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Genomics and population health in the era of data-driven care

Ayer's Cliff, Québec, Canada – 11 September, 2025

An international group of leading researchers, health professionals and policy makers met from 7th to 11th September at Ayer's Cliff, Canada, to determine how best to secure the potential benefits of genome-based technologies for population health globally over the next quarter century.

Participants were drawn together by a shared commitment to the responsible use of data from biomarkers and genome-based technologies to increase understanding of the biological and environmental determinants of disease, to guide disease prevention, and to protect and promote health. A central objective of the meeting was to identify leaders to carry forward the enterprise that was begun 20 years ago at a conference in Bellagio, Italy, under the banner of public health genomics. The group included some of those who were present at that initial meeting, as well as a new generation of leaders in relevant fields.

The group reviewed the achievements of the past two decades, and acknowledged challenges in the current international landscape and the specific obstacles facing the field, before discussing the responses needed to address them over the coming decades.

The global context affecting population health

The group acknowledged a multitude of external factors that had transformed the context of population health since the Bellagio meeting in 2005. These included:

- political factors, including the rise of populism and transactional politics, deglobalisation and the decline of the international rules-based order
- social factors, including demographic change, with ageing and declining populations in many regions, and the impact of the COVID-19 pandemic
- technical factors, including developments in RNA vaccines, digital technology and artificial intelligence, and the exponential increase in data, including genomic data
- environmental factors, including climate change and a host of complex or 'wicked' problems that interface with genomics and genome-based technologies

Specific obstacles facing genomics and population health initiatives

The group identified several obstacles that impede or inhibit the translation of scientific knowledge and emerging technologies into improvements in population health. These included:

- misplaced expectations about the implications of genomics for health care
- lack of scientific and genomic competency, including among health care professionals, and poor understanding of concepts related to risk and probability
- public mistrust of institutions, public services and commercial actors
- vested interests leading to poor utilisation of data and stifling innovation

- a failure to invest in translation alongside research
- disproportionate and inconsistent information governance measures and practices
- uncertainty, owing to lack of data, regarding wider impact of proposed genomic screening programmes
- limited understanding of behavioural science and the potential of behavioural interventions
- lack of resolution and capacity on the part of public authorities to deliver targeted disease prevention as a priority

Responding with a renewed agenda for genomics and population health

The value of preventing disease and preserving health rather than treating sickness is increasingly well recognised. The use of scientific knowledge and biomedical technologies to support this in a targeted way has great potential, yet its value remains to be proven. To resolve this and to overcome the obstacles above, it is necessary:

- to apply interdisciplinary approaches, and to engage in critical reflection on values to address wicked problems that arise with the entanglement of population health with other public policy priorities
- to articulate plausible and desirable visions of the future involving innovation to orchestrate efforts towards common goals and respond to grand challenges in population health
- to set a coordinated research agenda to support these visions for the next generation of researchers and professionals
- to develop and implement anticipatory and participatory governance tools applied throughout the lifecycle of technologies
- to implement processes and inculcate cultures, particularly in relation to the collection and use of data, that support innovation through learning health ecosystems
- to explore the potential of behavioural sciences and the use of digital technologies to support targeted behaviour change
- to develop educational and informational practices, tools and resources to ensure that knowledge, expertise and capacity are available at the right place and right time in the system
- to respond to potential for divergence owing to competition between national and regional interests by supporting international coordination of standards, governance and institutions
- to recognise current inequities relating to population health, to advocate for the recognition of claims and responsibilities that arise as a consequence of social and technological change, and to promote equitable access to the benefits of scientific progress and its applications

Conclusion

Leaders of the future must work across geographical and disciplinary boundaries to anticipate and respond to the issues identified by the Ayer's Cliff group. In doing so they will need to adapt the model of working developed at Bellagio to preserve human values in a world that is increasingly dominated by data and structured by transactions.

Notes

- Further information about the Ayer's Cliff meeting and a full report of the discussions will be published on the websites of the organisers, the PHG Foundation (Cambridge, UK) and the Centre of Genomics and Policy (McGill University, Montréal, Canada), which can be accessed via the following links: www.phgfoundation.org and www.genomicsandpolicy.org.
- The preceding Bellagio meeting took place at the Rockefeller Conference Centre in Bellagio, Italy from 14-20 April 2005. It was followed by meetings at Ickworth, UK between 10-14 May 2010 and again between 4-7 October 2016. Information about these forerunner meetings is available in reports published on the PHG website and via published academic journal papers. The meetings and their wider context are usefully described in the book *Making Genetics and Genomics Policy in Britain, from personal to population health* by Philip Begley and Sally Sheard (Routledge, 2023).
- Contact for further information: intelligence@phgfoundation.org