Roundtable with 10 MG on Technology and Innovation Report 2021
Catching technological waves: Innovation with equity
Taking recommendations forward

Paulo Gadelha
Coordinator of the Fiocruz Strategy for the 2030 Agenda
Oswaldo Cruz Foundation (Fiocruz)

UN STI Forum 2021

Health and Sustainable Development

ESTRATÉGIA FIOCRUZ PARA A AGENDA 2030

Health is a collective and individual right that articulates social and development policy, combining growth, innovation, equity and social inclusion. It is one of the most dynamic areas of development, generating mass consumption, employment, investment and innovation and a structuring factor of the social welfare state. Health is also a privileged field for innovation in all major technological trends (AI, Biotechnology, Nanotechnology etc) and respond for 10% of Global Expenditure. Last, but not least, Health has an increasing role in international geopolitics.

FIOCRUZ

Specificity of health innovation

ESTRATÉGIA FIOCRUZ PARA A AGENDA 2030

- Dependency on health professionals, organizations and systems;
- Strong role of governments and regulatory mechanisms;
- Non-linear relation between innovation and health costs;
- Crucial role of technological incorporation management;
- Hard, soft and social technologies are closely intertwined;
- Challenge for Social Steering of Disruptive Technologies.
- Technological breakthroughs (biopharmaceutical, personalized medicines, devices etc.) with high aggregate value leads to increasing inequality.

FIOCRUZ

Covid- 19 Pandemic

Covid-19 represents a major systemic hazard, and its emergency reflects social, economic and environmental determinants that are deeply rooted in the unsustainable prevailing model of global development. The pandemic highlighted the recognition that health may be a major anchor for shaping a sustainable and inclusive economic recovery.

The overall dynamics of Science, technology and Innovation and the moto of TFM, “Harnessing STI to SDGs” were deeply challenged, especially in the interface of Science, Society and Policies.

STI and Covid-19 Pandemic

ESTRATÉGIA FIOCRUZ PARA A AGENDA 2030

WHO Comprehensive approach: mission-oriented Innovation; evidence-based policies; open science; genomics and data sharing; common platforms for R&D; regulatory, procurement, governance and deployment innovations.

STI response to Covid-19. The case of vaccines: speed of innovation, emerging technology (gene editing, AI and big data); solidarity clinical trials; regulatory fast track; global initiatives to foster production vaccine deployment; “war on vaccines” and global inequality of access.

FIOCRUZ

Digital Transformation in Health

ESTRATÉGIA FIOCRUZ PARA A AGENDA 2030

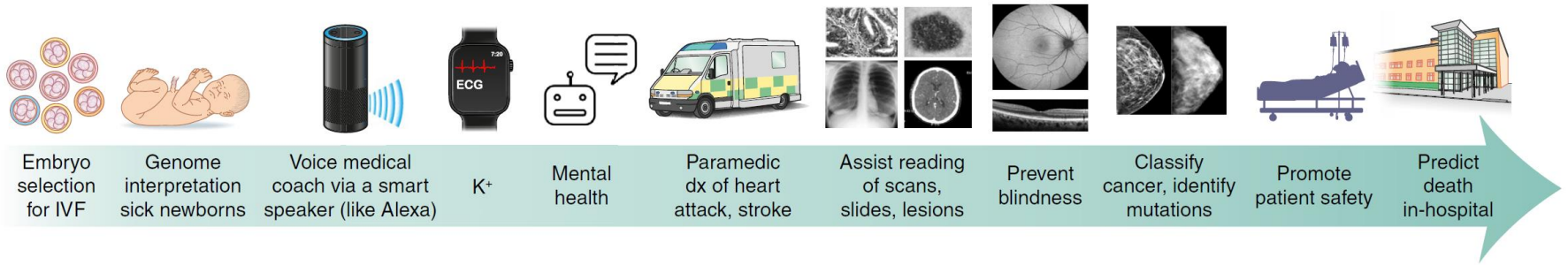
- **The World in 2050 - Report 2019**
  "Digital Health" section

  - Mobile health
  - Telemedicine
  - 3D printing
  - Robotic surgery
  - Virtual reality
  - Biotechnology
  - Synthetic biology
  - Genetic profiling
  - Personalized medicine
  - Computer-assisted diagnoses

TWI2050

Messner et al. (2019)

Topol (2019) High Performance Medicine



FIOCRUZ

Technological trends with major health impact

- TIC, Big Data and AI
- e-Health
- Wearables
- Diagnostics
- Devices and Artificial Organs and Tissues
- Gene Therapy
- Immunotherapies

Artificial Intelligence in Diagnostic Medicine

- Likelihood of integrating AI and diagnostic
  - X-ray diagnosis (81%)
  - Heart rhythm interpretation (80,9%)
  - Skin malignancy diagnosis (77,6%)

worldwide web-based survey assessing the opinions of 1,430 specialists (Mota et al., 2020)

- Impacts on healthcare services and systems
  - Quality: reduction in patients' hospitalization time (49.41%)
    increase of diagnostic reliability (68.04%)
  - Cost: reduction of screening costs (69.32%)

- Challenges
  - Difficulty of incorporating AI into clinical practice (41,0%)
  - Ethical or regulatory issues (36,6%)

Key points concerning digital technologies in health

- Infrastructure to digital technologies and services
  - peripheries, rural areas and distant locations

- Technology regulation
  - accountability and legal responsibility
  - transparency
  - personal data protection

Key points concerning digital technologies in health

- Integrate to local cultures and clinical practices
  - aligning AI to the specific contexts
  - addressing underrepresentation of minority and vulnerable groups

- Promote diversity
  - more comprehensive data sources for AI training
  - more diverse teams in IA and healthcare staff

Regulation and ethical x implantation

Topics related to regulation and ethical questions	Obstacles to Implementation
▪ Accesss to big data of patients to “train” AI Algorithms for clinical and diagnoses (data hunger) ▪ Cibersafety and data protection.	Access, sharing and storage of large amounts of patient’s data needed to develop AI applications
▪ Iatrogenic risc related with lack of transparency of algorithm training process (“blackbox effect”)	Testing, validation, certification and auditing of AI algorithms and systems before launching in clinical practice
▪ Legal responsability and accountability of clinical dexisions supported by AI.	Uncertainty about legal responsibility and accountability for AI-supported clinical decisions.
▪ “Algorithm bias” from under-representation of minorities in the data banks used for training AI systems	Algorithmic bias caused by underrepresentation of minorities and underrated groups in datasets used in AI systems development
▪ Financial aspects (healath care securities reimbursement and incentive to transltion of Technologies based in AI	Financing, remuneration and reimbursement mechanisms and insurance models.

Precision public health

Similar to how precision medicine uses genomic and other personalized patient data to provide the right treatment to the right patient at the right time, precision public health is an emerging discipline that uses extensive population-specific data to provide the right intervention to the right population at the right time.

Khoury MJ, Engelgau M, Chambers DA, Mensah GA. Beyond public health genomics: can big data and predictive analytics deliver precision public health? *Public Health Genomics*. 2018;21(5-6):244-250. doi:10.1159/000501465PubMedGoogle ScholarCrossref

Big data in public health organizations more accurately

PERSPECTIVE
https://doi.org/10.1038/s41591-019-0345-2

nature medicine

Precision epidemiology for infectious disease control

Jason T. Ladner[1], Nathan D. Grubaugh[2], Oliver G. Pybus[3] and Kristian G. Andersen[4,5*]

Cardiovascular outcomes associated with use of clarithromycin: population based study

Angel Y S Wong,[1] Adrian Root,[2] Ian J Douglas,[2] Celine S L Chui,[1] Esther W Chan,[1] Yonas Ghebremichael-Weldeselassie,[3] Chung-Wah Siu,[4] Liam Smeeth,[2] Ian C K Wong[1,5]

thebmj | *BMJ* 2016;352:h6926 | doi: 10.1136/bmj.h6926

frontiers in Pharmacology

REVIEW
published: 23 September 2019
doi: 10.3389/fphar.2019.00984

M Sanni Ali[1,2,3*], Maria Yury Ichihara[3,4], Luciane Cruz Lopes[5], George C.G. Barbosa[3], Robespierre Pita[3], Roberto Perez Carreiro[3], Djanilson Barbosa dos Santos[6], Dandara Ramos[3], Nivea Bispo[3], Fabiana Raynal[7], Vania Canuto[7], Bethania de Araujo Almeida[3], Rosemeire L. Fiaccone[3,4,8], Marcos E. Barreto[3,8,10], Liam Smeeth[1,3†] and Mauricio L. Barreto[3,4†]

Administrative Data Linkage in Brazil: Potentials for Health Technology Assessment

Precision Health in Disaster Medicine and Global Public Health

Patel RB. Precision health in disaster medicine and global public health. *Prehosp Disaster Med.* 2018;33(6):565–566.

So beyond the essential steps of event surveillance and case management, on which the prevention and control of diseases are based, if we are to truly advance health and eliminate diseases, a case can be made for a tailored approach and the advent of precision-style global health. ■ *The Lancet Global Health*

A Bright New World?

ESTRATÉGIA FIOCRUZ PARA A AGENDA 2030

“Strategic and innovative use of digital technologies will be an essential enabling factor towards ensuring that 1 billion more people benefit from universal health coverage, that 1 billion more people are better protected from health emergencies, and that 1 billion more people enjoy better health and well-being (WHO’s triple billion target).

The current experience of Covid-19 doesn’t point in this direction. There is an increase in inequality, well-being and social injustice, which nurture from the pattern of STI production and access. A possibility of reinventing the world lies on the adoption of the values and tools for implementation of 2030 Agenda by society, state governments and global institutions.

FIOCRUZ