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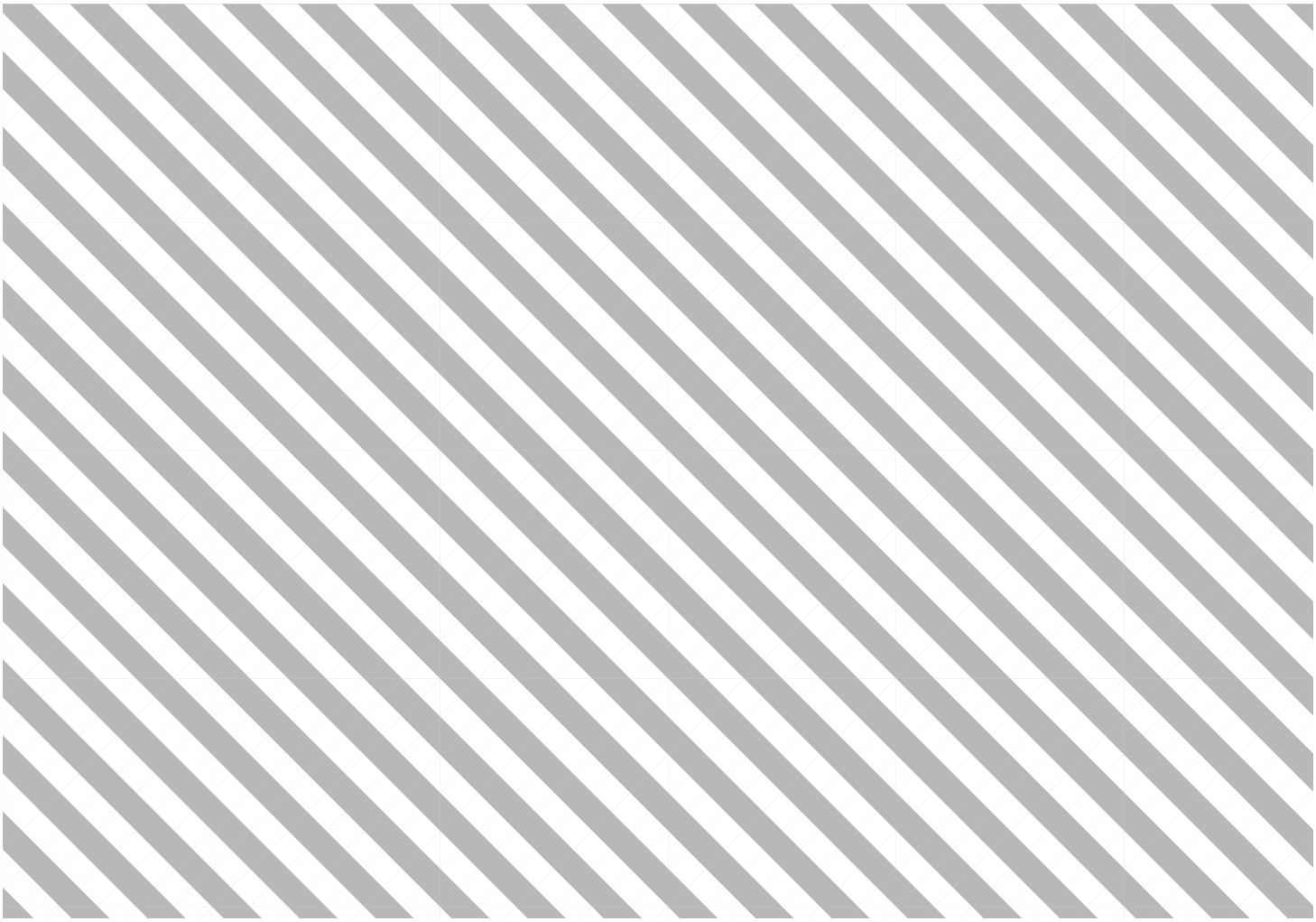
White Paper

Genomic Data Policy Framework and Ethical Tensions

June 2020



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Contents

Foreword

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Many scientists, authors and thought leaders have posited that we are in the "Age of the Genome". Our ability to understand humans at the very basic level – the level of our genes, or the units of material that pass along instructions from one generation to the next – allows us to take a more targeted and personalized approach to screening, preventing, diagnosing and treating disease. Researchers and clinicians are, for example, struggling to determine whether genetic factors play into the severity of a person's response to SARS-CoV-2 exposure and infection during the COVID-19 pandemic that started in early 2020. The expectations are high: As more people provide their genetic and genomic information to researchers and clinicians, we do so expecting that our highly personal information will translate into advances in health and healthcare not just for individual patients but for entire populations. Genetic and genomic information is sensitive and has implications not just for the individual who provided it but, based on laws of heredity, for the person's relatives and broader ancestry. Genetic and genomic data also embodies the transformation of biological (physical) materials to digital (virtual) information, allowing this deeply personal information to be transmitted quickly and widely via today's information communication technologies. This is well illustrated by the incorporation of advances in computational tools and digital communication platforms to enable rapid and cross-border genomic data sharing, which is critical in responding to public health emergencies.

Arnaud Bernaert, Head of Health and Healthcare, World Economic Forum

The collection of genetic and genomic information from individuals and populations should be approached with care and humility. We have observed in the past several years increased efforts to collect such information from understudied populations, in places with difficult histories of researchers or outsiders entering the community. We are very hopeful that the age of the genome will ultimately benefit many patients and patient populations globally, provided that communities are empowered to develop, test and refine appropriate ethical and cultural safeguards. Many communities are taking leadership positions to ensure that they are able to participate on their own terms in the global genomics age, and the World Economic Forum is grateful to contribute this Genomic Data Policy Framework and Ethical Tensions white paper to a growing collection of resources for policy-makers, business leaders, academics and others navigating this path. It is our hope that this paper's "future of healthcare" perspective will help practitioners explore new and anticipated legal, ethical and privacy issues raised by genomic data, with practical resources and guidance as part of the Forum's Data for Common Purpose Initiative that can be tested and refined over time.

Introduction

The Leapfrogging with Precision Medicine Project, which is part of the Precision Medicine Portfolio of the World Economic Forum, focuses on co-designing and piloting policy, governance and business frameworks that enable healthcare leaders in emerging economies to prepare for and integrate precision medicine approaches into their health ecosystems. Leapfrogging with Genomic Data is one workstream within this project.

Genomic and genetic data – the digitized record of a person's DNA – is an especially sensitive form of human health data, and its collection and use support the scientific research and improved diagnostics and treatments that underscore precision medicine. Genomic and genetic data collection is accelerating, including in low- and middle-income countries (LMICs) and emerging economies,[1] to fill critical gaps in the understanding of populations not traditionally included in research[2] and to support more precise clinical care. Without future-looking policies that address genomic and genetic data collection and use in research, countries face two main risks: 1) their data does not inform scientific research that may lead to more population-relevant screening guidelines, diagnostics and treatments; or 2) their data may be used by and primarily benefit outside parties. Without future-looking policies that address genomic and genetic data collection and use in clinical care, countries may inadvertently slow adoption of advancing healthcare approaches that can improve patient care pathways.

This white paper aims to begin addressing the need for new or modified policies by proposing a genomic data policy framework and corresponding set of ethical tensions for policy-makers, business leaders, researchers, patients and others to consider before taking actions that affect or involve the collection and use of human genomic and genetic data for research and clinical use. Generally, genomics refers to all genes and their interrelationships and genetics focuses on a single or set of genes. The distinction is important and nuanced in several fields; however, for the purposes of this paper, the authors will refer to genomics when our thinking applies to data about all or some genes.

This paper is written from a "future of healthcare" perspective, and with a focus on LMICs and emerging economies. This is not to imply that there should be a different standard among countries, but to ensure consideration of the differing perspectives and needs informed by these countries' diverse historical, societal and cultural contexts.
This work also aims to keep the interests of research participants and patients at the forefront of policy and ethical considerations, and we hope that is reflected in the following pages. Advancement in genomics would not be possible without those who provide their data. Inclusion of citizens, patients or community representatives in the discussion and development of approaches to genomic data collection and use would likely prevent numerous blind spots, conflicts and sources of mistrust, while fostering understanding and better outcomes.

The areas of focus for the policy framework are four foundational elements germane to human genomic data collection and use: consent, data privacy, data access and benefit sharing. These are followed in the paper by six ethical tensions that underpin these elements. The paper focuses on principles and guidelines, not the implementation or application of these elements. As such, topics including data security and infrastructure, while critically important to data privacy and access, are not addressed here. Gene-editing research and testing is out of scope, too. Forms of health data beyond human genomic data are also out of scope for this paper, though a future document may consider expanding the ideas to other -omic data. Finally, this document focuses on activity within the medical and scientific establishment and not the direct-to-consumer genetic testing market or non-healthcare fields such as law enforcement or surveillance, though we have drawn from developments in those spaces.

How to use

At its core, this white paper is intended to provide a basis for discussion and decision-making primarily by policy-makers, but also by researchers, clinicians, patients and business leaders who engage in the collection and use of genomic data.

This white paper begins with a high-level, forward-looking, scalable policy framework. In this section, core terms are defined, and key policy principles are outlined. The goal of the policy framework is to set forth principles that may inform the development of corresponding policies, regulations or guidance, modified as appropriate for local context.

The next section explores a set of six ethical tensions that permeate the four foundational elements explored in the policy framework. Corresponding ethical questions will help facilitate discussion and prompt awareness of gaps or barriers when developing a genomic data policy that attends to ethical concerns. Working through the questions will help in projecting how various people who participate in genomic data collection and use may grapple with ethical issues before, during and after data collection, and in carrying ethical considerations into policy, research design and clinical applications.

The policy framework and ethical tensions are meant to be complementary. Policy should reflect a society's ethical positions on issues, and too often the two are divorced until a conflict arises. The framework and tensions reflect a distillation of critical elements of genomic data policy and ethics. As such, the tools in this document are presented as a starting point to develop or refine a set of guiding principles and ethical standards as you craft or revise genomic data policy and regulation, or best practices in your government, organization or institution. They are intended for customization and use in a local context.

We suggest exploring the framework, ethical tensions and questions through multistakeholder working sessions. Including stakeholders – research participants, patients, researchers, physicians, nurses, business leaders and others – who are affected differently by genomic data collection and use will expose issues that may otherwise be overlooked and uneven power dynamics that often complicate ethical positions and corresponding actions. A multistakeholder approach will help cultivate a comprehensive understanding of policy principles and ethical dynamics and create a sound path forward within your jurisdiction. A companion ethical tensions guidance document, a mini-guide to running scenario vignette-based workshops and a set of sample scenario vignettes are available to guide these activities (see Appendix).

Methodology

The content of this white paper was developed through desk research, expert interviews and multistakeholder workshops. Desk research began by collating a Genomic Data Policy Resource Guide, which offers a review of prevailing laws, regulations, guidelines and commentary addressing consent, data privacy, data access and benefit sharing of health and genomic data, drawn from General Data Protection Regulation (GDPR), Health Insurance Portability and Accountability Act (HIPAA), Genetic Information Nondiscrimination Act (GINA) documents, as well as organizations including the Global Alliance for Genomics and Health (GA4GH), Human Heredity and Health in Africa (H3Africa), the Organisation for Economic Co-operation and Development (OECD), the World Health Organization (WHO) and other sources. Additional research included the collection and review of real-world examples of tensions in genomics and genetics, corresponding expert commentary, professional organization guidelines and other existing frameworks for data collection and use.

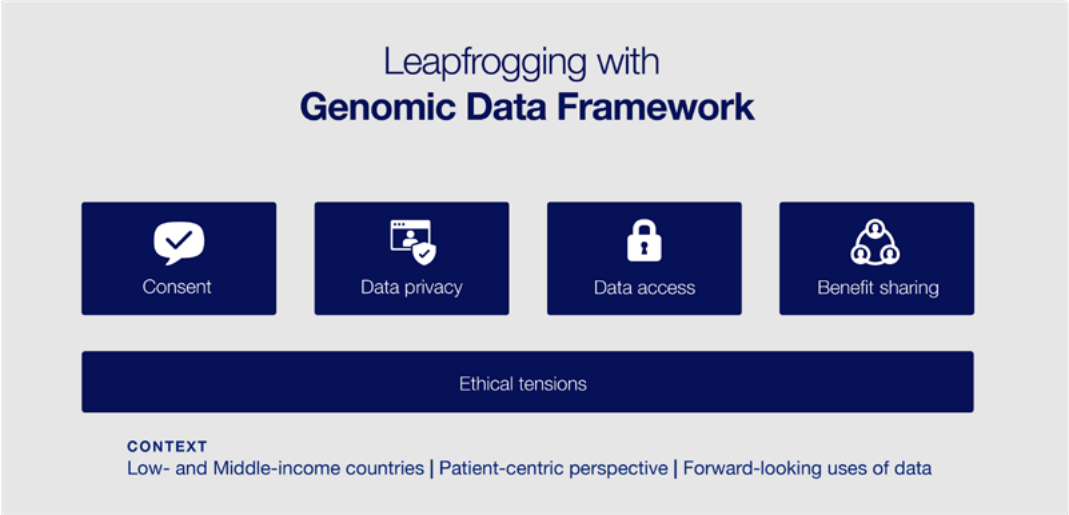
A World Economic Forum Leapfrogging with Genomic Data workshop in San Francisco, USA, in July 2019 used various scenario vignettes, representing opportunities and risks germane to LMICs, to explore and validate the four foundational elements of genomic data policies discussed below: consent, data privacy, data access and benefit sharing. Each vignette focused on one of the four elements of genomic data policy and presented fictionalized short stories oriented five to 10 years in the future. The vignettes included two main personas, often representing perspectives of the Global North and South. The personas helped illuminate the ethical tensions underpinning each policy issue. Thirty experts in policy, industry, research and civil society from Africa, the Middle East, Latin America, Asia and North America worked through these vignettes in small groups, with each group adopting one of the personas as they identified the cause of the conflict, underlying considerations and possible solutions. Groups then returned to plenary to address the group that adopted the counter persona. These presentations offered an opportunity to question each other and discuss conflicts from a solution-oriented perspective.

A World Economic Forum Roundtable on Ethical Tensions, held in November 2019 with a select group of experts in bioethics, helped refine the ethical tensions informed by the July scenario vignette workshop and develop intuitive and accessible tools for the application of these tensions to policy development. Additionally, Elissa Prichep co-led two events: 1) the Genomic Data Policy Consultative Session with the Rwanda Ministry of Health; and 2) the Roundtable on Governance of Human Genome Sequencing with the Dubai Future Foundation to

begin transitioning this framework to government officials and translating it into policy approaches within a local context.

Throughout, the authors conducted dozens of interviews with thought leaders in government, academia, research, medicine, civil society and industry who are located in and working across emerging economies. Those interviewed educated us, answered our questions, provided feedback on our work and expanded the expert network engaged in this project.

Policy framework



Framework structure and components

This white paper aims to address the need to develop new or modify existing policies and approaches regarding the collection and use of genomic data by proposing a policy framework and a corresponding set of ethical tensions focused on four foundational elements: consent, data privacy, data access and benefit sharing. For the purposes of this paper, these elements are defined as follows:

Consent is the point at which a person chooses to provide a sample containing their genomic information to a researcher or healthcare provider and allows access to this data. From this point onwards, something that was once private is now shared, making it incumbent upon the receiver of consent and the information to clearly inform how that information could be used and adhere to those terms.

Privacy refers to freedom from observation, and is a protection enumerated or implied by many governments. Data privacy translates this principle to one's data. Since the creation and storage of data can involve many parties, ensuring "data privacy" requires sound practices of data stewardship and protection. An element of data privacy is confidentiality, which refers to keeping information secret.[3] The distinction is important and those who handle genomic information should clarify whether they keep that information from observation – keep it private – or enable access to the information with identifying aspects kept confidential.

Data access refers to the viewing, exchange or transfer of genomic data among two or more entities. Responsible data access hinges on adherence to consent and data privacy policies, and the development of laws, regulations and governance that address data visibility to more than one entity.

Benefit sharing refers to the distribution of value created through the collection, application, commercialization or other use of genomic data. Benefits may be non-monetary or monetary in nature. A recipient may refer to one or several individuals, communities, organizations or governments.

As previously described, this paper takes a "future of healthcare" perspective, meaning it explores the four foundational elements through the lens of new and anticipated legal, ethical and privacy issues raised by genomic data. For example, how might one think about consent knowing that data may ultimately be shared with other organizations? How might one develop policies on data access when biobanks are no longer filled with physical samples but digital records? How might privacy laws respect the rights of individuals when insights about them can be derived from close relatives? How might indigenous populations align genomic research processes with their traditions, religions and culture when their data is combined with that of non-indigenous populations? While the future of genomics cannot be predicted, the speed of its advancement necessitates that leaders use educated hypotheses to plan for future issues as opposed to adopting a reactive approach to policy, regulation and guideline development.

Policy framework guiding principles

The policy framework described below seeks to identify universal principles under each policy element in our Genomic Data Policy Framework that stakeholders can expand upon within their local context. Some of these principles may be more pertinent to research or clinical circumstances in practice.

Consent

1. **Comprehension** – people must understand to what they are consenting, which means consent forms and processes should be developed and delivered to support accessibility, clarity of language, comprehension, educational information as appropriate, and the opportunity to have a dialogue about the consent. This may involve translating into local languages or reading a consent form out loud. Understanding can be assessed by asking people to share back what they've learned.

2. **Openness** – consent forms must be transparent in disclosing how the genomic data could be used and treated, who is responsible for that data and who owns the information. They should also inform consenters as to the potential risks and benefits of providing their genetic information.

3. **Respectfulness** – those providing consent should be given appropriate time to review and consider their consent before providing it, and they should also have an opportunity to adjust or revoke their consent after providing it. The consent forms should make clear who the consenter can contact to make such adjustments and what may not be reversed (e.g. data used in a published study) once those adjustments are made.[4]

4. **Fitness for purpose** – the consent should be for a clearly documented research or medical purpose. This purpose may be specifically defined or broadly framed, so long as the consenter is sufficiently informed of the future uses of their data.

5. **Renotification** – consenting to provide genomic data does not imply an openness to receiving results related to that data, including incidental findings. The consent process must include an opportunity for the data provider to understand and make known their desired feedback on results related to their sample. The process and approach to returning results requires thoughtfulness, jurisdictional context, guidance on interpretation and, if applicable, medical actionability.

Data privacy

1. **Autonomy** – individuals should have a right to maintain the privacy of their own genetic information and should not be compelled to disclose it.[5]

2. **Confidentiality** – all efforts should be made to prevent violation of confidentiality through minimizing the opportunities to link data back to an individual or their family.[6]

3. **Non-maleficence** – careful consideration must be given to ensure that use of genomic data in research or clinical care avoids harm through the creation of stigma or the violation of individual and community rights.

4. **Beneficence** – care must be taken to ensure that genomic data in research or clinical care is used to benefit the individual, community or society.

5. **Transparency** – entities holding human genomic data must identify and make transparent their approaches to data oversight and accountability, and observe best practices in protecting the confidentiality of individuals' genetic information.

Data access

1. **Restraint** – decisions about privacy protections and data-sharing practices should be based upon an assessment of risks and benefits for the participants, their communities and society at large.

2. **Consideration** – policies should facilitate data sharing and protect confidentiality in a way that both advances research and respects participants' consent, privacy and preferences.

3. **Responsibility** – access arrangements should denote explicit, formal institutional practices, rules and regulations regarding the responsibilities of the various parties involved in data-related activities.

4. **Reliability** – those engaging in data-access arrangements should be responsible data stewards, observing and promoting best practices of data quality, interoperability and security.

5. **Accountability** – access to genomic data must be aligned with consent forms, adherent to privacy protections guaranteed by local laws and regulations, and respectful of local customs and traditions.

6. **Vigilance** – access to genomic data should be for consented and permitted uses and exchanged only with third parties, such as certain research institutions, hospitals or business entities, which can uphold those terms. An institution or community should have the right to deny a third-party request for genomic data.

Benefit sharing

1. **Justness** – benefits arising from the access and use of genomic information collected from research participants or patients should be shared in a fair and equitable manner among the parties involved. The nature of these benefits should be agreed upon by the parties involved, and these may include non-monetary or monetary exchanges of value. Parties should also discuss how the benefit-sharing agreement may evolve to accommodate subsequent applications, uses and commercialization of the data or discoveries based on the data.

2. **Cooperation** – in the instances where multiple organizations or countries have data of value to third parties, they should endeavour to cooperate so as not to minimize the potential benefits or cause harm to one another. Additionally, where data is shared among parties that have unequal power or resources, it is important that all parties act in good faith, and endeavour to form an agreement that is cooperative and builds trust in order to establish long-term global cooperation.

3. **Clarity** – those engaging in benefit sharing should establish clear and explicit rules, procedures and practices, specify those with a right to benefits and set mutually agreed terms.

4. **Dignity** – the goal of benefit sharing is to support the exchange of human genomic information in a way that leads to results that benefit the health of the individual, community or society at large, respects the dignity of those providing genomic information and supports the strengthening of knowledge and empowerment of the students, researchers and others engaged in the work.

5. **Inclusion** – the individuals or community representatives that provided data should be included in conversations about the benefits to be shared, and have their interests represented in a final agreement.

Application of the framework

The above framework is intended to provide a starting point for the development or modification of genomic data policies and approaches. The principles set forth are intended to prompt a discussion of values that may eventually be communicated and upheld through laws, regulations and standards. These should be developed in accordance with existing laws and regulations, as well as ethical standards. In some cases, genomic data will be governed appropriately by existing structures, but it is important to recognize when that is not the case and close those gaps.

Additionally, governance systems should be set up to ensure appropriate and responsible implementation and oversight of such policies and approaches. Governance encompasses the processes and procedures of governing, including standards, incentives, implementation and accountability, and should be transparent, predictable and stable. Where good governance exists, trust in oversight and enforcement mechanisms will enable the collection and use of genomic data. Setting up and implementing good governance is certainly a challenge, but it cannot be taken for granted. A trustworthy system is imperative, particularly when trust between parties does not exist.

Ethical tensions

Overview

Since the completion of the Human Genome Project in 2003, genomic sequencing is increasingly moving from being a complex and exorbitantly expensive undertaking to a readily available and widely accessible technique for using genomic information to understand and improve individual and population health. Creating policy will always come with trade-offs and ethical considerations, and this is especially true in genomic data policy; while widespread public participation in genomic research could be a boon for society, the intrinsic power contained in genomic information and its sharing necessitates careful ethical consideration.

This section highlights six broad ethical tensions policy-makers, researchers, clinicians, business leaders and others should be aware of when crafting genomic policy or engaging in the collection and use of genomic information. These tensions highlight the competing ethical priorities surrounding genomic data and require thorough, diligent and nuanced exploration in order to develop ethically balanced policy, regulations and best practices.

There is no universal and overarching way to resolve the ethical tensions that inevitably arise in relation to genomics and when crafting genomic data policy; solutions may differ in different circumstances (e.g. in research or clinical care), jurisdictions and cultural contexts. This section does not presume to provide answers, rather it provides a set of key questions that can help guide policy-makers and others as they create a sound regulatory environment in which ethical genomic research and clinical application may flourish.

A note on trust

Creating trust is often cited as a solution to bridge ethical tensions between parties or institutions. The history of exploitation and discrimination in LMICs, combined with existing global healthcare disparities and the lack – real or perceived – of policies, rules, procedures, regulations and accountability mechanisms governing genomic data collection and use make trust a tenuous topic.

Trust is built, in large part, on the trustworthiness of people or institutions as demonstrated through numerous interactions. Where trustworthiness has foundations, trust can be built further through collective approaches. Two such approaches are for groups to jointly develop: 1) a transactional model in which fair compensation is agreed and payment made in exchange for providing a service or item of value; or 2) a collaborative model that includes and benefits participants and enables them to resolve issues together. The second option, while more complicated to develop and maintain, is the better approach when building long-term relationships and addressing complex, evolving issues such as genomic data collection and use.

Where trust between parties is currently absent, developing a trustworthy system is imperative. Laws, governance models, regulatory standards and accountability mechanisms can be tools for building such a system. These approaches can support short-term collaborations while fostering the long-term development of trust.

Whether pursuing collaborative approaches or system-strengthening approaches, it is critical to: 1) clearly identify the roles and responsibilities of those engaged in genomic data collection and use; 2) include research participants and third-party collaborators to minimize potential points of conflict and strengthen outcomes; and 3) develop governance approaches to ensure oversight of the approaches put in place. Governance is particularly important in encouraging collaborative efforts between parties who have yet to develop a trusted relationship.

Power dynamics

The experts with whom the Forum worked to develop this white paper agreed that power supersedes all of the tensions. Economic and material power disparities, in addition to the informational asymmetry that can come with the scientific complexity and findings from genomic research, will influence behaviour. The skewing effect of power may influence actions so they are no longer aligned with ethical intent. This may result in, for example, leveraging power imbalances to move forward with an initiative at disproportionate advantage to the lead research institution, or the willingness of LMIC-based researchers to accept minimal benefits if they feel that another opportunity may not arise. Some actors may exploit power imbalances with malicious intent, while others may be unaware of the impact of such imbalances on behaviour.

Collaborating parties should strive for awareness of the skewing effect of power imbalances on their behaviour. Otherwise, they risk falling short of the ethical tenets they establish to guide their interactions with each other and the work they undertake. Furthermore, serious consideration must be given to how individuals and communities will be safeguarded from potential harms stemming from power imbalances, whether they come from governments, corporations, academic institutions or care providers.

Six ethical tensions

1. Balancing individual privacy and societal benefits

Conflicts between individual privacy and societal benefits supersede almost every aspect of the tensions that follow. In the realm of genomic data, disregard for the individuals providing the data can have lasting, irreversible ramifications for them, their relatives and the communities in which they are embedded. Without robust privacy laws and protections, societies run the risk of harming those who choose to participate in research or their relatives, whose data may be divulged by proxy. Yet absolute privacy ultimately hurts everyone – it is the aggregation of large genomic datasets that help us to understand how genes affect our health and well-being. Policy-makers must ensure participants' privacy will be respected while honestly communicating how their data will be used and the risks of participation.

Key questions

- Does our society lean towards autonomy or societal good, or balance both? How might this manifest in terms of genomic data?
- In what context should individuals who supply their genomic data be the decision-makers with regard to that data versus having researchers or healthcare providers be the decision-makers?
- Should consented data be identifiable, anonymous or deidentified? Under what circumstances is identifiability appropriate? How will identifiability be protected or enabled?
- Will genomic data be linked to other pieces of health data? How might this increase the risk of reidentification?
- Should consent be broad, tiered or specific as it pertains to genomic data use in research and medical testing? If broad consent is used, what are the limits?
- Should consent be static or dynamic? Should researchers and others be required to re-obtain consent each time a person's genetic data is used?
- How will data governance be addressed:
  - Who owns the data?
  - Who has access to the data?
  - Who benefits from the data and how?
  - Who is responsible for safeguarding the data?
  - Who is accountable for upholding requirements?
  - Do these roles and responsibilities shift at certain points throughout the life cycle of the data?

2. Balancing open and restricted data access

Deciding who will have access to genomic datasets and under what circumstances is essential to sound regulation. In the past decade, examples of data, especially health data, falling into the wrong hands have become more frequent, and debates over by whom, and how, sensitive data should be accessed have become ubiquitous. While open access may be a laudable goal, it is also important to anticipate any unintended consequences and nefarious actions when planning for what could go wrong if this data ends up in the wrong hands. At the same time, if data remains siloed and inaccessible to those with good intentions, research efforts and advances in clinical care will be stymied.

Adding to the conflict embedded in this tension is the belief that population-level genomic data is valuable, considered by some to be equivalent to a natural resource. Restricting access may be a way for a jurisdiction to increase or singularly benefit from the value inherent in a certain genomic dataset, or it could leave jurisdictions behind as collaborators shift elsewhere. More open data access could lead to insights that carry more value than one dataset alone, yet those insights may confer uneven benefits to those who are already technologically advanced.

Key questions

- What does “open” access mean in this context?
- Which types of organizations or professions should have access to human genomic data and how should that access differ?
- Who gets to decide who has access? Are there mechanisms in place to ensure consistency?
- Are data-sharing protocols different for entities in your country versus internationally? Should data collected always remain in-country? How might this benefit or hinder advancements in genomic-based healthcare?
- Should patients or research participants have access to their own data?
- Should participants receive regular updates about where their data is being used? Is there a transparent way for them to see who is using their data?
- Who is the gatekeeper of this data? What is the gate?
- Is there a protocol in place for participants to withdraw their data?
- Is there a moral obligation to return this data if requested?

3. Balancing receiving benefits and altruistic donations

The matter of compensating those who participate in research or whose genomic data is included in a dataset that is monetized or leads to monetizable insights and applications is a nuanced one. Most international ethics guidelines support providing some form of benefit for research participation, but the nature of that benefit will vary by situation, and the provision of additional benefits stemming from the use of someone’s data is often a controversial issue. In either case, questions will arise regarding what constitutes a benefit, when it is appropriate to provide a benefit, what form that benefit should take and on whom it should be conferred.

Some experts believe individuals should be compensated in a non-monetary or monetary way for their participation in research and also for value derived from their data (e.g. commercial application based on the research). Others believe participation should be viewed as an altruistic act. Health discoveries often require large numbers of research participants and have the intent of benefitting society, though sometimes the discoveries come from a few patients who want to help doctors find a solution to a disease. Putting a price on genomic data may infringe upon a social norm of altruism and lead to negative consequences such as less research participation, slower scientific advancement, bias or valuing people differently based on their genetic uniqueness, prevailing research priorities and prevalence of certain diseases.

In regard to receiving benefits, some believe benefits should be devolved not to the individual, but to the communal level. However, there is no consensus on how far one should “zoom out” when defining a “community”. Regardless of how this difficult term is defined, it is essential to remain aware of the impact of power differentials between those conducting the research, and those participating in the research.

Key questions

- Who decides how benefits will be shared? Is the process democratic? Representational?
- At what points before, during and/or after research should any benefits be discussed and determined? Should there be options to reassess this based on the research outcomes or commercial potential?
- Should data contributors be consulted about what sorts of benefits they wish to see? How will this take place?
- To what level should the benefits trickle down and how broadly should benefits be distributed?
- If benefits are returned to communities, who decides what constitutes a community?
- Does benefit sharing differ depending on the type of research? Is altruistic donation more acceptable if the research has no commercial value?
- What is the timescale for returning benefits?

4. Balancing community and researcher oversight

As medical research became increasingly standardized in the 20th century, it became clear that ethical oversight of research was essential, leading to now standard institutional bodies such as national ethics boards, institutional review boards and research ethics committees. Genomic research raises new ethical issues, including issues related to the handling of incidental findings, findings with implications for family and the community, or the risk of conflict with cultural or religious beliefs. Determining how to adjust practices or procedures to ensure appropriate oversight, with checks and balances, and participant or community engagement, is a timely issue and will vary in different contexts.

Awareness of and attentiveness to this tension will help keep those with power from imposing their own cultural contexts on communities with different conceptions of the body, inheritance and communal belonging. It may not even be apparent to some that they are perceived as having power, which could influence the behaviour of the researchers or the participants with whom they engage.

Deep consideration must be given as to how to best assess and uphold what is ethical across contexts. When decisions are made about what counts as "ethical" research without input from the communities participating, cultural needs and nuances may be passed over. However, it is also true that the complex nature of genomic research demands multidisciplinary input from the scientists and researchers who understand the implications of their project. A balance must be struck so that research may proceed in a manner that respects the deep knowledge communities have of their needs and aspirations and that researchers have about the scientific aspects of their work.

Key questions

- Who will be included on an ethics review board? Do community authorities or leaders have a place? How much say is given to community members versus researchers?
- What is the relevant local authority?
- What does an ethics board look like? If one exists, should its structure or purview evolve to address new issues pertinent to genomic data collection and use? How should it evolve?
- Does your system include multiple ethics bodies? Does this lead to increased oversight, or redundancy and diffusion of responsibility?
- Does anyone have veto power? Who? Is it someone on a local ethics board, or a national one?
- What is the governing body for ethical violators?

5. Balancing inclusion and exclusion

Genomic research has mostly been performed on Caucasian populations. To gain a more holistic understanding of how genomics affects everyone's lives, research must become far more inclusive and reach out to indigenous, historically excluded or less studied populations. Not considering diverse populations in research and clinical testing leads to data gaps that can result in the incorrect interpretation of genomic information and cause harm. However, careful consideration must be given as to how these populations will be included and under what circumstances – examples exist where populations participated in genomic research that resulted in stigmatization and, in some cases, even persecution of their communities, leading them to feel they were taken advantage of by those in power, and to mistrust future research requests.

Key questions

- What is in place to ensure indigenous, historically excluded and less studied populations are included in research?
- How can researchers and participants work together to craft a plan that is mutually beneficial?
- How are you identifying individuals/ representatives for engagement and engaging them? How can you ensure they are representative of and knowledgeable about the participant community?
- What power does the community have in the process?
- What are the incentives for community to be engaged?
- What is in place to protect these groups from

exploitation?

- Were they consulted about expectations from the use of their genomic information?

6. Balancing confidentiality and duty to inform

Genomic research can reveal serious, even deadly, issues contained within a person's DNA. When these maladies are heritable, this information may have life-altering consequences for relatives or partners of those with the genetic mutation. Healthcare practitioners typically adhere to consent forms and do not return results or incidental findings to family members; however, this increasingly places them in a difficult position regarding delivery of care and prevention of harm.[7]

The position is even more tenuous in an LMIC or emerging economy context, where the absence of data makes it difficult to determine whether one's genes could increase the risk of developing a disease or cause a disease. A genetic mutation linked to a significant risk of developing disease in one population may not carry the same risk, if any, in another population. And who would provide feedback and guidance given the lack of clinical geneticists and genetic counsellors? Ethical questions remain about providing findings if a patient is unable to access treatment, and more ethical questions remain about disclosing findings that can affect one's standing in society.

While many researchers and clinicians feel strongly about their duty to inform individuals, questions about the possibility and desirability of returning individual results to genomic research participants or patients still requires resolution. Policy-makers should consider how to handle cases in which the duty to inform runs up against situational constraints and participant or patient well-being. They should also consider when the duty to inform conflicts with the duty of confidentiality to not inform family members of findings that could affect their health and well-being.

Key questions

- Is the duty of confidentiality always absolute?

- Are there circumstances under which relatives will be informed of a result? What are those circumstances?

- If a participant explicitly refuses to share their results, must their wishes be respected in all circumstances?

- Who is responsible for informing others of findings? Researchers? Participants? Physicians?

- What lengths should the person responsible go to to locate relatives?

- Which relatives should be informed?

- Are there legal protections/punishments in place for those who share this information without permission?

- How can results be delivered in a way that respects cultural norms and avoids stigma?

- Does the duty to inform change when results are not medically actionable?

Next steps

Elements of the genomic data policy framework will be piloted with several government partners in their own contexts, providing a “sandbox” for addressing policy and ethical issues related to genomic data. Testing the policy framework and ethical tensions through real-world applications with geographically diverse government partners will enable revision and refinement of this work. Learnings from these pilots will be incorporated into the framework and ethical tensions and shared with the intent of scaling approaches to additional government partners.

We seek opportunities to learn from local customization as well as refine the ideas herein through test cases developed in collaboration with interested organizations. Please contact Elissa Prichep if your government or organization has a project underway. As the field of genomics continues to evolve, so will humanity’s knowledge and perspective on how to ethically govern it.

Conclusion

Using policy and ethics frameworks to balance the promise and opportunities of genomic data with the real-world practicalities of implementing such initiatives provides a path forward for countries. Leapfrogging is possible. The potential for international and national-level frameworks informed by this white paper and early pilot projects can support the development of standards and guidelines that will inform policies and regulations. It is the hope of the authors and those engaged in the Leapfrogging with Precision Medicine community that such work supports the goal that genomic data from LMICs and emerging economies will lead to diagnostics and treatment developed with, tailored to and accessible to those populations, improving health outcomes globally.

Appendix

These documents are available on the World Economic Forum's Leapfrogging with Precision Medicine project page.

- Leapfrogging with Precision Medicine One-Pager
- Genomic Data Policy Resource List
- Leapfrogging with Genomic Data Workshop Report
- Leapfrogging with Genomic Data Vignettes
- Addressing Ethical Tensions in Genomic Data Policy: Case Studies and Learnings

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Endnotes

[1] While this document refers to LMICs, it is important to note that this project scope also includes high-income countries such as those in the Middle East, whose populations have not traditionally been included in genomic research and who are advancing their health ecosystems to include precision and genomic medicine.

[2] Morales, J., Welter, D., Bowler, E.H., et al. (2018). A Standardized Framework for Representation of Ancestry Data in Genomics Studies, with Application to the NHGRI-EBI GWAS Catalog. Genome Biology 19 (21), Figure 2: https://genomebiology.biomedcentral.com/articles/10.1186/s13059-018-1396-2#Fig2 (link as of 24/2/20).

[3] Oxford English Dictionary definition.

[4] Note, the ability to change one's consent does not imply they are the owners of the data. This is a separate legal issue.

[5] Societal values, such as liberal individualism and communitarianism, may influence individual decision-making and the age at which people are legally considered independent.

[6] Implementation will vary by necessity. A patient with a rare disease, for example. may require identification among a limited group of healthcare providers and researchers.

[7] The exception is when a physician returns results on a minor to their parent(s) or care provider(s).

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