Systems Engineering of the US Population Health Ecosystem

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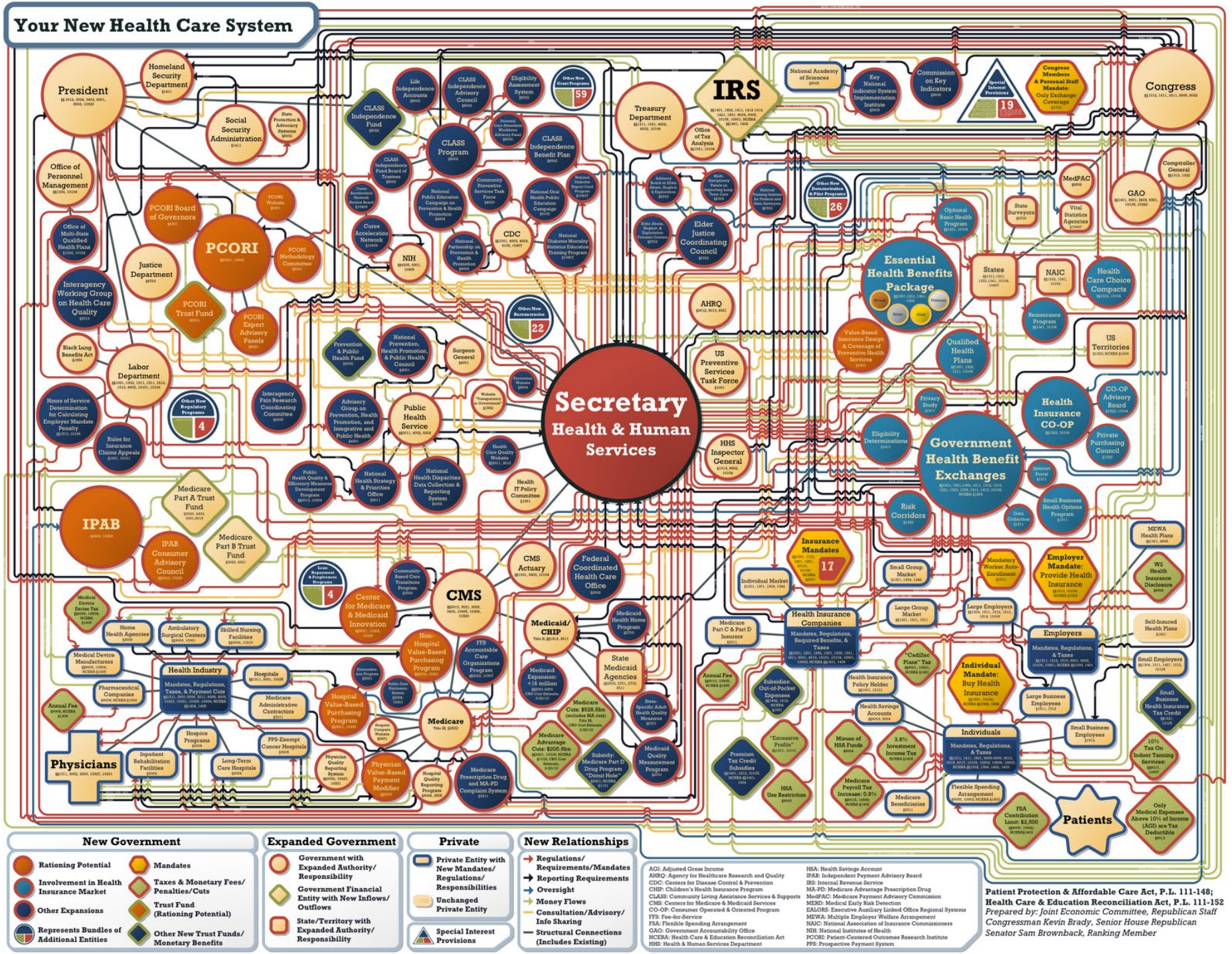
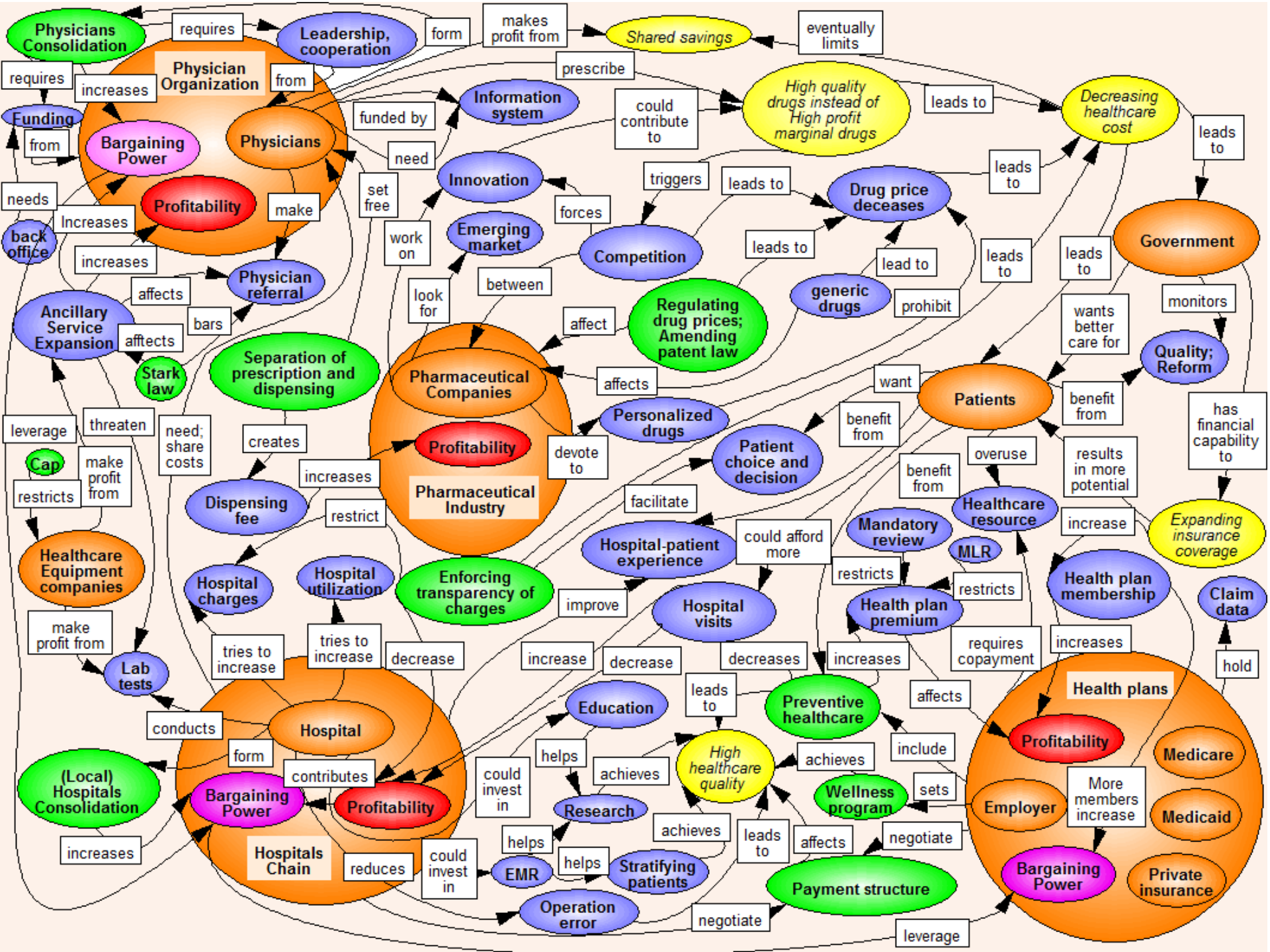
Overview

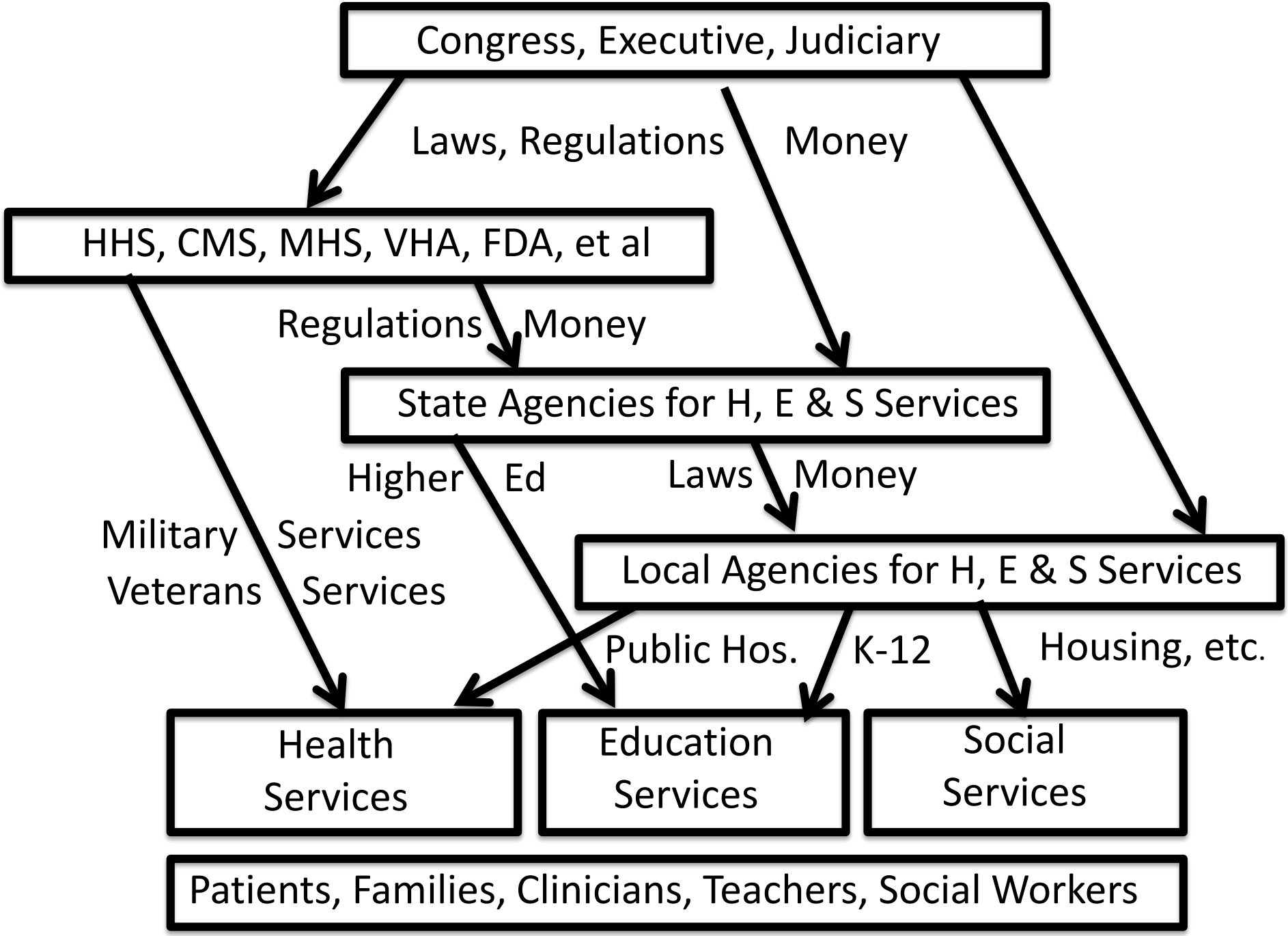
- Definition of Population Health
- Views of Health Ecosystem
- Case Studies
  - Substance Abuse and Opioid Epidemic
  - Assistive Technologies for Disabled & Older Adults
- Architecture of Health Enterprise
- Path To Success
  - Enterprise Transformation
  - Model-Based Decision Making
  - Immersive Decision Making
- Technology Enablers
- Summary

Population Health

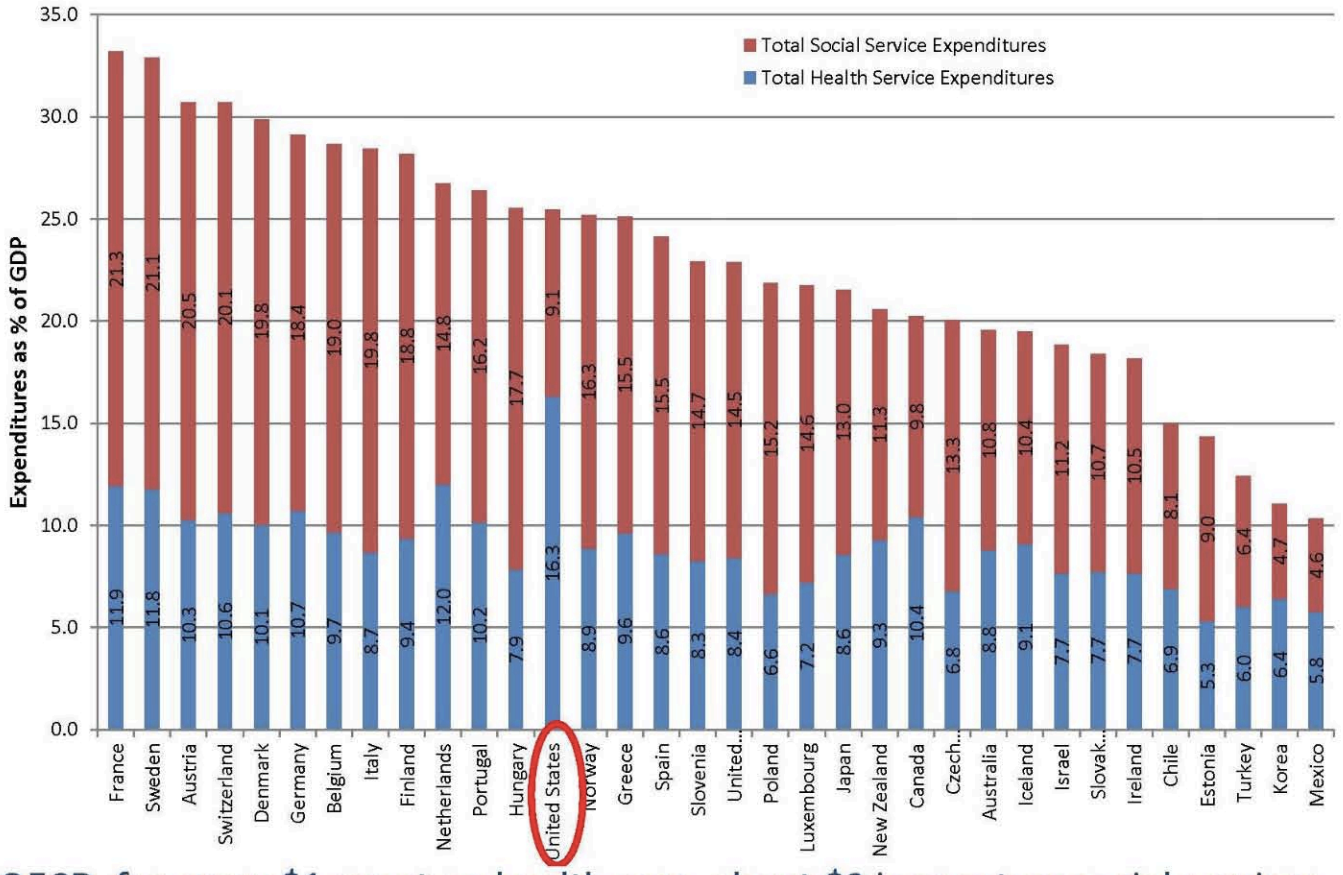
Population health involves integration of health, education, and social services to keep a defined population healthy, to address health challenges holistically, and to assist with the realities of being mortal.


Your New Health Care System
President
Homeland Security Department
Social Security Administration
Office of Personnel Management
Office of Multi-State Qualified Health Plans
Interagency Working Group on Health Care Quality
Black Lung Benefits Act
Labor Department
Hours of Service Determination for Calculating Employer Mandate Penalty
Rules for Insurance Claims Appeals
Other New Regulatory Programs
4
Justice Department
PCORI
PCORI Board of Governors
PCORI Website
PCORI Methodology Committee
PCORI Trust Fund
PCORI Expert Advisory Panels
Interagency Pain Research Coordinating Committee
IPAB
IPAB Consumer Advisory Council
Medicare Part A Trust Fund
Medicare Part B Trust Fund
Secretary
Health & Human Services
Treasury Department
IRS
Office of Tax Analysis
National Academy of Sciences
Key National Indicator System Implementation Institute
Commission on Key Indicators
Special Interest Provisions
19
Congress Members & Personal Staff Mandate: Only Exchange Coverage
Congress
Comptroller General
GAO
MedPAC
Vital Statistics Agencies
Life Independence Accounts
CLASS Independence Advisory Council
Eligibility Assessment System
Other New Grant Programs
59
CLASS Independence Fund
CLASS Program
CLASS Independence Benefit Plan
CLASS Independence Fund Board of Trustees
Personal Care Attendants Workforce Advisory Panel
Cures Acceleration Network
Cures Acceleration Network Review Board
NIH
National Public Education Campaign on Prevention & Health Promotion
Community Preventive Services Task Force
National Oral Health Public Education Campaign
National Diabetes Report Card Program
CDC
National Partnership on Prevention & Health Promotion
National Diabetes Mortality Statistics Education Training Program
Other New Bureaucracies
22
Prevention & Public Health Fund
National Prevention, Health Promotion, & Public Health Council
Surgeon General
Prevention Website
Website "Transparency in Government"
Advisory Group on Prevention, Health Promotion, and Integrative and Public Health
Public Health Service
Health Care Quality Website
Public Health Quality & Efficiency Measures Development Program
National Health Strategy & Priorities Office
National Health Disparities Data Collection & Reporting System
Health IT Policy Committee
Advisory Board on Elder Abuse, Neglect, & Exploitation
Multi-Disciplinary Panels on Improving Long-Term Care
National Training Institute for Federal and State Surveyors
Other New Demonstration & Pilot Programs
26
Elder Abuse, Neglect, & Exploitation Forensic Center
Elder Justice Coordinating Council
AHRQ
US Preventive Services Task Force
Essential Health Benefits Package
Bronze
Silver
Gold
Platinum
Optional Basic Health Program
State Surveyors
States
NAIC
Health Care Choice Compacts
Reinsurance Program
Value-Based Insurance Design & Coverage of Preventive Health Services
Qualified Health Plans
US Territories
Privacy Study
Health Insurance CO-OP
CO-OP Advisory Board
Private Purchasing Council
Eligibility Determinations
Government Health Benefit Exchanges
HHS Inspector General
Internet Portal
Small Business Health Options Program
Risk Corridors
Data Collection
Insurance Mandates
17
Individual Market
Small Group Market
Mandatory Worker Auto-Enrollment
Employer Mandate: Provide Health Insurance
MEWA Health Plans
W2 Health Insurance Disclosure
Large Group Market
Large Employers
Self-Insured Health Plans
Medicare Part C & Part D Insurers
Health Insurance Companies
Mandates, Regulations, Required Benefits, & Taxes
Employers
Mandates, Regulations, & Taxes
Small Employers
Annual Fee
Subsidies: Out-of-Pocket Expenses
"Cadillac" Plans" Tax
Individual Mandate: Buy Health Insurance
Health Insurance Policy Holder
Health Savings Accounts
Large Business Employees
Small Business Health Insurance Tax Credit
Small Business Employees
Individuals
Mandates, Regulations, & Taxes
10% Tax On Indoor Tanning Services
Premium Tax Credit Subsidies
"Excessive Profits"
Misuse of HSA Funds
3.8% Investment Income Tax
HSA Use Restriction
Medicare Payroll Tax Increase: 0.9%
Flexible Spending Arrangement
Medicare Beneficiaries
FSA Contribution Limit: $2,500
Only Medical Expenses Above 10% of Income (AGI) are Tax Deductible
Patients
CMS
CMS Actuary
Federal Coordinated Health Care Office
Center for Medicare & Medicaid Innovation
Community-Based Care Transitions Program
Non-Hospital Value-Based Purchasing Program
FFS Accountable Care Organizations Program
Medicaid/ CHIP
Medicaid Health Home Program
State Medicaid Agencies
Medicaid Expansion: +16 million
Medicare Cuts: $528.9bn (includes MA cuts)
Medicare Advantage Cuts: $205.9bn
State-Specific Adult Health Quality Measures
Subsidy: Medicare Part D Drug Program "Donut Hole"
Medicaid Quality Measurement Program
Medicare
Medicare Prescription Drug and MA-PD Complaint System
Hospital Value-Based Purchasing Program
Hospital Quality Reporting Program
Physician Value-Based Payment Modifier
Physician Quality Reporting System
Medicare Administrative Contractors
PPS-Exempt Cancer Hospitals
Long-Term Care Hospitals
Inpatient Rehabilitation Facilities
Hospice Programs
Home Health Agencies
Ambulatory Surgical Centers
Skilled Nursing Facilities
Medical Device Excise Tax
Medical Device Manufacturers
Pharmaceutical Companies
Annual Fee
Health Industry
Mandates, Regulations, Taxes, & Payment Cuts
Hospitals
Physicians
New Government
Rationing Potential
Involvement in Health Insurance Market
Other Expansions
Represents Bundles of Additional Entities
Mandates
Taxes & Monetary Fees/ Penalties/Cuts
Trust Fund (Rationing Potential)
Other New Trust Funds/ Monetary Benefits
Expanded Government
Government with Expanded Authority/ Responsibility
Government Financial Entity with New Inflows/ Outflows
State/Territory with Expanded Authority/ Responsibility
Private
Private Entity with New Mandates/ Regulations/ Responsibilities
Unchanged Private Entity
Special Interest Provisions
New Relationships
Regulations/ Requirements/Mandates
Reporting Requirements
Oversight
Money Flows
Consultation/Advisory/ Info Sharing
Structural Connections (Includes Existing)
AGI: Adjusted Gross Income
AHRQ: Agency for Healthcare Research and Quality
CDC: Centers for Disease Control & Prevention
CHIP: Children's Health Insurance Program
CLASS: Community Living Assistance Services & Supports
CMS: Centers for Medicare & Medicaid Services
CO-OP: Consumer Operated & Oriented Program
FFS: Fee-for-Service
FSA: Flexible Spending Arrangement
GAO: Government Accountability Office
HCERA: Health Care & Education Reconciliation Act
HHS: Health & Human Services Department
HSA: Health Savings Account
IPAB: Independent Payment Advisory Board
IRS: Internal Revenue Service
MA-PD: Medicare Advantage Prescription Drug
MedPAC: Medicare Payment Advisory Commission
MEXD: Medical Early Risk Detection
EALORS: Executive Auxiliary Linked Office Regional Systems
MEWA: Multiple Employer Welfare Arrangement
NAIC: National Association of Insurance Commissioners
NIH: National Institutes of Health
PCORI: Patient-Centered Outcomes Research Institute
PPS: Prospective Payment System
Patient Protection & Affordable Care Act, P.L. 111-148;
Health Care & Education Reconciliation Act, P.L. 111-152
Prepared by: Joint Economic Committee, Republican Staff
Congressman Kevin Brady, Senior House Republican
Senator Sam Brownback, Ranking Member


Physicians Consolidation
requires
Leadership, cooperation
form
makes profit from
Shared savings
eventually limits
requires
Physician Organization
increases
from
prescribe
High quality drugs instead of High profit marginal drugs
leads to
Decreasing healthcare cost
Funding
from
Bargaining Power
Physicians
funded by
Information system
could contribute to
leads to
needs
Profitability
make
need
Innovation
triggers
leads to
Drug price deceases
leads to
Increases
back office
set free
work on
Emerging market
forces
Competition
leads to
lead to
generic drugs
prohibit
leads to
Government
increases
Physician referral
affects
bars
look for
between
Regulating drug prices; Amending patent law
affect
wants better care for
monitors
Ancillary Service Expansion
afftects
Stark law
Separation of prescription and dispensing
Pharmaceutical Companies
affects
Quality; Reform
want
Patients
benefit from
leverage
threaten
need; share costs
creates
Personalized drugs
devote to
Profitability
Pharmaceutical Industry
Patient choice and decision
benefit from
has financial capability to
Cap
make profit from
restricts
increases
Dispensing fee
restrict
facilitate
overuse
results in more potential
Expanding insurance coverage
Healthcare Equipment companies
Hospital-patient experience
could afford more
Mandatory review
MLR
Healthcare resource
increase
Hospital charges
Hospital utilization
Enforcing transparency of charges
improve
Hospital visits
restricts
restricts
Health plan membership
Claim data
make profit from
Lab tests
tries to increase
tries to increase
decrease
increase
decrease
decreases
Health plan premium
increases
requires copayment
increases
hold
conducts
Hospital
Education
leads to
Preventive healthcare
affects
Health plans
form
contributes
helps
achieves
High healthcare quality
achieves
include
Profitability
Medicare
(Local) Hospitals Consolidation
Bargaining Power
Profitability
could invest in
Research
achieves
Wellness program
sets
Employer
More members increase
Medicaid
increases
Hospitals Chain
reduces
could invest in
helps
EMR
helps
Stratifying patients
achieves
leads to
affects
negotiate
Bargaining Power
Private insurance
Operation error
Payment structure
negotiate
leverage


Congress, Executive, Judiciary
Laws, Regulations
Money
HHS, CMS, MHS, VHA, FDA, et al
Regulations
Money
State Agencies for H, E & S Services
Higher Ed
Laws
Money
Military Veterans Services
Services
Local Agencies for H, E & S Services
Public Hos.
K-12
Housing, etc.
Health Services
Education Services
Social Services
Patients, Families, Clinicians, Teachers, Social Workers

Comparable total health and social services spending – significant proportional differences



In OECD, for every $1 spent on health care, about $2 is spent on social services

In the US, for $1 spent on health care, about 55 cents is spent on social services

Source: Bradley, EH, Taylor, LA. *The American health care paradox: Why spending more is getting us less*. 2013

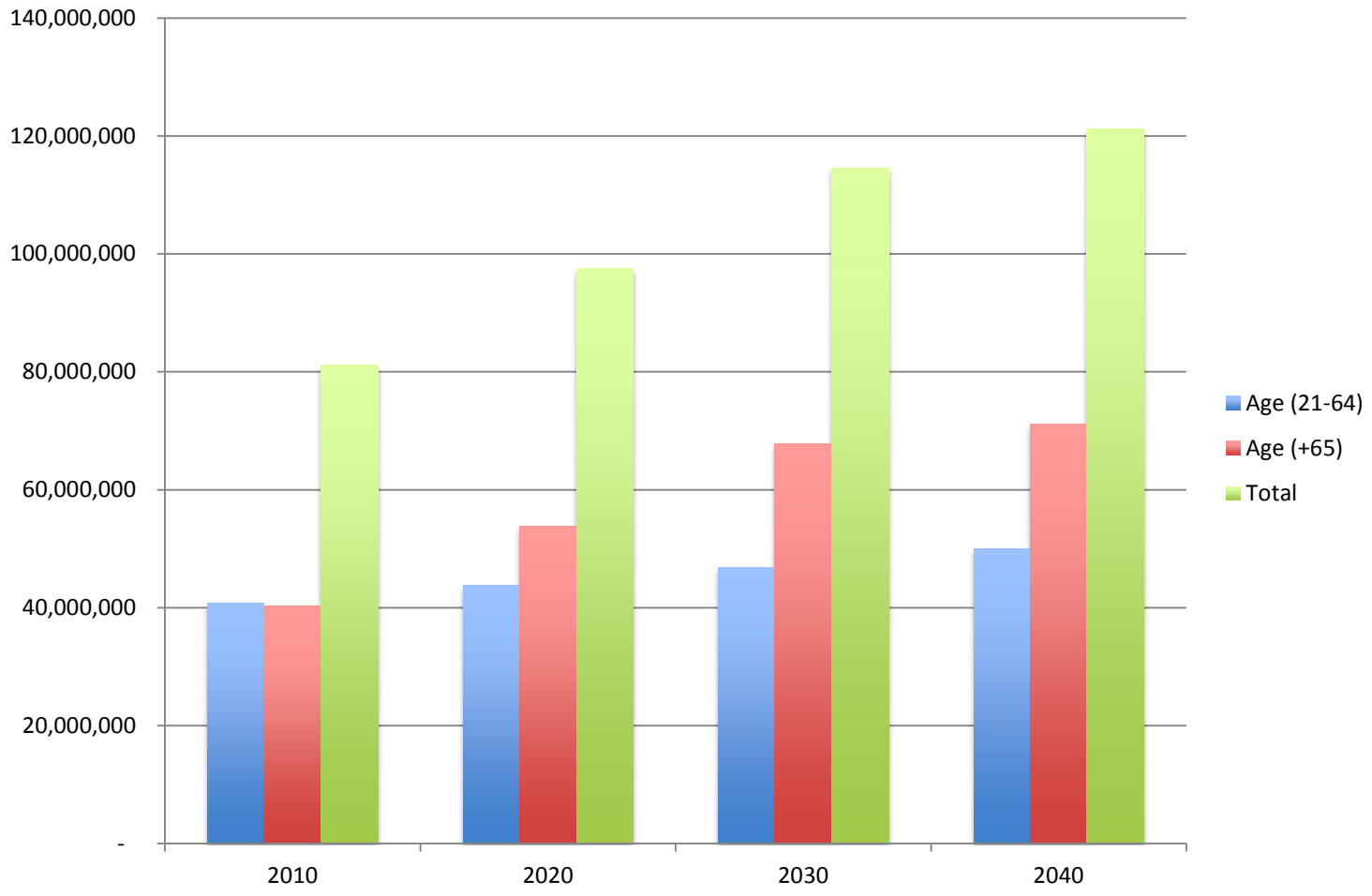
Substance Abuse and Opioid Epidemic

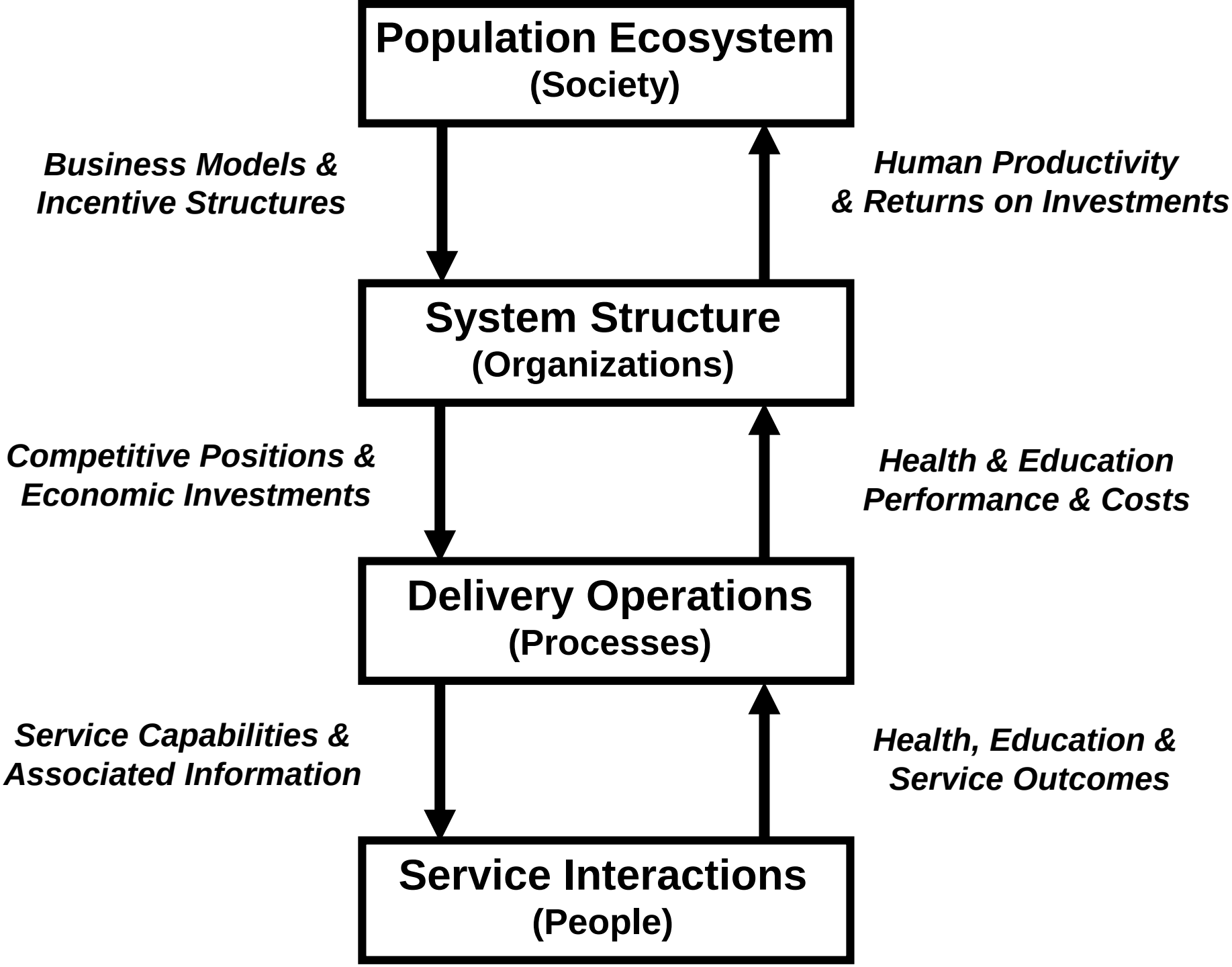
- Long waiting times, across the healthcare ecosystem, due to inadequate and poorly organized treatment capacities, increase the likelihood of patients avoiding or postponing treatment, and a higher rate of missed appointments. Mental disorders reduce lifespan by 10 years.
- Demands for substance abuse treatment have been increasing much faster than capacities. Average delays have been found to range from over two months to over a year. HHS has projected project that by 2025 most of the needed specialties will have shortages exceeding 10,000 full-time equivalents.
- Services that are not highly reimbursed have longer waits, in the US at least, e.g., mental health services and the elderly with chronic diseases. Waiting times are increased by prioritization of highly reimbursed patients and under-investment in capacities for poorly reimbursed services.
- Substance abuse, which includes tobacco, alcohol, illicit drugs, and prescription opioids, costs the US $740 billion annually in terms of crime, lost work productivity, and healthcare. $232 billion (31%) is for healthcare.

Assistive Technologies for Disabled and Older Adults

- Populations
  - There are 40 million Americans with a disability in 2015, representing almost 13% of the civilian non-institutionalized population. Older Americans are more likely to have a disability, 25% of those 65-74 and 50% of those 75 or older.
  - The number of Americans 65 and older is projected to increase from roughly 50 million today to almost 80 million in 2040. This group's share of the total population will rise to nearly 24 percent from 15 percent.
- Market
  - “The global elderly and disabled assistive devices market was valued at $14 billion in 2015 and is expected to surpass $26 billion by 2024.”
  - “The U.S. market for assistive technologies is projected to grow from $40.6 billion in 2014 to $43.1 billion in 2015 and $58.3 billion in 2020.”
  - “The U.S. market for assistive technologies is projected to grow from $39.5 billion in 2010 to $55 billion in 2016.“

Addressable Market




Population Ecosystem
(Society)
Business Models &
Incentive Structures
Human Productivity
& Returns on Investments
System Structure
(Organizations)
Competitive Positions &
Economic Investments
Health & Education
Performance & Costs
Delivery Operations
(Processes)
Service Capabilities &
Associated Information
Health, Education &
Service Outcomes
Service Interactions
(People)

Levels vs. Concerns

Level	Example Concerns
Society	Outcomes Targeted, Services Covered, Reimbursement Models (i.e., fee for services vs. payment for outcomes), Policy, Regulations
Organizations	Planning & Strategy, Capacity Investments, Decision Analysis, Optimization, Performance Assessment, Risk Management
Processes	Demand Forecasting, Patient Scheduling. Outpatient Scheduling, Inpatient Scheduling, Work Force Planning and Scheduling
People	Disease Incidence & Progression, Screening, Clinician & Patient Decision Making, Patient Engagement

Levels vs. Models

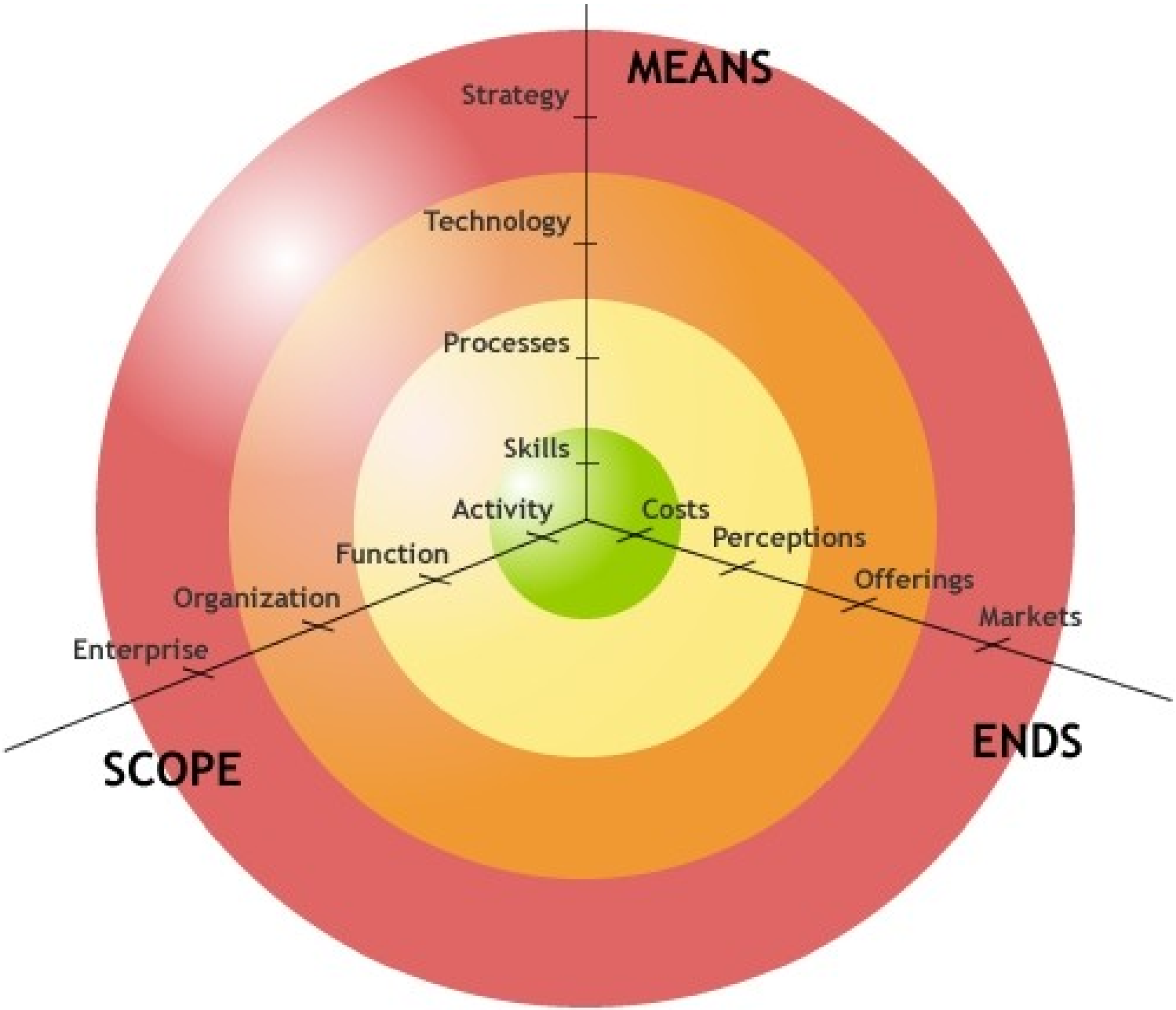
Level	Concern	Models
Society	GDP, Supply/Demand, Policy	Macroeconomic
	Economic Cycles	System Dynamics
	Intra-Firm Relations, Competition	Network Models
Organizations	Profit Maximization	Microeconomic
	Competition	Game Theory
	Investment	DCF, Options
Processes	Patient, Material Flow	Discrete-Event Models
	Process Efficiency	Learning Models
	Workflow	Network Models
People	Patient Behavior	Agent-Based Models
	Risk Aversion	Utility Models
	Disease Progression	Markov, Bayes Models

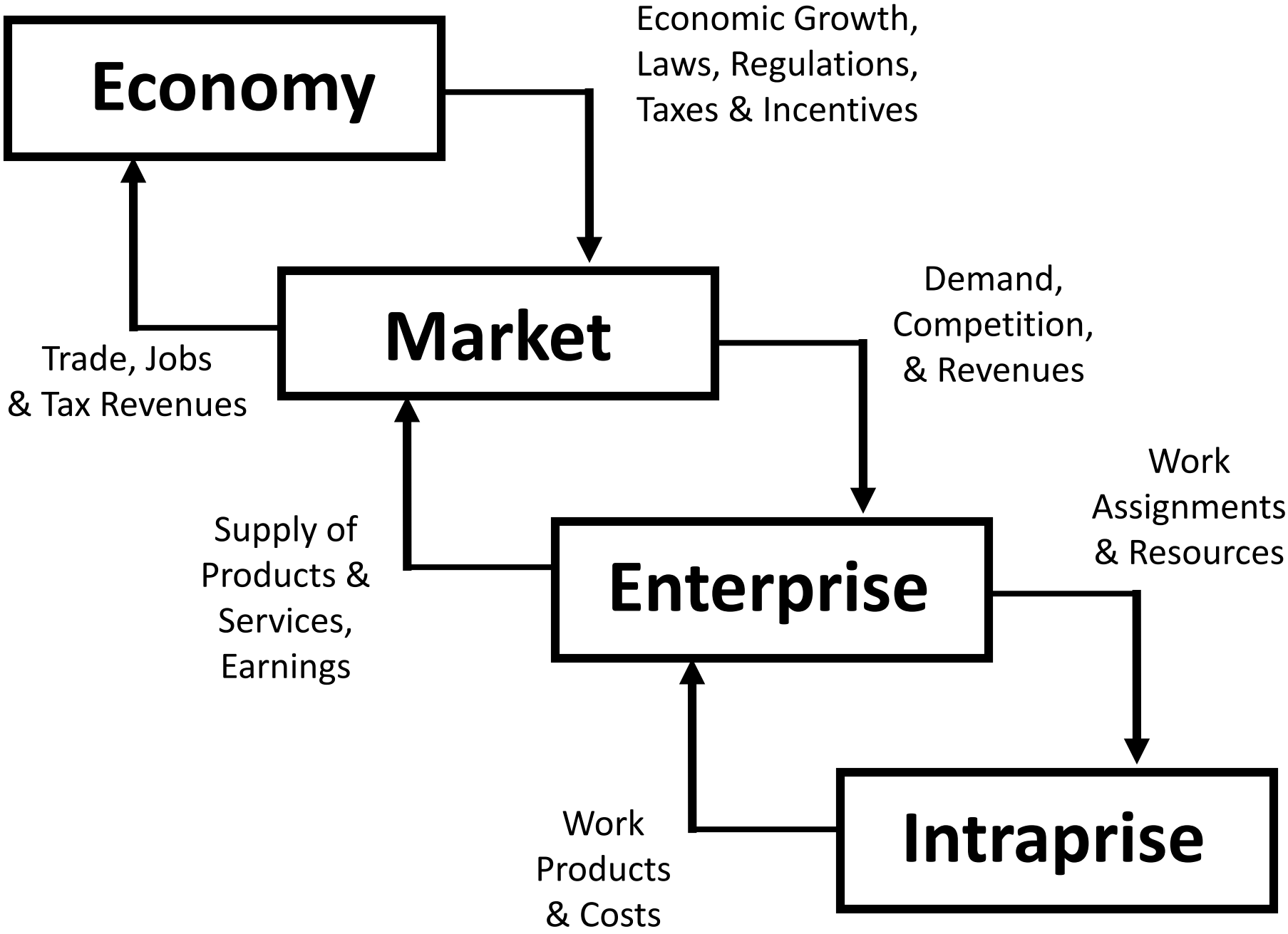
Path to Success

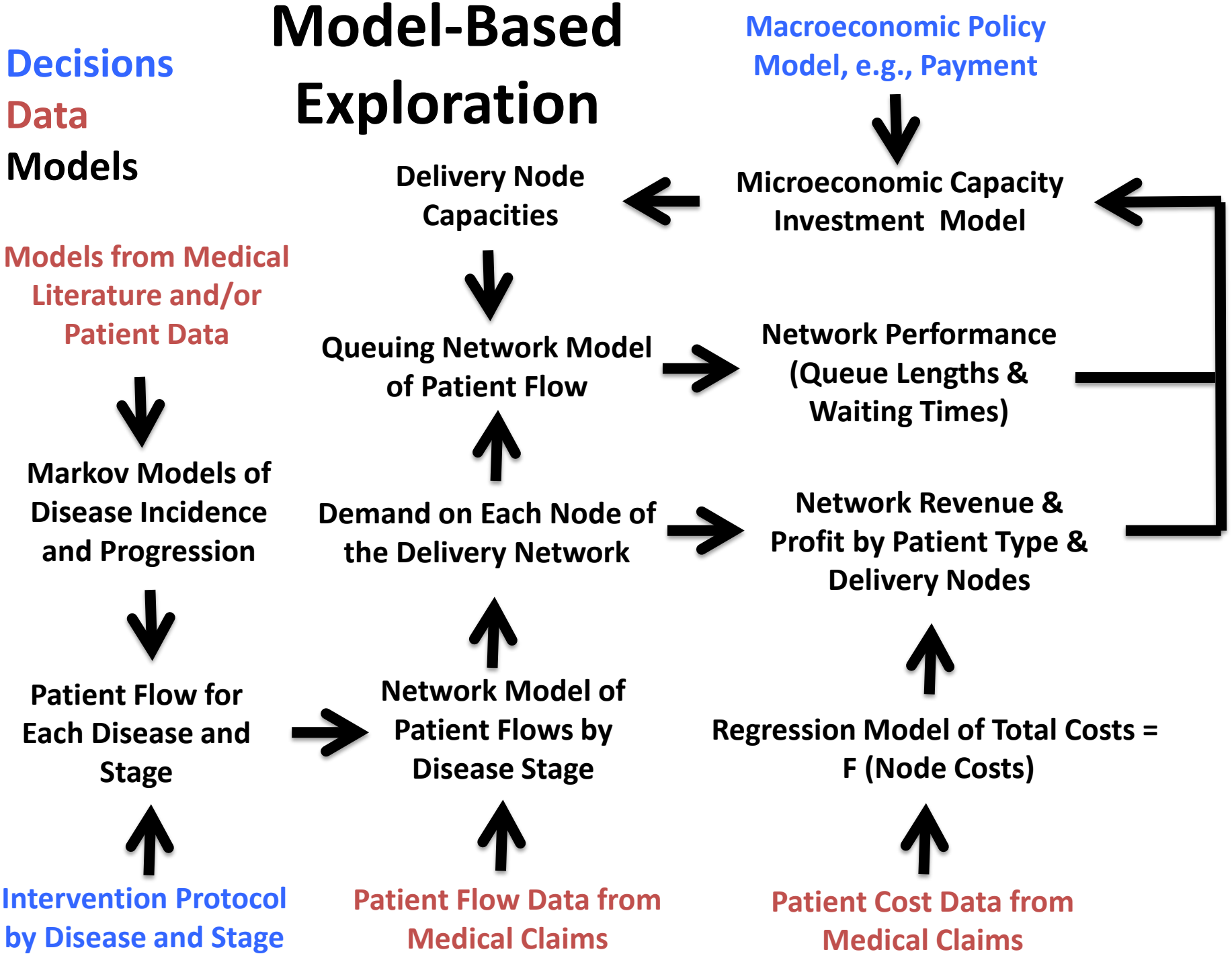
- Enterprise Transformation
- Model-Based Explorations of “What if?”
- Immersive Decision Making Environments

Enterprise Transformation

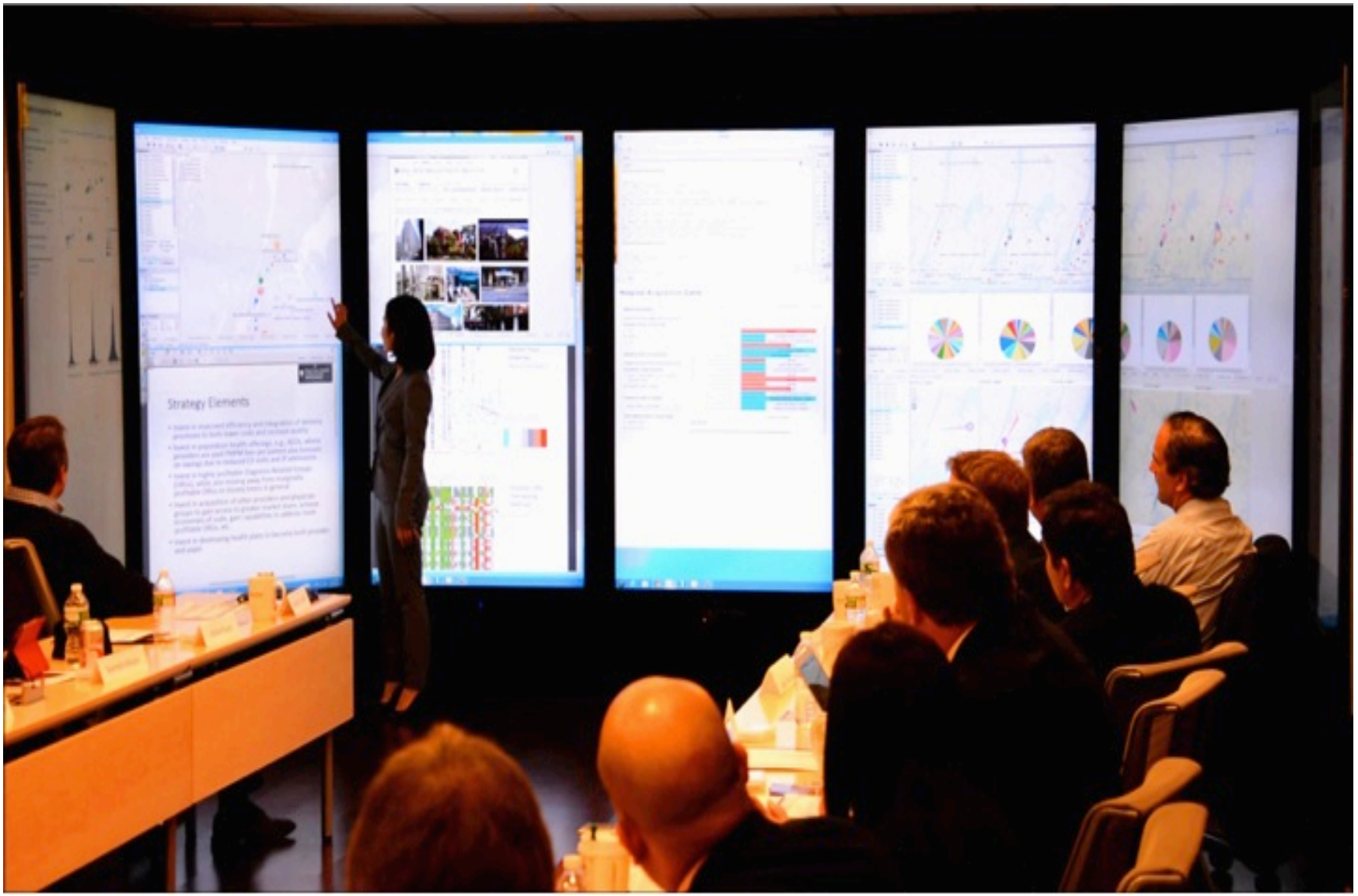
Enterprise transformation is driven by experienced and/or anticipated **value deficiencies** that result in significantly redesigned and/or new **work processes** as determined by management's **decision making** abilities, limitations, and inclinations, all in the context of the **social networks** of management in particular and the enterprise in general.


MEANS
Strategy
Technology
Processes
Skills
Activity
Costs
Perceptions
Offerings
Markets
Function
Organization
Enterprise
SCOPE
ENDS


Economy
Economic Growth,
Laws, Regulations,
Taxes & Incentives
Market
Trade, Jobs
& Tax Revenues
Demand,
Competition,
& Revenues
Enterprise
Supply of
Products &
Services,
Earnings
Work
Assignments
& Resources
Intraprise
Work
Products
& Costs


Model-Based Exploration
Decisions
Data
Models
Macroeconomic Policy Model, e.g., Payment
Microeconomic Capacity Investment Model
Delivery Node Capacities
Models from Medical Literature and/or Patient Data
Queuing Network Model of Patient Flow
Network Performance (Queue Lengths & Waiting Times)
Markov Models of Disease Incidence and Progression
Demand on Each Node of the Delivery Network
Network Revenue & Profit by Patient Type & Delivery Nodes
Patient Flow for Each Disease and Stage
Network Model of Patient Flows by Disease Stage
Regression Model of Total Costs = F (Node Costs)
Intervention Protocol by Disease and Stage
Patient Flow Data from Medical Claims
Patient Cost Data from Medical Claims

Immersive Decision Making



Technology Enablers

- IT-enabled capabilities to foster information sharing and care coordination
- AI-based cognitive assistants that understand work domains, workflows and preferences of patients, disabled and older adults, and clinicians.

Summary

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