

3D Bioprinting Presents Positive Health and Social Benefits—But Equitable Utilization Necessary

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Me and my Project

- Senior at Utah State
 - Applying to medical school this upcoming cycle
- Majors: Biochemistry and Molecular Biology
 - Minors: *Anticipatory Intelligence* and Chemistry
- Research project for *Threats and National Security* class within the *Anticipatory Intelligence* program at USU



Utah State's Center for Anticipatory Intelligence

- What is Anticipatory Intelligence?
- Analytical Parameters
 - Opportunities
 - Security Challenges
 - Unintended Consequences
- Why 3D Bioprinting?

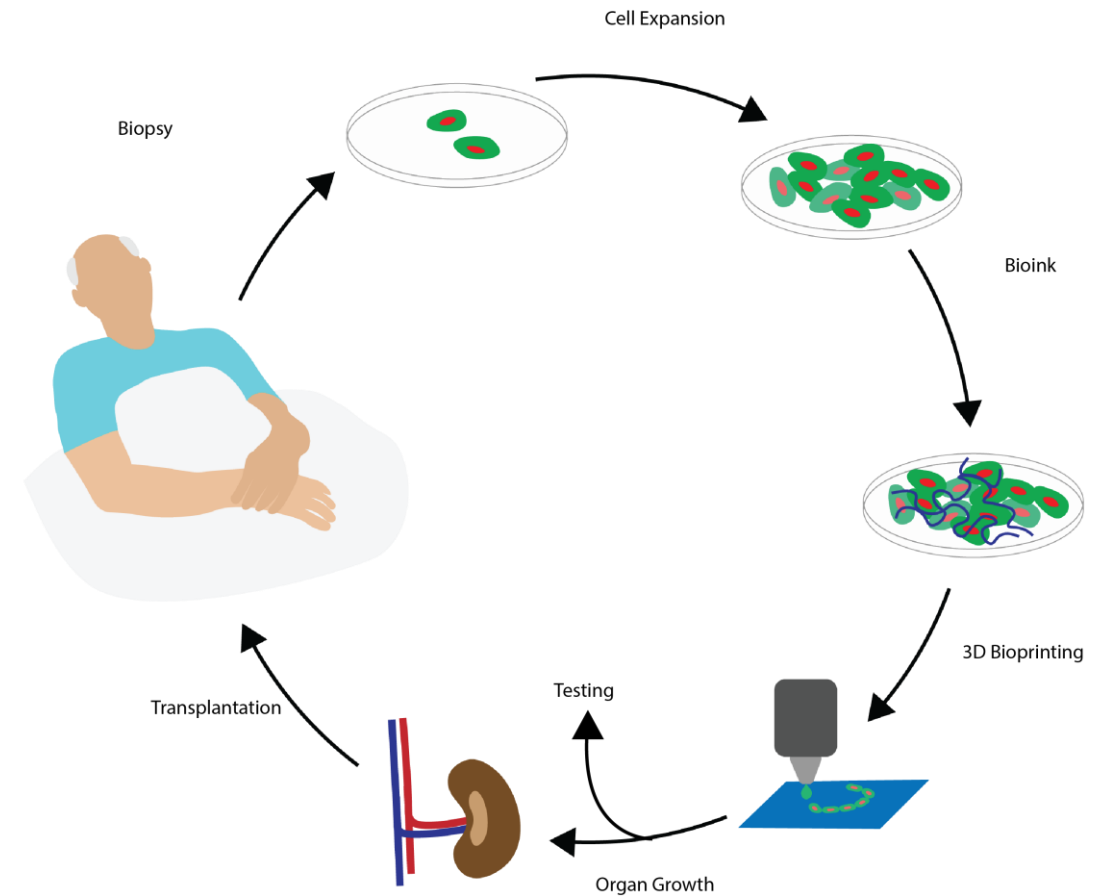


Research Framework

- Use research-driven questions within the interdisciplinary CAI environment to analyze an emerging technology of interest.
- CAI's frameworks of analysis
 - The 4 R's of Resilience
 - Resistance, Retention, Recovery, Resurgence
 - WII and ISES models
- Sources:
 - Subject matter experts
 - Peer reviewed journals
 - Global/regional health data
 - Student collaboration

Defining 3D Bioprinting

- 3D Bioprinting is an additive manufacturing process similar to conventional 3D printing
- Components:
 - Bioink
 - Design + scaffold
 - 3D Printer
 - Cell-Specific Growth Conditions



Findings

Opportunity Analysis

1. Solution to the Organ-donor Crisis
2. Personalized Medicine
3. Drug Testing and Research
4. Grafting



104,000+

Individuals waiting for
organ donations as of
February 2021

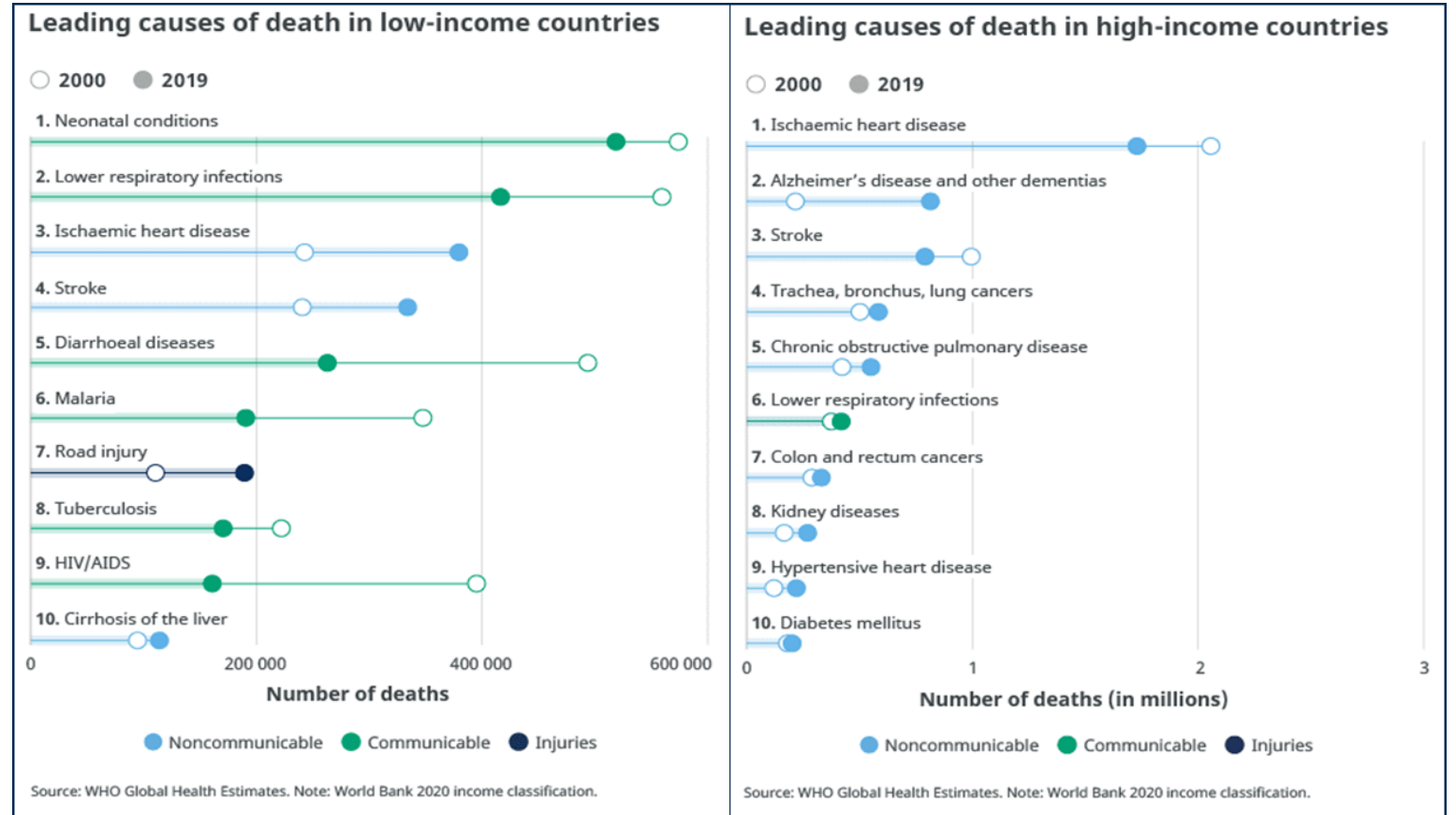
Threat Analysis

1. Distribution

- Global
- Regional
- Black markets

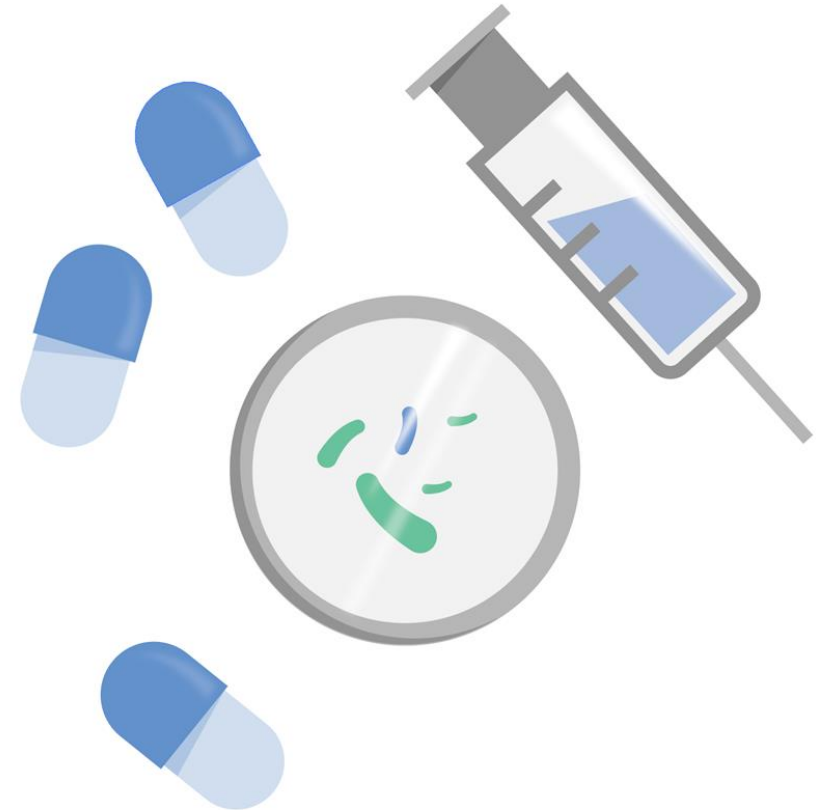
2. Ethics

- Differences among groups
- Boundaries?



Threat Analysis

5. Regulation
6. Intellectual Property and Ownership
7. Other Unintended Consequences



MATERIAL SYSTEMS

redundancy

diversity

variety

disparity

resource base

flexibility & elasticity

upgradeable

adaptable

premeditated shock absorbers

balance

RESILIENCE

RESISTANCE

RETENTION

RESURGENCE

RECOVERY

alignment of purpose
planning

communication

trusted sources of information

resource mobilization

self-organization

institutional memory

cross-training

ritualized ingenuity

trust

HUMAN GOVERNANCE OF SYSTEMS

Conclusion

3D Bioprinting will produce unprecedented progress in the fields of medical research and personalized medicine, but concerns regarding distribution, ethics, and regulation, must be addressed before the technology is widely implemented.

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Thank You!

