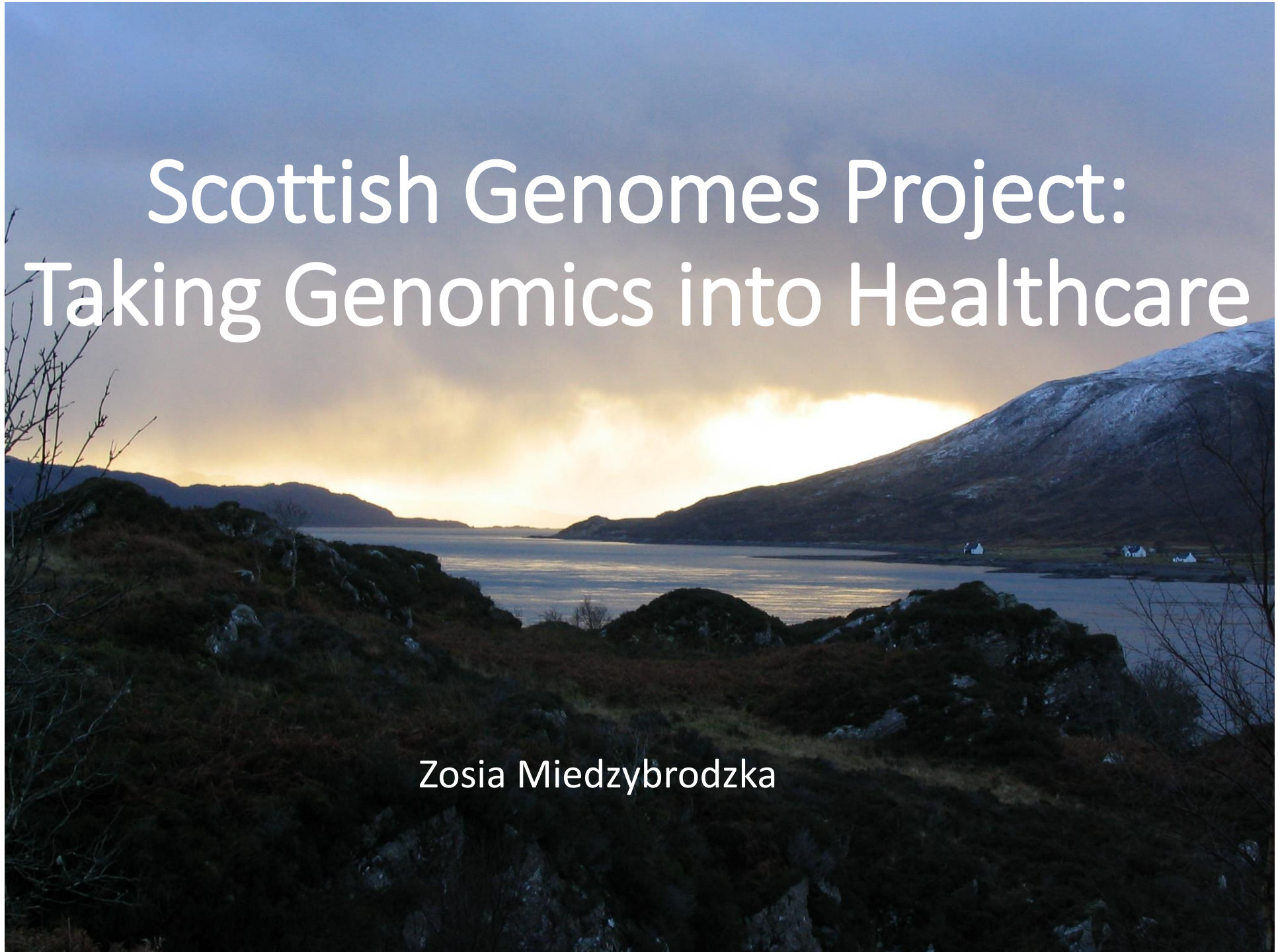


Scottish Genomes Project: Taking Genomics into Healthcare

Zosia Miedzybrodzka

DNA

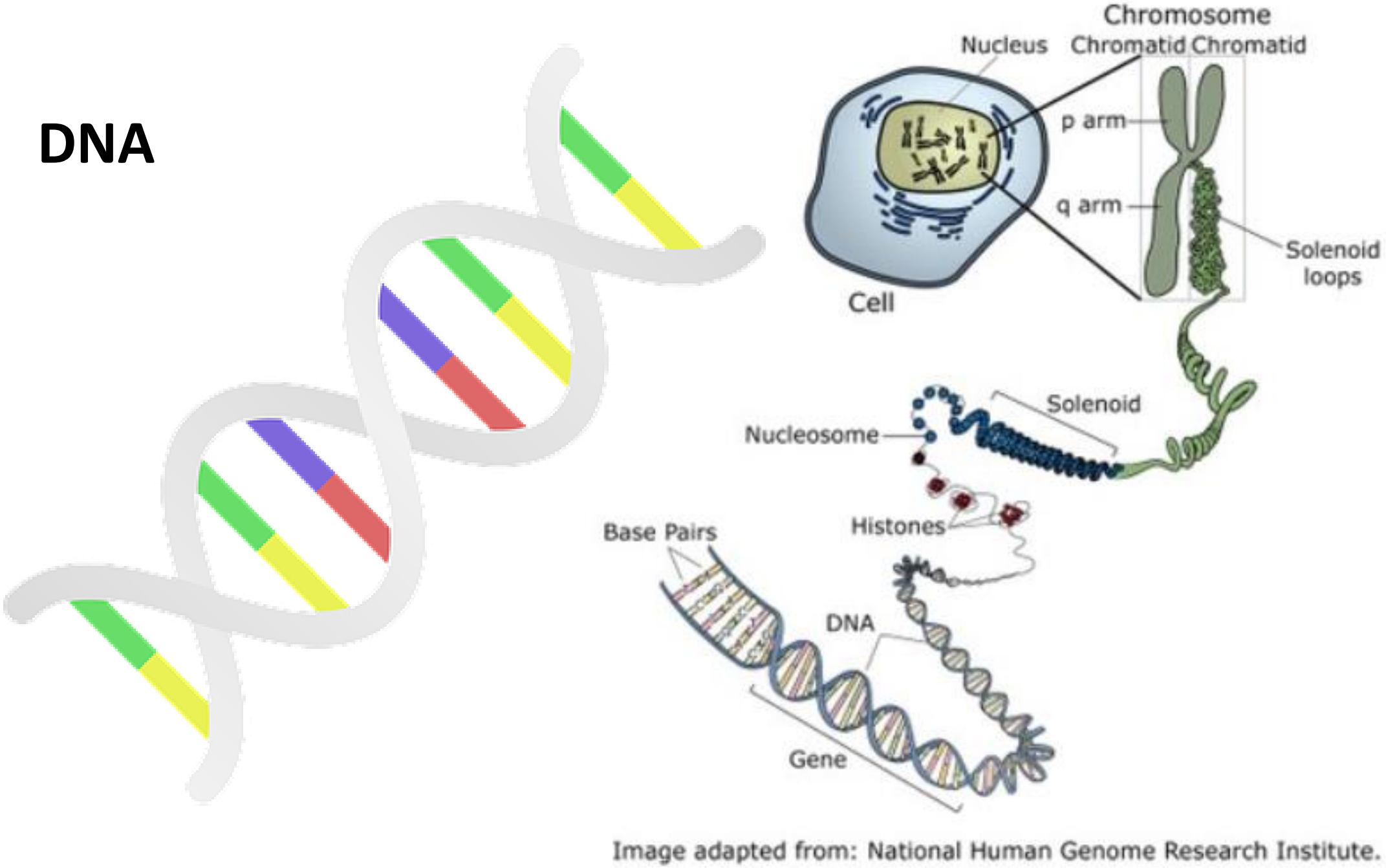
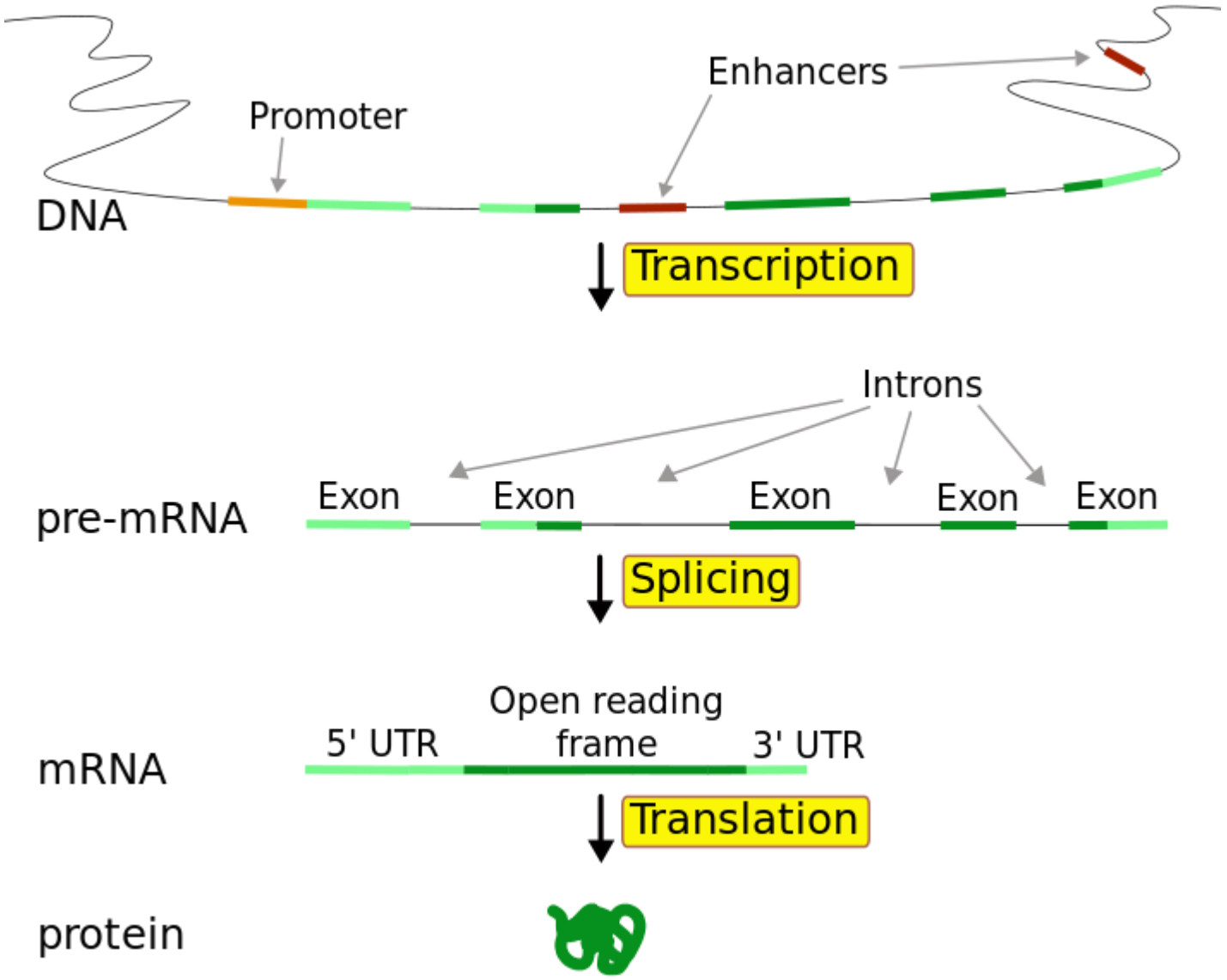


Image adapted from: National Human Genome Research Institute.



GENOME IS ALL OF OUR DNA: CODING & NON-CODING

Sequencing of Whole Genomes at Scale in Scotland

The Scottish Genomes Partnership

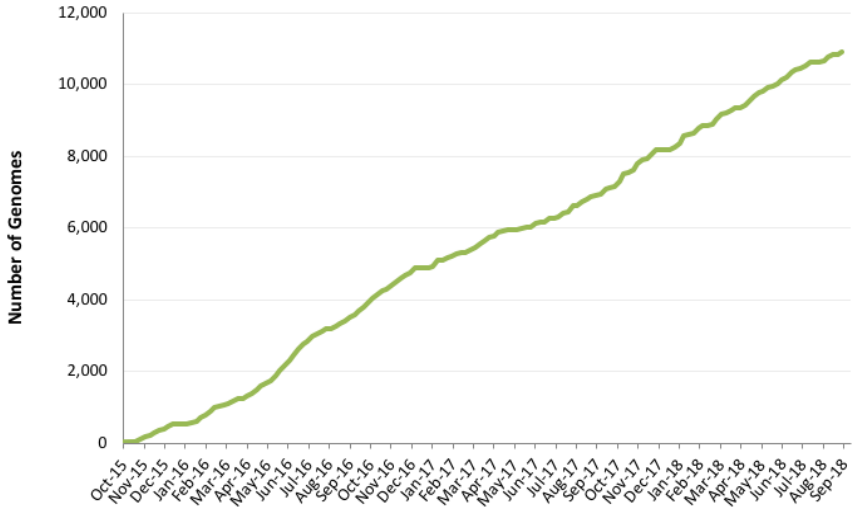
£21m boost for Scotland's gene research

- £15M investment by Edinburgh and Glasgow Universities
  - Illumina HiSeq X Ten platform
- £6M award from Scottish Government and MRC

"Scotland is amongst the 20 global leaders in genomics"

JP Morgan Investors' Conference, Jan '15

Edinburgh Genomics Sequencing Facility



11,000 whole genomes sequenced
(Oct 2018)

Cancer Genomes at University of Glasgow

Scottish Genomes Project

- Scotland-wide collaboration (PIs Tim Aitman & Andrew Biankin)
- Major investment by Universities of Edinburgh & Glasgow in equipment
- Building on Scotland's strengths in genetics research and clinical practice across four centres
  - Population cohort sequencing- Lothian birth cohort, Viking cohort, rare disease, MND
  - Cancer- focus on pancreatic, ovarian & oesophageal cancers
  - NHS Scotland in 100,000 Genomes Project to improve diagnosis of rare disease

Scottish Variant Repository: scotvardb.igmm.ed.ac.uk

- Browser of “normal” genetic variation in Scottish population
- Integrated Variant Analysis browser for aggregate data
- Virtual server provisioned for 5 years with 1Tb of storage
  - Behind University of Edinburgh firewall
  - VPN access with user login
- Access by application to SGP OMC
- OpenCGA database back-end, not accessible to outside

NHS Scotland in 100,000 Genomes Project

Zosia Miedzybrodzka

Chief Investigator

Professor of Medical Genetics, University of Aberdeen

Lead Clinician, NHS Scottish Genetics Consortium

NHS Genetics in Scotland

- Managed consortium for laboratory testing- 32 years
- 4 genetic centres
  - High proportion of adult disease (paeds <20% of referrals)
  - Labs and clinics work together
- Higher level of genetics initiated and mainstream testing than England for many years despite test criteria being the same
  - Early adopters

Taking Genome Testing to the Clinic

- Standard genetic testing
  - Number of chromosomes & pieces of chromosomes
  - Details of one to a few hundred genes
  - Aimed at particular conditions considered likely
- 10,000 genes implicated in rare disease
  - Looking at them all could be better for diagnosing some patients
  - Genome examines non-coding DNA too
  - At present tests in NHS focus on coding DNA
- Standard tests cheaper with better coverage but look at fewer genes

It's Not Rare to Have a Rare Disease

It's Not Rare to Have a Rare Disease

Wednesday, July 9, 2014

ISBN: 9781784126575

The Implementation Plan for Rare Diseases in Scotland

Executive Summary

'It's Not Rare to Have a Rare Disease', describes how Scotland is currently contributing to the delivery of the UK Rare Disease Strategy committments and sets out areas for future partnership to deliver actions in:

- Empowering those affected by rare diseases
- Identifying and preventing rare diseases
- Diagnosis and early intervention
- Co-ordination of care

Contents

View as HTML

Associated downloadable documents

Contact

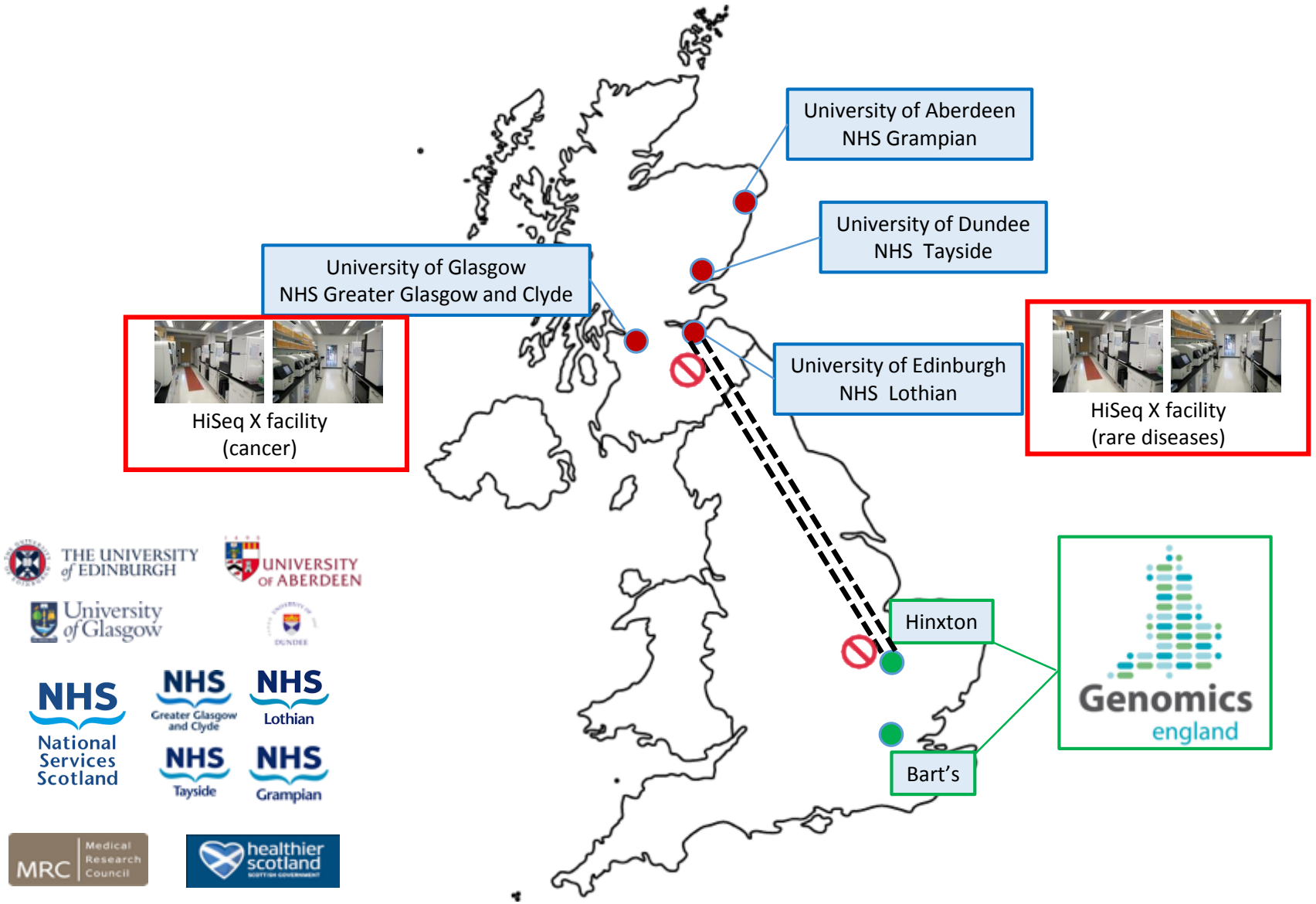
Paul Currie

Genome Trio-based Analysis

- https://www.genomicsengland.co.uk/the-100000-genomes-project

Glut1 deficiency: SLC2A1 deletion or mutation
Treatment with ketogenic diet

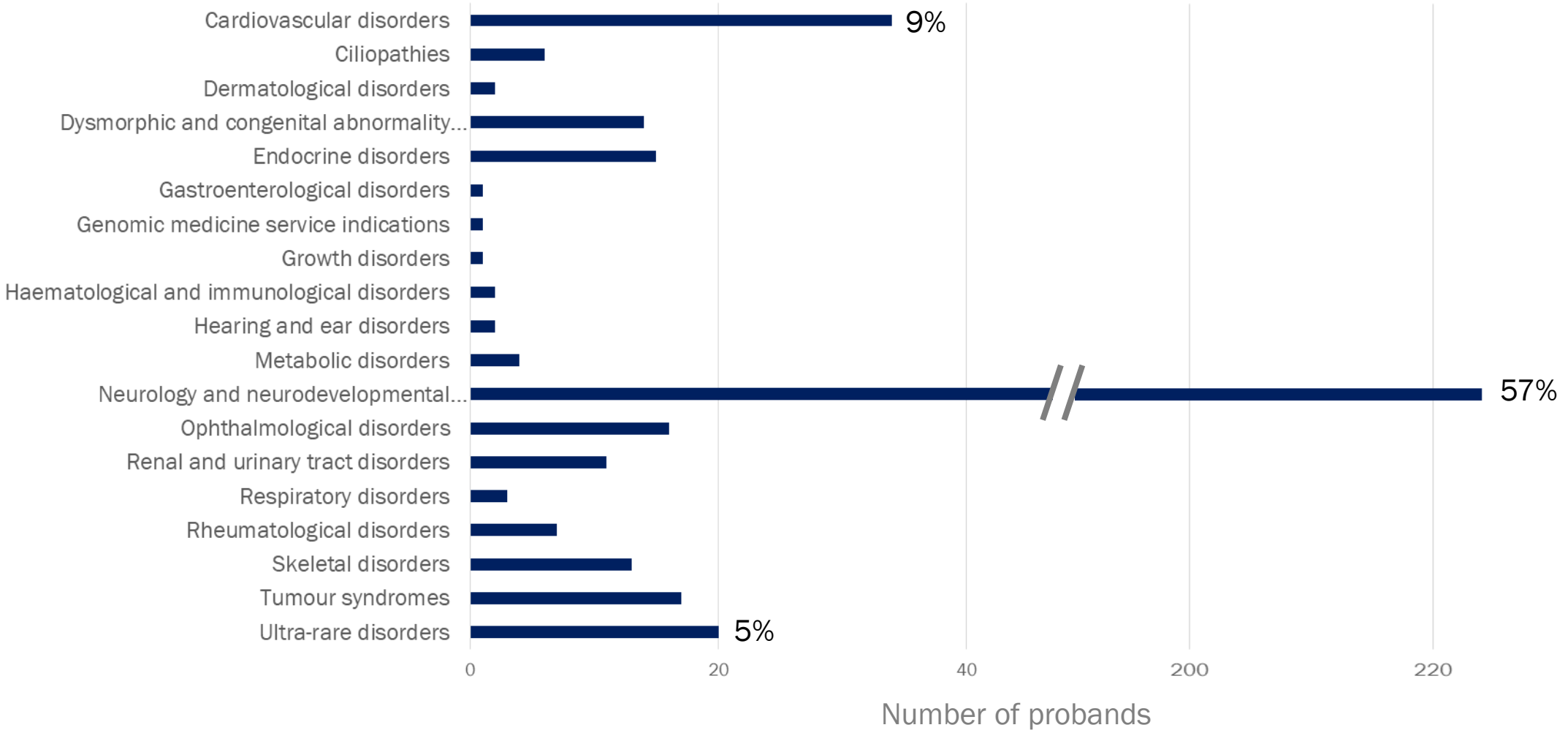
Scottish Genomes Partnership and Genomics England



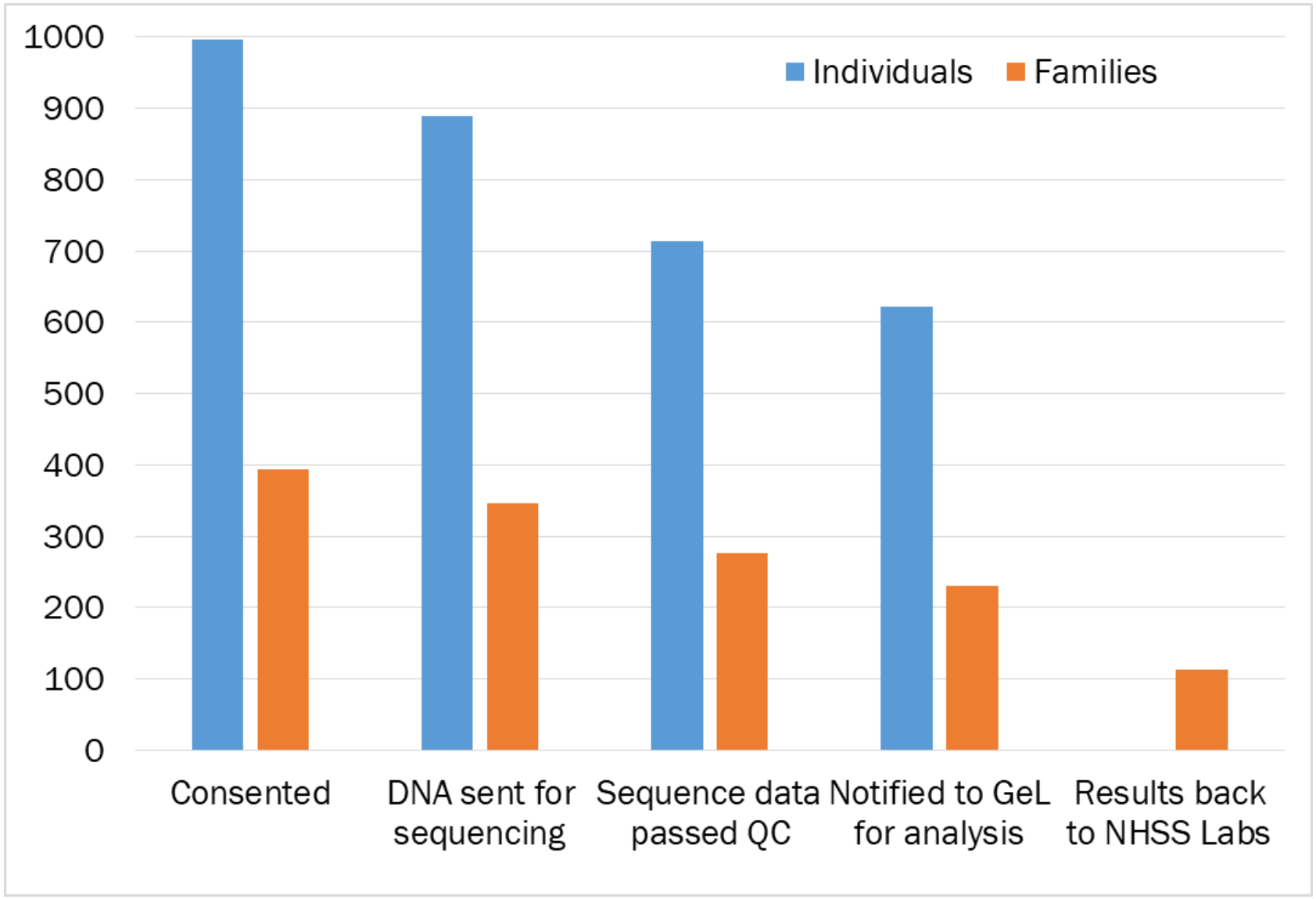
Scotland in 100,000 Genomes

- 1,000 genomes sequenced in Scotland
- Usually child & parents- consented
- Anonymised genetic & clinical data transferred, stored, used & shared in Genomics England datastore
  - Genome results filtered to possible suspects using automated software
- Suspect genes checked by NHS Scotland lab & clinic staff
- Reported back to patients by their genetics doctor's team
- Additional analysis using more detailed filter systems developed in Edinburgh (Fitzpatrick)
- Consent to lifetime follow-up of clinical records

Scottish participation in the 100,000 Genomes Project: **Proband phenotype distribution**

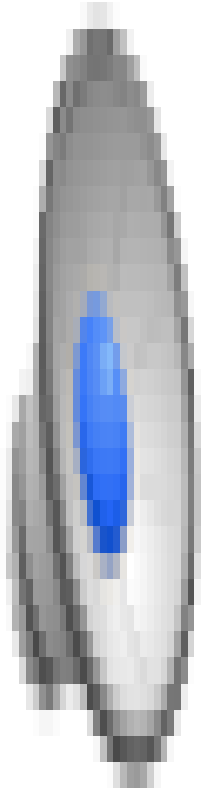


Scottish participation in the 100,000 Genomes Project: **Project progress**



Genomics in NHS Scotland

- Review of Scottish Genetics Consortium set genomic testing as a priority
- SGP has established processes for clinical genome analysis in NHS Scotland
- Establishing best way to test each patient depending on presentation
  - Ongoing health economics review
  - Detailed costing & development of appropriate measure of value
- Ongoing Scottish Scientist Advisory Council review to discuss how to make genomics standard care in Scotland & to expand other genetics tests to deliver personalised medicine



Scottish Strengths

- Key strengths of bioinformatics, high performance computing and health care evaluation to bring to the table
- Engaged and effective NHS genetic workforce working as one
- Research embedded in workforce culture
- Education programmes available
- We need to define our place in the worldwide genomic landscape

Acknowledgments

- NHS Scotland Genetics teams & National Services Division
- Genomics England
- CSO, MRC & Scottish Government for funding

Acknowledgements

MRC Human Genetics Unit

- Colin Semple
- Kevin Donnelly
- Ewan McDowall
- John Ireland
- Jim Wilson

Cambridge Big Data Strategic Research Institute

- Ignacio Medina

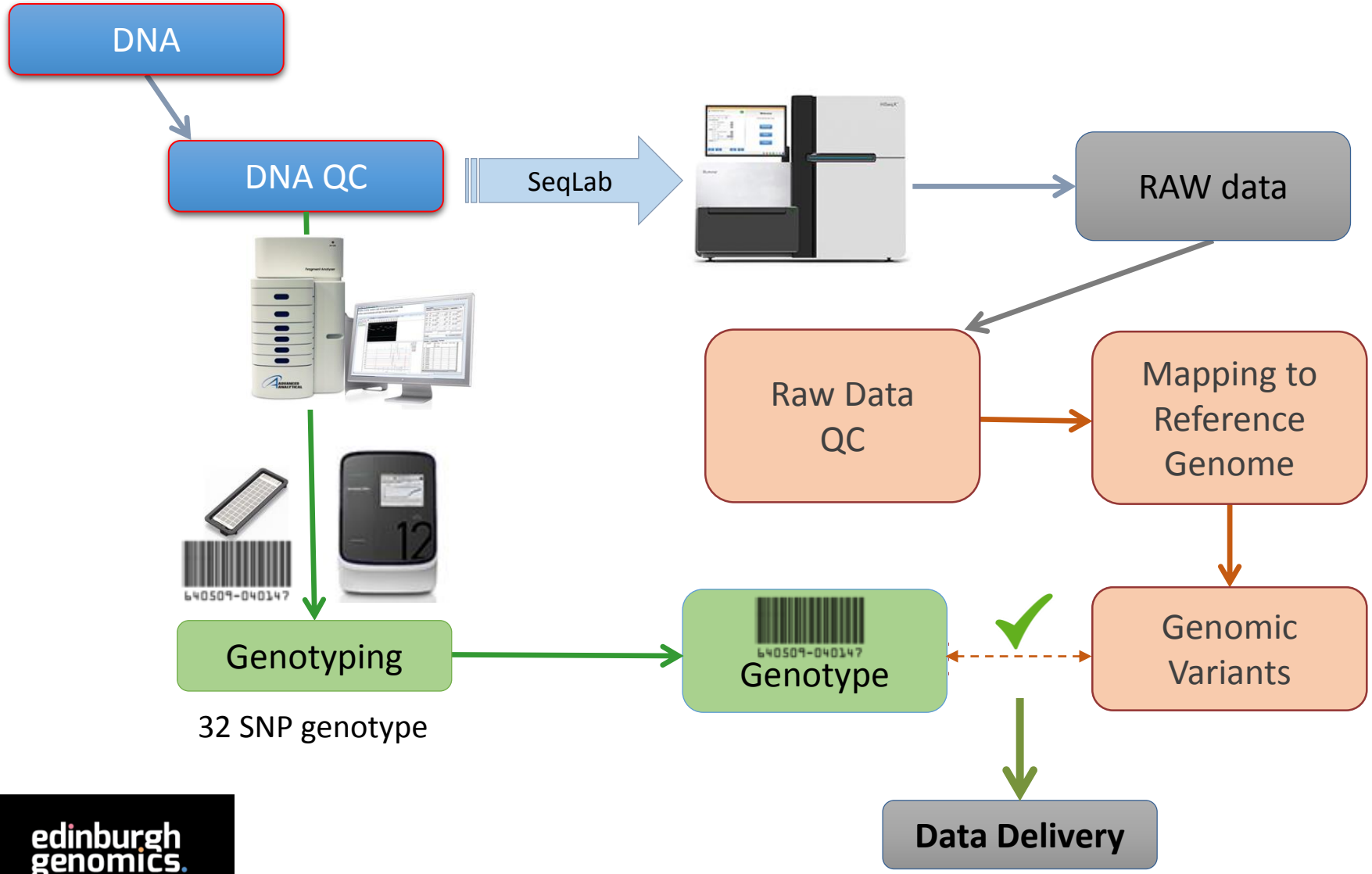
University of Edinburgh Centre for Cognitive Aging and Cognitive Epidemiology

- Ian Deary

How is Scotland different from the rest of the 100,000/

- Separate consent and data governance
  - Considered as a research study
- Sequencing in Scotland- only de-identified data flows south
  - Cipher held in clinical genetics centres
  - In Scotland analysis in parallel
- Reports to patients as part of NHS care as per NHSE

Excellent QC for whole Genome Sequencing at Edinburgh Genomics (Clinical)



Reports of QC for Whole Genome Sequencing at Edinburgh Genomics (Clinical)

- **Genomics England:** “No queries on either sample swaps or data entry errors. This is a major achievement when entering such complex information on large numbers of participants.”

- **UK NEQAS:** “The Scottish system is a high quality, good approach.”

- **ISO 17025:** Final audit passed August 2018.

Current ScotVar Datasets

- VIKING study
  - 500 individuals from Shetland population isolate
- Unaffected parents from rare disease cohorts
  - ~150 individuals
- Germline normal samples from ovarian cancer project
  - 200 individuals
- Non-SGP: Lothian Birth Cohort
  - 1300 individuals