Cornell University

Pharmaceutical and Biotech Companies: How Are They Managed?

PUBPOL 2350

October 26, 2023

BIG RED THON

BIG RED THON
DANCE MARATHON

Big Red Thon is Cornell's largest student-run non-profit organization!

We raise funds for Children's Miracle Network Hospitals, specifically Upstate Golisano (right here in New York!) to help provide kids with lifesaving treatments and the best quality care.

Every year, we host an annual **DANCE MARATHON** at Barton Hall as our main fundraising event, with games, prizes, food, and more! Your participations and contributions go directly to Upstate Golisano, so sign up now to show your support and save your spot at the event!

SCAN ME

REGISTER FOR THE EVENT!

WHEN: SATURDAY, NOVEMBER 11TH, 2-7PM

WHERE: BARTON HALL (CENTRAL CORNELL CAMPUS)

EMAIL US AT BIGREDTHON@GMAIL.COM

SCAN BELOW TO REGISTER!

Global Health

EXPERIENTIAL LEARNING SYMPOSIUM

Hosted by the GHSAB and DNS

FRIDAY, NOV 3RD

Physical sciences Building

4:30 PM - 6:00 PM

At the Experiential Learning Symposium you'll:

- Learn about students' ELOs
- Participate in the Health Humanities Contest

THE GLOBAL HEALTH STUDENT ADVISORY BOARD PRESENTS:
THE THIRD ANNUAL

HEALTH HUMANITIES CONTEST

2023 THEME: TOPICS IN GLOBAL AND PUBLIC HEALTH

HELD AT THE 2023 EXPERIENTIAL LEARNING SYMPOSIUM

NOVEMBER 3, 2023 FROM 4:30 - 6:00 PM AT THE PHYSICAL SCIENCES BUILDING (PSB) SOUTH PASSAGEWAY AND CLARK ATRIUM

DEADLINE: OCTOBER 30TH AT 11:59 PM

Application and guidelines here:

NOVEMBER 1ST, 2023 AT 6:30 PM
ROCKEFELLER 104

GRADUATE SCHOOL DEMYSTIFIED: HUMANITIES

Meet current Cornell Graduate Students in the Humanities and Social Sciences Fields

Learn about applying to and attending grad school!
Ask your own questions!

Contact Eva Weiner (ekw43) and Daniel Zhang (drz23) with any questions

CORNELL UNDERGRADUATE RESEARCH BOARD
CURB
Established in 1985

Cornell Brooks
Public Policy

Are you enjoying this course?

The Brooks School may be right for you!

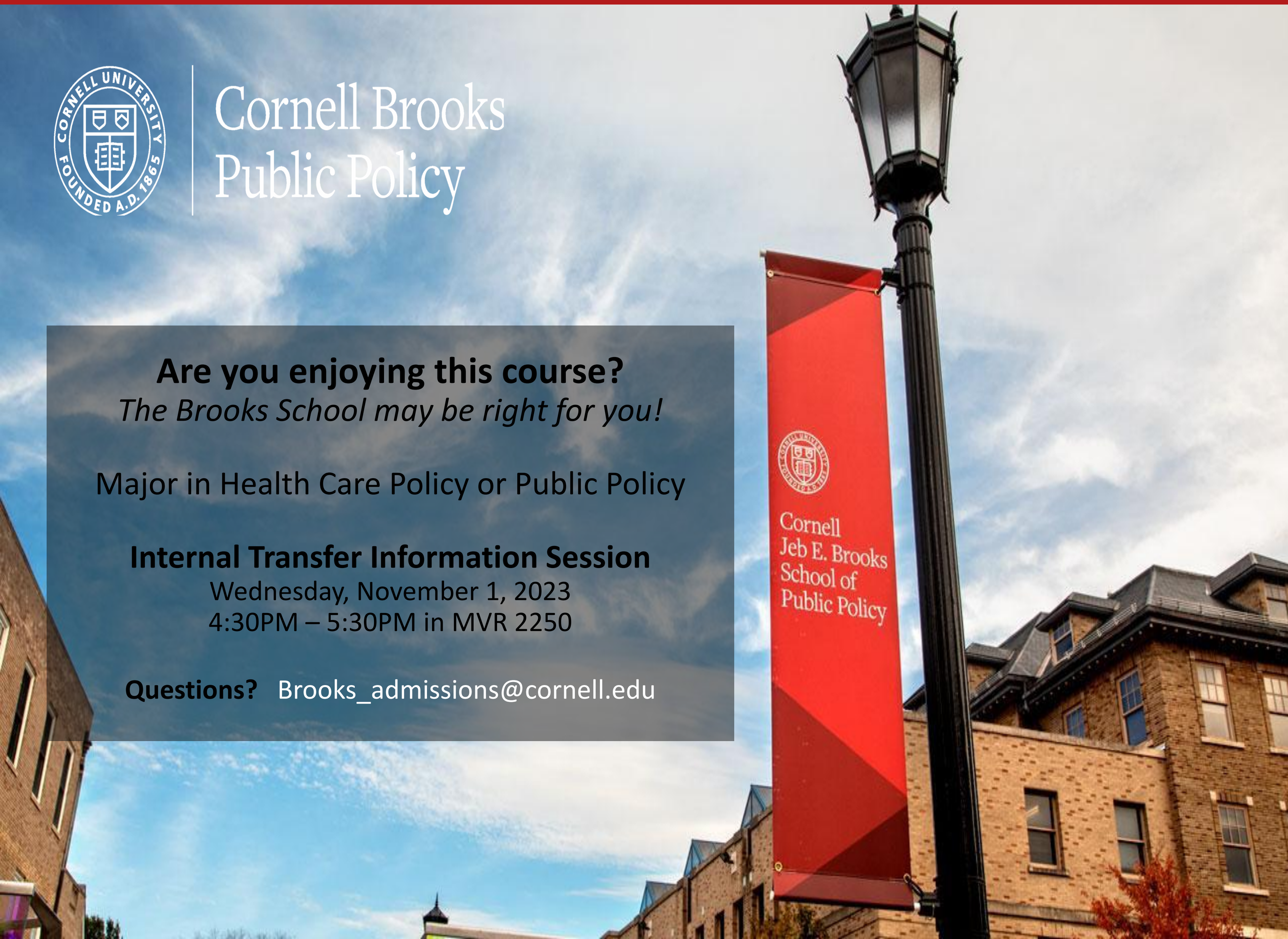
Major in Health Care Policy or Public Policy

Internal Transfer Information Session

Wednesday, November 1, 2023

4:30PM – 5:30PM in MVR 2250

Questions? Brooks_admissions@cornell.edu



Asha Cornell

7:00 PM | OCTOBER 28
STATLER AUDITORIUM

@asha_cornell
Asha Cornell
cornell.ashanet.org

ASHA CORNELL PRESENTS

PENNOMASALA

SCAN TO BUY TICKETS!

$15 GENERAL ADMISSION
$13 GROUP ADMISSION (10+)

100% of proceeds go toward Asha's partner schools to support the education of underprivileged children in India

Co-Sponsored by: Bartels Fund | Asian Studies Department

Prelim #2: Tuesday, October 31st at 7:30pm

- Last names beginning with…
  - A – Q: Kennedy/Call Auditorium (“our” classroom)
  - R – S: MVR G151
  - T – Z : MVR G155

- Covers material from September 21st through today’s lecture (the last slide we cover today)

- We do have class on Tuesday, October 31st, but that material will be covered on the final

Any Current Events?

Today's First Set of Topics

1) How much more do private insurers pay health systems relative to Medicare

2) Implications of new health system reimbursement methods featured in the Affordable Care Act (ACA)

3) Why doesn't the government tax nonprofit hospitals?

Medicare Instituted the Diagnosis-Related Group (DRG) Payment System in 1983

1

Medicare Cost Estimation

Government estimates the average cost of treating Medicare patients in each of the 750 different DRGs across all 4,700 hospitals in the United States.

2

Payment = Estimated Costs

Government pays each hospital about 90% of the estimated national average cost for each DRG (so hospitals lose money, on average).

3

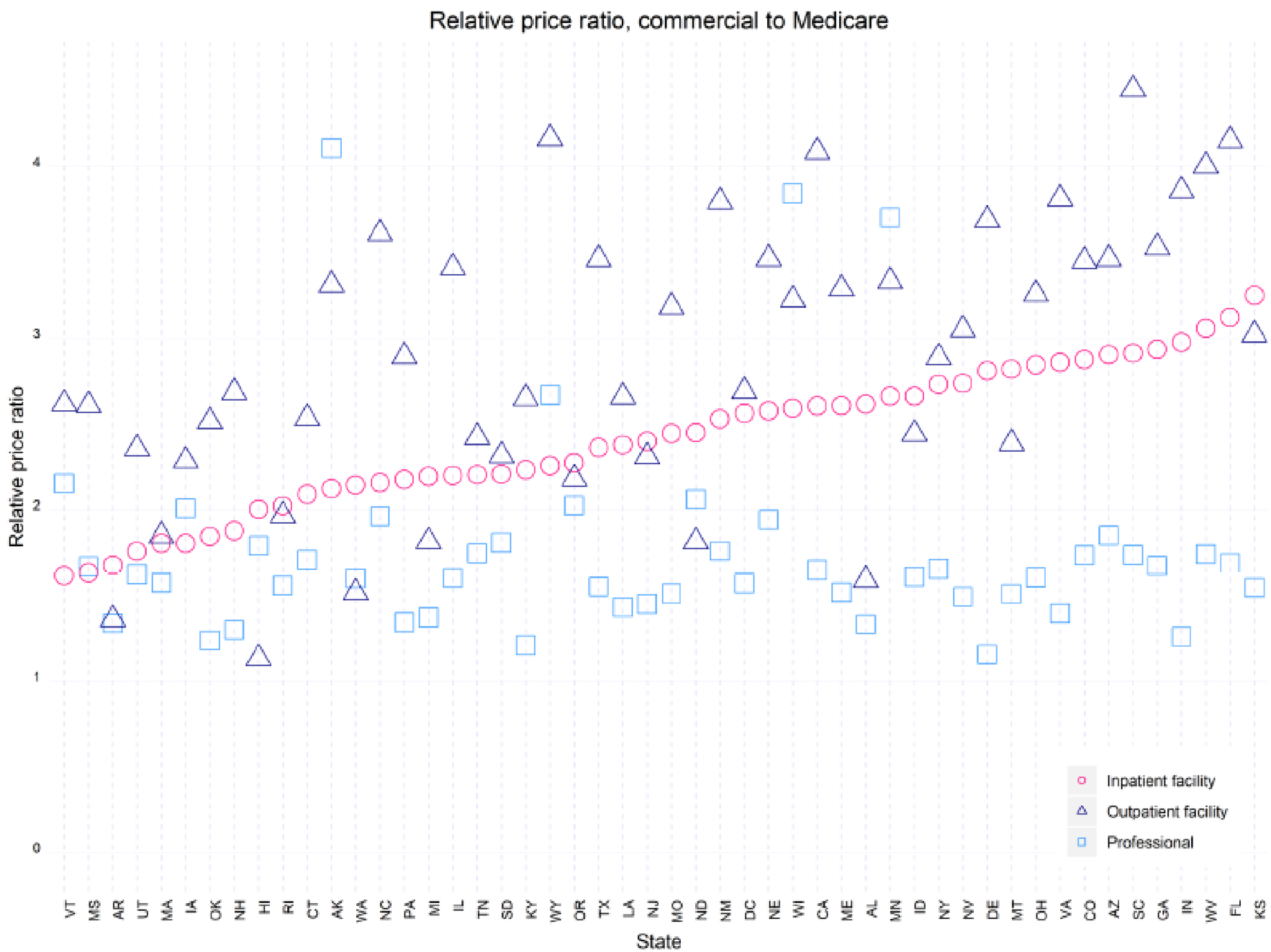
Hospitals With High Costs Will Lose $

This payment is the same regardless of how long the patient spends in the hospital or how many services the patient receives (e.g., whether they hire a lot of nurses or use expensive surgical equipment).

An efficient hospital can make $

As With Physicians, Private Health Insurers Pay Hospitals Much More Than Medicare (and Medicaid): from 75% to 250% More Across States

Figure 3.3. Relative Facility and Professional Prices by State, 2020



Average

224%

Source: Whaley et al., RAND, 2022.

Insurers Are Trying to Shift Hospitals and MDs From Volume-Based (e.g., DRGs) to Value-Based Reimbursement Methods. 3 Programs Introduced by the ACA.

1

Pay – for – Performance (P4P)

Higher pay for higher quality, and lower pay for lower quality (we'll discuss next week).

2

Bundled Payments

Ask MDs and hospital to divide a single payment. Fosters coordination. See next slide

3

Accountable Care Organizations (ACOs)

An insurer shares cost savings with a health system and its MDs.

With a Single, Bundled Payment, the MD and Hospital Should Work Together to Reduce Costs

1. MD schedules elective surgery; refers pt. to hosp. for pre-admission tests
2. Patient admitted; transported to operating room
3. MD performs surgery w/ RN, OR tech, surgical supplies, anesthesiologist
4. Patient recovers in Recovery Room
5. MD admits patient to Coronary Care Unit: 1 RN for every 2 patients
6. MD visits pt.; orders lab tests, x-rays, medication. Hospital staff perform tests and administers medication
7. Patient complains of complications. Resident on-duty calls MD and administers treatment.
8. MD transfers patient to Med/Surg unit for days 3-4. 1 RN for every 6 patients.
9. MD discharges patient to: home, skilled nursing facility (SNF), rehab hospital. May recommend home care.
10. MD and hospital SPLIT a single payment.

Physician

RN = registered nurse; OR = operating room

The ACA Created the Accountable Care Organization (ACO) Program

Accountable Care Organizations

What is an ACO?

An ACO is a network of doctors and hospitals that shares financial and medical responsibility for providing coordinated care to patients in hopes of limiting unnecessary spending. Each patient's care is managed by a primary care physician.

How are ACOs Paid?

ACOs create an incentive to be more efficient by offering bonus payments when providers keep costs down. Providers get paid more when patients are healthy and out of the hospital.

What are the Incentives?

ACOs change incentives so that it is in the providers' best interest to maximize patient health, rather than just simply increase the volume of services rendered.

The ACA Created the Accountable Care Organization (ACO) Program: an Example

01 **Start Date:** Voluntary program that began in 2012.

02 **A group of MDs and hospitals agree to be accountable** for the quality and cost of care provided to a group of Medicare patients (e.g., 20,000 Medicare patients in Boston treated by Mass General health system and its MDs).

03 **Medicare forecasts those patients' costs** for next year based on patients' previous 3 years of Medicare spending (e.g., $10,000 per Medicare beneficiary).

04 **Hospitals and physicians continue to be paid fee-for-service** (MDs by the RBRVS system; hospitals by DRG system).

05 If quality and cost targets are met, the **ACO receives about 50% of the savings** and Medicare keeps the rest.

06 **Example:** if Medicare only spent $9,600 per person, Mass General would receive a $4 million bonus payment ($400 X 50% X 20,000). Mass General would owe government money if actual spending exceeds the target.

07 **Cost forecast/benchmark recalculated each year.**

ACO Results: Not Exactly Bending the Cost Curve

01 In 2021, 58% of ACOs earned shared saving payments, up from 31% in 2016.

02 Providers received shared savings of $2.0 billion in 2021, while saving Medicare $1.9 billion. Smaller savings than expected.

03 Average shared savings of only $2 million per year for those ACO receiving shared savings.

04 ACOs led by a physician group have been much more successful than those led by a health system.

Source: CMS, 2022; National Association of ACOs, August 20, 2018; McWilliams et al., NEJM, September 20, 2018.

Health Systems That Can Gain the Cooperation of Physicians and Work Effectively With Physicians are More Likely to Reduce Costs, Improve Quality, and Thrive Under Value-Based Reimbursement Systems

This helps explain why hospitals have been buying physician practices and employing physicians recently (besides trying to capture more of the physicians' admissions and the profits from the facility payments)

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And now, for something completely different…

How the ACA is messing up the health care system

http://www.cc.com/video-clips/cbbn22/the-daily-show-with-jon-stewart-third-world-health-care---knoxville--tennessee-edition

Role of Nonprofit Hospitals

- 20% of U.S. hospitals are for-profit: they pay sales, property, and corporate income taxes that help pay for government programs (e.g., education, Medicaid).

- 80% of hospitals are nonprofit: they don't pay <u>any</u> taxes. In 2020, these hospitals saved $28 billion by not being taxed.

Why would the government allow so many hospitals to avoid paying taxes?

Source: Bai et al., *JAMA Network Open*, 2022; Kaiser Family Foundation, 2023.

Nonprofit Hospitals Provide Substantial Benefits to Their Communities in Lieu of Paying Taxes

- In 2020, nonprofit hospitals spent only $16 billion on free/ charity care to patients who are uninsured and can't pay.
- % of a hospital's costs devoted to charity care:
  - Nonprofit hospitals 2.3% **(less than for-profit hospitals!)**
  - For-profit hospitals 3.8%
  - Government hospitals: 4.1%
- Between 2012 and 2019, nonprofit hospital profits grew by 36% but charity care didn't increase at all.
- Some states are threatening to begin taxing nonprofit hospitals.
- Because the uninsured rate is now lower due to the ACA, some policy makers think nonprofit hospitals should increase the benefits they provide to their communities.

Source: Bai et al., *JAMA Network Open*, 2022; Bai et al., Health Affairs, 2021; Jenkins and Ho, 2023; Rosenbaum et al., *Health Affairs*, July 2015.

Conclusions on Hospitals/Health Systems

- Hospitals must attract physicians (and their patients) in order to generate revenue/profit.
- Hospitals used to compete with one another for physicians' loyalty by offering expensive medical technologies.
- Hospitals still do this, but also try to attract patients from health insurers by cutting costs, and accepting lower prices in order to be included in an insurer's network.
- Medicare's DRG system creates incentives for hospitals to reduce costs and get patients out of the hospital faster.
- The ACA ushered in new reimbursement methods (i.e., not volume-based) that encourage physicians and hospitals to work together to reduce costs and improve quality.
- Nonprofit hospitals receive substantial tax savings in exchange for providing charity care and other benefits.

Today's Next Focus: View the World from a Pharmaceutical or Biotech Company's Perspective

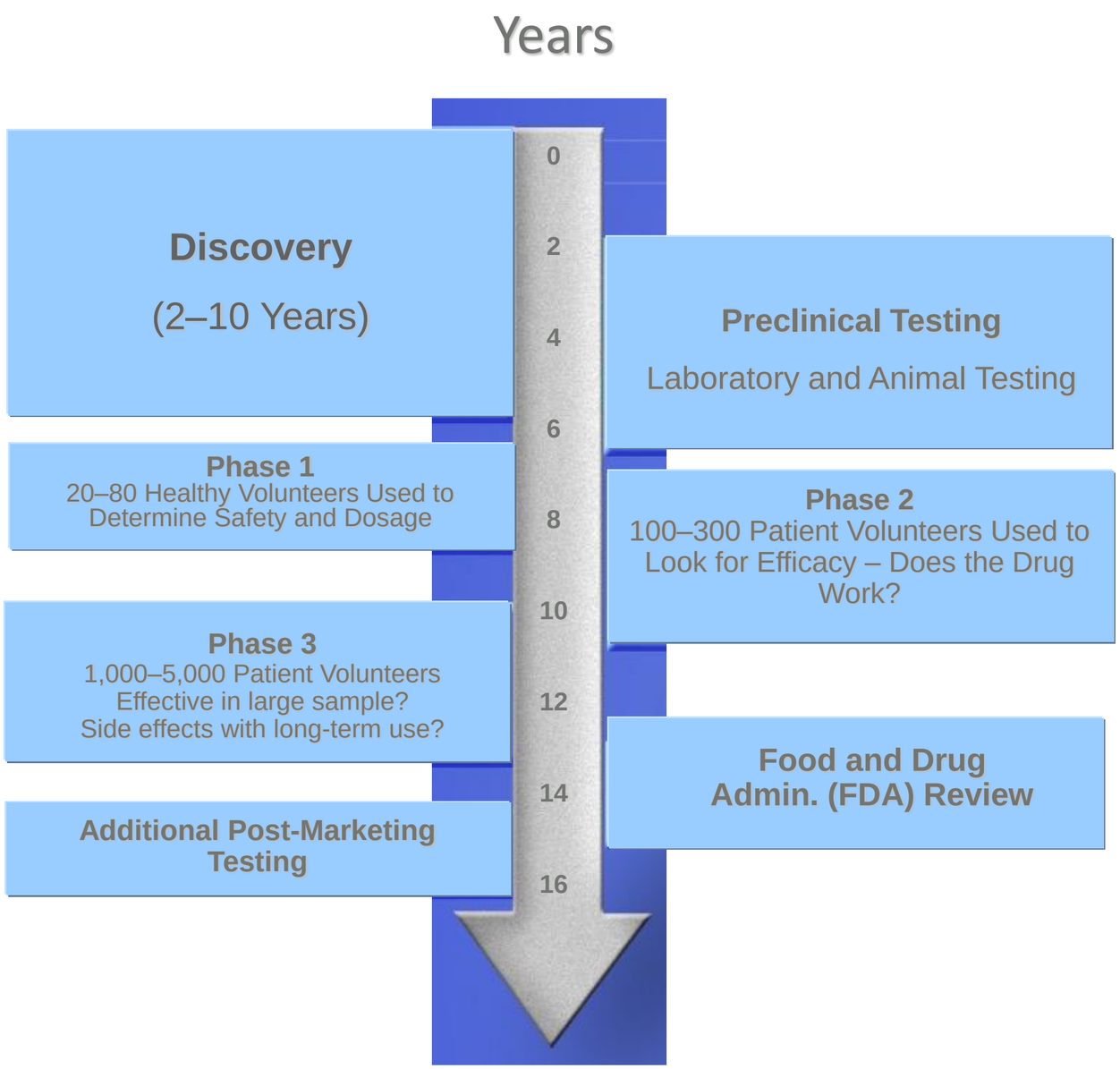
1. **Development and Approval:** Discuss how new drugs are developed. How long does it take and how much money is required, on average?

2. **Government's Role:** Describe the government's critical role in drug development

Tuesday: discuss key policy issues in the biopharmaceutical industry

Developing a New Drug is a Long, Uncertain, and Expensive Proposition: Typical Timeline

Drug Development Timeline



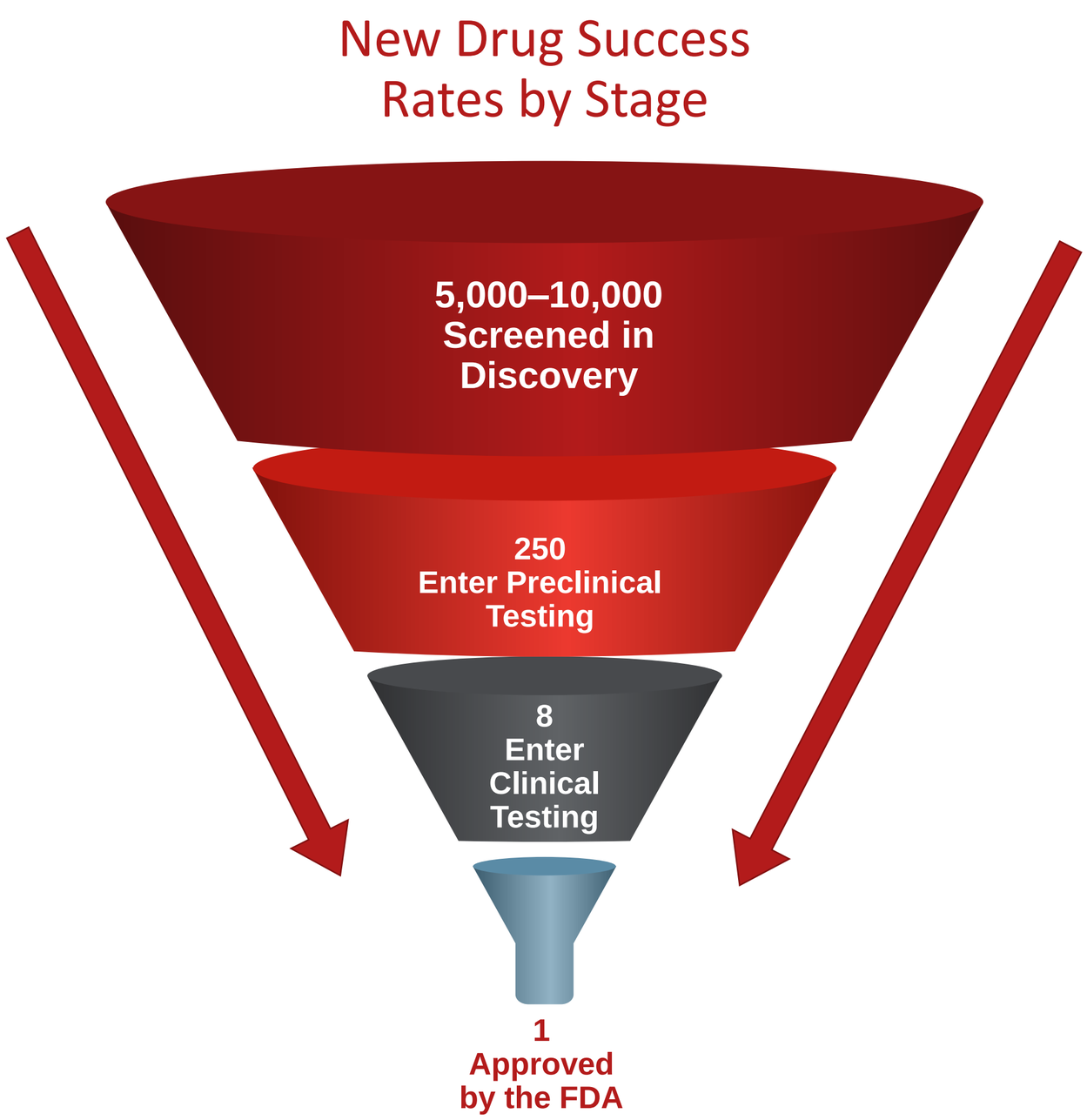
Source: PhRMA Pharmaceutical Industry Profile 2003, Chapter 1: Increased Length and Complexity of the Research and Development Process. DiMasi, JA, Hansen, RW, Grabowski, HG. “The Price of Innovation: new estimates of drug development costs.” *Journal of Health Economics*. 2016.

Early Stages of Drug Development: Searching for Brilliant Insights in the Discovery and Preclinical Phases

- Understand how a disease works.
- Hypothesize how a drug/compound might intervene in the disease process.
- Identify compounds that have favorable properties: likely to be effective, but not likely to be (too) toxic.
- Test those compounds with *in vitro* (cells in the lab) and *in vivo* (animals with the disease) methods.
- Pick a winning compound: discovery and preclinical research is much less expensive than clinical (i.e., testing on humans) research.
- File active ingredient and method of use patents to protect intellectual property.

Source: Campbell, 2008.

Developing a New Drug is a Long, Uncertain, and Expensive Proposition: Success by Stage

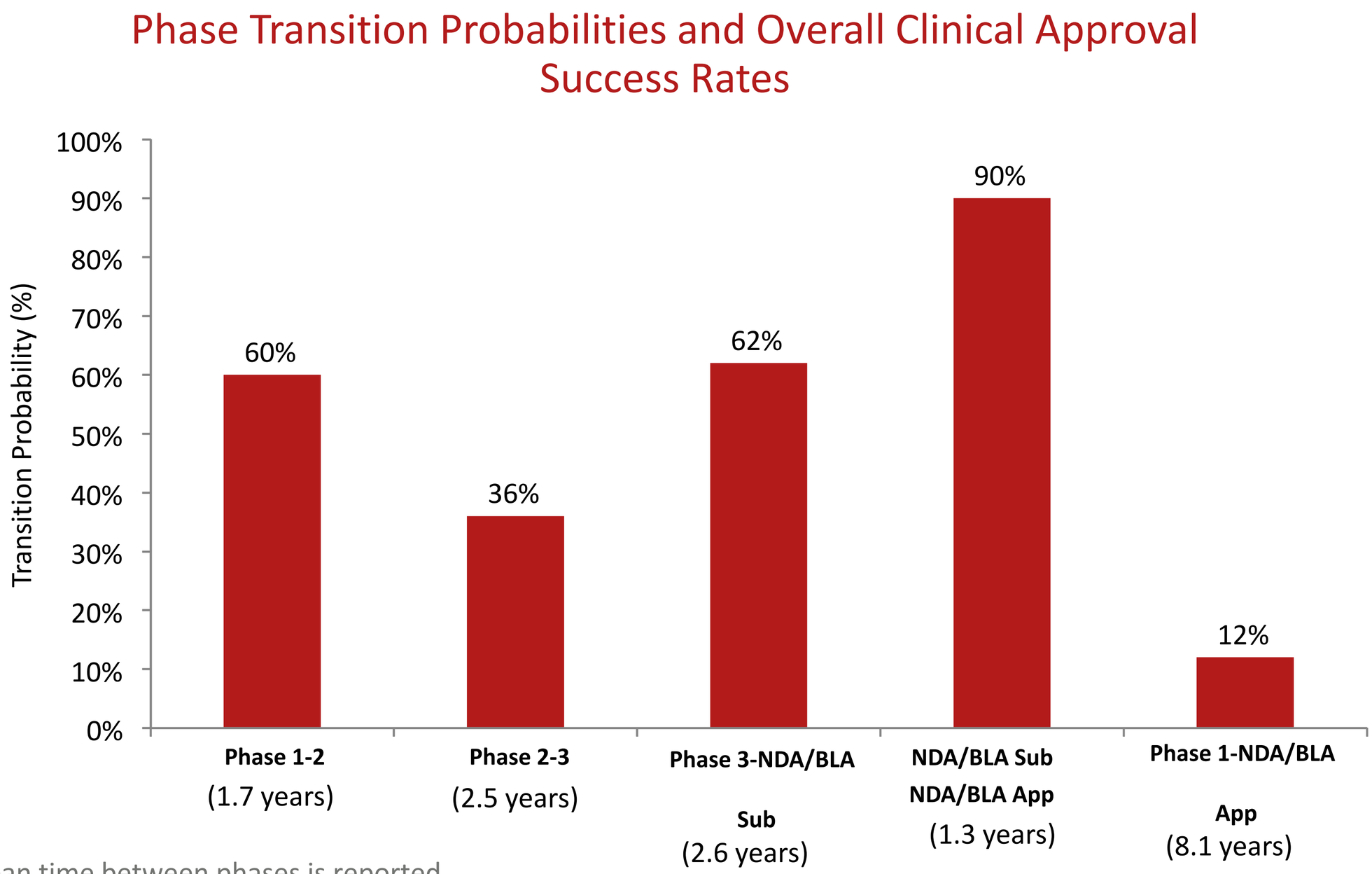


Source: PhRMA Pharmaceutical Industry Profile 2003, Chapter 1: Increased Length and Complexity of the Research and Development Process. DiMasi, JA, Hansen, RW, Grabowski, HG. “The Price of Innovation: new estimates of drug development costs.” *Journal of Health Economics*. 2016.

The Government's Role

- Approve patents, where appropriate (we'll discuss this later). Usually filed in the discovery and preclinical phase.
- Safety and efficacy
  - Determine whether compounds are safe enough to be tested on humans (right before Phase 1).
  - Work with pharmaceutical firms to determine appropriate health outcomes to measure during Phases 2 – 3.
  - After Phase 3, evaluate the drug's performance: is there a statistically significant improvement in health outcomes (e.g., survival, blood sugar levels) among patients in the experimental group vs. patients in the control group?
  - Post-approval surveillance: monitor safety/adverse incidents among patients when the drug is more widely used.
  - Monitor and approve drug manufacturing facilities.

12% of Drugs That Start Phase 1 are Approved, and it Takes an Average of 8 Years (same % with more recent data)



Note: Mean time between phases is reported In (parentheses)

Source: DiMasi et al. 2016.

Drug Development Case Study: Eli Lilly Was Ready to Test Mounjaro in a Phase 3 Type-2 Diabetes Trial in Late 2019

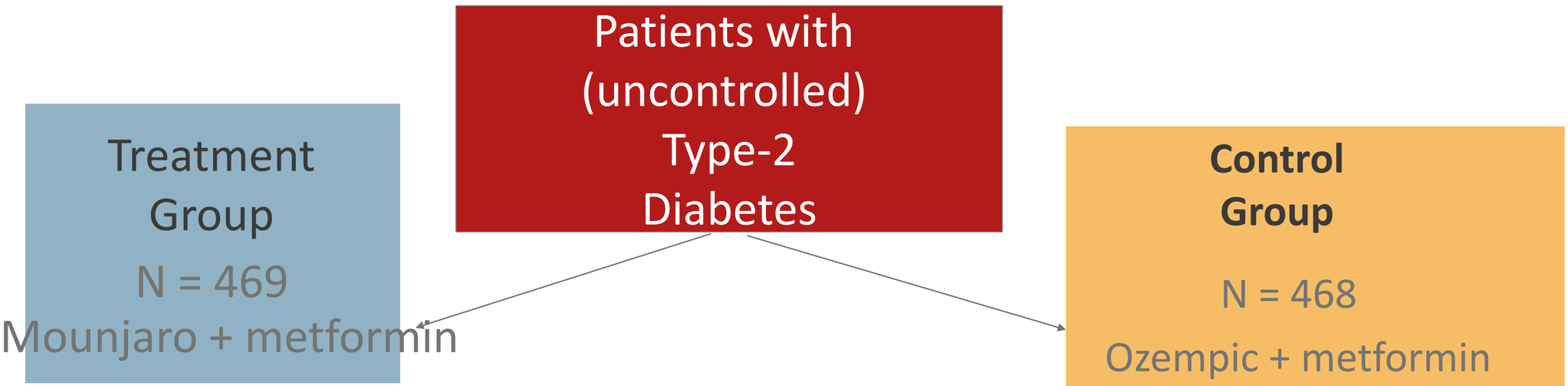
- Most Type-2 diabetes patients take a generic drug, metformin, by itself or in combination with another drug from a different class with a different mechanism of action (+ exercise and healthy diet).

- However, many patients still do not meet the recommended blood sugar level (i.e., an HbA1c level of less than 7.0).

- Mounjaro (brand name) is a GLP-1 receptor agonist.

- “Tirzepatide (scientific/generic name) lowers fasting and postprandial glucose concentration, decreases food intake, and reduces body weight in patients with type 2 diabetes” (from Mounjaro’s label).

Mounjaro's Phase 3 Randomized Controlled Trial (RCT)



Primary Endpoint

Secondary endpoint

Efficacy:		
- Reduction in HbA1c	2.3	1.8
- % patients hitting 7.0	86%	79%
- Pounds lost	28	13
% of patients with:		
- Abdominal pain	5%	4%
- Diarrhea	18%	9%
- Nausea	17%	4%
- Vomiting	9%	2%

In 4 separate trials, Monjaro was compared w/o metformin vs. a placebo; and separately versus 3 insulin drugs.

1) Should the Food and Drug Administration (FDA) approve Mounjaro?

2) What decision rule does the FDA use?

How the FDA Makes Approval Decisions

FDA's decision rule:
Are the health benefits (actual or expected) better than or same as the control group?

If so, do the health benefits outweigh the possible side effects or safety issues?

Phase 4 Studies

The FDA often mandates Phase 4 (post-approval) studies as a condition for approval, to explore whether safety issues in a RCT persist in a broader patient population.

NOT Prices

The FDA does not consider the drug's price. Ditto with European regulatory bodies.

FDA Approves a Drug for an Indication, Not a Drug

INDICATIONS AND USAGE

MOUNJARO® is a glucose-dependent insulinotropic polypeptide (GIP) receptor and glucagon-like peptide-1 (GLP-1) receptor agonist indicated as an adjunct to diet and exercise to improve glycemic control in adults with type 2 diabetes mellitus. (1)

Limitations of Use:

- Has not been studied in patients with a history of pancreatitis (1, 5.2)
- Is not indicated for use in patients with type 1 diabetes mellitus (1)

Mounjaro's Approved Label

Physicians can use a drug "off-label" once it is approved.

- Mounjaro for Type-1 diabetes, for example
- Mounjaro for weight loss for non-Type-2 diabetes patients, for example

But pharmaceutical firms cannot market off-label, and health insurers are more likely to refuse to pay when a drug is used off-label (and/or to require prior authorization).

About 20% of Prescriptions Are for Off-Label Uses, and a Majority for Some Drugs

Off-Label Prescription Efficacy

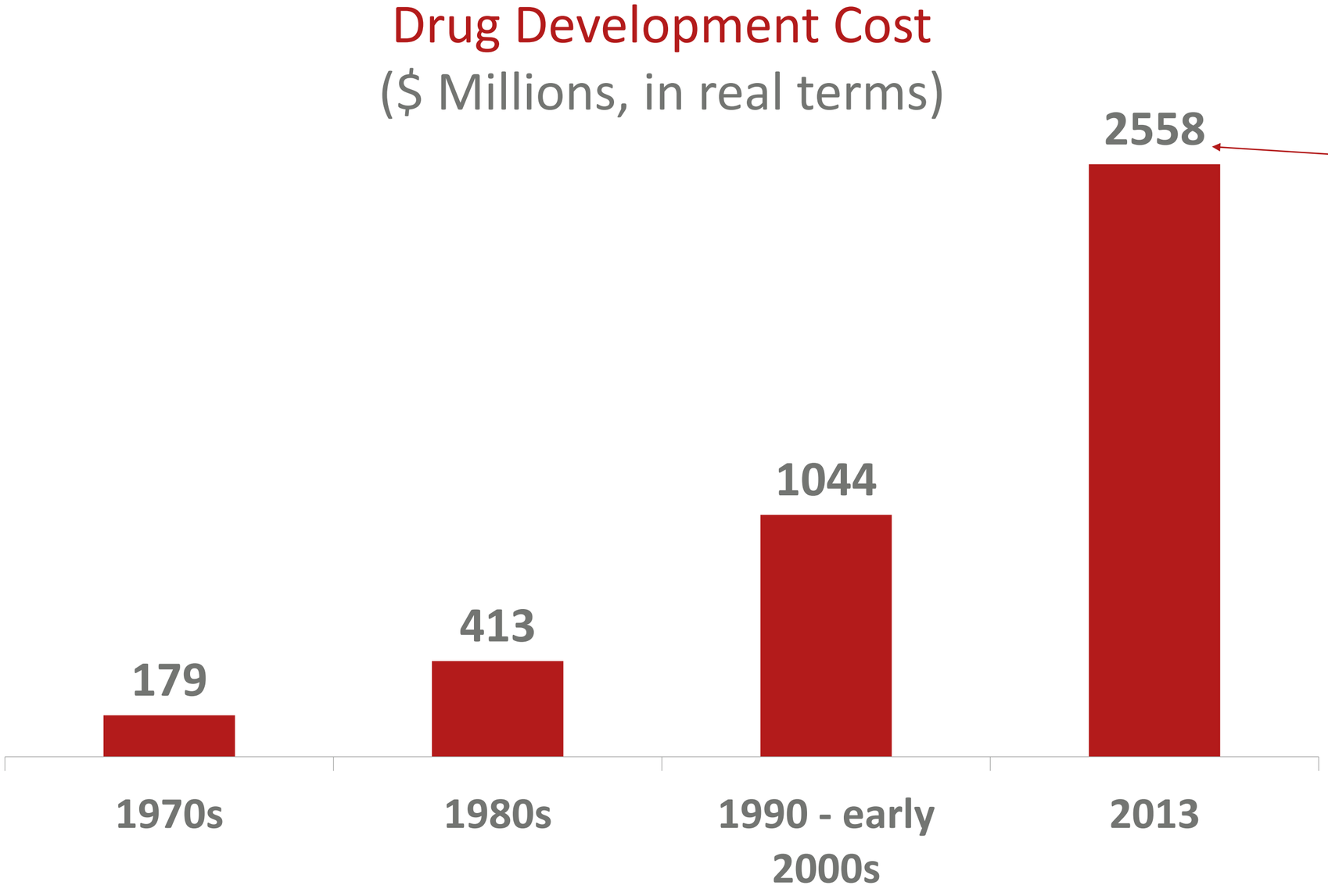
Only 30% of off-label prescriptions were supported by evidence of clinical efficacy (e.g., results from a published study after the drug was approved).

Physician Determination of On- vs Off-Label

In a separate survey of 1,200 physicians, only 55% could correctly determine whether or not a particular use of a drug was on-label (supported by RCT evidence) or off-label.

Source: Pan, *Clinical Pharmacology & Therapeutics*, May 2012.

Why Are Biotech and Pharmaceutical Firms Willing to Spend So Much to Develop a New Drug?

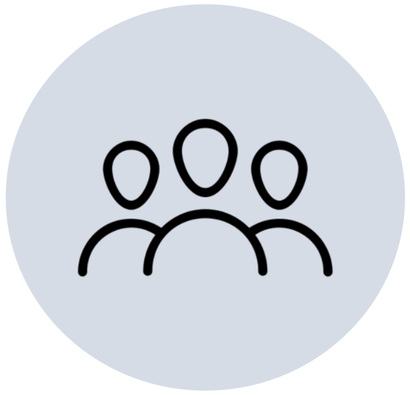


Source: DiMasi et al., 2016, *Journal of Health Economics*.

Patents Allow a Firm to Recover R&D Costs; Expiration Triggers Fierce Competition

Generic Protection

Patents **prevent other firms from producing a generic**, or bioequivalent, copy of a drug for the 20-year life of a patent.



Bioequivalent Competitors

Without patent protection, any firm could take a drug the day it is approved by the FDA and **"reverse-engineer"** it. They could sell a bioequivalent version of the drug **without having invested** millions of dollars developing it.

Competitive Pricing

Multiple firms in competition would **lead to drug prices close to production cost**, meaning research and development (R&D) costs couldn't be recouped.

Patent Pricing

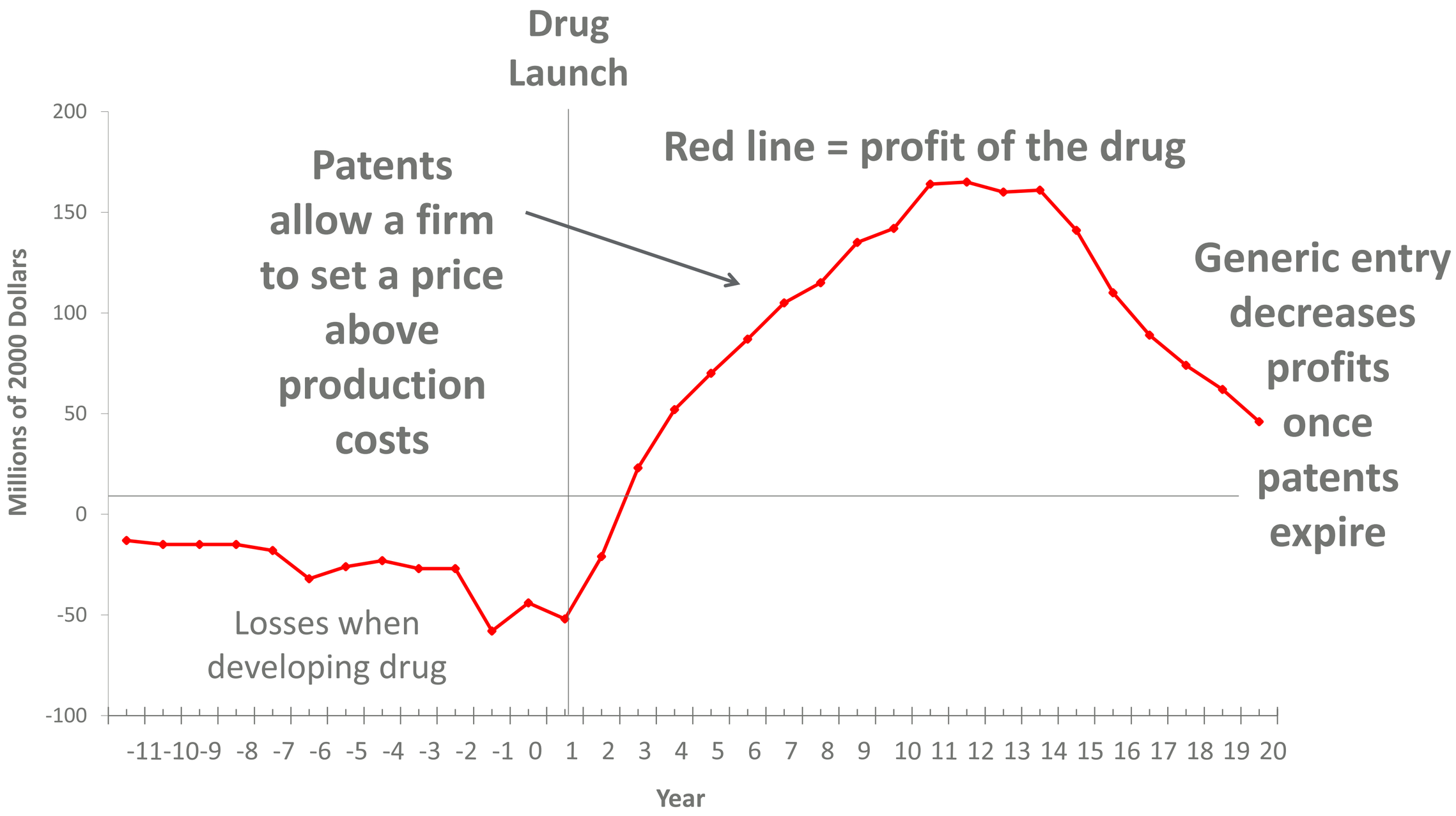
Patents allow a firm to **charge a price above the cost of producing** the drug to make a profit and recoup R&D costs.

https://www.iconfinder.com/mrpixel

https://www.iconfinder.com/laurareen

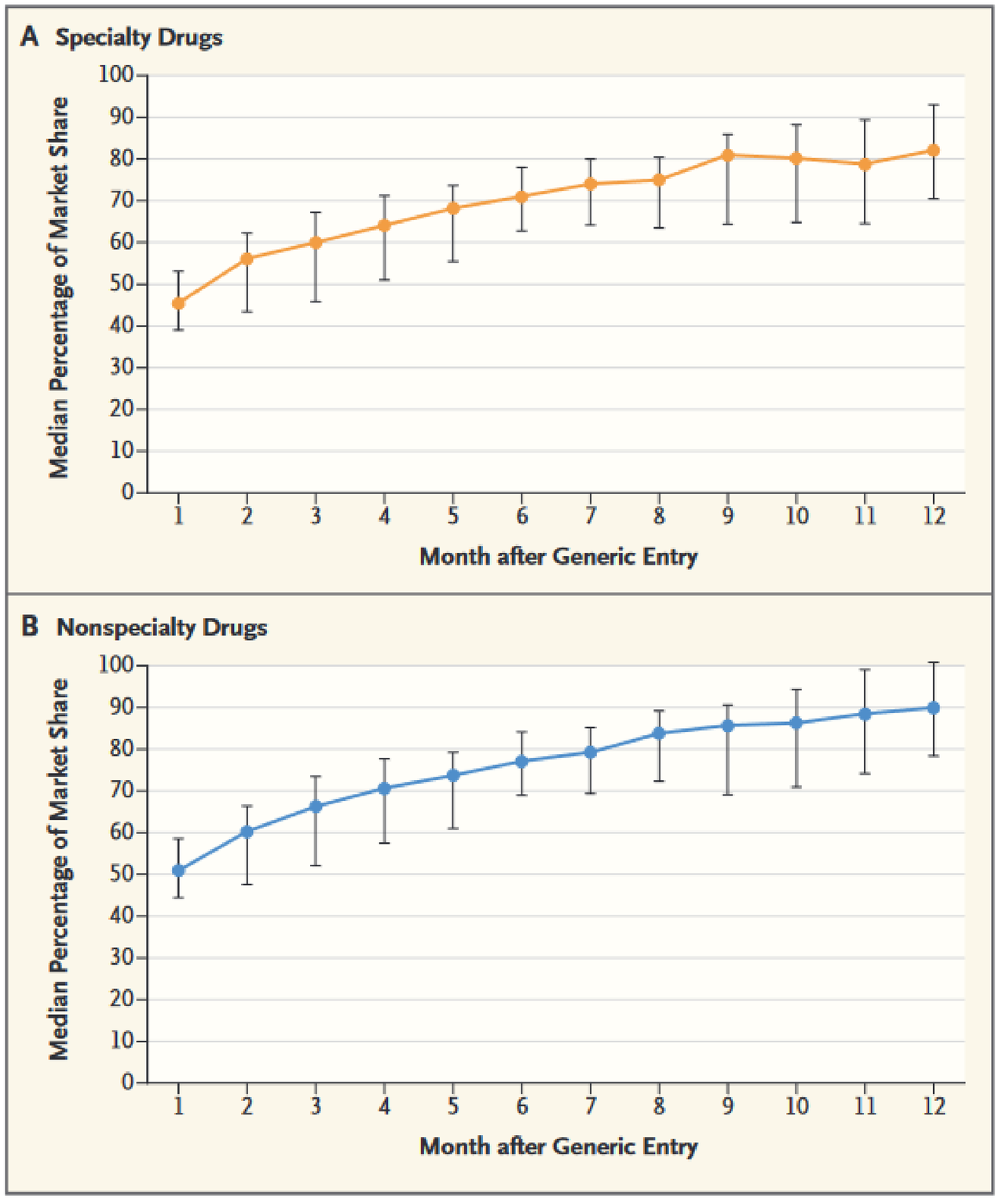
https://www.iconfinder.com/iconsets/security-double-colour-blue-black-vol-3

Product Life Cycle: Revenue Grows Steadily Over an Extended Time, Then Falls Precipitously



Source: DiMasi and Grabowski, 2012.

Once Patents Expire Generic Versions Enter and 97% of Patients Eventually Shift From the Branded to a Generic Product



Generic Market Share in Medicare Part D by Month after Generic Entry for Specialty and Nonspecialty Drugs, 2014–2019.

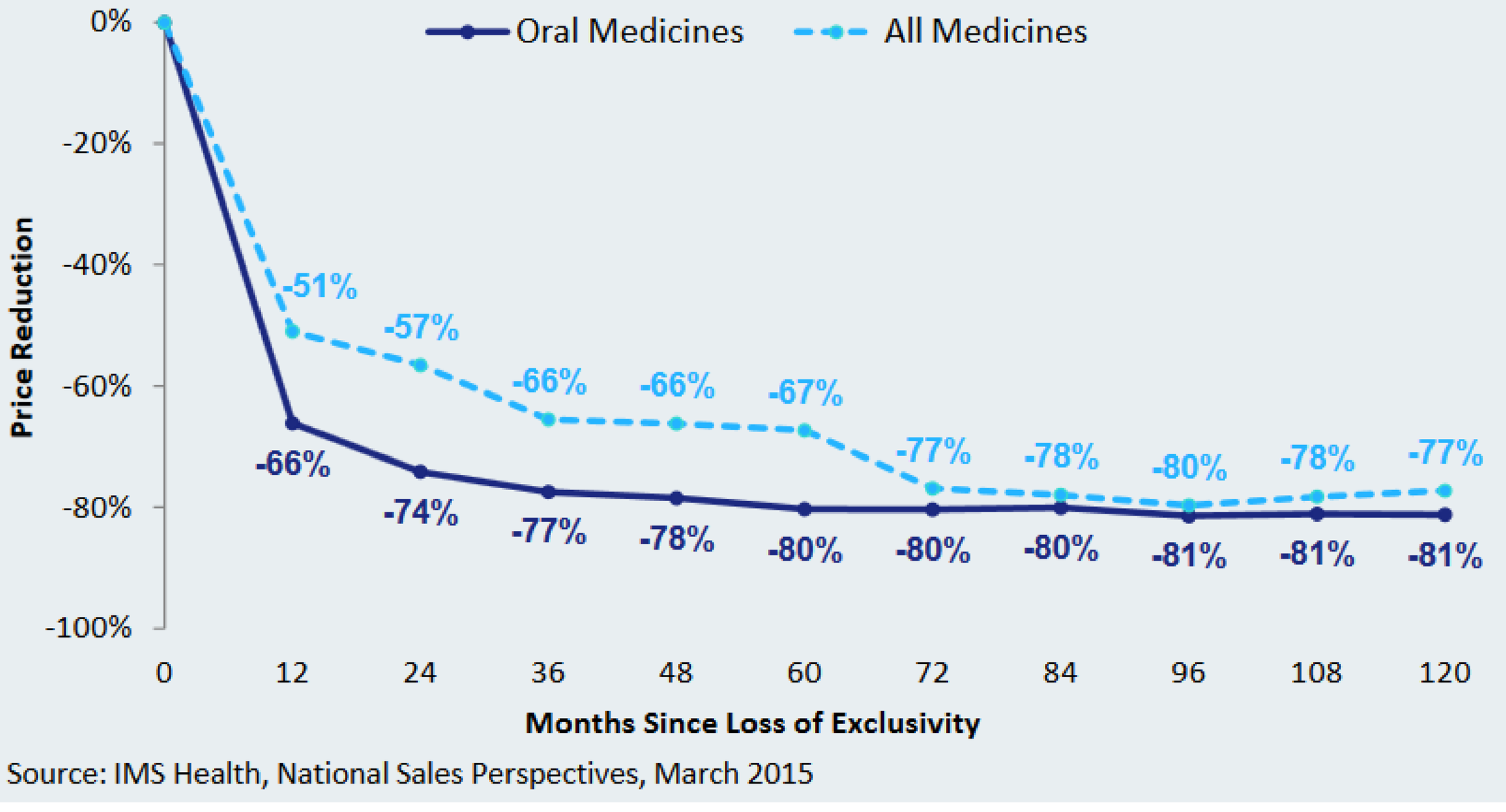
Loss Drivers

- Automatic substitution at pharmacy
- Health insurers set lower co-pays for generic versus branded drugs

Source: Dusetzina et al., 2023

Generics Cut the Price Substantially Once They Enter

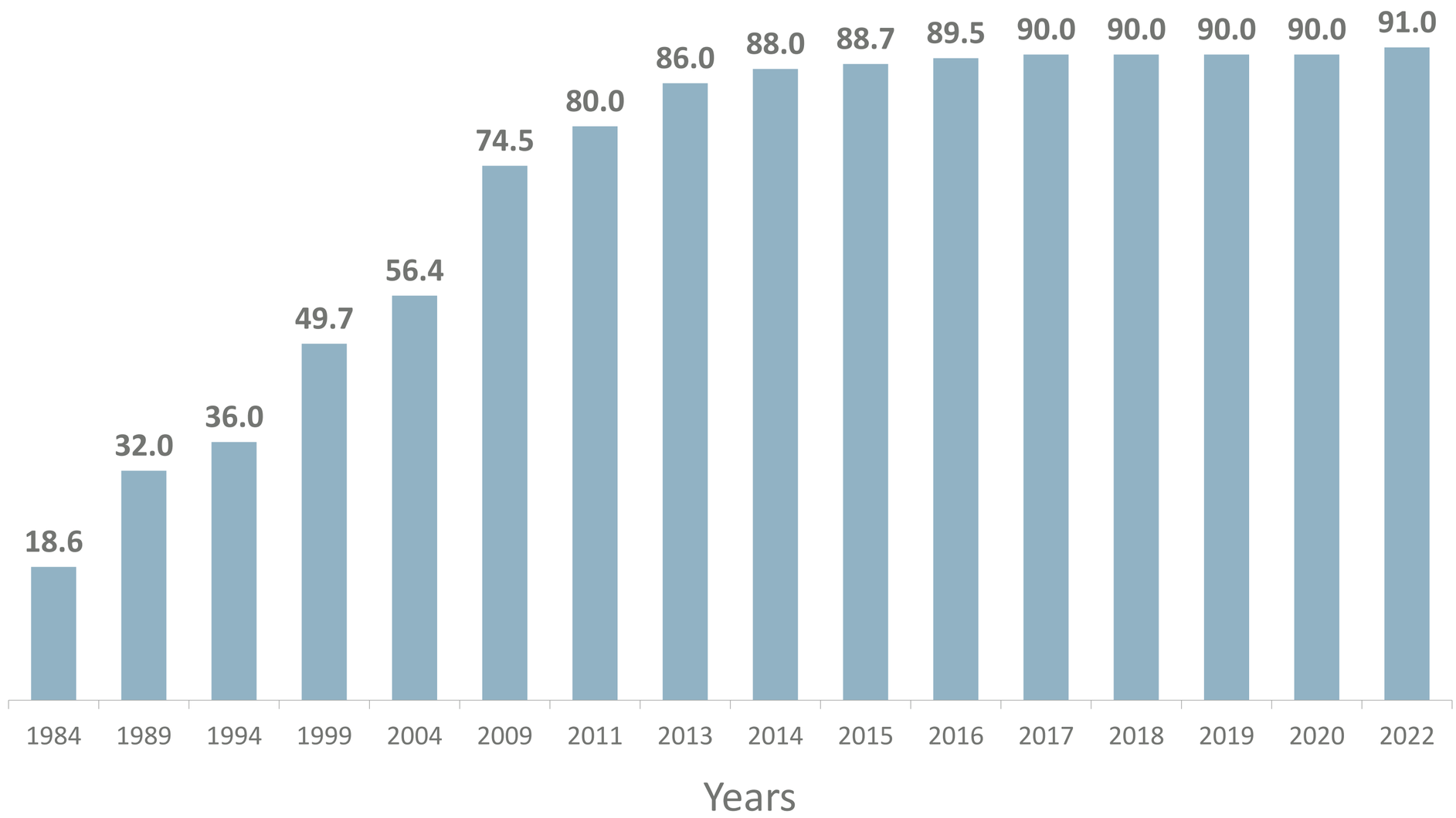
Monthly Price Reductions after Loss of Exclusivity



Source: IMS Health, National Sales Perspectives, March 2015

Generic Drugs Now Account for 91% of Prescriptions Filled (but a Much Smaller % of Pharma Spending)

Generic Share of Total Prescriptions, 1984-2022



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Sources: For 1984-2004, IMS Health National Prescription Audit archives; for 2005-2009, IMS Health National Sales Perspectives; 2010-2012, IMS; GPHA, 2015; for 2018, IQVIA Medicine Use and Spending in the U.S., May 2019.