

# OFFICE OF THE ASSISTANT SECRETARY FOR HEALTH



## INNOVATION TO ADDRESS PUBLIC HEALTH IMPERATIVES



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# U.S. PUBLIC HEALTH SERVICE: ABBREVIATED HISTORY



**1798** The Beginning: Act for the Relief of Sick and Disabled Seamen

**1870** Marine Hospital Service

**1871** First Supervising Surgeon (later Surgeon General)  
Dr. John Maynard Woodworth

**1878** National Quarantine Act

**1889** Legislation created the Commissioned Corps

**1912** Public Health Service (with broadened powers)

**1930** Parker Act: Expanded PHS to Non-Physicians

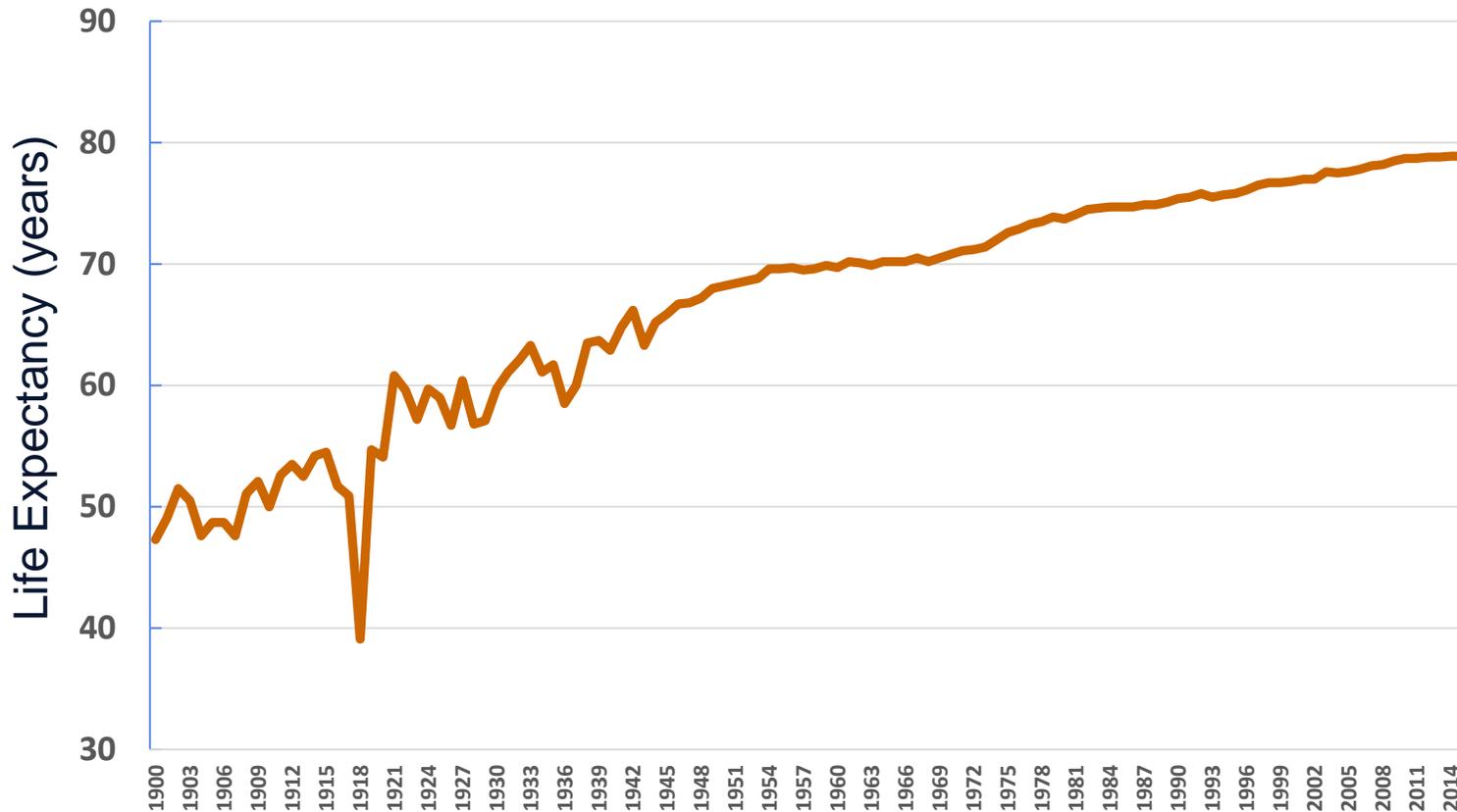
**1955** Establishment of the IHS

**1979** Department of Health and Human Services established

**1999** First Disaster Response Mission for Commissioned Corps



# U.S. LIFE EXPECTANCY: 1900 - 2015



## PUBLIC HEALTH SUCCESSES

- Influenza and Pneumonia
- Enteric Diseases
- Stroke and CV Disease
- Tuberculosis
- Cancer
- Accidents

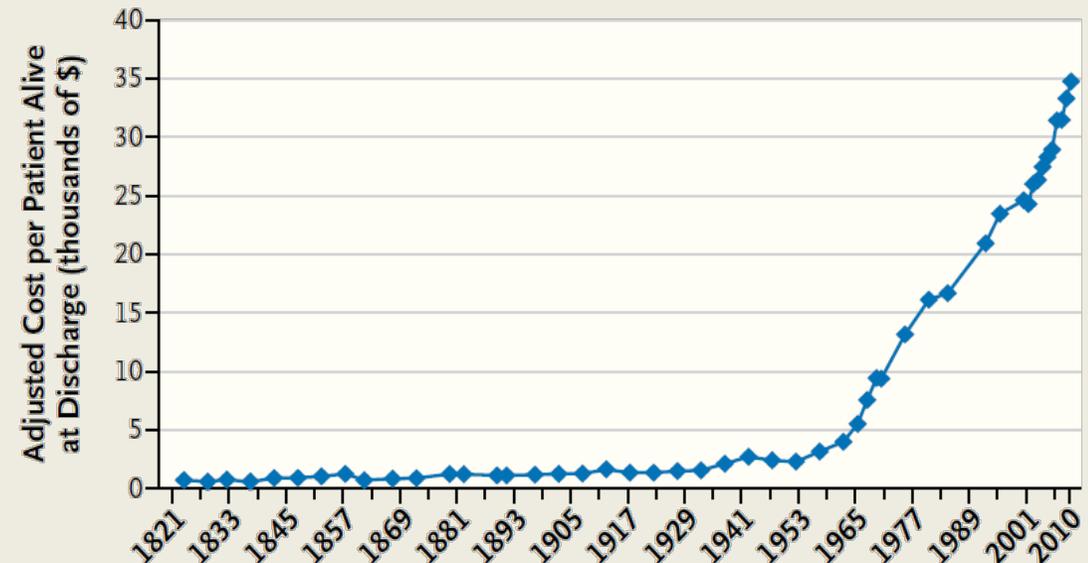


# U.S. HEALTH CHALLENGES IN THE 21<sup>st</sup> CENTURY

U.S.: Highest spending on health care in the world (**\$3.3 trillion, or 17.9% of GNP**)

Spending is predicted to reach \$5.7 trillion by 2026

## MASS GENERAL'S INPATIENT ADJUSTED COSTS PER LIVE DISCHARGE



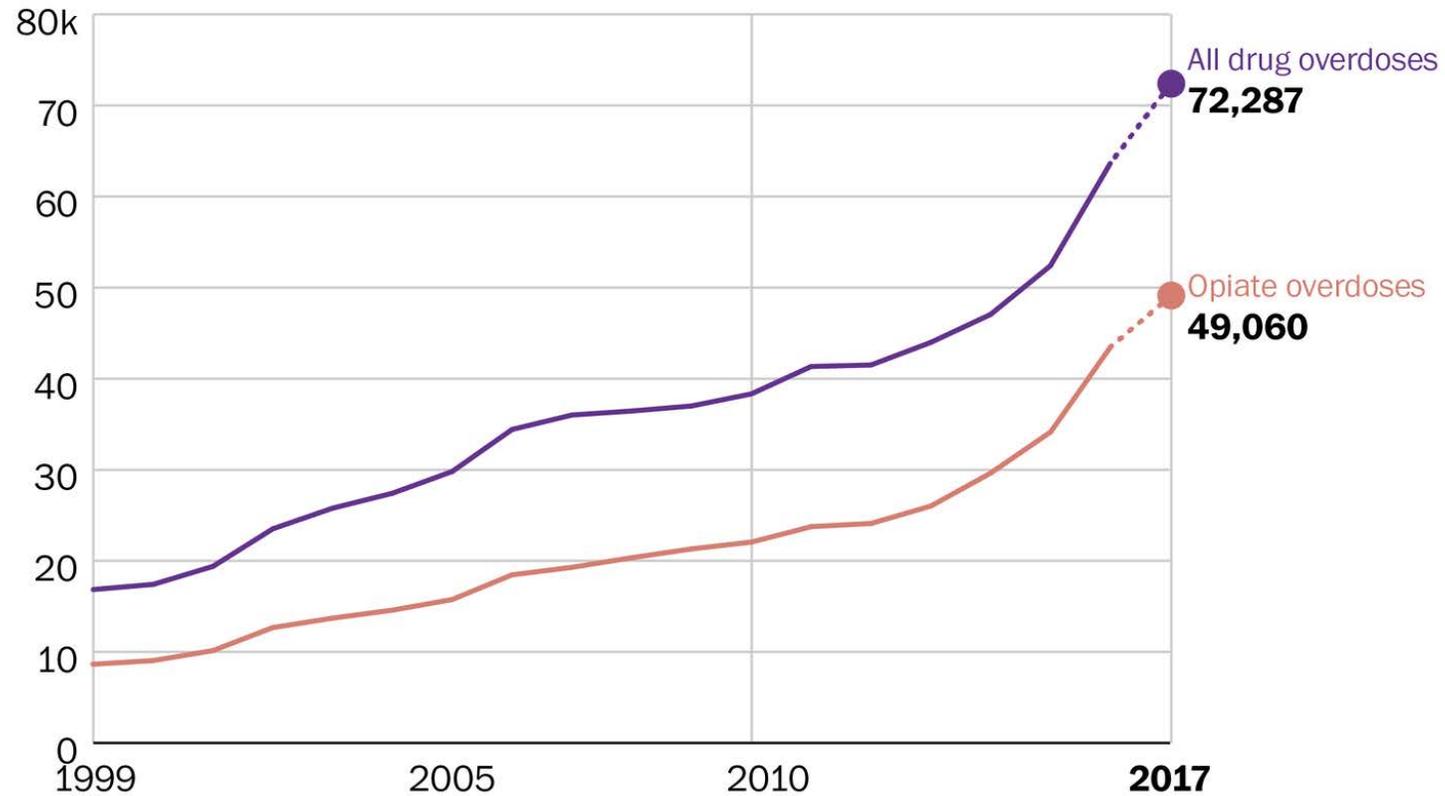
# U.S. HEALTH CHALLENGES IN THE 21<sup>st</sup> CENTURY

- **Life Expectancy**
  - Among the 36 OECD\* nations, the U.S. ranks 28th in life expectancy; 33rd in infant mortality; 32nd in suicide rate
  - In 2015 and 2016 life expectancy decreased in the United States
- **Sexually Transmitted Diseases**
  - Highest number ever reported in U.S. in 2016
  - >2 million; 50% in adolescents and young adults
- **Influenza and Infectious Diseases**
  - Enhanced risks from pandemic influenza, emerging infectious diseases, anti-microbial resistance
- **Rogue States and Organizations**
  - Intentional chemical, biological, radiological, and nuclear attack



# U.S. DRUG OVERDOSE DEATHS

THE MOST CRITICAL PUBLIC HEALTH CHALLENGE OF OUR TIME



# U.S. HEALTH CHALLENGES IN THE 21<sup>ST</sup> CENTURY

WSJ

## Recruits' Ineligibility Tests the Military

*More Than Two-Thirds of American Youth Wouldn't Qualify for Service, Pentagon Says*



“...the Defense Department estimates 71% of the roughly 34 million 17- to 24-year-olds in the U.S. would fail to qualify to enlist in the military if they tried....”

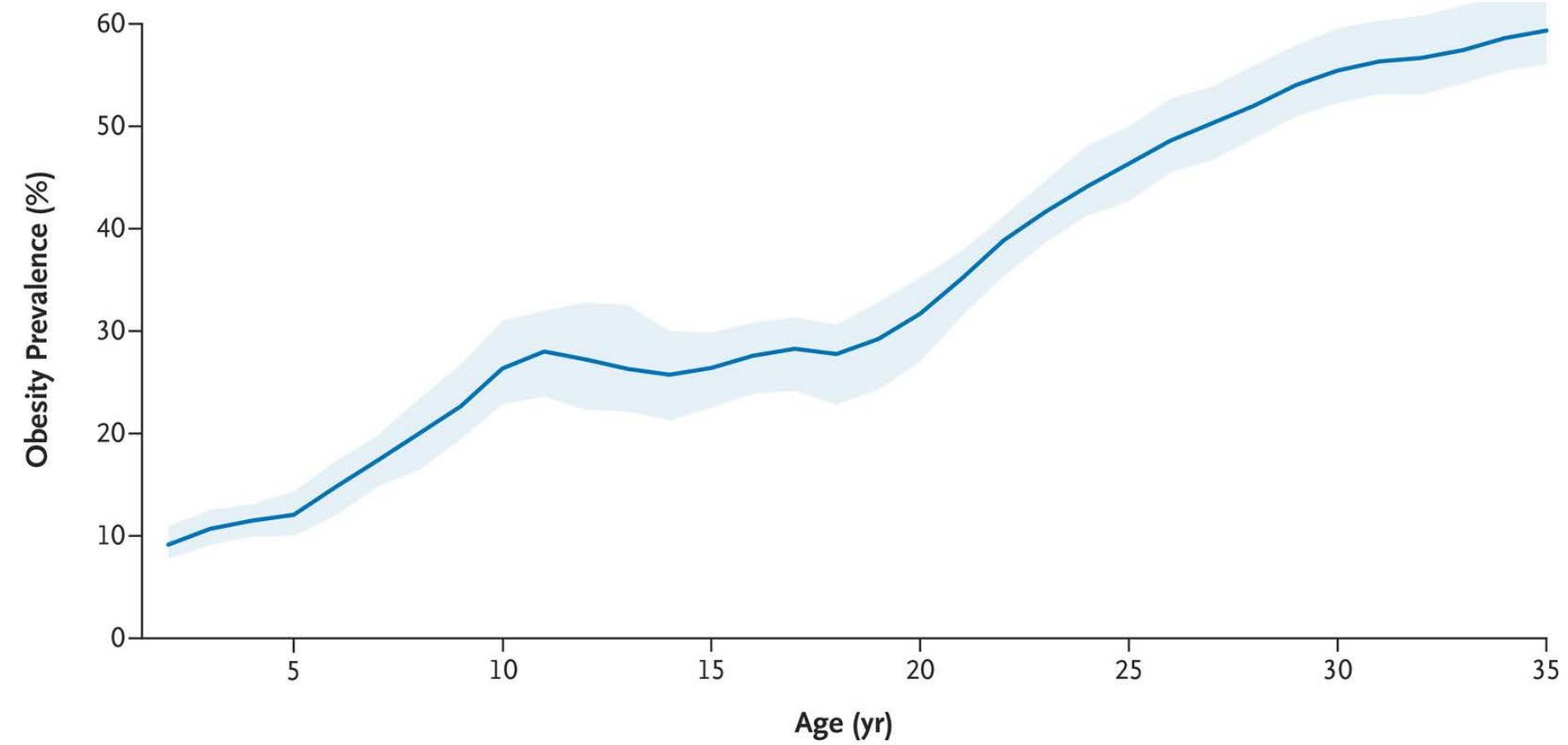
Physical Fitness, Drug Abuse, Education



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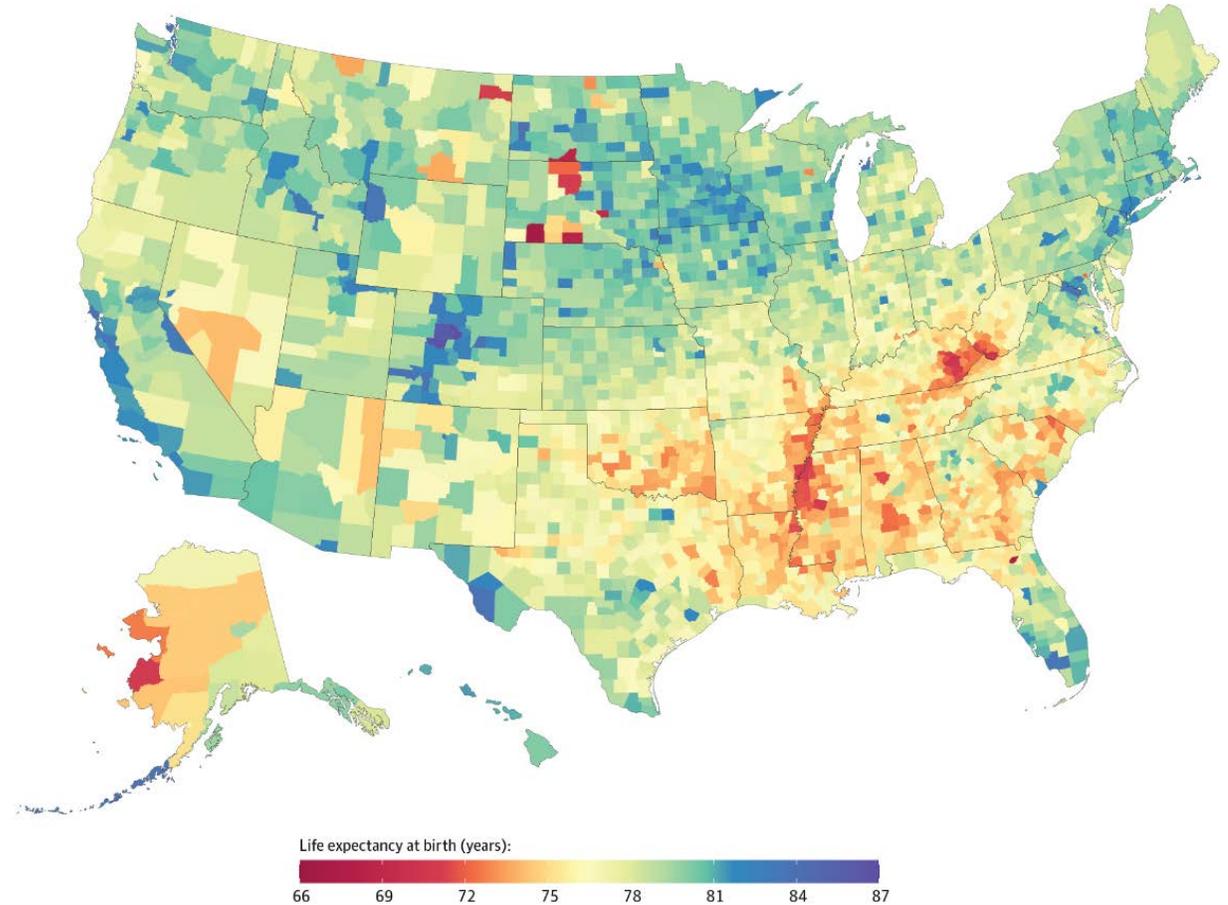
# PREDICTED OBESITY OF TODAY'S TWO YEAR OLDS



# INEQUALITIES IN LIFE EXPECTANCY AMONG U.S. COUNTIES

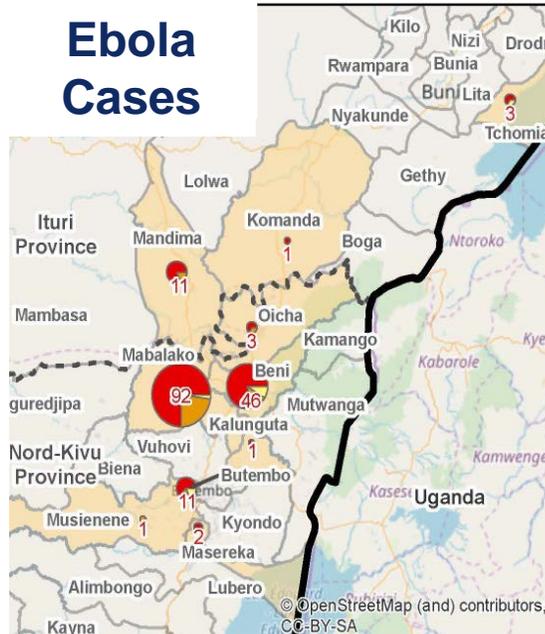
1980 – 2014 (DWYER-LINDGREN, 2017)

- Inequalities in life expectancy among counties are large and increasing over time
- Difference in life expectancy between the lowest ranking county and the highest ranking county is 20.1 years (66.8 – 86.9 years)
- Lowest life expectancies: Kentucky, West Virginia, Alabama, Mississippi, North Dakota, South Dakota



# GLOBAL HEALTH CHALLENGES IN THE 21<sup>st</sup> CENTURY

## Ebola Cases



**Risks of Pandemics:**  
Influenza, SARS, MERS, Ebola, others

## INFECTIOUS DISEASE

- **Malaria:** 216M cases and 445,000 deaths annually
- **Tuberculosis:** 25% of world population infected 1.7M deaths annually
- **HIV/AIDS:** 36.9M people infected 1.8M new cases in 2017
- **Neglected Tropical Diseases:** >140 diverse communicable diseases affecting the poorest 1B people on the planet (examples include Dengue, Hookworm, Schistosomiasis)

## NON COMMUNICABLE DISEASE

- **Cancer, Cardiovascular Disease, Diabetes, Chronic Lung Disease** caused 37% of deaths even in low income countries

**16,000+ Children Die Every Day of Preventable Diseases**



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\*Organization for Economic Development and Cooperation



# MODEL OF DISRUPTIVE INNOVATION

GPS



NASA



UAVs



STEALTH

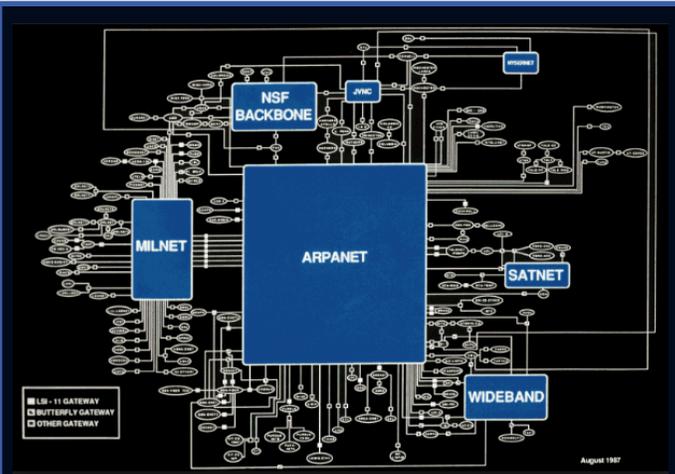


Siri

AUTONOMOUS VEHICLES



REVOLUTIONIZING PROSTHETICS



ARPA-NET



# THE DARPA MODEL: WILL IT TRANSLATE TO PUBLIC HEALTH?

- Few (if any) single technologies are transformative
- Solutions
  - Must address information, beliefs, human behavior, social determinants, historical biases and inequities
  - Generally depend on venture capital or public markets to reach critical milestones (valley of death)
- Multiple barriers to development and dissemination
  - Regulatory
  - Human subjects protections
  - Slow adoption by health professionals and systems
  - Global financial and cultural barriers; conflicts



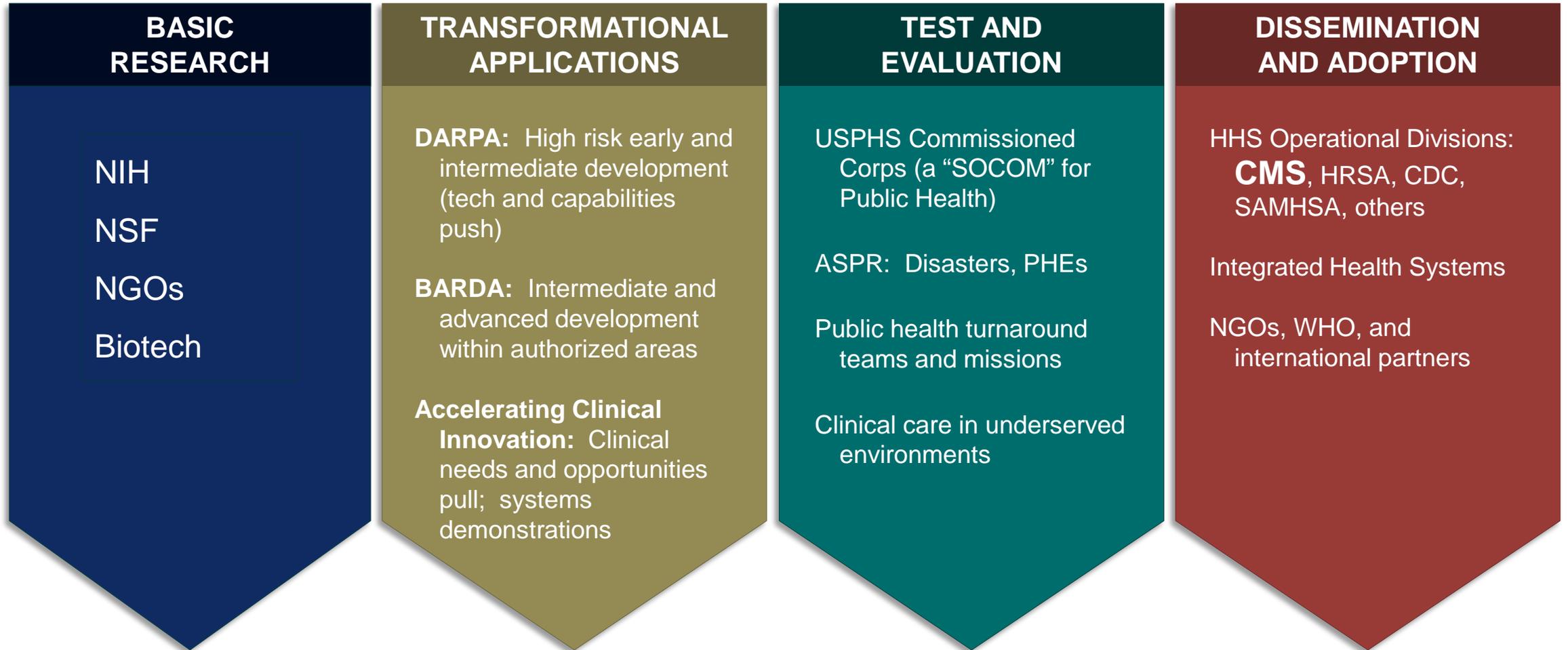
# THE DARPA MODEL: TRANSLATES TO PUBLIC HEALTH

- “DARPA” is a model of innovation and translation that is independent of the problem’s domain, and uniquely American in its approach and implementation
- Has been highly effective for developing novel systems and systems of systems

**The DARPA Model will only work in an appropriate environment and continuum, which do not currently exist for medicine and public health**



# PROVIDING THE INNOVATION CONTEXT AND CONTINUUM



# PRIORITIES FOR PUBLIC HEALTH INNOVATION ENVIRONMENT

- Orthogonal technologies and paradigms for the current ***most costly medical issues*** (for example, hemodialysis, falls, sepsis, pain)
- Technologies and approaches that allow for more ***advanced care outside of hospital settings including in rural environments***
- Socio-behavioral approaches and distributive technologies to ***transform the current “sick care system” into a “health promoting system”***
- Leverage big data, social networks, and digital platforms for public health, including ***epidemiology, prediction, prevention, and treatment***



# PRIORITIES FOR PUBLIC HEALTH INNOVATION ENVIRONMENT

- End U.S. infectious disease epidemics *within our technical control*:  
HIV, HCV, HPV
- ***Genetic cures and immunotherapies***
- A new paradigm for understanding and treating ***neurodegeneration***
- ***Global health security***: an endogenous global capacity, early warning, detection, diagnosis, rapid mitigation, and assured effective response
- The ***Commissioned Corps*** as an agent of change



# WHERE WILL WE STAND ON BEHALF OF PUBLIC HEALTH?

## **The New York Times**

**“The flying machine  
which will really fly  
might be evolved by the  
combined and continuous  
efforts of mathematicians  
and mechanics  
in from one million  
to ten million years”**

**October 9, 1903**

**“We started assembly  
today”**

**Orville Wright’s Diary**

**October 9, 1903**

