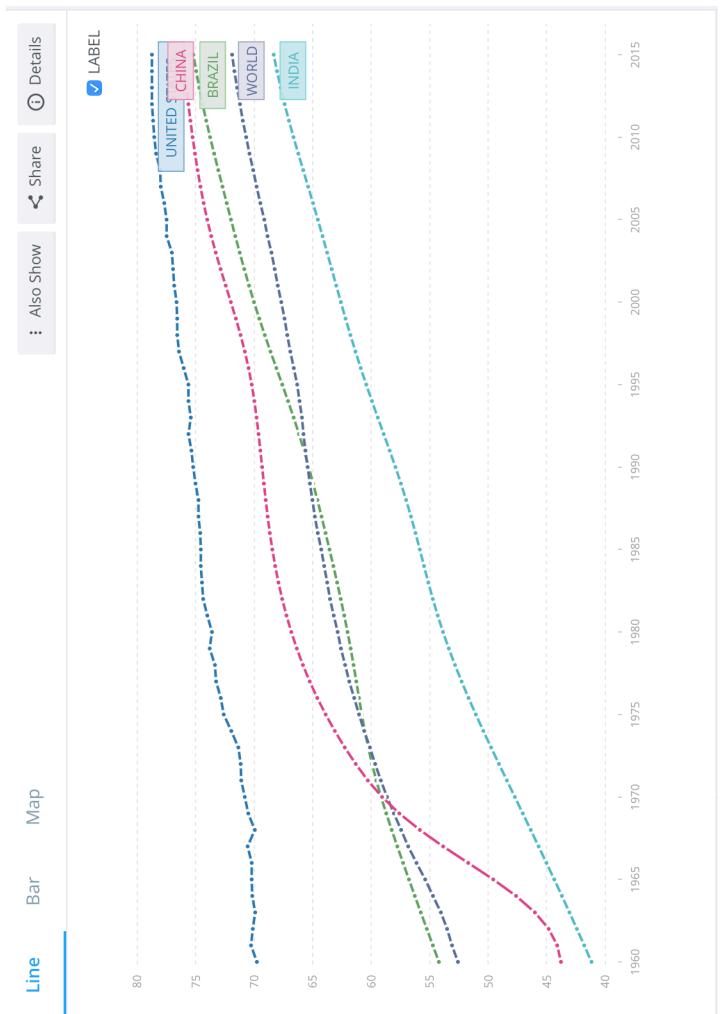
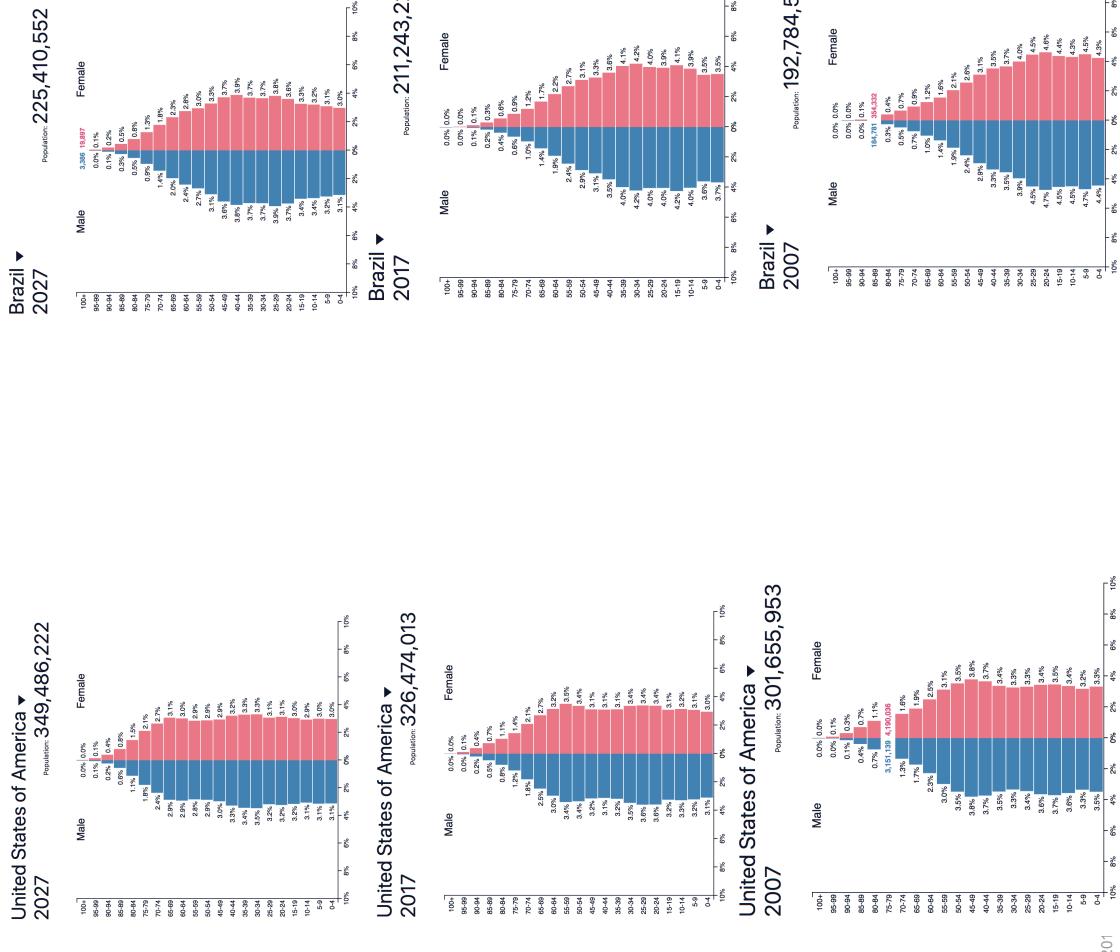


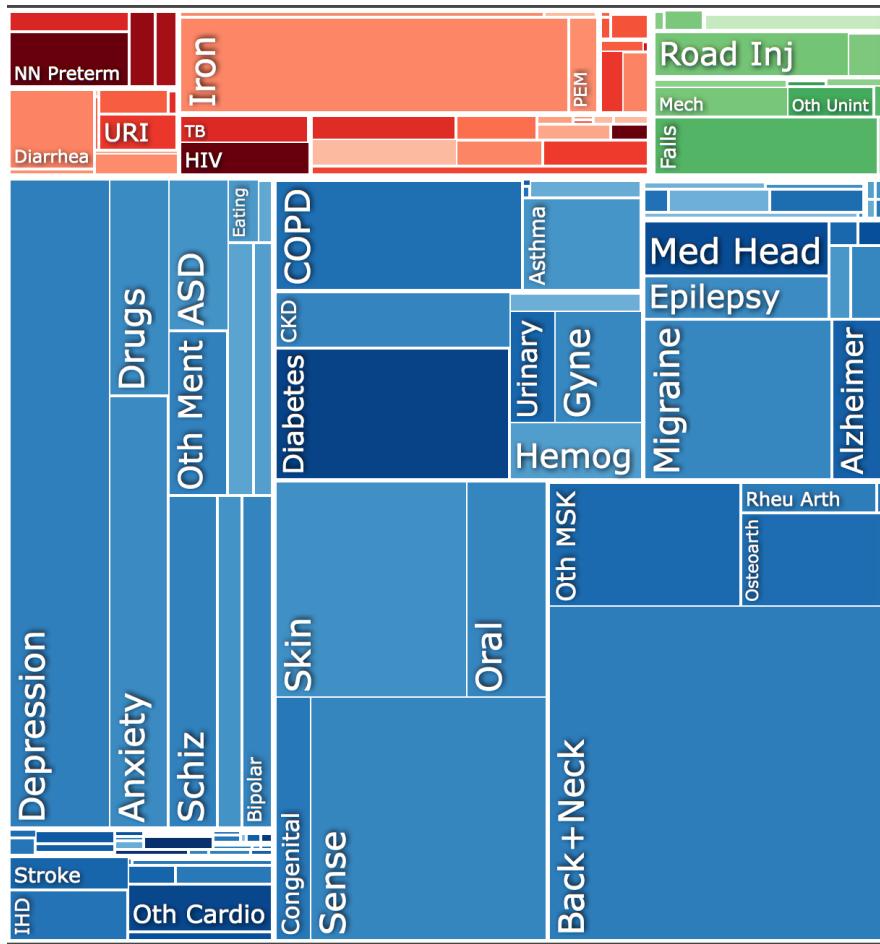
Brazil and US Healthcare: An Overview

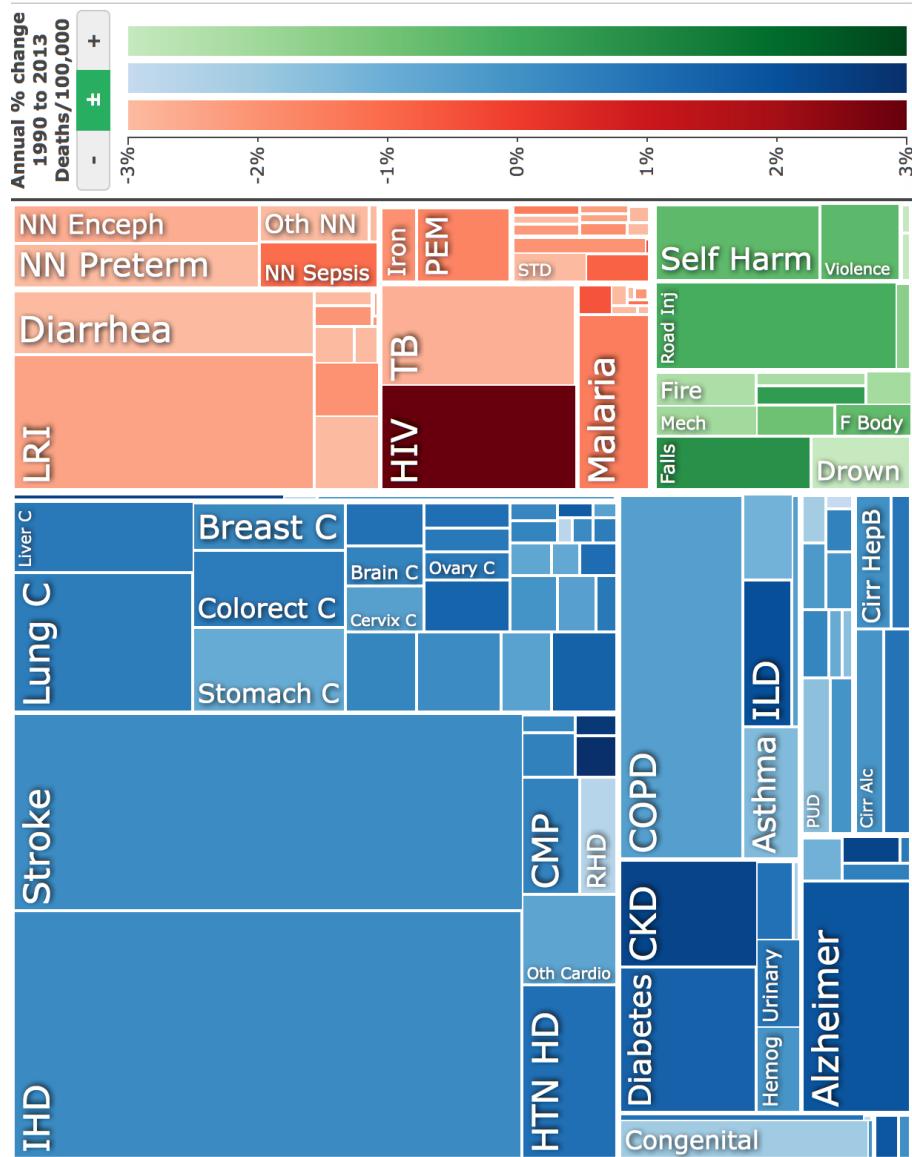
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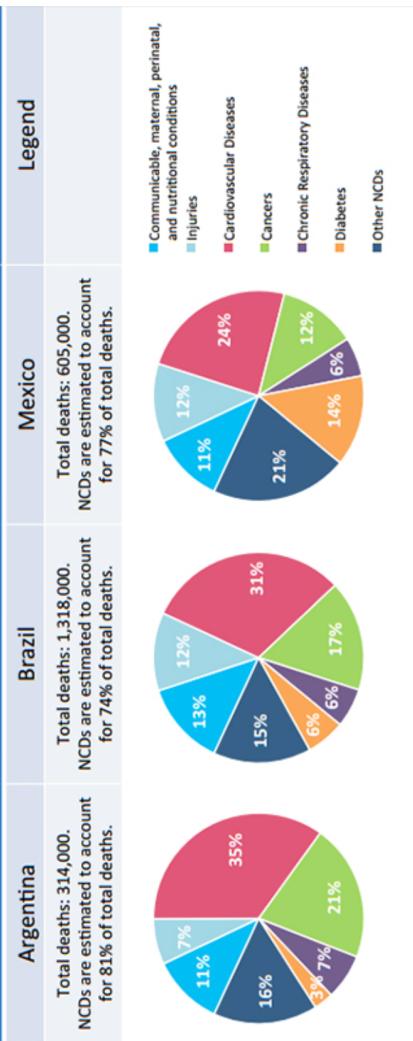
Robson Capasso M.D. ; FAASM
Chief, Sleep Surgery Division
Department of Otolaryngology, Head and Neck Surgery
Biodesign Faculty Fellow
Stanford University







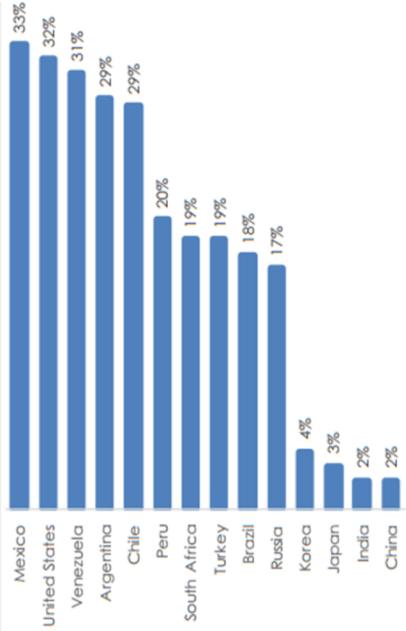




Total Deaths

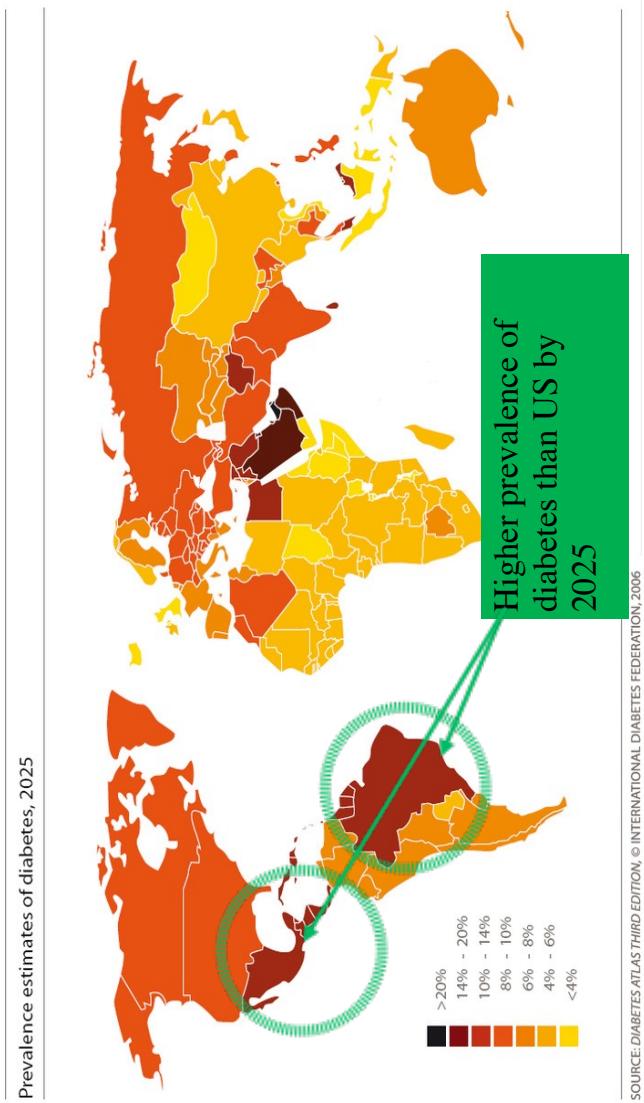
www.globalhealthintelligence.com

Prevalence of adult obesity in the world (as a percentage of total population)



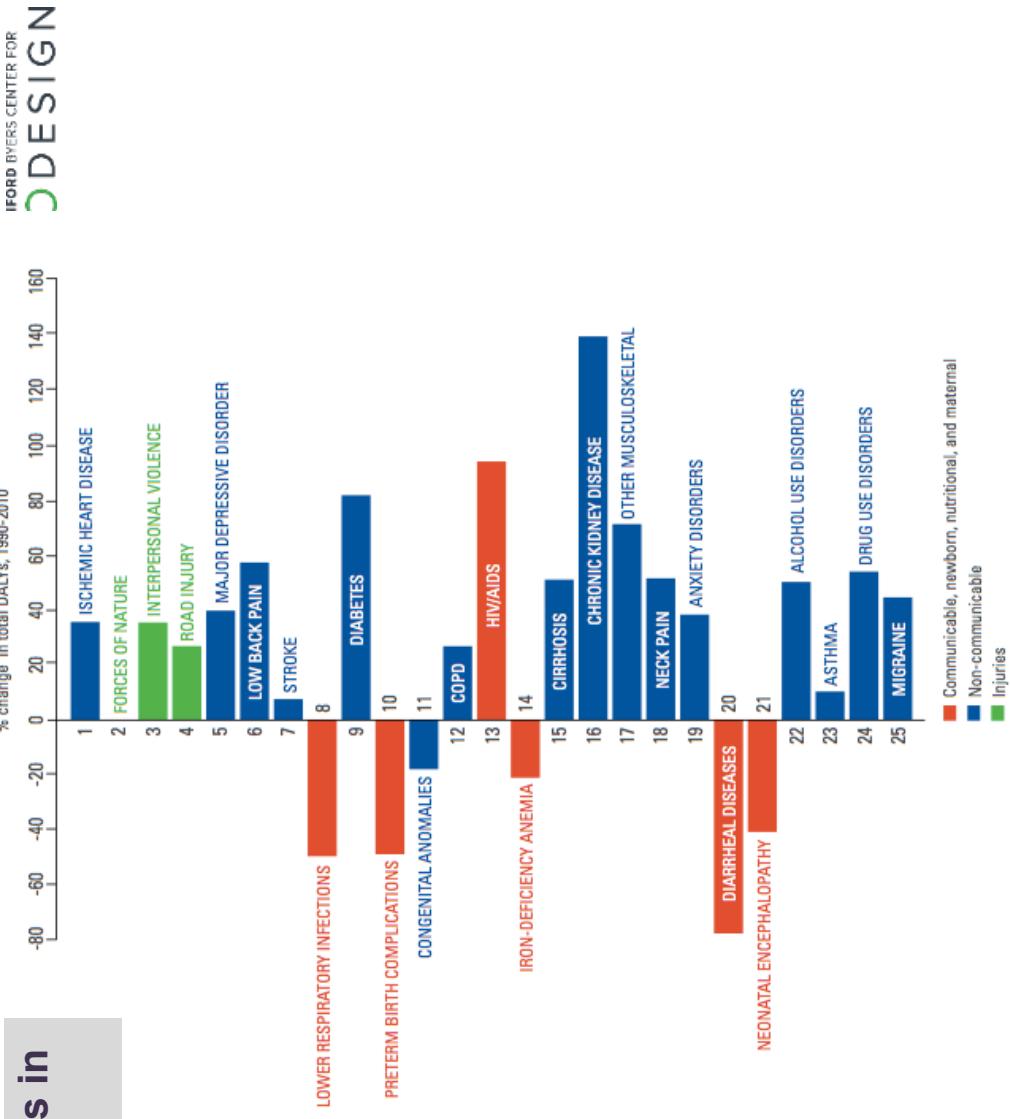
Source: GHI Analysis based WHO Infobase, OECD Health 2014, and foreignpolicy.com

Global disease burden shifting



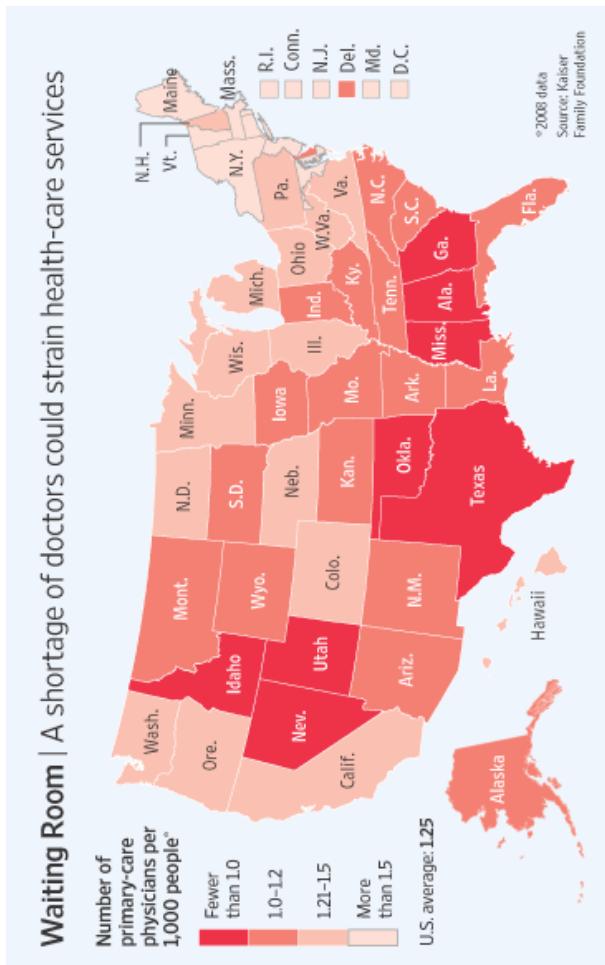
Shift toward chronic

Shifts in leading causes of DALYs in Latin America, 1990-2010

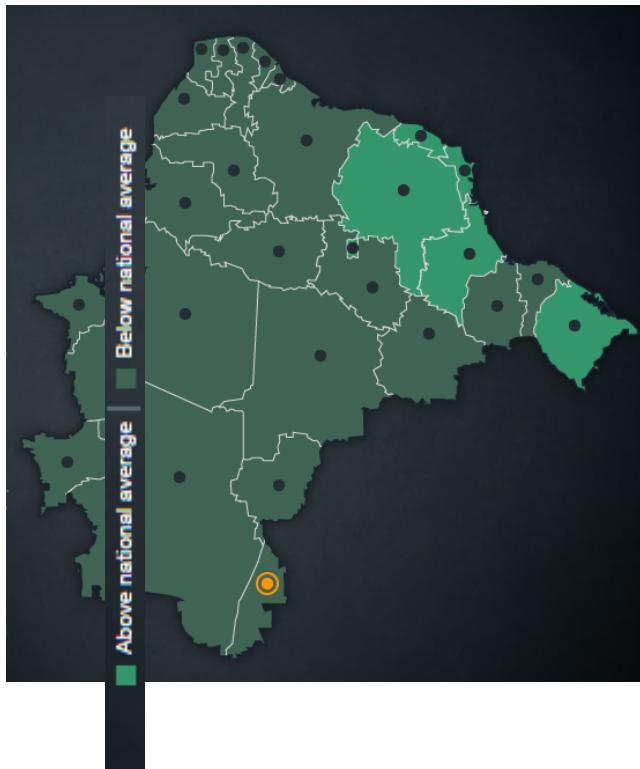


In most countries, DALYs from non-communicable disease are rising while DALYs from communicable, newborn, nutritional and maternal causes are declining

Source: The Global Burden of Disease, World Bank, 2013



2.4/1000

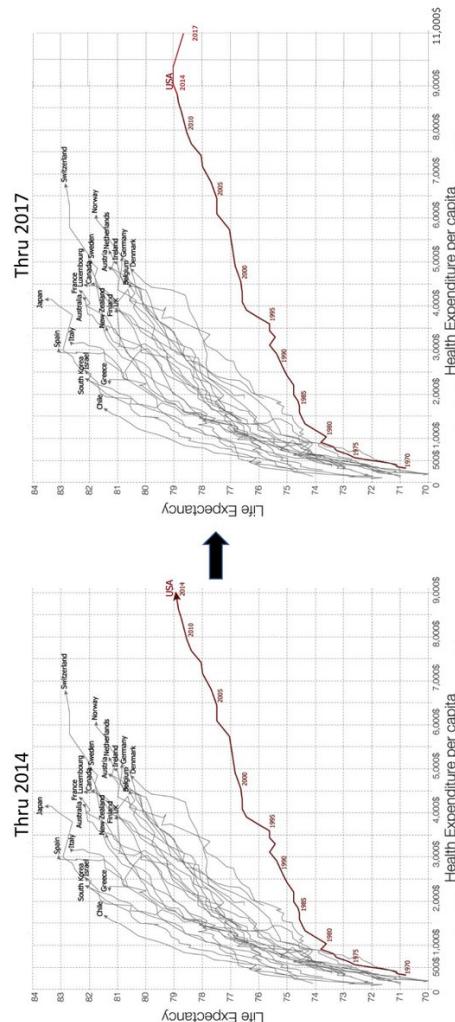


1.9/1000

STANFORD BYERS CENTER FOR
BIODESIGN



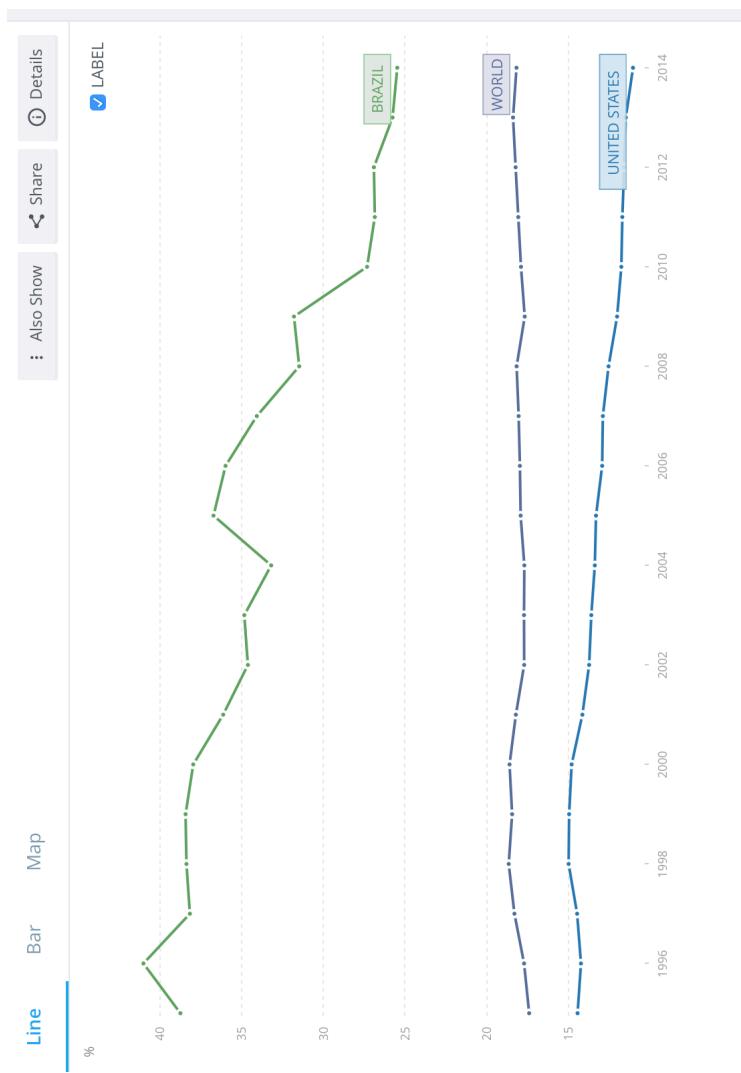
Life Expectancy Vs. Health Expenditure Per Capita



Health expenditure, public (% of total HE)



Out-of-pocket HE (% of total expenditure on health)



Brazil - Public

• 1988
Brazilian
Constitution
provides
for
the
right
to
health
care
and
the
right
to
a
safe
environment.



SUS – Pros

- Immunization, antenatal care, and hospital deliveries with improvements in life expectancy, child and infant mortality, and to a lesser extent, maternal mortality
- Geographic and socioeconomic disparities in outcomes have become less pronounced.
- Lack of primary care for perception of not having money to seek medical care decreased

SUS - Cons

- Lack of availability and inefficient coordination of care for specialist, diagnostic, and surgical procedures.
- Small hospitals/cities frequently have complex equipment without role, budget or personal to host it.
- Inevitably, SUS has not been able to provide all services for all.

Brazil - Private Health

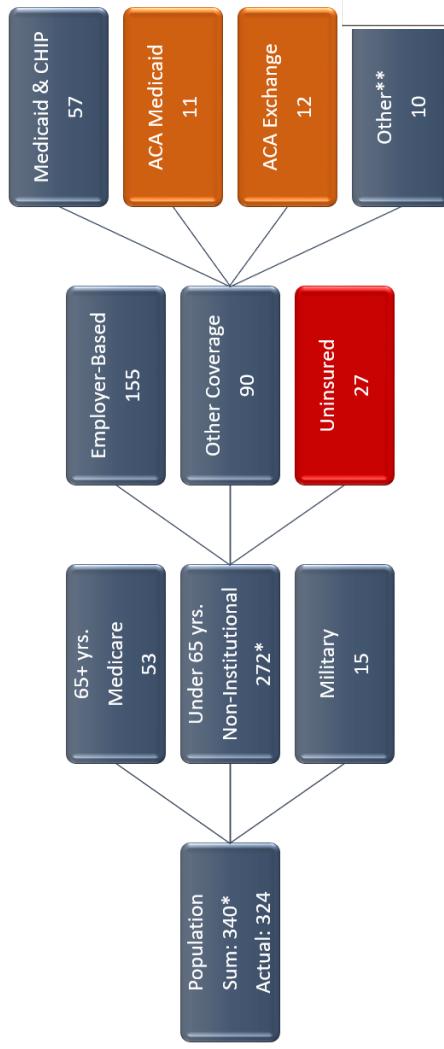
- When the SUS was established, importance of the private health system was expected to decline.
- Share of total public health spending is significantly lower than many middle-income countries.
- Private spending remained stable (from around 57% of total health spending in 1995 to 49% in 2009).
- The number of individuals with private health plan coverage grew steadily.

Brazil – Private

- Brazil's private health insurance sector lost 2.5 million beneficiaries between 2014 and 2016.
 - Companies changed their employees' health insurance plan to a cheaper one. (Deloitte 2018).
 - Coverage varies widely.
- Profit margins became less attractive following a ruling by the high court, are to reimburse SUS in the same way that private hospitals are reimbursed for treating privately insured patients.

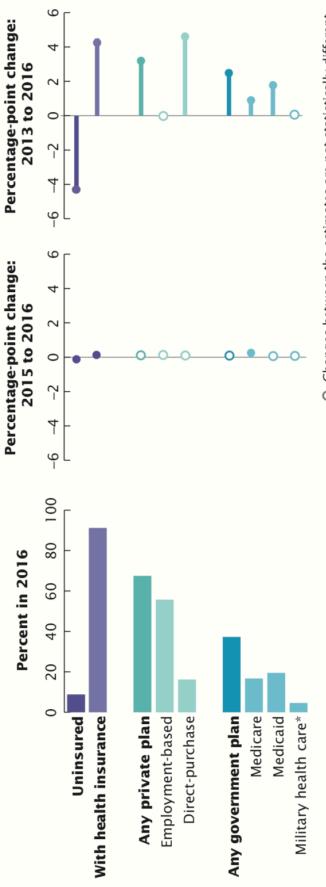


Sources of Health Insurance Coverage in 2016 (Millions of Persons)



Source data:
CBO "Federal Subsidies for Health Insurance Coverage for People Under Age 65: 2016 to 2026" (March 2016)
Census Bureau "Health Insurance Coverage in the United States: 2015" (September 2016)

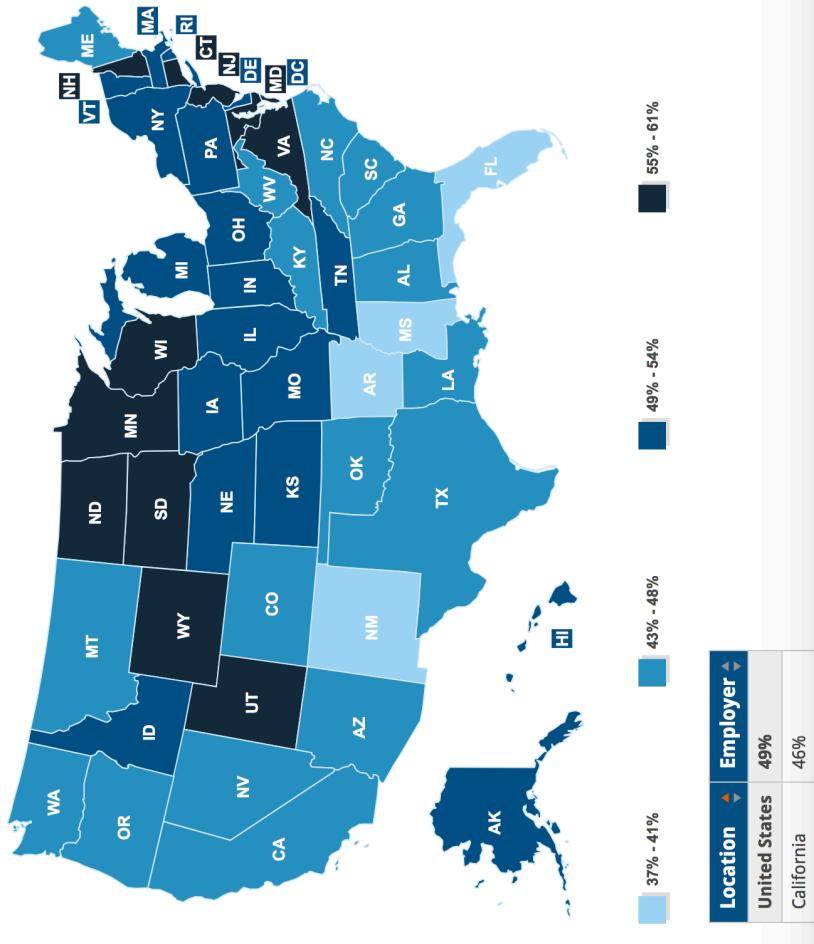
Figure 1.
Percentage of People by Type of Health Insurance Coverage and Change From
2013 to 2016
(Population as of March of the following year)



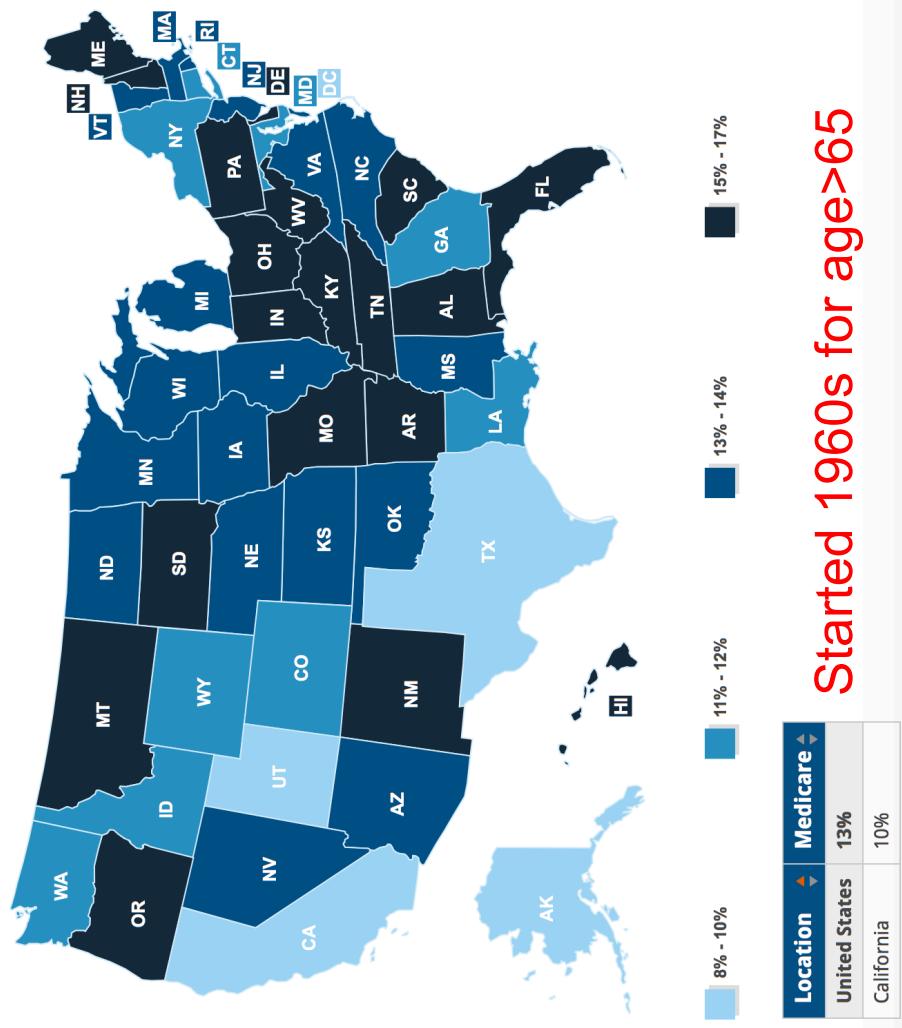
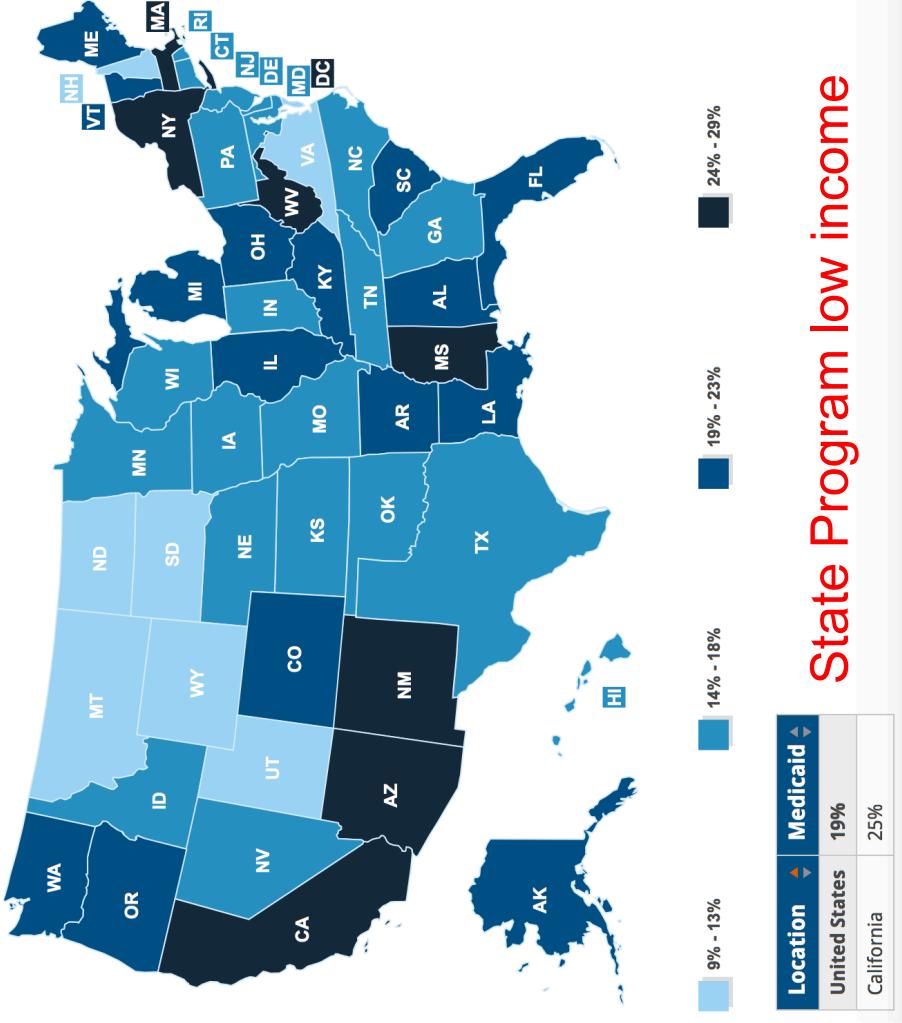
* Military health care includes TRICARE and CHAMPVA (Civilian Health and Medical Program of the Department of Veterans Affairs) as well as care provided by the Department of Veterans Affairs and the military.
Note: For information on confidentiality protection, sampling error, nonsampling error, and definitions in the Current Population Survey, see <www2.census.gov/progts/cps/techdocs/cpsmar17.pdf>. Source: U.S. Census Bureau, Current Population Survey, 2014 to 2017 Annual Social and Economic Supplements.

Health Insurance 2014

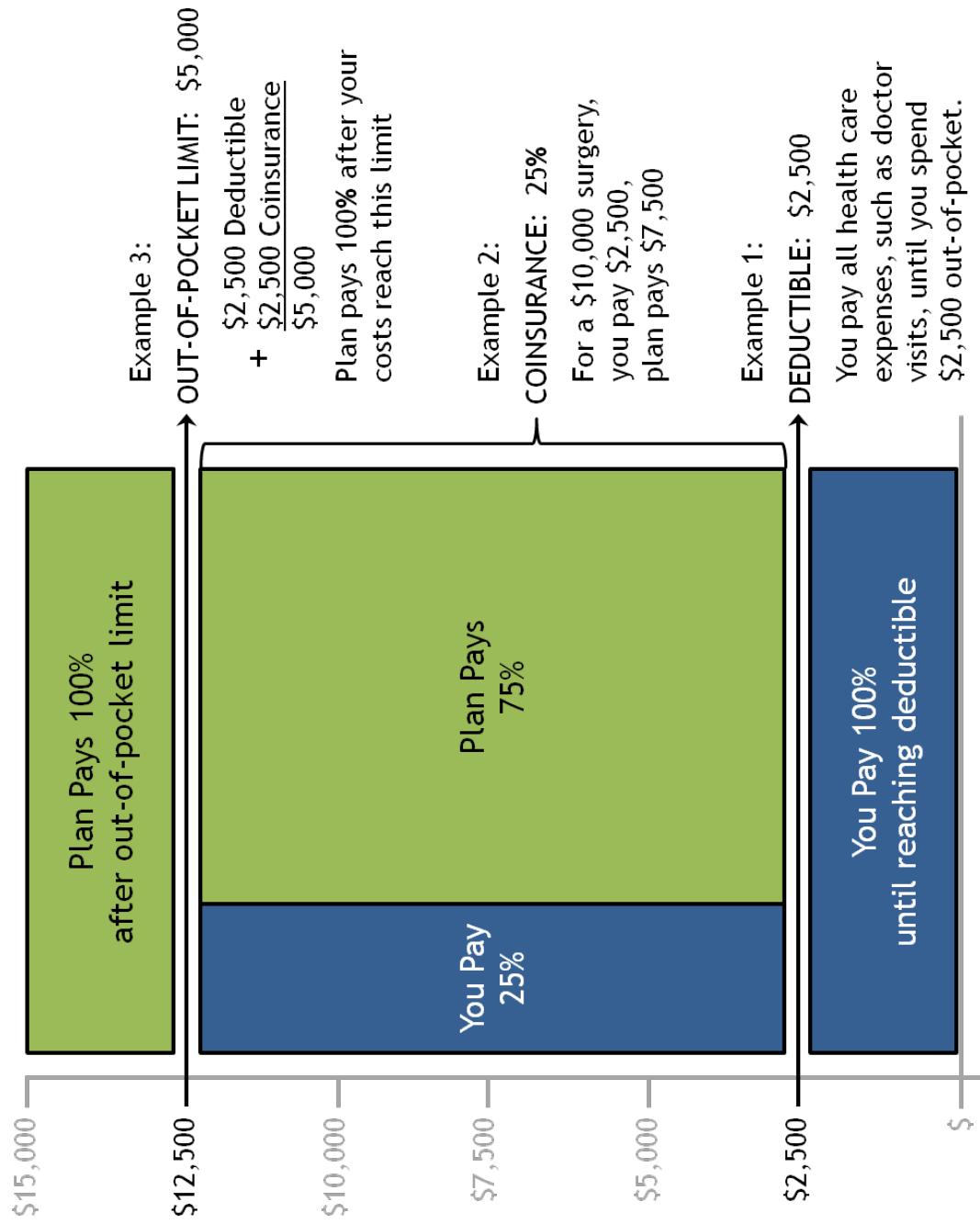
% of Employer Coverage ~37-61%



~8% buy own insurance



Cost-Sharing Illustration





Medicare

- CMS - 2002 to 2010 ->
 - 65 - 84 y/o - 36 % (\$11,692 to \$15,857 per capita).
 - Older than 85 - 38 %, (\$25,192 to \$34,783).
- 5-6 % of Medicare patients who die annually generate 30% of costs.
- 10-15% generate 65%-70% of costs.

Eric Topol,
Stanford's Human & Artificial Intelligence in Medicine Symposium, 2018

Metric	1975	Now
Jobs	4 million	>16 million
Healthcare expenditure per person	\$550/yr	>11000/yr
Most expensive drug	\$1200/yr	>700000/yr
Time per consult	60 new, 30 return	12 new, 7 ret
% of GDP on healthcare	<8	18
Hospital daily room charge	\$100	\$4600
Other	None	RVUs, PBMs, EHRs, Health systems

Conclusion

- US, BR face demographic challenges.
- Healthcare cost structure not sustainable.
- Demand for better quality, personalized services at lower cost.
- Value.
- Technology integration at all levels.

How? - Overview of the Biodesign Process

Imbalance?

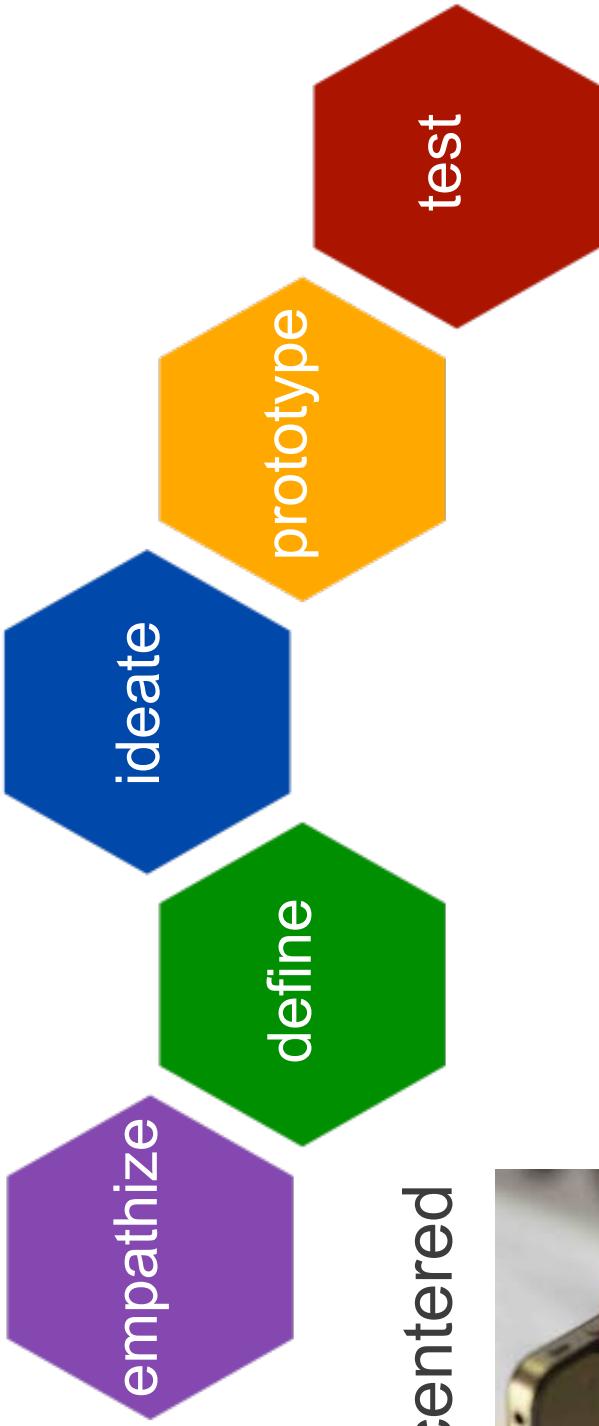
Technology Push

Technology

Need

Need Pull

Design thinking



User-centered





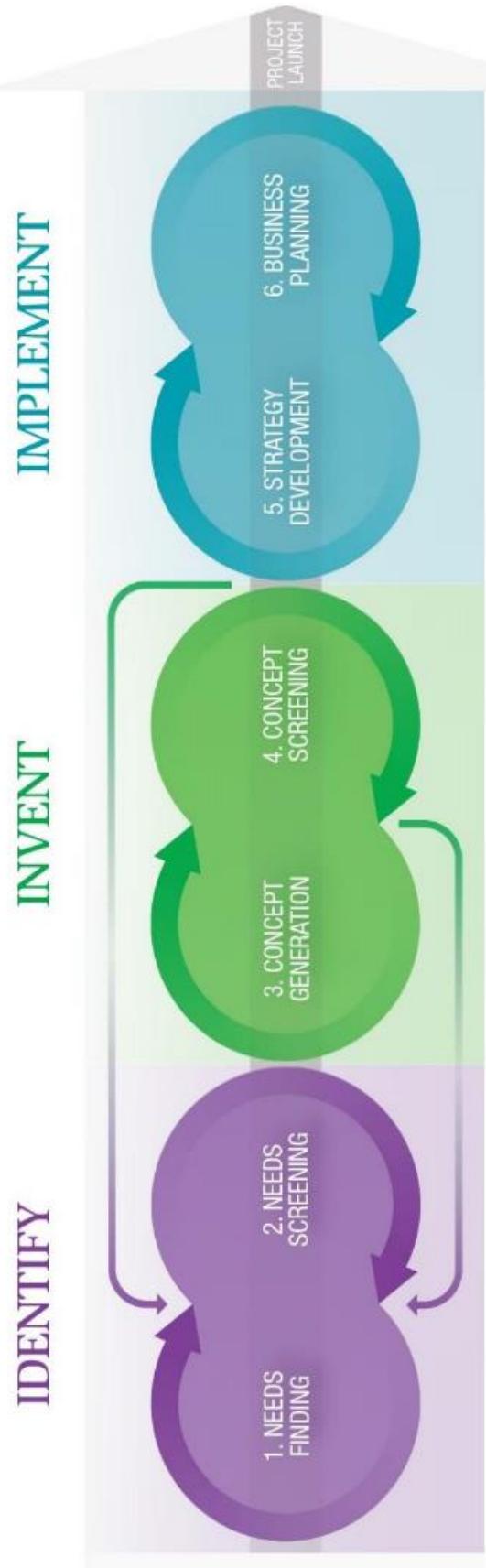
What if your “user”
is the 8-headed monster
called *healthcare*?



Salon.com

© 2016 Stanford Byers Center for Biodesign

To deal with this complexity ...



Biodesign fellow teams



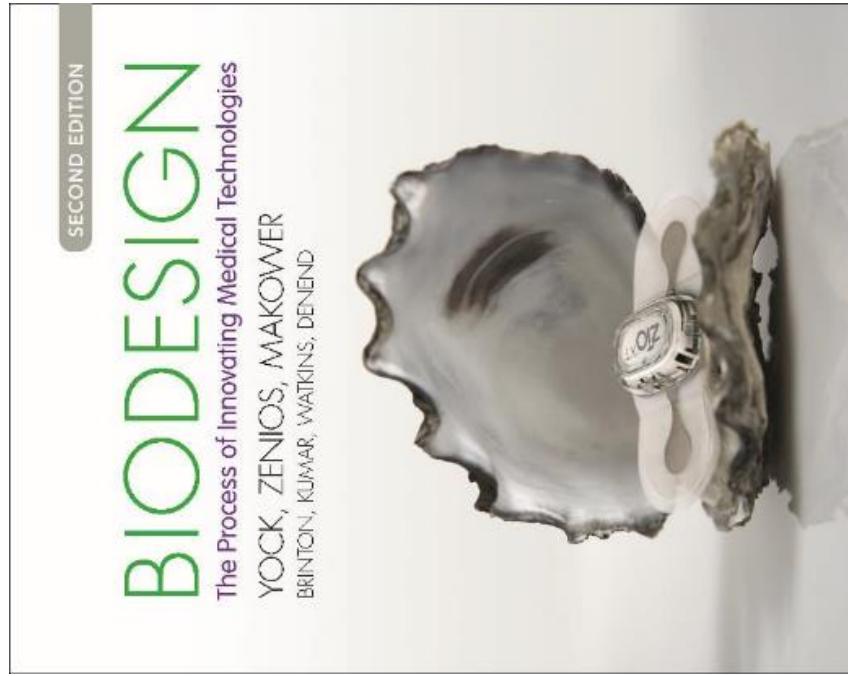
Need Identification

- Efficacy
- Cost
- Safety
- Usability

Factors to consider ...



Key resources



ebiodesign.org/chapter/1-3-need-statement-development/

BIODESIGN The Process of Innovating Medical Technologies

NEEDS FINDING NEEDS SCREENING CONCEPT GENERATION BUSINESS PLANNING STRATEGY DEVELOPMENT

1.3 Need Statement Development

Pranav Chopra
Stanford Bioodesign Fellow

NEED STATEMENT DEVELOPMENT

Identify the needs for a product or service, determine the feasibility of meeting those needs, and prioritize resources to develop a feasible solution approach to the challenge of developing medical technologies that are practical.

RELATED VIDEOS

- 1.3 Need Statement Development • BioDesign Fellows • Todd Brinton
- 1.3 Need Statement Development • BioDesign Fellows • Pranav Chopra

NEED STATEMENT EXAMPLE

Todd Brinton, BioDesign Fellow, Stanford BioDesign

NEED STATEMENT: Develop a medical ultrasound system that can detect breast cancer earlier than existing methods and at a lower cost.

RELATED VIDEOS

- 1.3 Need Statement Development • BioDesign Fellows • Todd Brinton

GETTING STARTED

When it is time to translate problems, populations, and outcomes into need statements, the steps below can help make this challenge more approachable.

ebiodesign.org

Buzzwords

- Value Based Healthcare:
 - Improves clinical impact, **cost**, access, convenience/experience to stakeholders when compared to current status/solutions.

ECONOMICS & SOCIETY

Harvard
Business
Review

We Won't Get Value-Based Health Care Until We Agree on What "Value" Means

by Robert C. Pencilleton

FEBRUARY 27, 2018

Value Drivers: Patients

- ▶ Increased cost sharing
- ▶ Consumers have an increasing role in HC decision making:
 - ▶ Transparency around quality and price,
 - ▶ Price sensitive.
 - ▶ Push towards innovative, personalized care models
- Research as a model for care delivery.

Value Drivers - Providers

- Key partners, but can be resistant to changes in how to deliver medicine/ "standard of care".
 - 44% burnout rate
 - Physician burnout and depression are driven largely by bureaucratic and practice demands
- Medscape
 - Education is deficient
 - Educate the next generation in interdisciplinary, evidence-based, digitally/technology enabled care.

- value drivers

Others

- Governments: Will need to create a regulatory environment that encourages innovation and research while putting patients first.
- Industry / Academia Interface: Cost, silos and roadblocks prevent effective data sharing but, at the same time, privacy and security of patient data is paramount.

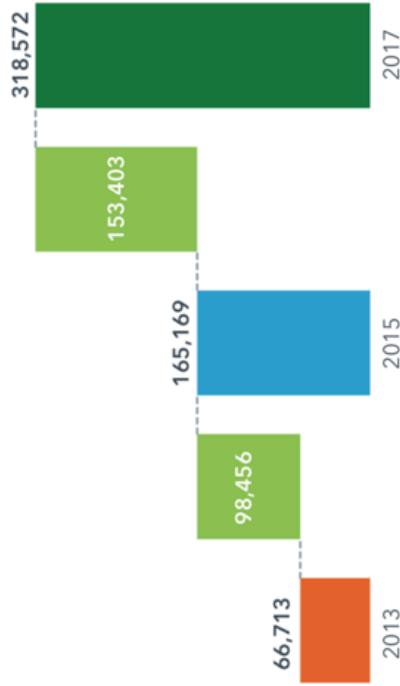


Precision Medicine

- Genome – current status
- Pharmacogenetics
- Management of genetic health risks
- Carrier status screening for prospective parents

Digital Health

Exhibit 2: Number of Digital Health Apps 2013, 2015 and 2017



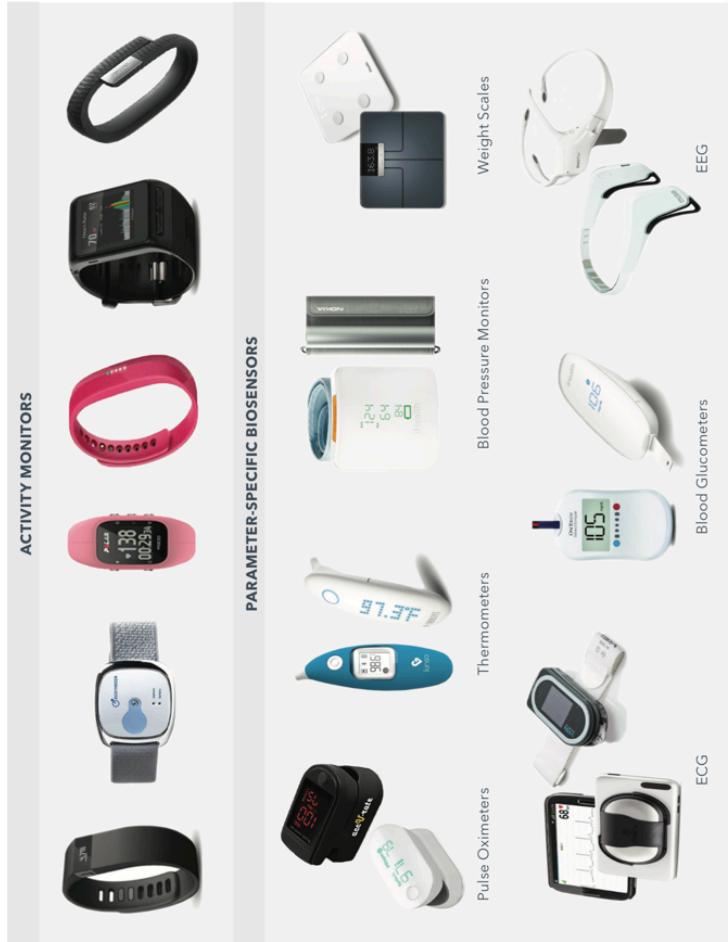
Sources: 42 Matters, Jul 2017; Mevvy, Jun 2015; IQVIA AppScript Database,

Jul 2015; IQVIA Institute, Jul 2017

Note: Includes digital health apps publicly available to consumers via the Apple Store and Google Play

“Buzzwords”

- Wearables



“Sweatables”?

Wearable sweat sensor paves way for real-time analysis of body chemistry

Flexible plastic sensor sends molecular test results to a smartphone.

Linda Geddes

27 January 2016

 Rights & Permissions



Roxanne Makasdjian and Stephen McNally
Ali Javey, of the University of California, Berkeley, shows the flexible, wearable sweat-sensing device his team has created.

“Breathables”

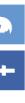
Detection of Cancer Through Exhaled Breath



By Leah Lawrence

Aug 23, 2018

News



GET IN TOUCH

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Research Products & Services

Science & Technology



A Breathalyzer for Disease

Our Mission: To save 100,000 lives and \$1.5B in healthcare costs.

Our Vision: The global leader in Breath Biopsy for early detection and precision medicine.

LEARN ABOUT OUR MISSION



Meet the Bryte™ Bed

A photograph of a modern, modular bed frame. The headboard and footboard are black, while the mattress is white and grey. The word "BRYTE" is printed vertically on the side of the bed frame. A white button with the text "LEARN MORE" is overlaid on the right side of the image.

AI



ARTERYS

The World's First Online Medical Imaging Platform

FDA cleared | Powered by AI | 100% Web based

At Stanford MedicineX a DIY diabetes e-patient becomes study PI

The Open Artificial Pancreas System project (#OpenAPS) is an open and transparent effort to make safe and effective basic Artificial Pancreas System (APS) technology widely available to more quickly improve and save as many lives as possible and reduce the burden of Type 1 diabetes.

OpenAPS means basic overnight closed loop APS technology is more widely available to anyone with compatible medical devices who is willing to build their own system.

We believe that we can make safe and effective APS technology available more quickly, to more people, rather than just waiting for current APS efforts to complete clinical trials and be FDA-approved and commercialized through traditional processes. And in the process, we believe we can

