Foresights on Human Genomics in 2030

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Regional meeting
Human Genomics for Health:
Enhancing the Impact of Effective Research
Some Recent Advances

NGS

- Accelerated genetic mapping
- Cost reductions
- Accessibility increase
- Personalized treatments based on genomic profiles
- Increased therapeutic efficacy

Precision Medicine
Impacts on Research and Treatments

• Early identification of genetic diseases and cancers
• Improvement of prognoses
• Development of specific treatments for individuals
• Increase of success rates
• Reduction of side effects
• Advances in understanding complex diseases
Technological Predictions for 2030

• Faster and more accessible sequencing
  • Continued cost reduction
  • Increased sequencing speed
  • Greater throughput

• Advances in genomics
  • Powerful data analysis algorithms
  • Improved data-sharing policies
  • More statistical power

• AI for genomics
  • Identify patterns in large genomic datasets
  • Better disease predisposition prediction
  • Treatment suggestions
Future of Personalized Medicine

• Gene therapies (will)
  • become more common
  • be cheaper
  • offer cure to some genetic diseases
  • treat some cancers

• Preventive medicine
  • Genomic profiles will allow for personalized disease prediction and prevention
  • Early interventions and lifestyle changes will avoid chronic conditions
Genomic Data Management

- Robust infrastructure
  - Hardware
  - Software
- Advanced tools for
  - Data storage
  - Data processing
  - Data analysis

- Advanced Statistical Methods
  - Data collections
  - Correlation mapping
  - Bigger cohorts and n = 1
Ensuring Equitable Access

• Public Policies
  • Ensuring everyone has equal access to all benefits from genomics
  • Access should be the same regardless: population, location, socioeconomics

• International Collaboration
  • Sharing knowledge and resources between countries and institutions
  • Collaborations and other efforts must promote genomic technologies and scientific findings/advances for all
Federated Learning

• Data is distributed by nodes (countries, universities, hospitals)
• Algorithms are trained in a decentralized way
• Data does not leave the node
• Privacy-preserving analytics
Ethical and Legal Challenges

• Data privacy
  • Protects genetic, clinical and other information
  • Avoids discrimination
  • Ensures individual trust

• Informed consent
  • Ensures understanding of risks and benefits prior to consent
  • Empowering the individual

• Intellectual Property
  • Intellectual property
  • Clear definition of rights and discoveries
  • Encourage innovation
  • Ensure that benefits are widely distributed
Education and Training

• Professional Training
  • Data literacy
  • Genomics professionals
  • Clinical bioinformaticians
  • Genetic Counselors

• Continued Education
  • Updating knowledge and skills
  • Technologies are fast-evolving and so must the professionals

Technologies are fast-evolving and so must be (the knowledge of) the professionals.
Thank you