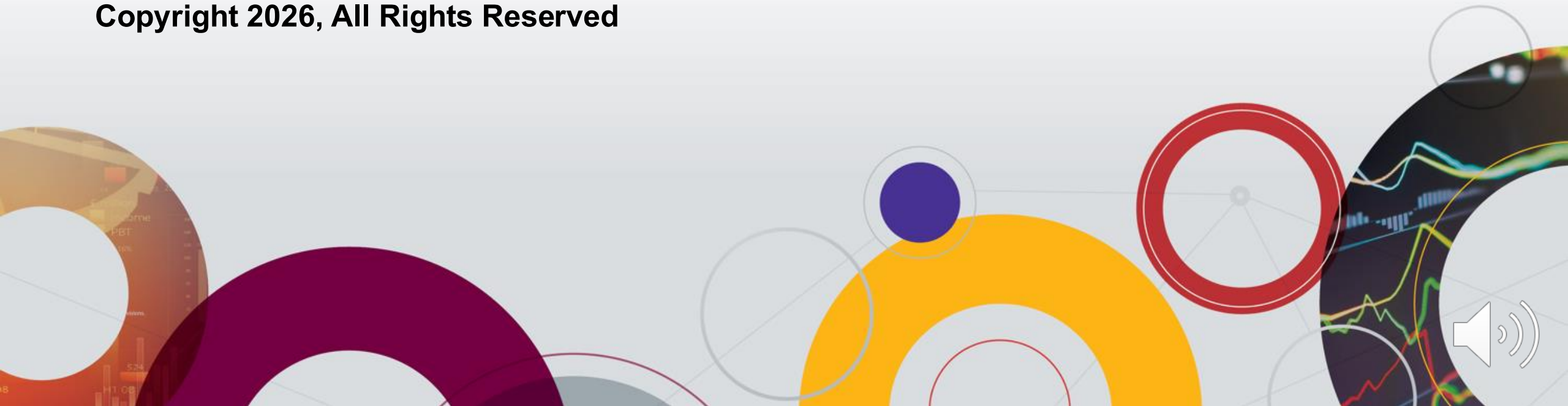


1.3c Problems in Healthcare Motivating Biomedical Informatics and AI

10x10 – Introduction to Biomedical Informatics & Artificial Intelligence
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Problems in healthcare motivating biomedical informatics and AI

Some perspective

Overview of healthcare systems in the US and elsewhere

Notable successes of modern healthcare

Problems of current healthcare

- Cost
- Quality
- Variation
- Access

Healthcare reform in the US

Related to cost and quality is variation in services

First documented by Dartmouth Atlas of Health Care, formerly a book, now an [archived Web site](#)

- History of work described by founder (Wennberg, 2010)

Other findings on variation of care

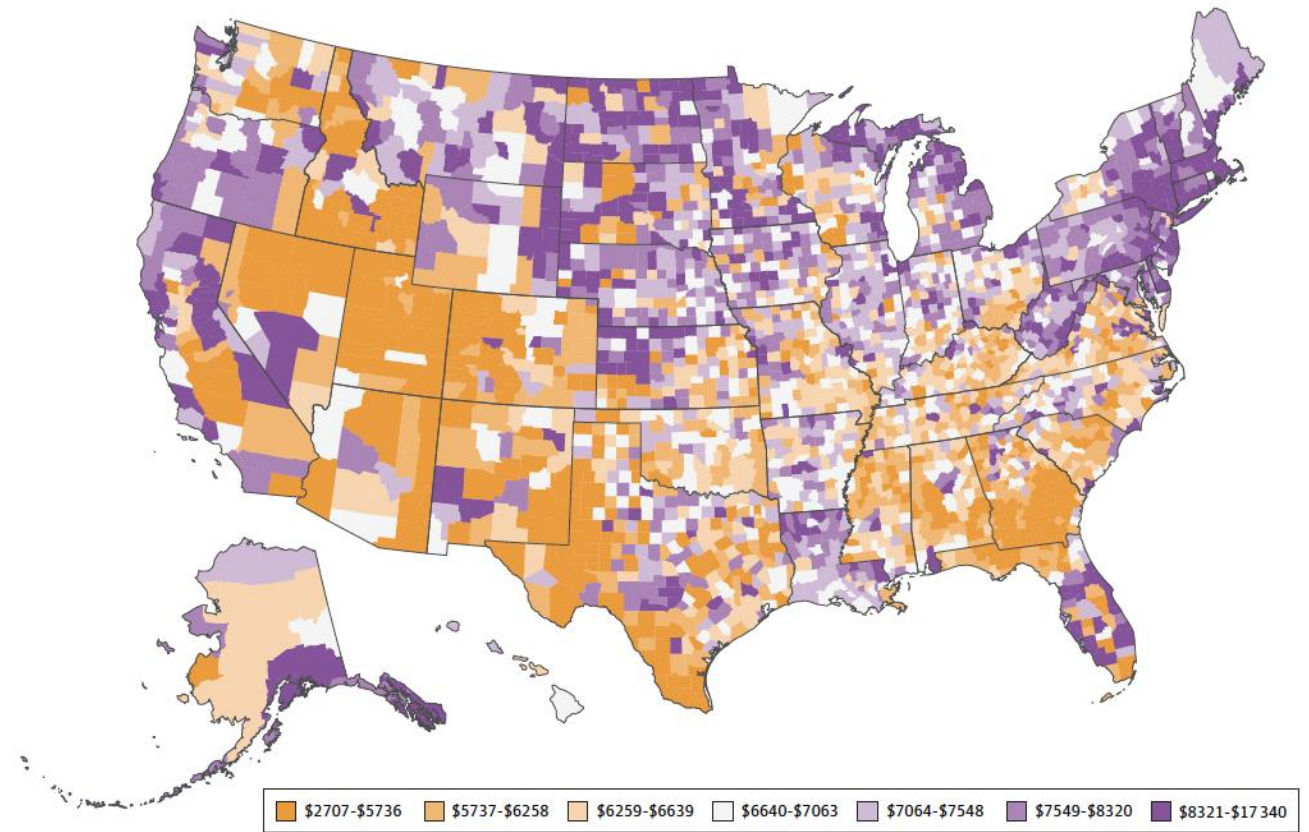
- Existence and extent of problem reaffirmed by IOM (2013)
- Continued variation at state and regional levels for variety of disease mortality rates, safety indicators, and prevention measures (Rosenberg, 2016)
- Only 8% of all Americans receive all high-priority, appropriate clinical preventive services (Borsky, 2018)
- Continued variation in provision of low-value care across physicians but within regions and organizations (Schwartz, 2019)
- Major driver of variation is physician belief in unsupported practices (Cutler, 2019)

Problem persists

Per capita spending varies widely across us (Dieleman, 2025; Dieleman, 2025)

Explanation of variation

- Variation in service utilization – 65%
- Price and intensity of services – 24%
- Disease prevalence – 7%
- Population age – 4%



Other variations of note

No association between physician spending and quality of care or patient outcomes (Hussey, 2013; Tsugawa, 2017)

Lower mortality rates in US hospitals for Medicare patients cared for by

- Female vs. male physicians (Tsugawa, 2017)
- Younger physicians (Tsugawa, 2017)
- International medical graduates (Tsugawa, 2017)

Improved outcomes for patients

- In hospitals performing larger volume of surgical procedures (Sternberg, 2015)
- In outpatient settings for practices treating larger volume of patients with diabetes (Cheung, 2017)
- In heart disease when there is physician-patient gender concordance (Greenwood, 2018)
- In academic medical centers when adjusting for patient severity of illness (Burke, 2018)

In Sweden, female surgeons achieve better surgical outcomes (Blohm, 2023; Wallis, 2023)

In US, patients have lower mortality and readmission rates when treated by female physicians; better for female than male patients (Miyawaki, 2024)

Access

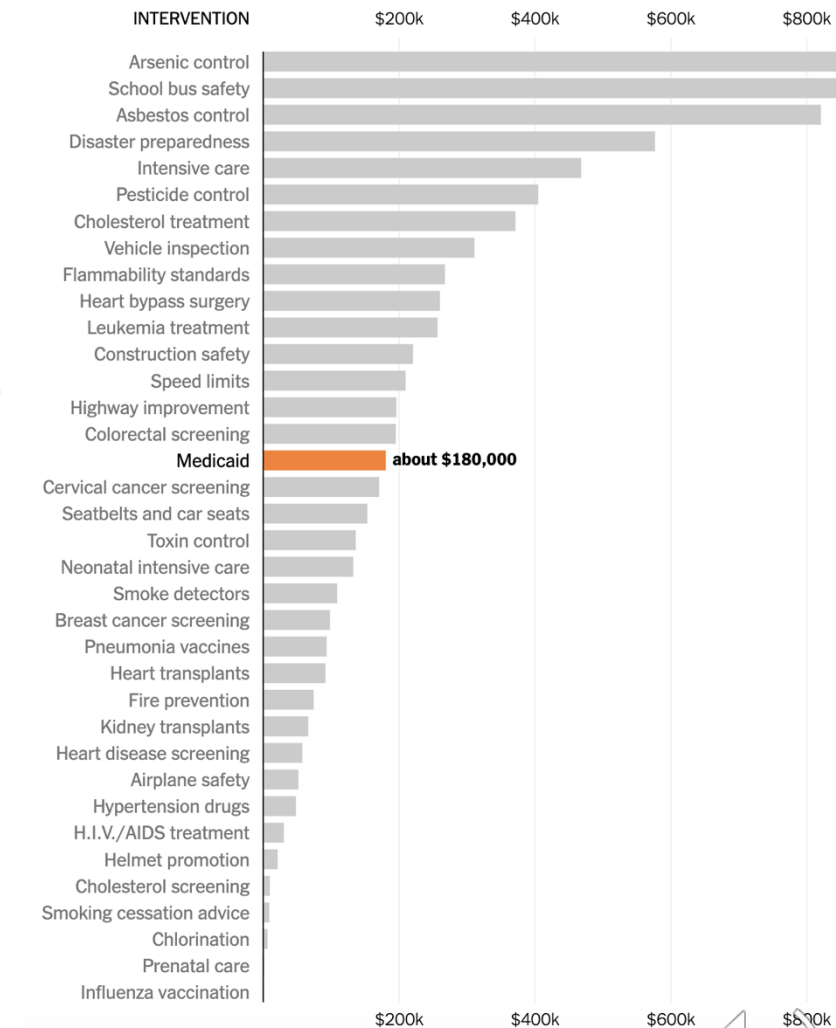
US only advanced economy without universal health insurance (Reid, 2010)

Consequences of uninsurance

- Hospitals and others end up providing uncompensated care (IOM, 2007)
- Interruptions in Medicaid coverage increase risk of hospitalization for “ambulatory care-sensitive” conditions (Bindman, 2008)

Benefit of health insurance difficult to research but number of studies show benefits (Woolhandler, 2017; Sommers, 2017)

- Expansion of Medicaid under Affordable Care Act (ACA) reduced mortality (Wyse, 2025; Kliff, 2025)
- Reduction in completeness of coverage led to increased later-stage cancer diagnosis (Yang, 2025)



Healthcare reform – not new

Presidents of both major parties have proposed comprehensive plans

- Democrat Harry Truman (1949)
- Republican Richard Nixon (1974)

Emergency Medical Treatment & Labor Act (EMTALA – CMS, 2012, Katz, 2019)
– passed in 1986, requires emergency departments to evaluate patients and treat emergent conditions

Healthcare reform

Patient Protection and Affordable Care Act (PPACA), also known as the Affordable Care Act (ACA) or “Obamacare” (Obama, 2016; Selker, 2021)

- Conceptual underpinnings from conservative Heritage Foundation (Butler, 1989) – including individual mandate

Massive legislation had three broad goals

- Expansion of coverage – e.g., individual mandate, health insurance subsidies, Medicaid expansion, employer penalties
- Regulation of coverage – e.g., eliminating coverage restrictions, requiring comprehensive set of conditions to be covered
- Bending cost curve – e.g., provide incentives for higher-quality, lower-cost care

Original legislation mostly intact, though parts have been modified, such as individual mandate

ACA insurance specifics

Stabilize private insurance market with “three-legged stool” of (Krugman, 2017)

- Community rating – same plan, same benefits to all
- Individual mandate – so everyone pays in, whether health or sick
- Subsidies for those who cannot afford

Ten essential benefits

Ambulatory patient services

Emergency services

Hospitalization

Maternity and newborn care

Mental health and substance use disorder services, including behavioral health treatment

Prescription drugs

Rehabilitative and habilitative services and devices

Laboratory services

Preventive and wellness services and chronic disease management

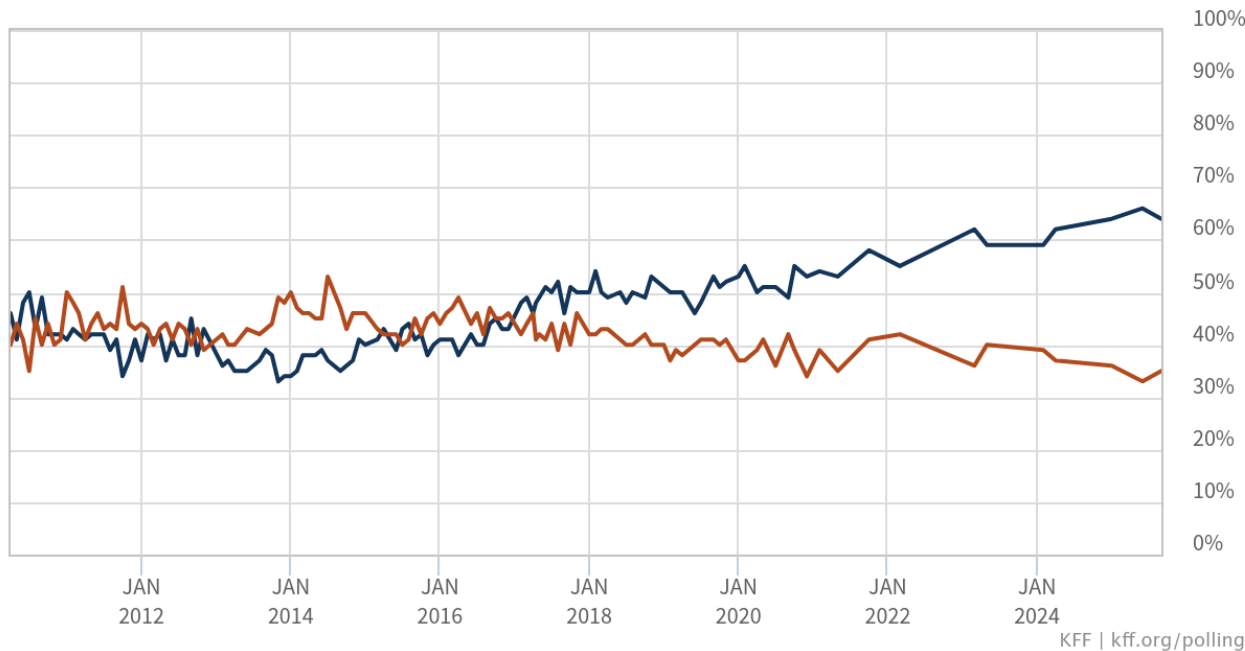
Pediatric services, including oral and vision care

Current views of ACA (KFF, 2025)

KFF Health Tracking Poll: The Public's Views on the ACA

We asked: "Given what you know about the health reform law, do you have a generally favorable or generally unfavorable opinion of it?"

— All Adults – Favorable — All Adults – Unfavorable



● REPUBLICANS ● INDEPENDENTS ● DEMOCRATS

Young adults can stay on parents' insurance until age 26

82 85 90

Individuals and small businesses can shop for insurance on health exchanges

72 80 90

Individuals may receive financial help to purchase coverage

67 81 91

States may choose to expand Medicaid

67 79 90

Prohibits denial of insurance coverage due to medical history

63 65 75

Most employers that don't offer health insurance must pay a fine

45 60 83

Most individuals who don't have health insurance must pay a fine

21 30 57

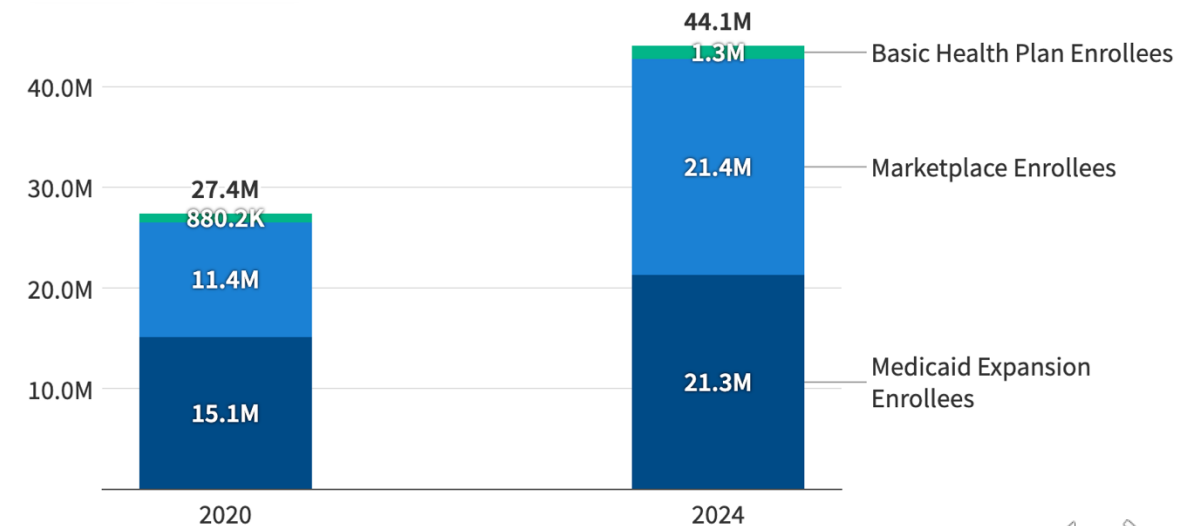
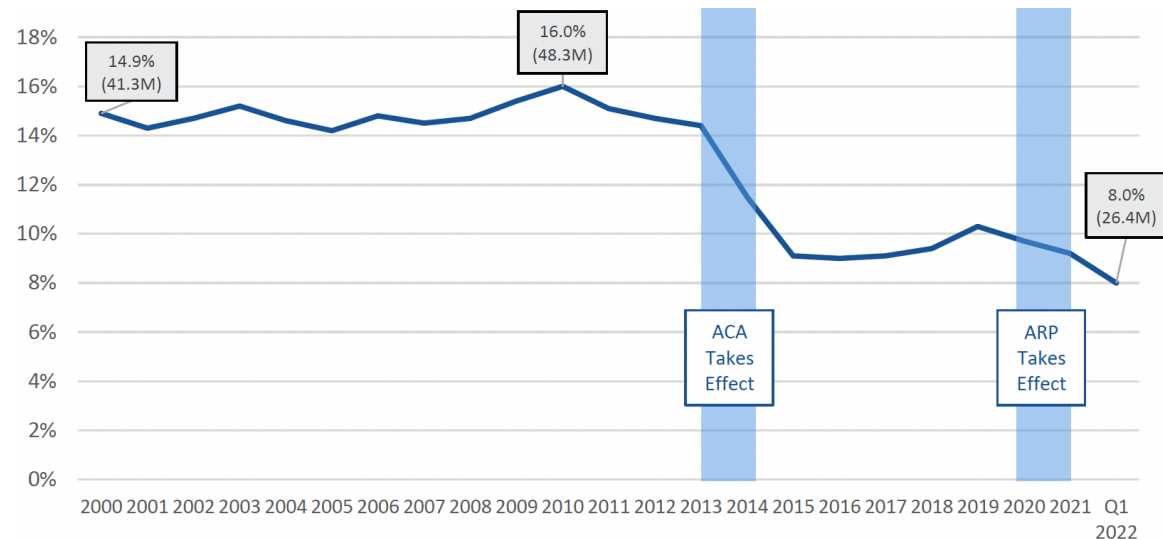
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Has ACA been successful?

So far, mostly in reducing rate of uninsurance

- Adults without insurance peaked at 16% around 2013 just before ACA and fell to 8% by early 2022 (Lee, 2022), where it has remained (Keisler-Starkey, 2024)
- Current ACA enrollment totals 44M (ASPE, 2024; Tolbert, 2025)
- Decrease in uninsurance larger in states with Medicaid expansion (Martinez, 2018)

Persistent challenge is individual market (Aaron, 2017)



Other benefits of ACA

Systematic review of studies showing numerous positive benefits – increases in (Mazuernko, 2018; Allen 2019)

- Self-reported health
- Condition-specific outcomes
- Population-level survival

Medicaid expansion under ACA associated with reduced mortality (Goldin, 2019)

- Consistent with other research showing all health insurance associated with reduced mortality (Levy, 2025)

Reverting to pre-ACA eligibility levels could lead to increases in rural hospital closures (Lindrooth, 2018)

Continued benefit found in COVID-19 pandemic (Agarwall, 2020)

Despite focus on insurance reform, ACA also addresses cost and quality

“Accountable care”

- Accountable Care Organizations (ACOs) provide flexible financial support in exchange for accepting accountability for overall quality and cost, aka “shared savings” (Longworth, 2011; Pham, 2015)
 - Including Oregon Medicaid “Coordinated Care Organizations” (CCOs) (McConnell, 2016)
 - Medicare ACOs generating about \$5-6 billion in shared savings in recent years (Early, 2025)

Focus on care “that works”

- [Patient-Centered Outcomes Research Institute \(PCORI\)](#) – supporting comparative effectiveness research (Frank, 2014)

Other approaches to reform

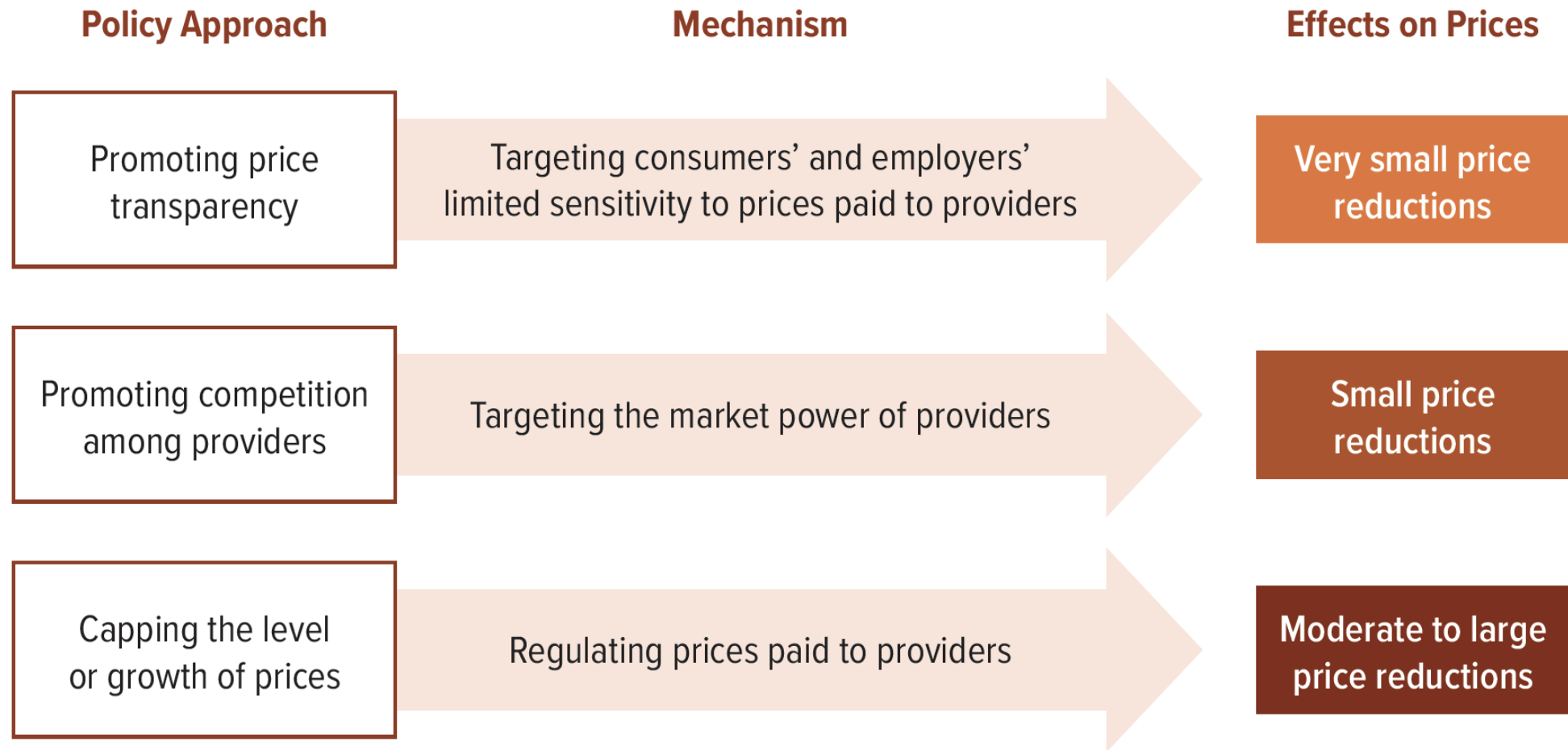
Use of effectiveness and cost-effectiveness data to make coverage decisions in US as is done in other advanced countries, e.g., UK, Australia, Canada (Clement, 2009)

Make better use of “connectors” (Halvorson, 2009), including use of community health workers (Brownstein, 2017; Kangovi, 2020)

Make provision of [high-value, cost-conscious care](#) a competency for physicians (Weinberger, 2011; Owens, 2011; Baker, 2013)

Aim to fix systems, not people (Mate, 2024)

Congressional Budget Office impact of policy approaches (2022)



Future directions for healthcare reform from the right

Conservative alternatives usually include (Antos, 2016)

- More competition in private insurance market
- Higher deductible plans that expose patients more to actual costs
- Replace government spending (e.g., Medicaid expansion and insurance subsidies) with tax credits
- Health savings accounts

These approaches do not always lead to desired consumer behaviors

- For “shoppable” conditions (e.g., lower leg MRI), most do not pursue lower spending options (Chernew, 2018)
- Those in high-deductible plans more likely to avoid care than seek cheaper care (Kullgren, 2018)

Future directions for healthcare reform from the left

Major debate is expanding on ACA vs. embracing single-payer

Medicare for All – for and against

- Majorities of populations satisfied with government-run systems in Canada (Ivers, 2018) and England (Robertson, 2018)
 - About 60K Canadians seek care annually in US, mostly to avoid waits for procedures (Ren, 2017)
- Single-payer system in US would increase government expenditures but not necessarily total expenditures (Blahous, 2018)
 - Many studies show cost would be lower due to decreased administrative expenditures (Cai, 2020; Galvani, 2020)
- Medicare reimbursement typically lower than commercial insurance, possibly leading to decreased revenues for hospitals and their labor force (Schulman, 2019)
 - Commercial insurance typically 2-3 times more than Medicare for same services (Whaley, 2020)

Calls for expanding ACA – Medicaid expansion in all states, restore individual mandate, expand insurance subsidies (Fiedler 2019; Crowley, 2019)

- Would still aim for universal coverage by providing insurance portability, coverage for pre-existing conditions, and a “public option” of being able to buy into Medicare

Other options to reduce cost and overuse

Engage patients who “want everything” (Quill, 2009)

End “disease mongering,” especially by pharmaceutical companies (Moynihan, 2002; Shapiro, 2018)

Stop “medicalizing” our society and recognize the small benefits of much of the healthcare we seek (Hadler, 2008; Rosenthal, 2017)

Rebalancing the transactional nature of healthcare while engaging clinicians and others in “solution shops” (Sinsky, 2022; Sinsky, 2022)

“Medicare 2.0” with focus on comprehensive coverage, primary care, and population health (Johnson, 2022)

- Some advocate reduction of Medicare Advantage, which has higher costs and insurance company profits (Lieberman, 2025); could adopt ACO-type approaches (Chernew, 2025)

Other options (cont.): healthy living

“Healthy living is the best revenge” (Ford, 2009) – we will always need medical care, but four simple healthy life-style factors can substantially reduce risks of diabetes, heart disease, stroke, and cancer

- Body-mass index (BMI) < 30
- >3.5 hours per week of physical activity
- High intake of fruits, vegetables, whole grains, and lean meats
- Not smoking

Life’s “essential 8” added sleep plus control of lipids, blood glucose, and blood pressure (Lloyd-Jones, 2022)

Another culprit is ultra-processed foods (Touvier, 2023)

Large body of evidence that adoption of such lifestyles by middle-aged US adults can reduced all-cause mortality and cardiovascular events (Micha, 2017; Shan, 2023; Currier, 2023; Garcia, 2023; Clausen, 2025; Tessier, 2025) and can

- Offset increased genetic risks of cardiovascular disease (Khera, 2016)
- Result in “compression of morbidity” (Khan, 2018)
- Reduce gap between lifespan and healthspan (Garmany, 2024)

Another modern need is health literacy (WHO, 2022)



Other options (cont.) – national-level planning

American College of Physicians – major vision for coverage, affordability, accessibility, addressing social determinants of health (Doherty, 2020)

- And “system where health information technologies enhance the patient–physician relationship, facilitate communication across the care continuum, and support improvements in patient care”

Focus on health equity (CMS, 2022), including

- Use of data to identify and address health disparities
- Foster inclusive language to engage diverse people and populations (AMA/AAMC, 2021)

Healthier Singapore (2022) – aiming to facilitate more care and resources at community and primary care levels as well as foster healthy living and other forms of prevention

Other options (cont.)

Education – consistent association with reduced adult mortality (IHME-CHAIN Collaborators, 2024)

A new Hippocratic Oath emphasizing prevention and digital health (Meskó, 2022)?

Tech companies? Maybe, but

- Consumer preferences different from medical need, there is aversion to accepting medical liability, and there are issues of data ownership (Pearl, 2019)
- Will we see rise in “platforms” (Kanter, 2025), e.g., how Uber and Lyft disrupted taxi industry (Joseph, 2021)?
- “Healthcare needs bridges and tunnels, not hammers and nails” (Kharraz, 2022)