CENTRE FOR POPULATION GENOMICS

Strategic Plan 2021-2022

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murdoch children's research institute

Garvan Institute of Medical Research

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Strategic Plan-on-a-page 2021-2022

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Vision:

A world in which genomic information enables comprehensive disease prediction, accurate diagnosis and effective therapeutics for all people

Purpose:

To establish respectful partnerships with diverse communities, collect and analyse genomic data at transformative scale and drive genomic discovery and equitable genomic medicine in Australia

Goals:

- Community partnerships
- Computational infrastructure
- Genomic datasets
- Scientific & medical knowledge

Principles:

- Respect
- Diversity
- Openness
- Scalability
- Connectedness

Vision:

A world in which genomic information enables comprehensive disease prediction, accurate diagnosis and effective therapeutics for all people

- *The next decade will see a transformation of medicine and biology, driven in part by an explosion in our understanding of the connections between human genetic variation and individuals' traits. This knowledge will allow the dissection of the biological basis of human traits, improve the prediction and diagnosis of disease, and accelerate the discovery and validation of new therapeutic targets. Key to these discoveries will be population genomics: the generation and analysis of massive-scale data sets of human genetic variation, combined with information on health and clinical outcomes.*

- *The Centre for Population Genomics (CPG), begun in 2020 as a joint initiative between the Garvan Institute for Medical Research in Sydney and the Murdoch Children's Research Institute in Melbourne, will be a key contributor to this new world of medical innovation – a world in which genomic information enables comprehensive disease prediction, accurate diagnosis and effective therapeutics for all people.*

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Purpose:

To establish respectful partnerships with diverse communities, collect and analyse genomic data at transformative scale and drive genomic discovery and equitable genomic medicine in Australia

- *The CPG is led by experts in community engagement, software development, genomic analysis and project management. Director Daniel MacArthur previously served as the co-director of Medical and Population Genetics at the Broad Institute of MIT and Harvard, where he led the development of the Genome Aggregation Database (gnomAD), the largest and most widely-used collection of human DNA sequencing data in the world.*

- *The CPG seeks to address an inequity. Australians come from a very diverse range of ancestries but the people most able to benefit from genomic medicine are those of European descent because the reference databases needed to assist with diagnosis and treatment largely contain the genome and exome data of Europeans.*

- *By working respectfully with Australia's diverse communities and collating and analysing genomic data, the CPG will help to drive equitable genomic medicine in Australia.*

Goals:

Community partnerships	Computational infrastructure	Genomic datasets	Scientific & medical knowledge

There are four pillars or goals of the strategy:

- ***Community partnerships*** *- Collaborate with communities to co-design genomic health projects*
- ***Computational infrastructure*** *- Create open source computational infrastructure for the storage, processing and analysis of large-scale genomic data*
- ***Genomic datasets*** *- Generate and assemble genomic datasets and make them openly and ethically available*
- ***Scientific and medical knowledge*** *- Drive biological discovery, disease diagnosis and the identification of therapeutic targets*

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Each goal has three objectives

Community partnerships

Understand characteristics & prioritise communities for engagement	Create trusting relationships & co-design research approach	Engage communities in recruitment & research

Computational infrastructure

Build a cloud-based platform for genomic data	Empower data analysis	Enable data and code sharing

Genomic datasets

Generate large, diverse reference datasets of human genomic variation	Generate genomic data from families affected by rare disease	Generate or collect genomic data from existing cohorts with clinical and/or functional data

Scientific & medical knowledge

Improve diagnosis in patients affected by rare genetic diseases	Discover new genes and biological mechanisms underlying human diseases and traits	Use genomic data to identify new targets for therapeutic intervention

Goal 1 - Community partnerships
Collaborate with communities to co-design genomic health projects

Objective 1
Understand characteristics & prioritise communities for engagement

1. *Develop criteria for identifying ancestry groups in Australia not represented in genomic databases*
2. *Assess size, relative clinical need, genomic data gap*
3. *Prioritise ancestry groups for research engagement (first level)*
4. *Analyse and describe cultural, ethnographic, geographic and organisational characteristics of first level communities*
5. *Refine prioritisation and select communities (second level)*

Products/measures: ***Prioritisation matrix & descriptive characteristics of communities***

Goal 1 - Community partnerships
Collaborate with communities to co-design genomic health projects

Objective 2
Create trusting relationships & co-design research approach

1. *Create connections and hold community consultations*
2. *Test and refine communication messages/channels to raise awareness*
3. *Build shared research engagement plans*
4. *Develop human research ethics protocols (including consent platform/process)*

Products/measures: ***Co-design framework, communication metrics, ethics protocol & consenting mechanism***

Goal 1 - Community partnerships
Collaborate with communities to co-design genomic health projects

Objective 3
Engage communities in recruitment & research

1. *Establish workflows for enrolment, informed consent, sampling & return of results*
2. *Conduct recruitment and sampling*
3. *Maintain relationships and provide follow-up communications & updates*

Products/measures: ***Number of samples; number of ancestry groups***

Goal 2 - Computational infrastructure

Create open source computational infrastructure for the storage, processing and analysis of large-scale genomic data

Objective 1
Build a cloud-based platform for genomic data

1. *Define and implement project structure, storage policies, and access control for genomic data*
2. *Build workflows to generate individual-level variant calls from raw sequencing reads*
3. *Build workflows to populate a metadata repository*

Products/measures: ***Policies and workflows for storing individual-level samples and metadata in the cloud***

Goal 2 - Computational infrastructure

Create open source computational infrastructure for the storage, processing and analysis of large-scale genomic data

Objective 2
Empower data analysis

1. *Deploy a scalable analysis platform*
2. *Build a QC pipeline for samples and variants*
3. *Productionize methods developed by the genomic analysis team*

Products/measures: ***Workflows to generate quality controlled aggregate data and research insights***

Goal 2 - Computational infrastructure

Create open source computational infrastructure for the storage, processing and analysis of large-scale genomic data

Objective 3
Enable data and code sharing

1. *Build and deploy public data browsers for aggregate data*
2. *Build workflows to make individual-level data available in an access-controlled environment*
3. *Develop and publish code in open source repositories*

Products/measures: ***Public data browsers, workflows to share data in access-controlled repositories, open source code***

Goal 3 - Genomic datasets
Generate and assemble genomic datasets and make them openly and ethically available

Objective 1
Generate large, diverse reference datasets of human genomic variation

1. *Generate large, uniform, high-quality data sets and perform robust quality checks*
2. *Perform rigorous data analysis, interpretation and validation*
3. *Share the results of our analysis (data products and scientific results) openly, in a timely and accessible fashion, and in a manner that is consistent with the wishes of participants and their communities*

Products/measures: ***Robust, releasable and accessible data sets; usable analytical results; number of users and citations***

Goal 3 - Genomic datasets
Generate and assemble genomic datasets and make them openly and ethically available

Objective 2
Generate genomic data from families affected by rare disease

1. *Generate large, uniform, high-quality data sets and perform robust quality checks*
2. *In close collaboration with clinical domain experts, perform rigorous data analysis, interpretation and validation,*
3. *Share the results of our analysis (data products and scientific results) openly, in a timely and accessible fashion, and in a manner that is consistent with the wishes of participants and their families*

Products/measures: ***Robust, releasable and accessible data sets; usable analytical results; number of users and citations***

Goal 3 - Genomic datasets
Generate and assemble genomic datasets and make them openly and ethically available

Objective 3
Generate or collect genomic data from existing cohorts with clinical and/or functional data

1. *Generate large, uniform, high-quality data sets and perform robust quality checks*
2. *Perform rigorous data analysis, interpretation and validation*
3. *Share the results of our analysis (data products and scientific results) openly, in a timely and accessible fashion, and in a manner that is consistent with the wishes of participants and our collaborators*

Products/measures: ***Robust, releasable and controlled access data sets; usable analytical results; number of users and citations; number of diagnoses supported***

Goal 4 - Scientific and medical knowledge
Drive biological discovery, disease diagnosis and the identification of therapeutic targets

Objective 1
Improve diagnosis in patients affected by rare genetic diseases

1. *In collaboration with existing clinical and research programs working on rare diseases, develop and deploy improved diagnostic pipelines*
2. *Return diagnoses and supporting evidence to participants through our clinical partners*
3. *Contribute the resulting knowledge to international databases*
4. *Collaborate to produce content for education and training in clinical genetics*

Products/measures: ***Analytical pipelines available and used; number of families who received a diagnosis; collaborations (clinical and training)***

Goal 4 - Scientific and medical knowledge
Drive biological discovery, disease diagnosis and the identification of therapeutic targets

Objective 2
Discover new genes and biological mechanisms underlying human diseases and traits

1. *From the rare disease datasets, identify new candidate disease-related genes, test and validate disease association, and drive characterisation of the underlying disease mechanisms*
2. *Using datasets from clinically or functionally characterised cohorts, examine the genetic architecture of complex traits*

Products/measures: ***New disease genes discovered; new findings regarding genetic effects on human biology; papers in prepublication***

Goal 4 - Scientific and medical knowledge
Drive biological discovery, disease diagnosis and the identification of therapeutic targets

Objective 3
Use genomic data to identify new targets for therapeutic intervention

1. *Develop improved analytical tools for the detection and prediction of gene-disrupting (loss-of-function - LoF) variants in human genomic datasets*
2. *Examine the impact of these LoF variants on human phenotypes and disease risk, thus identifying targets for pharmacological inhibition*
3. *Identify candidate loci for genome-guided therapies, and develop approaches to facilitate these*

Products/measures: ***Analytical tools for LoF variant identification; new candidate therapeutic targets identified; papers in prepublication***

Principles:

Respect Diversity Openness Scalability Connectedness

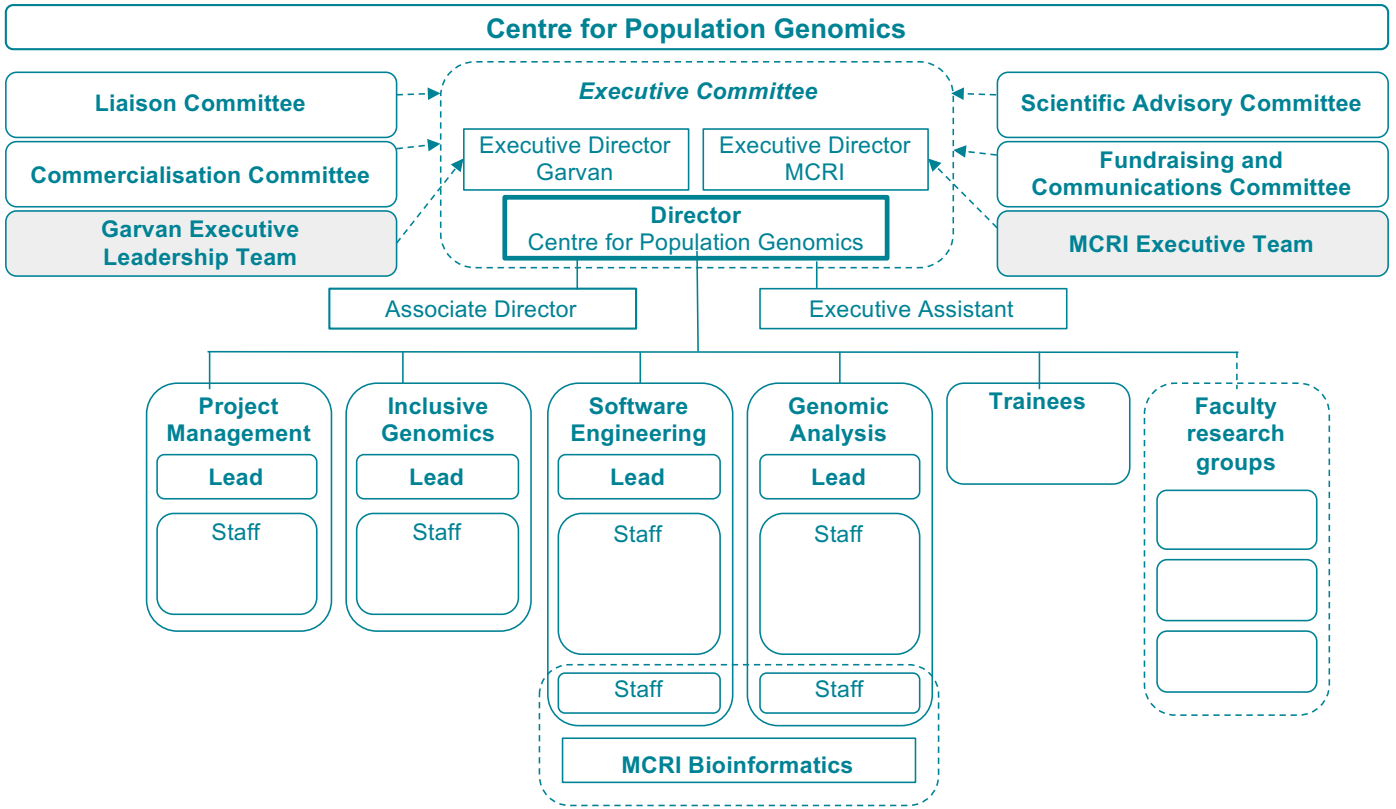
Five principles underpin the strategy:

- ***Respect**: CPG respects the rights and agency of individuals and communities with regard to their data and scientific results*
- ***Diversity**: CPG expands representation of the diverse communities of Australia in genomic datasets*
- ***Openness**: CPG practices open science, releasing all data, code, and scientific results as rapidly and openly as possible*
- ***Scalability**: CPG builds platforms and approaches that are robust for use at population scale*
- ***Connectedness:** CPG is part of and helps to build a global network of leading genomic research teams.*

Operating model

CPG's operating model provides four essential components to implement the strategy:

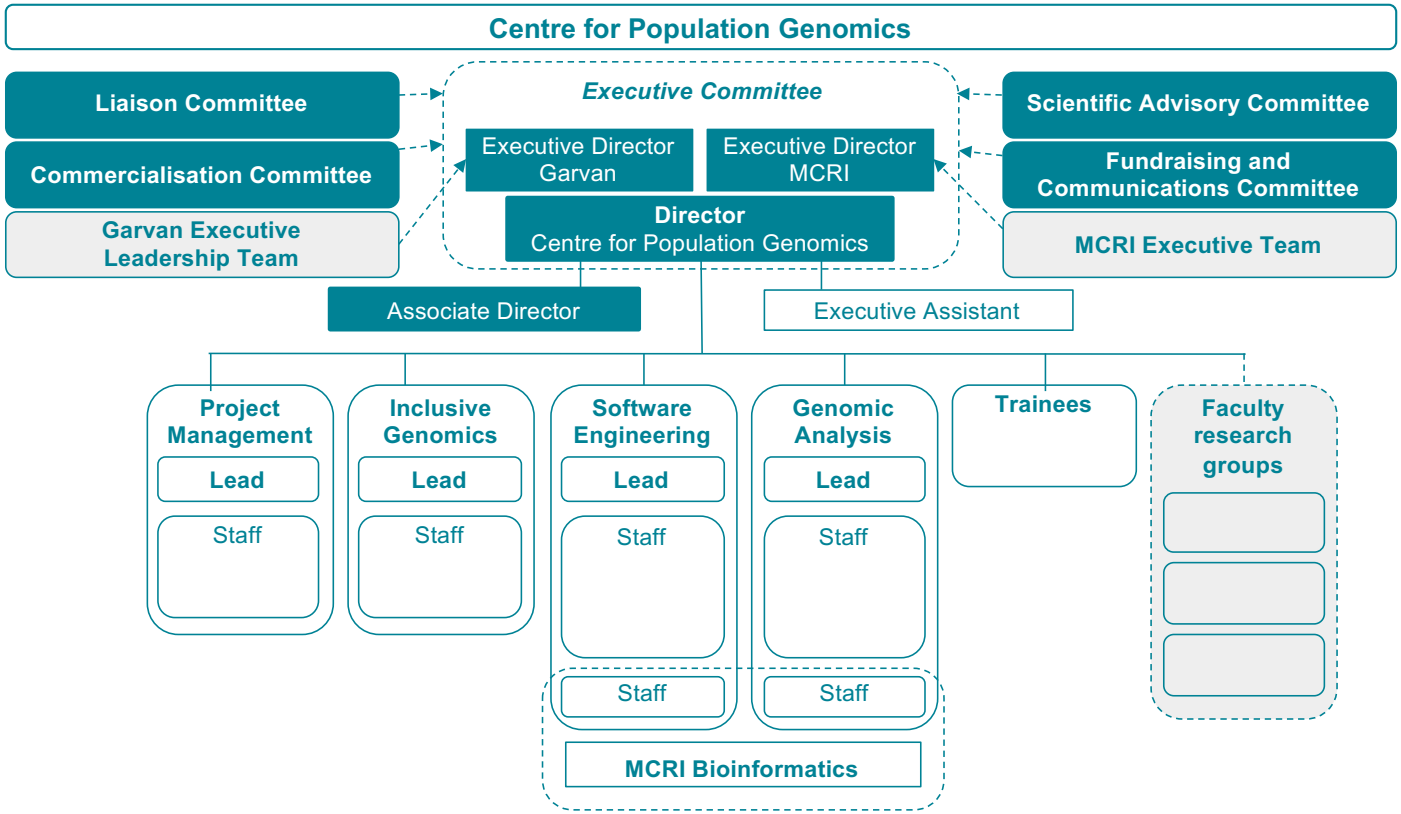
- *Governance & strategic oversight*
- *Genomics building blocks (communities, software, analysis, bioinformatics)*
- *Scientific thought leadership*
- *Cross-cutting coordination (projects and management)*



Operating model

Component 1
Governance and strategic oversight

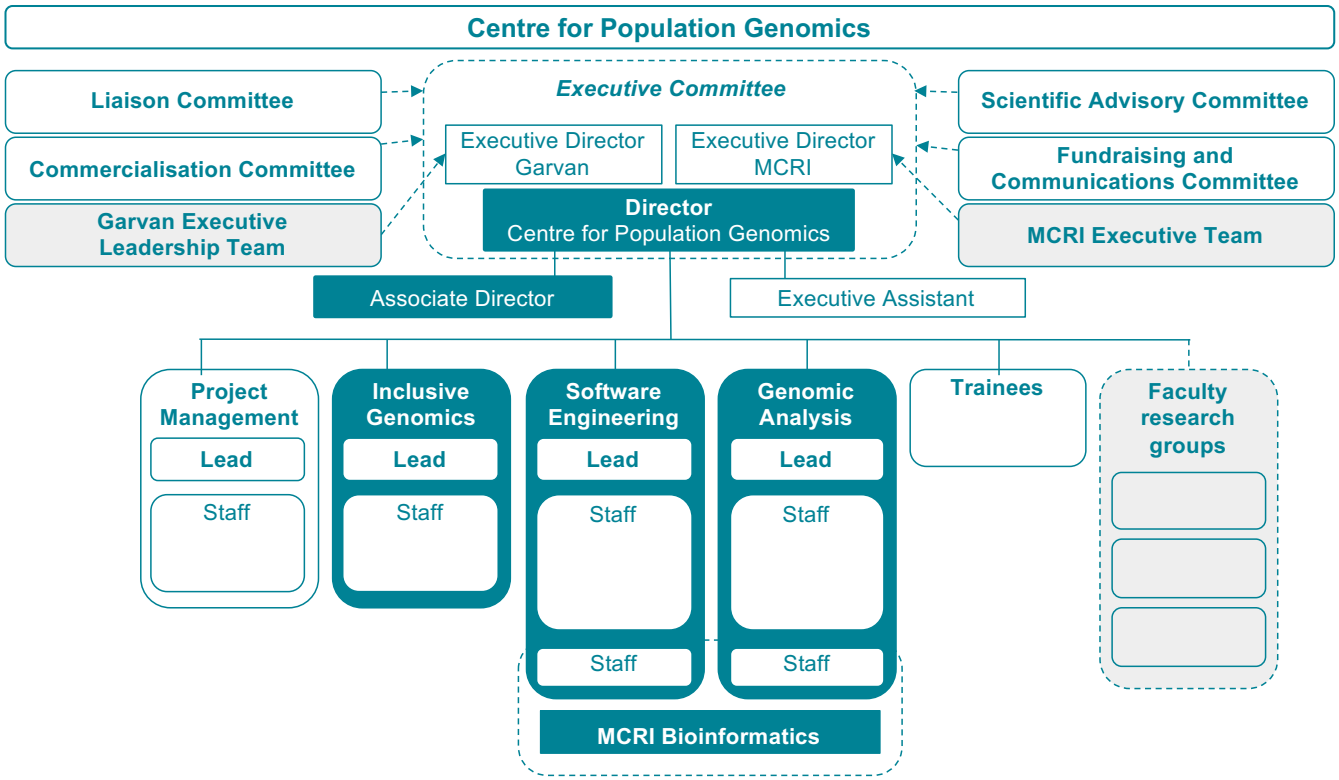
The Executive committee provides Governance and Strategic Oversight and consists of the Executive Director, Garvan and the Executive Director, MCRI (each representing her/his respective institute) and the Director, CPG, supported by the Associate Director, CPG, with inputs from advisory committees.



Operating model

Component 2
Genomics building blocks (communities, software, analysis, bioinformatics)

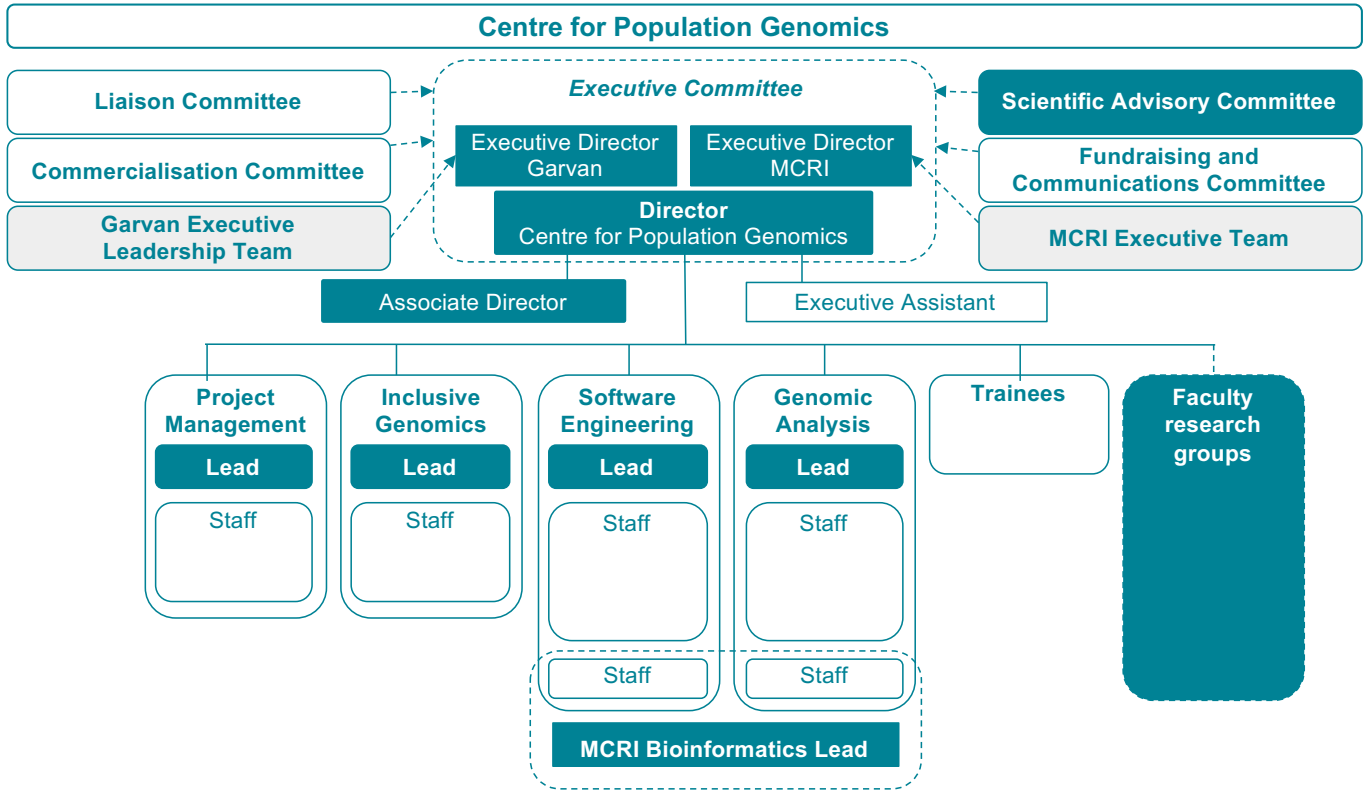
Four teams deliver the building blocks of the CPG strategy: Inclusive Genomics drives the community engagement, Software Engineering creates the computation infrastructure, Genomic Analysis and Bioinformatics build/refine the data and inform the analysis, all led by the Director, CPG and supported by the Associate Director, CPG.



Operating model

Component 3
Scientific thought leadership

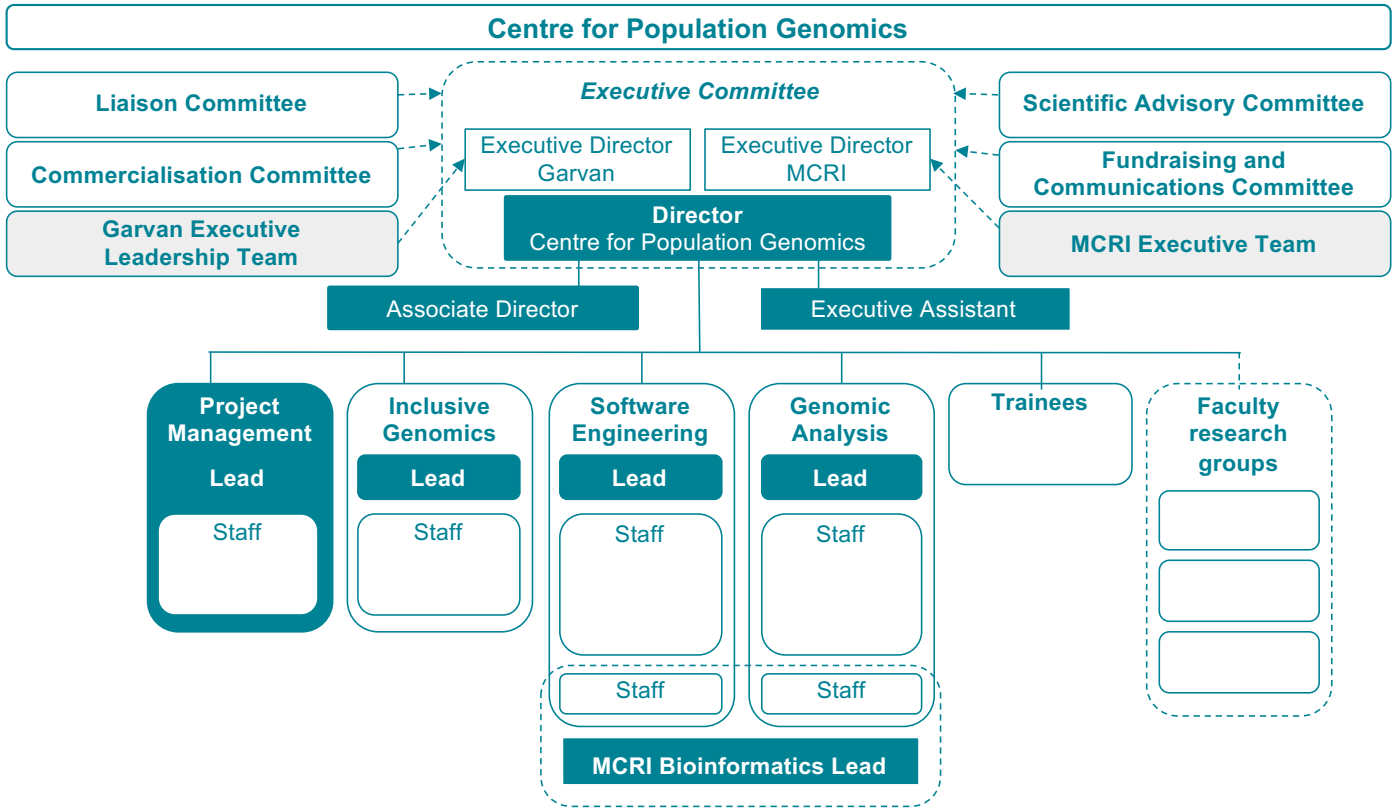
Scientific thought leadership is spearheaded by the Director, CPG with guidance from the Executive Directors of Garvan and MCRI and the Scientific Advisory Committee, support from the Associate Director, CPG and the Team Leads, Inclusive Genomics, Software Engineering, Genomic Analysis and Bioinformatics and ongoing collaboration from the faculty.



Operating model

Component 4
Cross-cutting coordination (projects and management)

Cross-cutting coordination to deliver projects and manage the centre is provided by the senior executive team, led by the Director CPG, supported by the Associate Director, CPG and the team EA, and driven by the Lead, Project Management along with the other team leads.



Operational plan

- *The implementation of this strategy is fleshed out in detail in CPG's Operational Plan (presented elsewhere).*
- *The Operational Plan also includes managerial components not articulated in this strategy, such as fundraising and financial management, recruitment and personnel management, etc.*
- *The Operational Plan is a living document that will be regularly updated and will evolve in response to changing circumstances.*

CPG Operational Plan

Goal X: Xxxxxxxxxx - Xxxxxxxxx

Objective 1.1: Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

Planning		Monitoring		
Actions	Persons accountable	Outputs	Status and date updated	Notes
1.1.1: Xxxxxxxxxxx				
1.1.2: Xxxxxxxxxxxxx				
1.1.3: Xxxxxxxxxxx				

Monitoring and evaluation plan

Delivery of this strategy will be tracked for each Goal and Objective against our intended activities, measured by products / results.

GOALS	PRODUCTS / RESULTS
Goal 1 - **Community partnerships**: Collaborate with communities to co-design genomic health projects	Prioritisation matrix Descriptive characteristics of communities Co-design framework(s) Communication metrics Ethics protocol(s) Consenting mechanism(s) Number of samples Number of ancestry groups
Goal 2 - **Computational infrastructure**: Create open source computational infrastructure for the storage, processing and analysis of large-scale genomic data	Policies and workflows for storing individual-level samples and metadata in the cloud Workflows to generate quality controlled aggregate data and research insights Public data browsers Workflows to share data in access-controlled repositories Open source code

Monitoring and evaluation plan

GOALS	PRODUCTS / RESULTS
Goal 3 - Genomic datasets: Generate and assemble genomic datasets and make them openly and ethically available	Robust, releasable and accessible data sets Usable analytical results Number of users Number of diagnoses supported Number of citations
Goal 4 - Scientific and medical knowledge: Drive biological discovery, disease diagnosis and the identification of therapeutic targets	Analytical pipelines available and used Number of families who received a diagnosis Collaborations (clinical and training) New disease genes discovered New findings regarding genetic effects on human biology Analytical tools for LoF variant identification New candidate therapeutic targets identified Papers in prepublication

Team values

All staff worked together to define these 5 values that will drive our attitudes and behaviour at work:

We remember that our data come from people: Every file we work on comes from a human being. We respect the wishes of those human beings in using and sharing their data, and do whatever we can to ensure that our research benefits them.

We do things that matter, even if they are hard: We challenge ourselves to take on important problems affecting patients and communities, and we persist in the face of daunting obstacles.

We share accountability: We identify and transparently communicate challenges, even if they fall outside our job descriptions, and then we work together to solve them.

We support each other: We enjoy working collaboratively on tough problems and are not afraid to ask for help. We give people the tools and support they need to be successful, to enjoy their work, and to build rewarding careers.

We celebrate our differences: People are different, and that's a good thing. We bring together people with diverse backgrounds and personalities, and we all help to create an environment where everyone's opinion is heard.