to the recruiters. If we lose you, we'll call you to get you back in the Zoom again.

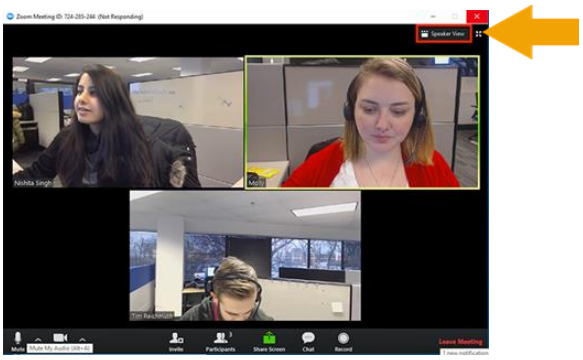
If you accidentally leave the workshop, use the link to return to the main Zoom room.

If your internet connection becomes unstable, try turning your video off and making sure you have no other windows open on your device.

8. Tips for using Zoom

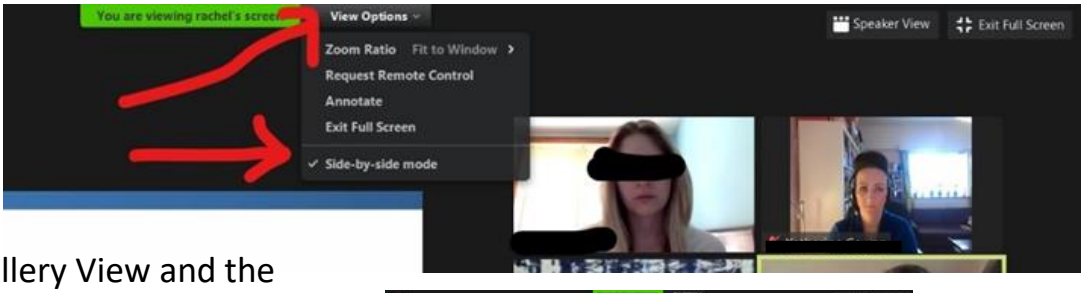
- Please use your video if you can, it makes having our conversations more effective.
- If you have a headset, you may want to use it for better sound quality.
- Please click on the microphone icon at the bottom of the screen to mute yourself when you are not speaking, to minimise background noise. Click on it again to unmute when you want to speak.



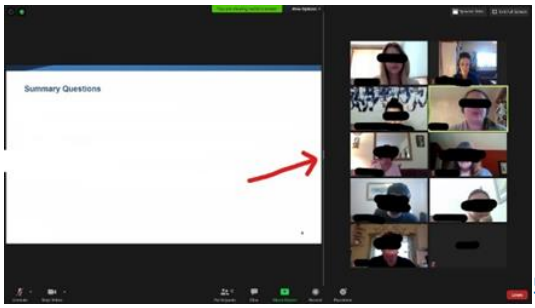


If you use Gallery View (top right hand corner), you can see everyone at once, rather than just the speaker.

To ensure you can see everyone when the screen is being shared, click View Options and choose side-by-side mode



If you are in Gallery View and the facilitator is sharing their screen, you can adjust the size of the screen by clicking and dragging here:



9. Points to help the online discussions

Here are some tips to help us work well together in the online discussions:

- Keep yourself on mute unless speaking
- Use the chat to make a comment

- Keep your video on

- Raise your hand
- Jemima will call you if we lose connection to you
- Don't use the 'print screen' function - we'll share materials
- We will record this session to help with reporting

- We'll be using the online polling tool **menti.com.** Have your smartphone at the ready to use this during workshops

- Respect each other's views and experience and listen to what everyone has to say
- There are no 'silly' comments or questions
- The team is here to help, the chat is often the best way to raise something with us

- Questions can be put in the chat during discussions and on the online space in between workshops

- We will be sharing some information with you from people who have experience of living with disabilities caused by genetic conditions. If you feel upset by anything you've heard please message Jemima directly on Zoom and we'll contact you by phone or through a separate Zoom room
- We may have to move conversations on to keep to time

- Don't Zoom and drive!

- We're all zooming in from our own homes – try and stay focused

10. How will I receive my thank you payment?

You will be paid £300 for taking part in the webinar and workshops and completing the between workshop reflection tasks. If this is more convenient to you as a voucher than a cash payment please let the recruitment team know. You will need to take part in all workshops and tasks to receive payment.

The recruiters are collecting your bank details – we will use those to pay you, unless you request voucher payment. You will receive payment within a month of completing the research once we have confirmed that you've completed all tasks and verified you as a payee. Reference will be **Genome.**

THANK YOU

Thank you for agreeing to take part in this research and for reading through this guide! We hope you found it helpful. We are looking forward to seeing you on Monday 8th February at 5.45pm for the webinar. The following pages in this guide give you the information you'll need for each workshop.

Organisations offering help and support

Hopkins Van Mil works to create safe spaces so that those involved in public dialogue can give their views on the issues that matter to us as individuals and as a society. Our key priority is to make you feel comfortable and ensure you have a positive and enjoyable experience.

If you feel troubled by anything discussed during these pilot workshops do talk to Henrietta or Jemima at HVM. You can ask to speak to either of them in the break-out space before and after the sessions. If you need time to step out of a workshop when it's in progress send a message to in the chat, or let your facilitator know. You will be helped to step out of the discussion to give you time to recover and re-join when you feel ready. To direct message just go to the chat and find Henrietta or Jemima's name on the list under the 'everyone' arrow.

The HVM team always stays behind on the Zoom after a session is over, so you can also catch us then if that feels more appropriate to you. In line with best practice in social research you are free to withdraw from this research at any point in the process.

The following provides a list of organisations you can contact for information, advice and support If you would like to talk to someone independent of these discussions after the workshop.
For a medical query we suggest you contact your GP. The following organisations may be of assistance in providing advice and guidance:

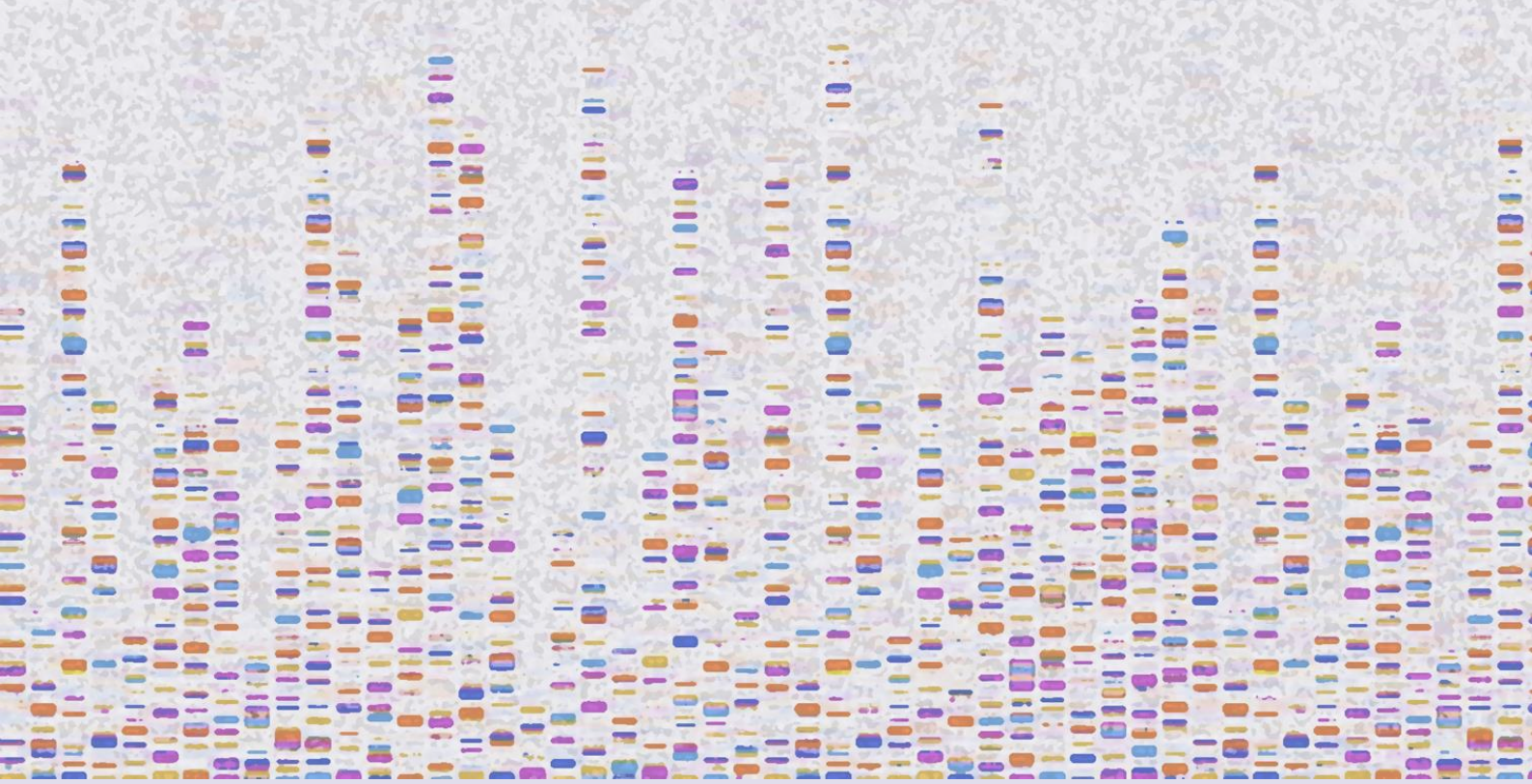
Breaking down Barriers
A network of 30 organisations working together to improve the lives of people from marginalised communities including those from BAME backgrounds, so they have equal access to health services. They have links to resources for families.
https://breaking-down-barriers.org.uk/resources-for-families/

Contact: for families with disabled children
Exists to help families feel valued, supported, confident and informed.
https://contact.org.uk/advice-and-support/

Genetic Alliance
An umbrella organisation working to improve the lives of patients and families affected by genetic, rare and undiagnosed conditions. The Genetic Alliance has a membership of over 200 patient organisations.
https://geneticalliance.org.uk/information

NHS Mental Health services
Links to support services including on anxiety, stress and depression provided by the NHS
www.nhs.uk/service-search/mental-health

Thank you again for being part of this important dialogue.



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