Module 2: Physician Agency and Treatment Decisions

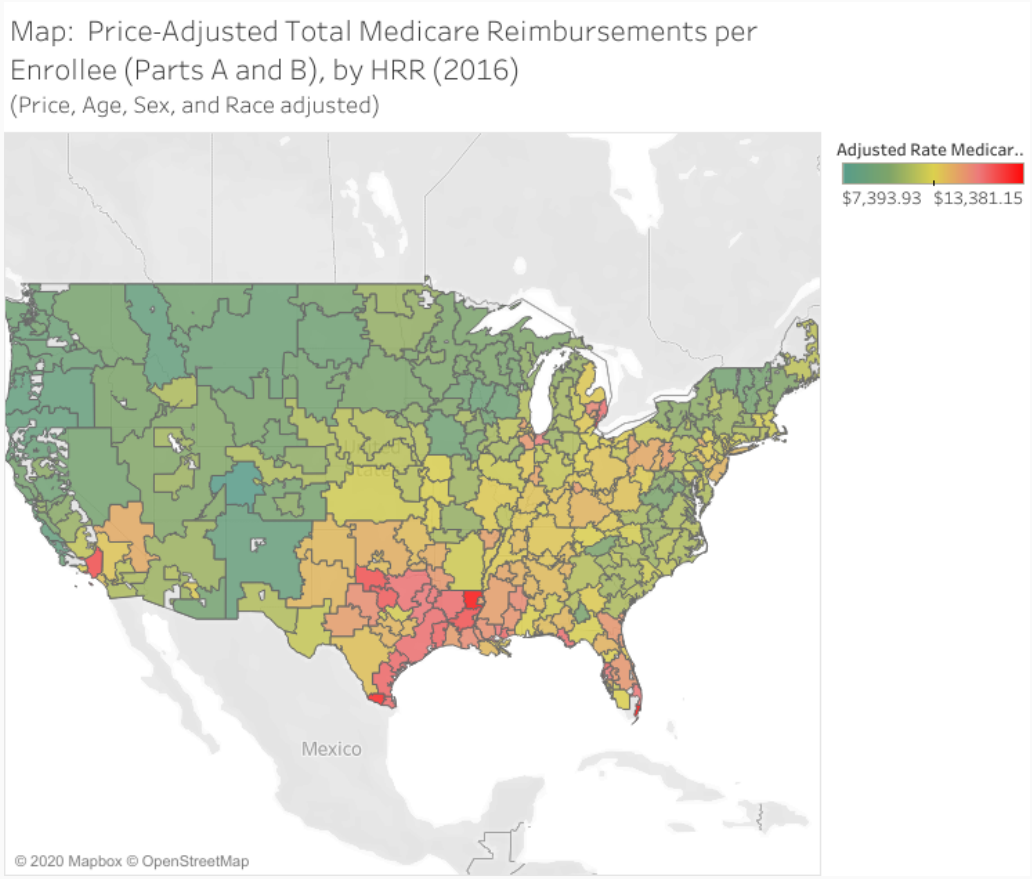
Ian McCarthy | Emory University
Econ 372

Table of contents

What is Physician Agency and Why Do We Care?

What is physician agency

Variation in care



Wasteful?

- Estimates are that more than 30% of health care expenditures are "wasteful": (The Atlantic, 2013)

- Some clear areas of waste:

  - Payment differentials by location of treatment (policy quirks)
  - Better imaging with little benefit
  - Proton treatment (for some conditions)
  - Heart stents (for some patients)
  - Arthroscopic knee surgery

Many estimates of "waste" are after-the-fact. It's actually very hard to identify waste before-hand. Report on End-of-life Spending

More examples

- Here's a great example of the role of physician agency and what it might mean for health care spending, link

Physician Agency

Definition

Physicians are better informed about treatment decisions than patients, and so there exists some **agency** relationship between the two. For many conditions, patients can't treat themselves even if they wanted to.

Setup

- Denote quantity of physician services by x
- Denote benefit of services to patient by $B(x)$
- Patients pay (and physicians receive) a price of p for each unit of service x
- Physicians incur cost c for each unit of care
- Net benefit to patients is $NB(x) = B(x) - px$
- Physicians must choose quantity of care at least better than the patient's outside option, $NB(x) = B(x) - px \geq NB^0$.

Solving the model

With this framework, how much care will be provided? (i.e., what is the optimal value of x)

Solve the model in two steps:

1. Physician will provide minimum surplus to keep the patient,
   $NB(x) = B(x) - px = NB^0$

2. Substitute into physician profit function,
   $\pi = (p - c)x = B(x) - NB^0 - cx$, and solve for x

Solving the model

This two step approach applies when prices and quantity of care are variable. If the physician cannot set price, then we just work off of the constraint, $B(x) - \bar{p}x = NB^0$.

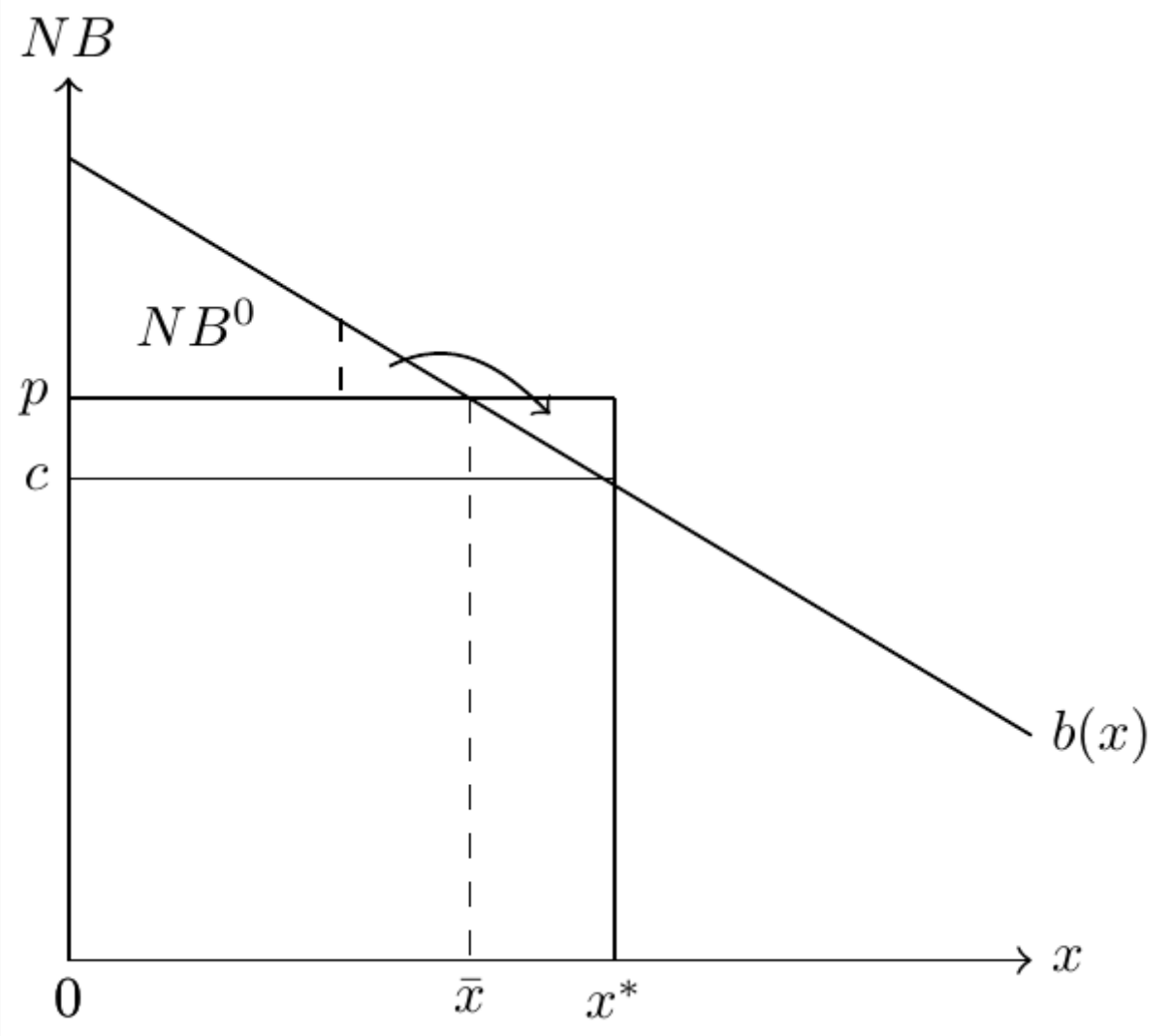
Why? This is a corner solution...can't just take a derivative.

In-class Problem: Physician agency

Denote the quantity of care consumed by x, and denote by $B(x)$ the function that determines the benefit of care to the patient. Assume that the patient must pay the full price of care, px, so that their net benefit is $NB = B(x) - px$. Further assume that the physician can choose both x and p.

1. Find the patient's optimal x.
2. Draw the marginal benefit function on a graph and note the price and patient's optimal quantity. Assume that $B'(x) > 0$ and $B''(x) < 0$ (i.e., the marginal benefit function is positive and downward sloping).
3. Find the physician's optimal x assuming $NB^0 = 0$.
4. Add the physician's optimal x to your graph and interpret the difference.

Physician agency in a graph



Example

Assume $B(x) = 8x^{1/2}$, $NB^0 = 2$, and $c = 1$:

1. Find the physician's optimal level of x and p.
2. Find the patient's optimal level of x.
3. Draw this graphically.

Answer

First let's re-write the constraint such that $px = 8x^{1/2}$ and $\pi = 8x^{1/2} - 2 - x$. The first order condition for x is then $4x^{-1/2} - 1 = 0$, which is satisfied at $x^* = 16$. Substituting this into the constraint, $8x^{1/2} - px = 2$ yields $p = \frac{15}{8}$.

But if they could choose on their own, the patient would prefer to maximize their net benefit. This would occur at $4x^{-1/2} = p$, which yields $x = (32/15)^2 \approx 4.5$ at $p = 15/8$.

Agency with Fixed Prices (FFS Payments)

What are fee-for-service payments?

- Fee-for-service (FFS) means providers are paid a set payment for a well-defined service
- More services = more payments
- Potentially encourages overuse

How are FFS payments calculated?

- Until 1983, Medicare paid hospitals on a "cost-plus" basis
- Can you think of some problems with this approach?

How are FFS payments calculated?

- In 1983, Medicare switched to a "Prospective Payment System
- PPS: fixed payment that hospitals know they will receive in advance
- **Fixed** based on the Diagnosis Related Group (DRG) code and other hospital characteristics

How are FFS payments calculated?

Let's work through a simple example:

1. PPS "standardized" amounts (one for labor and one for capital)
2. Adjust labor amount for wage index and add standardized capital amount
3. Multiply by DRG weight
4. Multiply by disproportionate share and teaching hospital adjustments (if relevant)
5. Account for outliers

How are FFS payments calculated?

Step 1

$$((\text{Labor} \times \text{Wage Index}) + \text{Capital}) * \text{DRG Weight} = \text{Base Payment}$$

Step 2

$$\text{Base Payment} \times (1 + \text{DSH Adj} + \text{Teaching Adj}) = \text{Final Payment}$$

Let's look at some of these in real life...

Downside to PPS system?

- Still an incentive for overuse
- Incentive to upcode

In-class Problem: Agency and fixed prices

Assume $B(x) = 4x^{1/2}$, $NB^0 = 0$, anc $c = 1$. Further assume that prices are fixed administratively at, $\bar{p} = 2$. Note that, in this case, we work only off of the patient's net benefit constraint.

1. What is the physician's and patient's optimal amount of care provided?
2. The government is considering increasing the price to $\bar{p} = 3$. What are the new optimal levels of care for physicians and patients at this new price?
3. How would the price change affect the difference between the patient and physician's optimal amounts?

Comparative statics

An increase in the administratively set price leads to a **decrease** in quantity of services provided. And vice versa, a reduction in price leads to an **increase** in quantity provided. Why?

$$b(x)\frac{\mathrm{d}x}{\mathrm{d}p} - x - p\frac{\mathrm{d}x}{\mathrm{d}p} = 0$$

$$\frac{\mathrm{d}x}{\mathrm{d}p} = \frac{-x}{p - b(x)} < 0.$$

Comparative statics

- This comes from the physician's constraint, which is essentially a reflection of demand
- Higher $\bar{p}$ means the constraint is met at a lower value of x, and vice versa

Why does this matter?

Say we want to reduce health care utilization, and we try to do so by cutting payments. Will this work?

Fixed payments in practice

Real life is a little more complicated!

- Often more than one treatment to consider
- Often more than one payer (private and public) to consider
- Patient's shielded from the full cost of care
- Benefit function is unknown and subject to asymmetric information

Some other ways to model provider treatment

- Target income hypothesis
- Physician-induced demand
- Real life is more nuanced

$$u(x) = V(\pi) - e(x) + \alpha B(x)$$

Capitated Payments and Physician Agency

What are "capitated" payments?

- Payments for a person or group
- Set amount intended to cover all expenses for a given person/group
- If expenses exceed that amount, the providers lose money
- If expenses fall below that amount, the providers make a profit

Examples of capitated payments

- No "fully capitated" payments in the U.S.
- Closest in the U.S. is an "accountable care organization"
- More common in UK, Canada, and other public systems

- We'll discuss more in the next section of this module

Incentives

Thinking about FFS versus capitated payments...

- What are the incentives in a FFS model if the goal is to make more money?
- Are those incentives different in a capitated payment model? How?

Agency with capitated payments

- Physician receives fixed ("capitated") amount for each patient, R, along with some price per unit of service, p_s
- Physician therefore paid $R + (p_s - c)x$ for each patient
- Number of patients for each physician expressed as a positive function of the net benefit offered, $n(NB)$, where $NB = B(x) - p_d x$. Here, we assume that the insurer sets p_d and p_s separately (the demand and supply price, respectively).
- Physician again aims to maximize profits, $\pi = n(NB)\left[R + (p_s - c)x\right]$.

Solution with capitated payments

Maximizing the profit function yields:

$$n'(NB)(B'(x) - p_d)\left[R + (p_s - c)x\right] + n(NB)(p_s - c) = 0.$$

Rearranging terms and multiplying both sides by $\frac{1}{NB}$, we get:

$$\frac{B'(x) - p_d}{NB}\,\frac{R + (p_s - c)x}{p_s - c} = -\frac{1}{\varepsilon_{n,NB}}$$

1. What happens for $R = 0$?
2. What about $R > 0$, assuming $p_s < c$?

In-class problem: Agency and Capitated Payments

1. Solve for the patient's optimal amount of care (if they could choose the amount on their own).
2. Write out the physician's profit function based on the information provided.
3. Find the physician's optimal x if $R = 0$ and $p_s - c = 1$.
4. Find the physician's optimal x if $R = 1$ and $p_s - c = 1$. How does this differ from part (3)?
5. Find the physician's optimal x if $R = 1$ and $p_s - c = 0$.

Takeaways

Excessive treatment may arise because physicians can choose a level of care, and this choice may derive from incentives that are not perfectly aligned with those of the patients. From this section, you should be able to:

1. Set up and solve the physician's optimization problem and compare the solution to that of the patient's optimum.
2. Show mathematically how the design of an insurance contract (namely, capitated payments versus fee-for-service payments) may determine the extent to which physicians overprovide care.

Major Public Payors

1. Medicare
2. Medicaid

Background on Medicare

- Created by the Social Security Act in 1965
- Originally health insurance to those 65 years of age and older
- Expanded to include certain disabilities (20% now below age 65)
- Consists of four parts:
  1. Part A: Hospital Insurance
  2. Part B: "Medical" Insurance (physician visits and outpatient care)
  3. Part C: Private supplemental care (Medicare plus Choice, now Medicare Advantage)
  4. Part D: Prescription Drug Coverage

Medicare Part A

- Automatic enrollment for anyone 65 and older who worked over their lifetime
- Financed with combination of payroll tax (current workers) and cost-sharing (deductibles, etc.)
- Funds exist as part of "Federal Hospital Insurance Trust Fund"...can't finance through debt
- Benefit structure:
  - Very good for short inpatient stays
  - Very bad for major problems with long stays
  - Doesn't cover nursing home care beyond 30 days

Medicare Part B

- Voluntary, but almost everyone enrolls
- Requires monthly premium ($144 in 2020)
- Small deductible and 20% co-insurance

Medicare Part C

- Private insurance provision of Medicare benefits
- Formally created under Balanced Budget Act in 1997 (existed informally before)
- Heavily revised in Medicare Modernization Act in 2003
- Medicare pays insurers a risk-adjusted amount to enroll a given beneficiary
- Broader benefits than Part A and B, often with $0 additional premiums, but restrictive networks

Medicare Part D

- Created under the Medicare Modernization Act in 2003
- Private insurance for prescription drugs
- Insurers receive payments from Medicare to enroll a given beneficiary (much like Part C)
- Many insurers offer a combined Part C+D plan

Privatization of Medicare

- Medicare Advantage (both Parts C and D) has been well-received and generally thought to be a success story for Medicare benefits
- Accounts for nearly 40% of total Medicare enrollees
- Some early difficulties with adverse selection and risk-adjustment
- Still slightly sicker people staying in traditional Medicare
- Could be a **big** part of any future "Medicare-for-all" type program

Medicare payments

- Prospective payment system
- Begin with two "base" rates:
  - Operating base payment rates, $5,797 in 2020
  - Capital base payment rates, $462 in 2020
- Adjustments:
  - Diagnosis Related Group (higher adjustments for more complicated things)
  - Academic Medical Center
  - Disproportionate Share

Background on Medicaid

- Also created by the Social Security Act in 1965
- Originally provided health insurance to people receiving "Aid to Families with Dependent Children", mainly extremely poor families
- Expanded over time with different rules by state
- Huge program: about 40% of births are covered by Medicaid/CHIP and 1 in 3 birhts!

ACA and Medicaid Expansion

- Big part of ACA was Medicaid expansion
- Originally mandatory but made voluntary by Supreme Court
- Expansion covers all adults (with or without children) below age 65 and with incomes below 138% of the federal poverty line ($35,535 for family of 4 in 2020)

Medicaid Funding

- Paid for by states and federal funding
- State funding is matched by federal funds, and the match amount depends on the state's per capita income
- Incentivizes services to be provided by Medicaid that historically may not be

Medicaid Benefits

- Pretty generous coverage
- Low to no copayments, deductibles, co-insurance
- Usually covers dental, vision, hospitals, and physician services
- Covers long term care (unlike Medicare). About 40% of all long term care is paid for by Medicaid.
- Growth in Medicaid managed care

Medicaid Payments

- Works similarly to Medicare with a base rate plus adjustments
- Base rates vary by state Medicaid agencies
- Adjustments (or supplemental payments) consist of:
  - Disproportionate share adjustments
  - Other (non-DSH) adjustments
  - Account for a little less than half of total Medicaid payments on average

Pay for performance

There are three main pay for performance programs employed in Medicare right now:

1. Hospital Readmission Reduction Program
2. Value-based Purchasing
3. Quality Payment Program for physicians: Merit-based Incentive Payment System (MIPS) and Advanced Alternative Payment Models (APMs)

Capitated Payments

There are two forms of capitated payments in Medicare now:

1. Bundled Payments
2. Accountable Care Organizations

Other payment issues

Information and Consumer Choice:

1. Hospital Compare
2. Penalty Information

Reading an academic paper

Let's answer these questions for the Clemens and Gottlieb (2014) paper.

1. What is the main question and what is new?

2. What data are they using?

3. What is the "unit of observation"?

4. What is the central "identification strategy"?

5. What is the main takeaway?