Ethical and Equity Considerations for Healthcare AI Applications

7th Illinois AI and Health Summit
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Background - Health Equity

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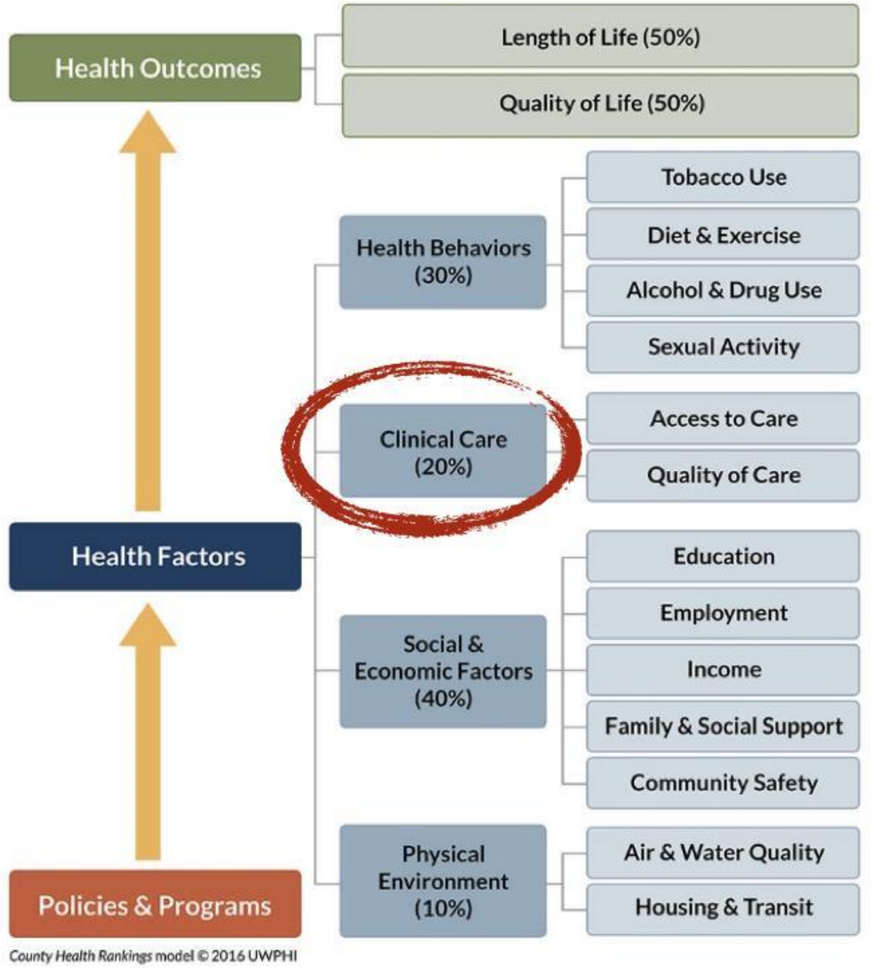
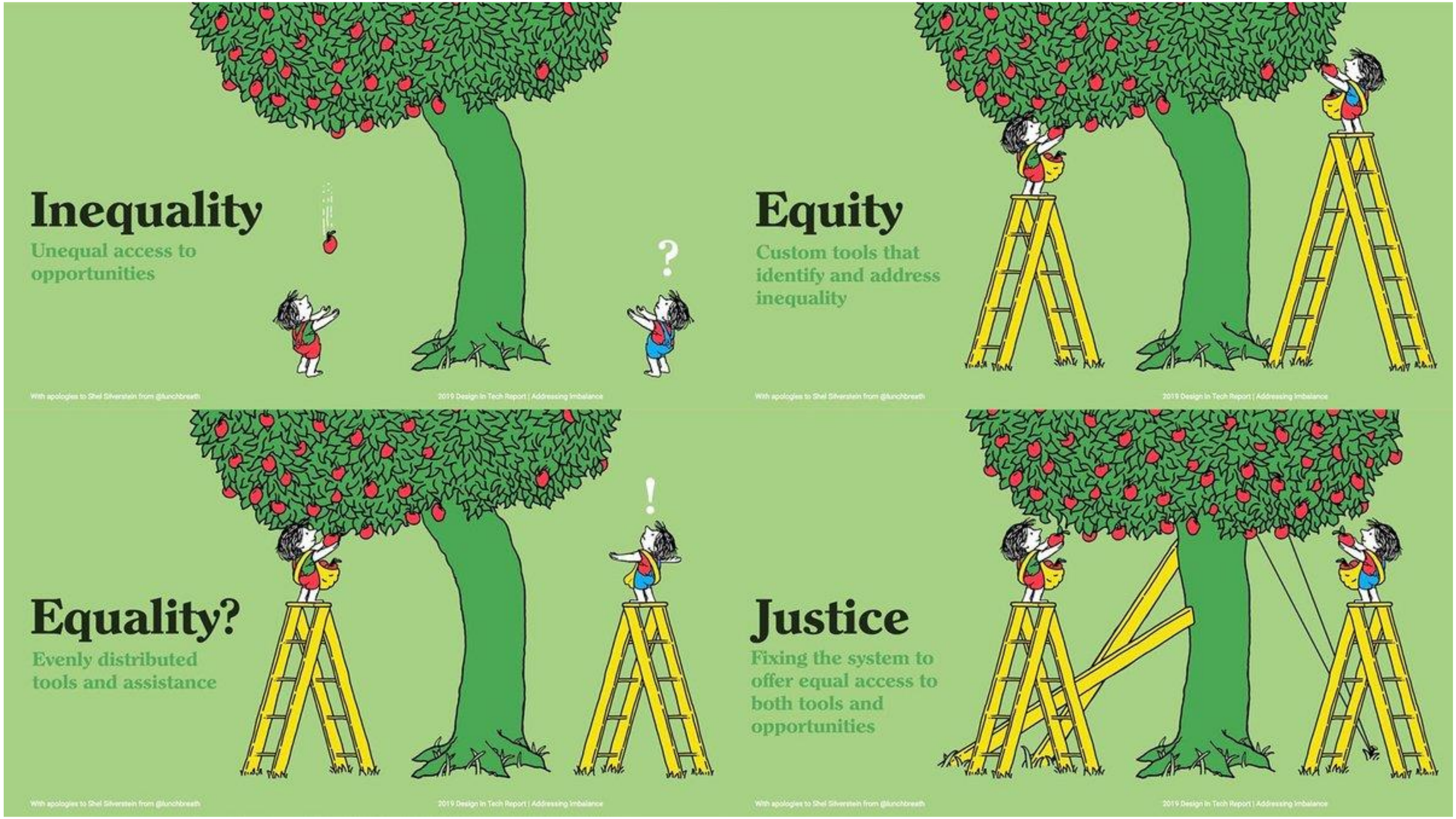
The Impact of Social Determinants of Health

Let's Get Healthy California

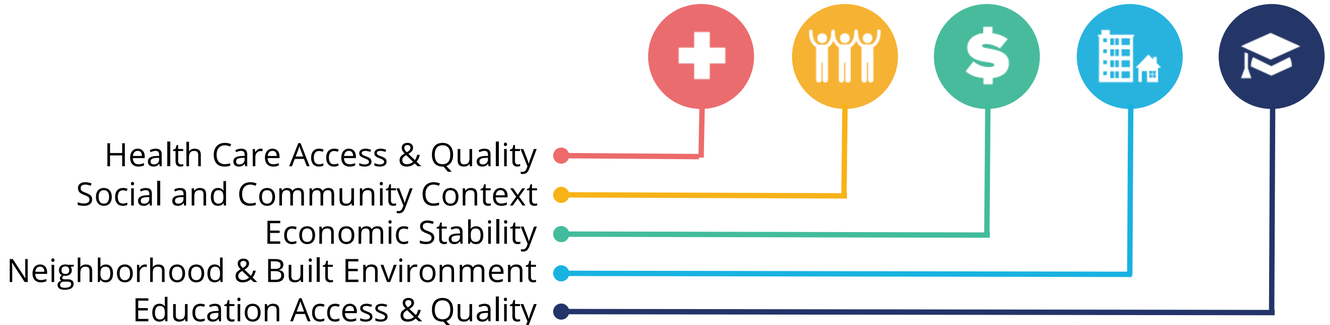


National Academy of Sciences

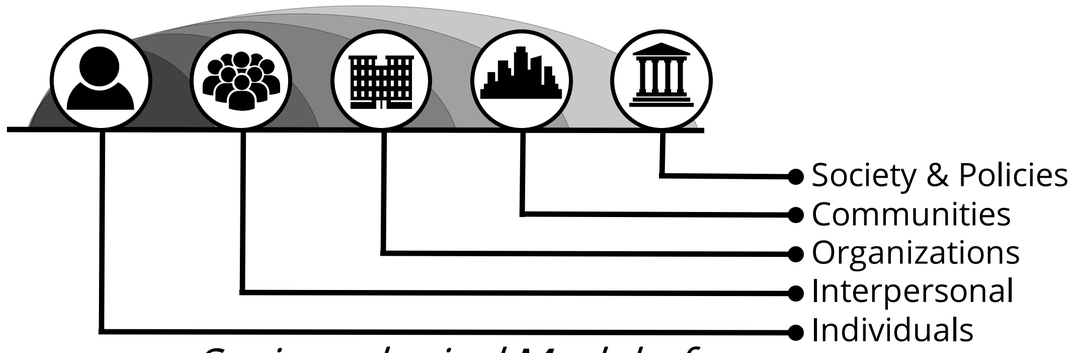


Source: "Addressing Imbalance," by Tony Ruth for the 2019 Design in Tech Report: https://designintech.report/2019/03/11/%F0%9F%93%B1design-in-tech-report-2019-section-6-addressing-imbalance/

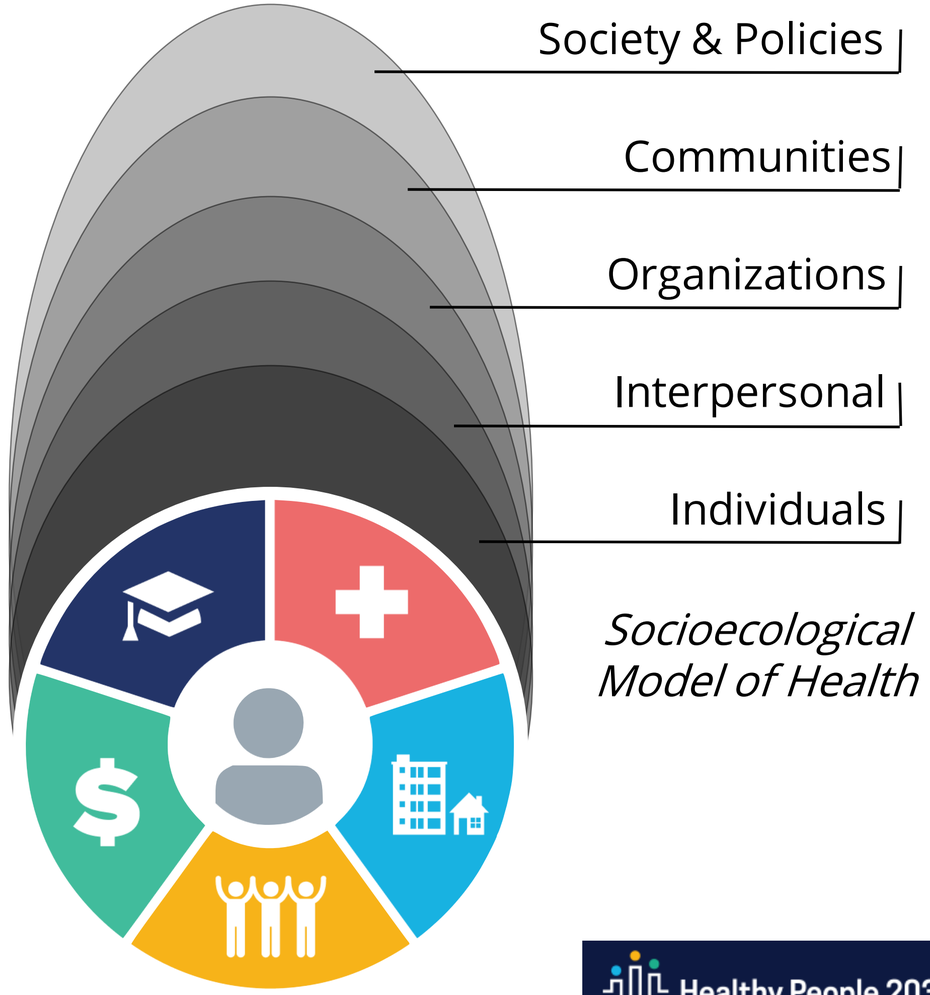
Conceptually Mapping SDoH



Social Determinants of Health (SDoH)



Socioecological Model of Health (SEM)



Socioecological Model of Health

Healthy People 2030

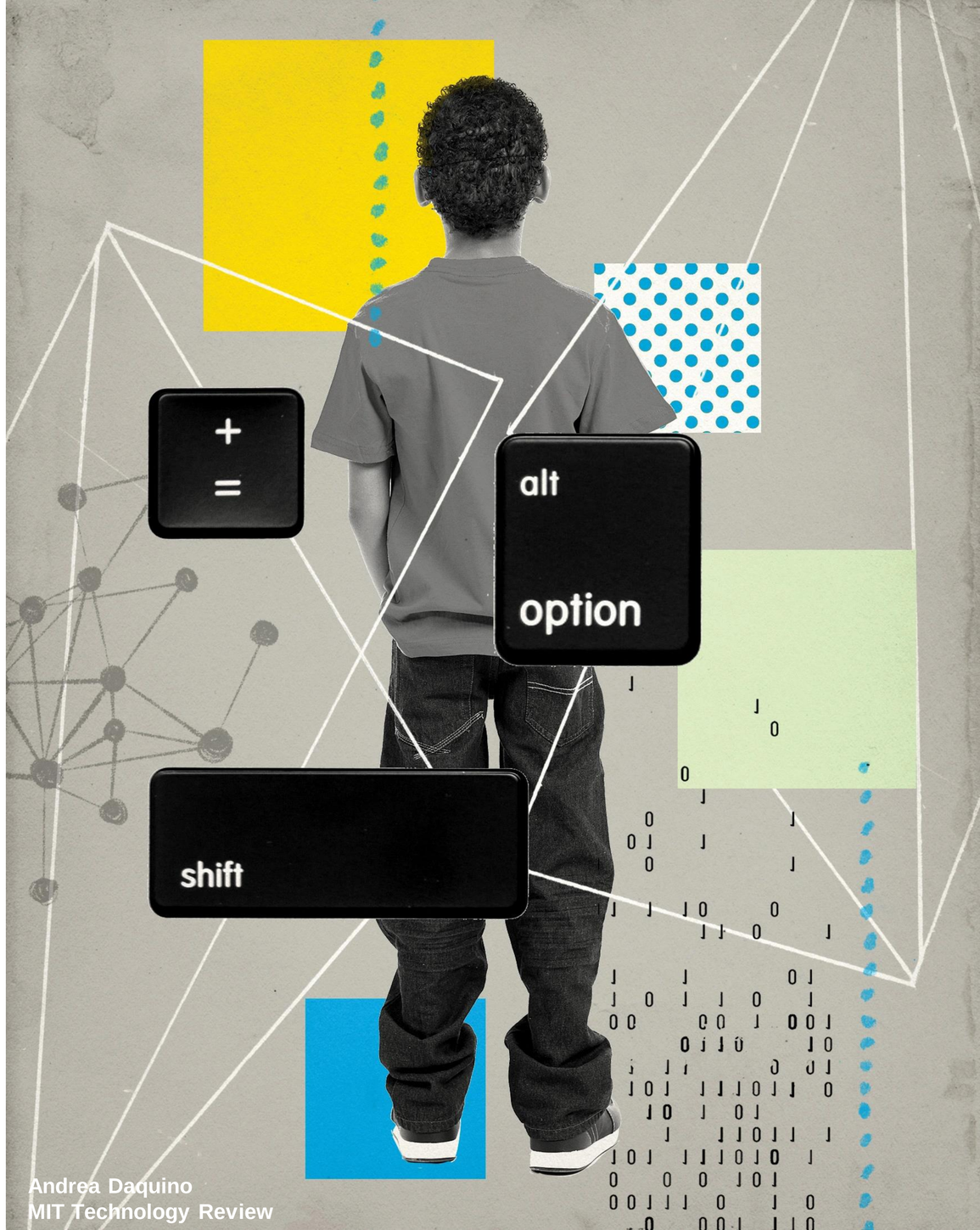
Adapted from Healthy People 2030, U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion.

Why this Matters

“However, if not developed and implemented equitably, technology advancements could actually widen disparities in care as the “haves” get more and the “have-nots” are increasingly left behind.”

The Persistent Health Care Access Gap for Children in Poverty

The Children’s Health Fund, 2015



Andrea Daquino
MIT Technology Review

Why this Matters

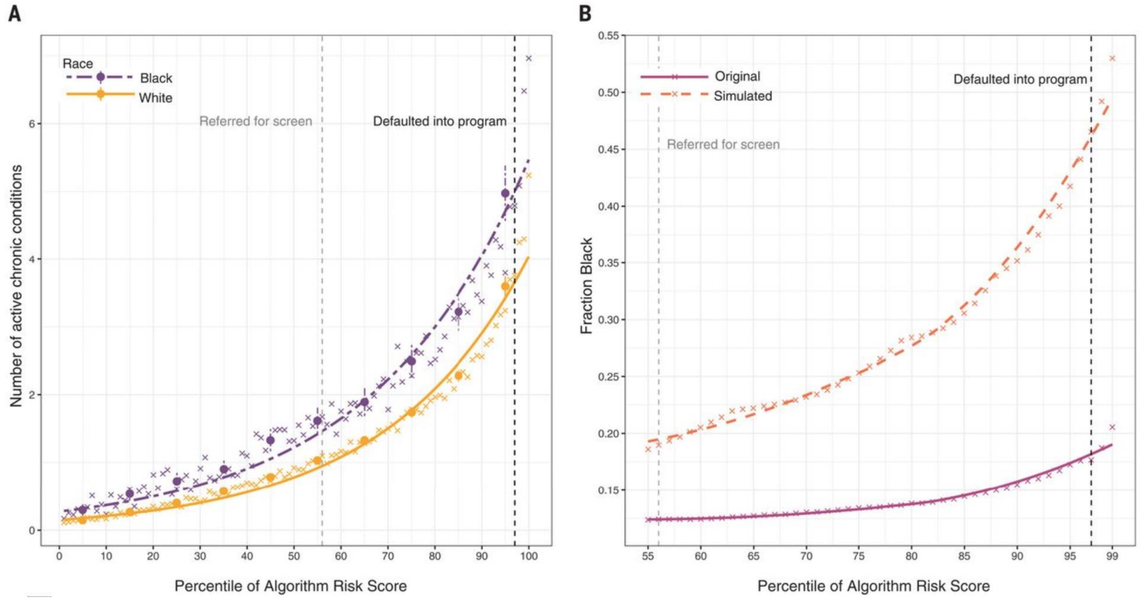
RESEARCH ARTICLE

Dissecting racial bias in an algorithm used to manage the health of populations

Ziad Obermeyer[1,2,*], Brian Powers[3], Christine Vogeli[4], Sendhil Mullainathan[5,*,†]

+ See all authors and affiliations

Science 25 Oct 2019:
Vol. 366, Issue 6464, pp. 447-453
DOI: 10.1126/science.aax2342



Black patients assigned the same level of risk by the algorithm are sicker than White patients. The authors estimated that this racial bias reduces the number of Black patients identified for extra care by more than half.

Why this Matters

IN THE NEWS

Pulse Oximetry May Be Inaccurate in Patients with Darker Skin

CORRESPONDENCE

Racial Bias in Pulse Oximetry Measurement

The NEW ENGLAND JOURNAL of MEDICINE

December 17, 2020
N Engl J Med 2020; 383:2477-2478
DOI: 10.1056/NEJMc2029240
Metrics

JANUARY 28, 2021

Senators Warren, Booker and Wyden Urge FDA to Address Concerns about Dangerous Pulse Oximeter Inaccuracies for Patients of Color

Clinical Science | April 2005

Effects of Skin Pigmentation on Pulse Oximeter Accuracy at Low Saturation FREE

Philip E. Bickler, M.D., Ph.D.; John R. Feiner, M.D.; John W. Severinghaus, M.D.

Anesthesiology April 2005, Vol. 102, 715–719.
https://doi.org/10.1097/00000542-200504000-00004

Comparative Study > Anesth Analg. 2007 Dec;105(6 Suppl):S18-S23.
doi: 10.1213/01.ane.0000285988.35174.d9.

Dark skin decreases the accuracy of pulse oximeters at low oxygen saturation: the effects of oximeter probe type and gender

John R Feiner [1], John W Severinghaus, Philip E Bickler

Special Considerations for AI in Healthcare

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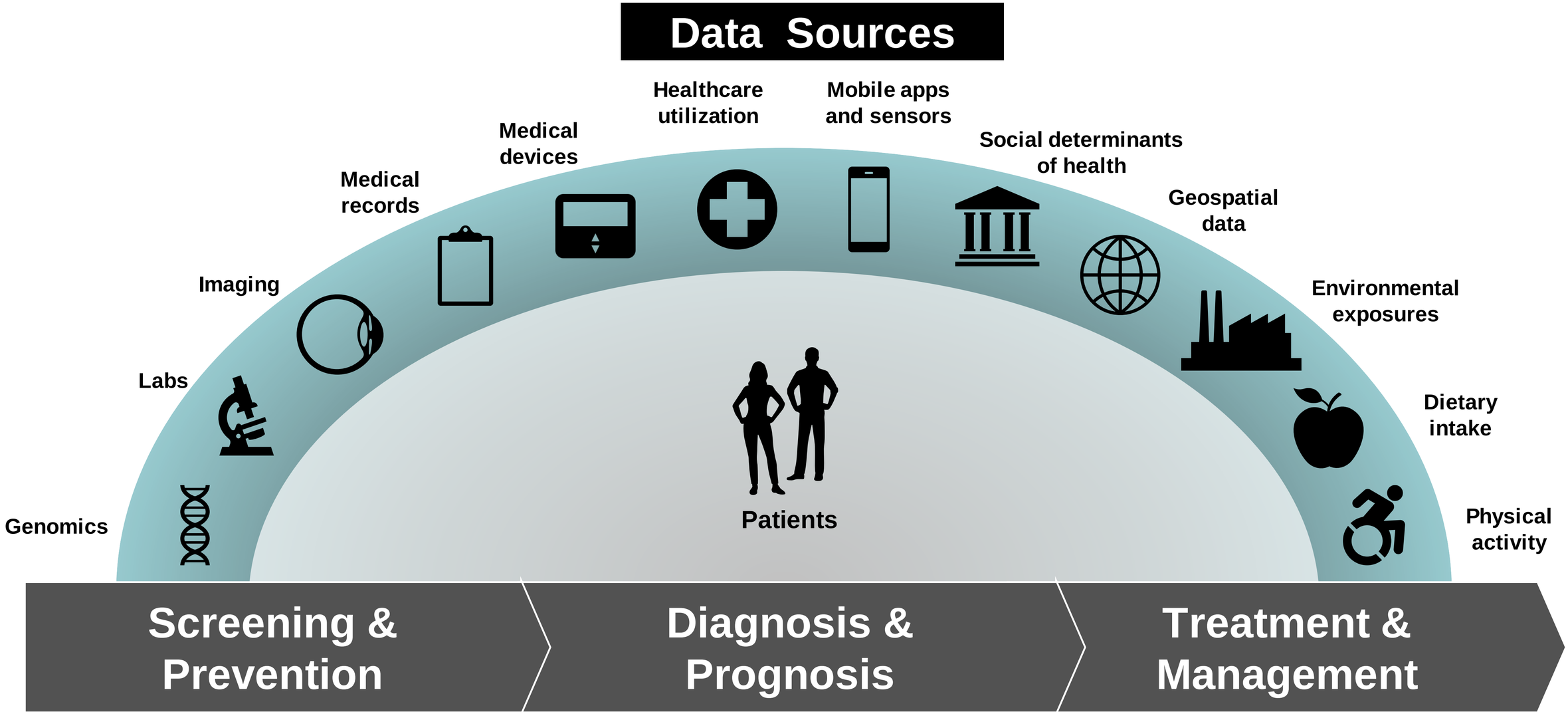
General Considerations

- AI is highly dependent on data
- Healthcare data is… messy
  - Missingness
  - Bias
  - Class imbalance
  - Human-generated variation
  - Result of complex interconnected systems that are not necessarily well understood by its users



- Identifying at risk individuals
- AI-enabled remote monitoring
- AI-driven behavior modification

- Early detection
- Risk stratification
- Comorbidity screening
- Patient support and education

- Clinical decision support
- Treatment optimization
- Comorbidity management
- Population health management

Potential Applications

Key Principles

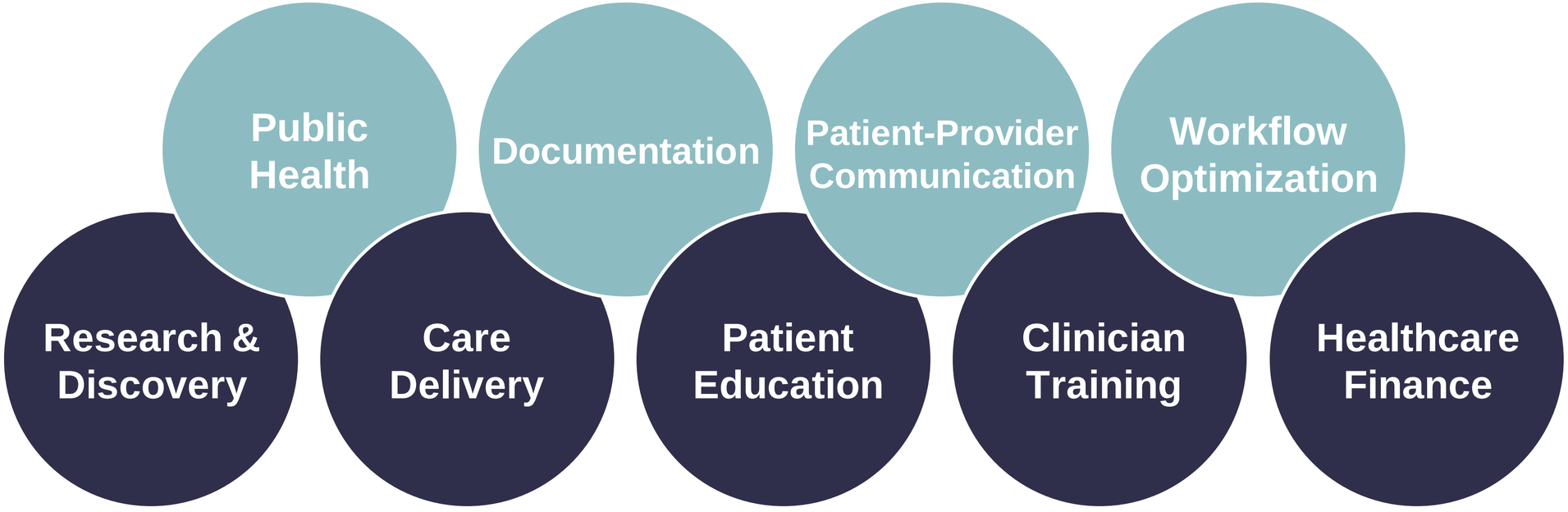
- Safety and Efficacy
- Equity and Inclusivity
- Informed Consent and Transparency
- Data Privacy and Protection
- Collaboration and Oversight
- Education & Training
- Ethical Considerations

Are applied at every stage of

AI Development

Judicious use of AI products for

Healthcare Applications



Regulation of AI in Healthcare

- Many countries regulate AI applications in healthcare
- Software as a Medical Device (SaMD)
  - Often treated as a medical device (FDA, EMA, Health Canada, etc)
- IMDRF guidance on SaMD

IMDRF International Medical Device Regulators Forum

State of Healthcare Situation or Condition	Significance of information provided by SaMD to the healthcare decision		
	Treat or Diagnose	Drive Clinical Management	Inform Clinical Management
Critical	IV	III	II
Serious	III	II	I
Non-Serious	II	I	I

Figure 10 - SaMD N12[2] Framework

- Most regulated AI is ***static***: AI was used to develop the algorithm, but once it is reviewed and approved, it is no longer learning in the real world (otherwise, not the same algorithm that was reviewed and approved)

AI Legislation

US - Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence

AI Safety & Security Enhancements
The executive order establishes new benchmarks for the safety and security of AI technologies. It mandates commercial developers to disclose their safety testing results to the U.S. Government, aiming to shield Americans from potential risks associated with AI systems.

Upholding Privacy of All Americans
The order champions bipartisan data privacy legislation, striving to safeguard the privacy of all citizens, with a particular focus on children. It emphasizes the development of technologies that preserve privacy and scrutinizes the data collection and utilization practices of government agencies.

Backing the Workforce
The order outlines principles aimed at minimizing harms and maximizing the benefits of AI for the workforce. It also calls for a comprehensive report to analyze the potential impacts of AI on the labor market.

Fostering Innovation and Competitive Practices in AI
By driving AI research nationwide and advocating for an open, fair, and competitive AI ecosystem, the order seeks to stimulate innovation and maintain healthy market competition.

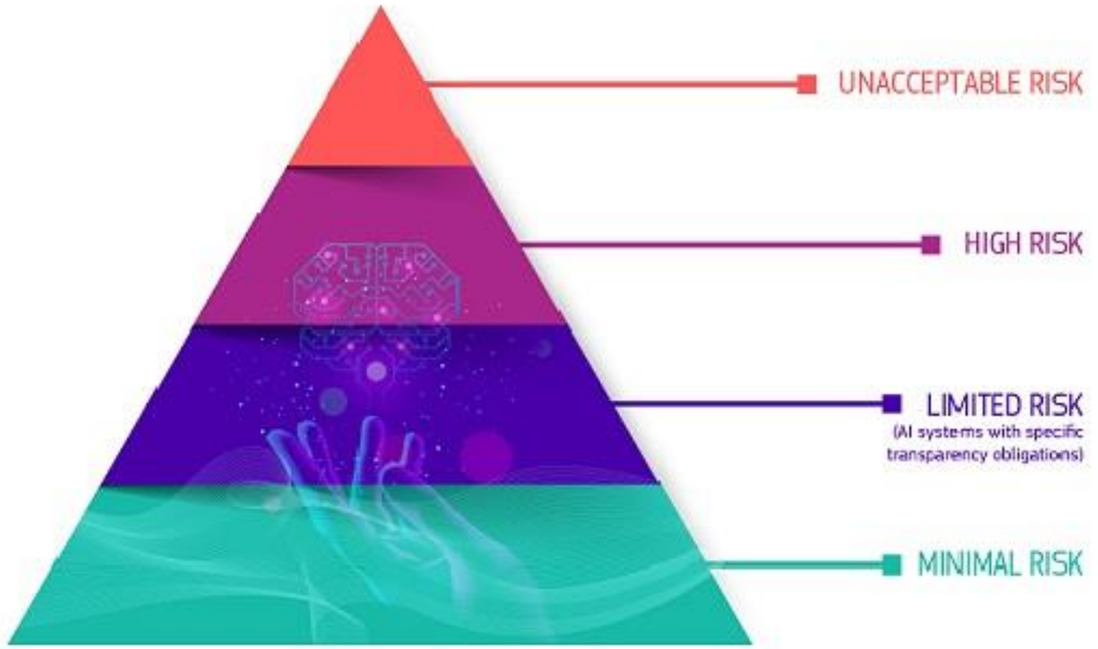
Promoting Equality and Fighting Algorithm Bias
Building on prior initiatives, the order is committed to ensuring equitable treatment and addressing issues of algorithmic discrimination to foster fairness.

Advocating for Consumers, Healthcare Patients and Students
The directive encourages the responsible deployment of AI in critical sectors like healthcare and education, prioritizing the well-being of consumers, patients, and students.

Bolstering American Leadership on Global Stage
The U.S. aims to extend its influence and collaboration in AI through bilateral, multilateral, and multi-stakeholder engagements, expediting the development and implementation of crucial AI standards worldwide.

Ensuring Responsible and Proficient Government Adoption of AI
The order provides guidelines for government agencies on AI usage and prioritizes the swift recruitment of AI professionals to enhance expertise within the public sector.

EU - The AI Act



AI Roadmaps

AI Roadmap Components

AI Governance

How will your organization govern AI models, their evaluation, and implementation?

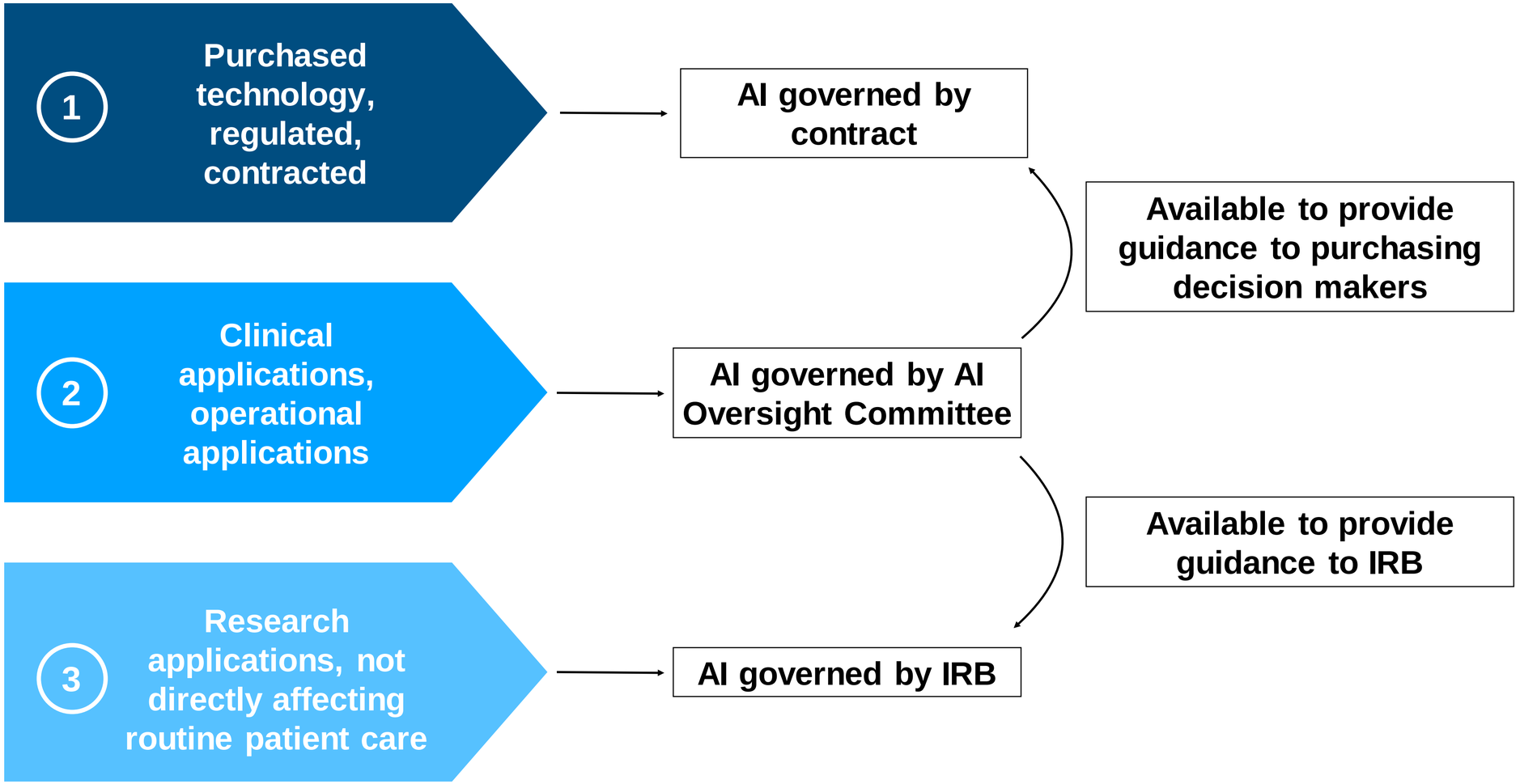
Models, Data & Architecture

How will your organization develop AI models and the required infrastructure?

Operating Model

How will your organization implement AI models and continuously improve and innovate?

3 General Pathways for AI:



Thank You.

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Please, give me feedback on today's talk:

https://tinyurl.com/JuanEval

https://airtable.com/shrgBH0ltwKdyyjDW

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