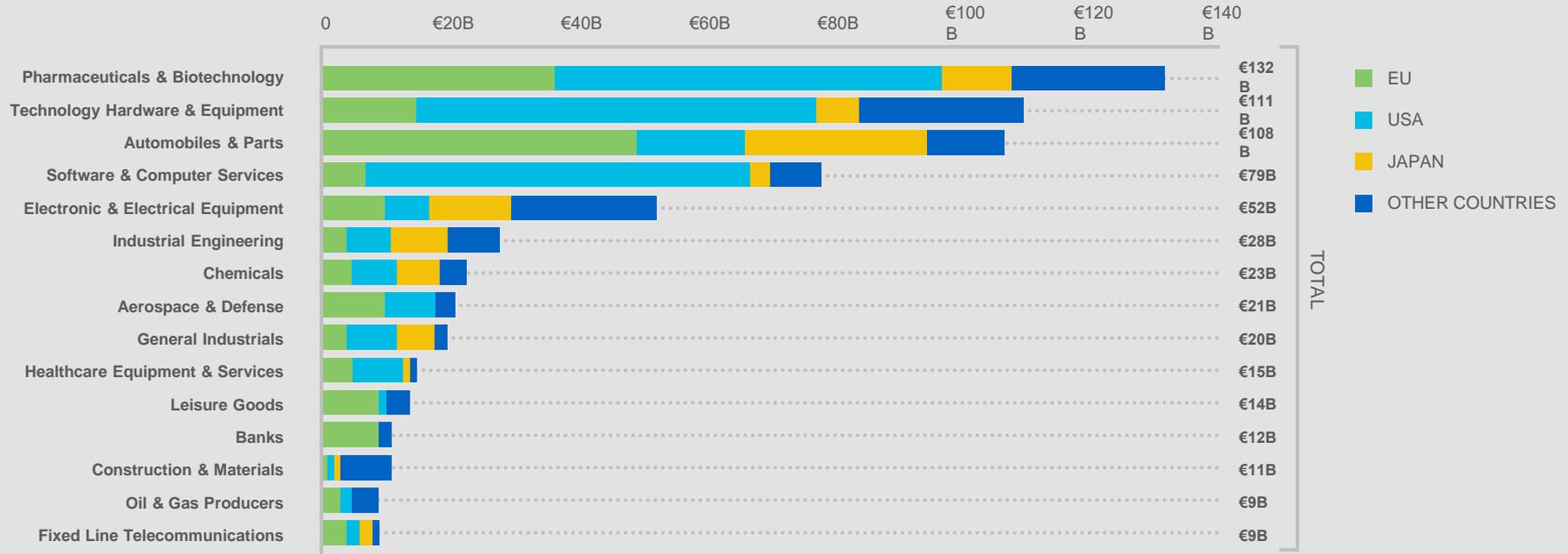


PRINCETON CONFERENCE 2018

THE BIOPHARMACEUTICAL SECTOR IS THE SINGLE LARGEST FUNDER OF BUSINESS R&D IN THE WORLD

R&D Investment by Sector



Source: PhRMA. Prescription Medicines: International Costs in Context. 2017. <http://phrma-docs.phrma.org/files/dmfile/PhRMA-International-Costs-in-Context-2017-03-011.pdf>. Accessed 7/20/17

THE INNOVATIVE BIOPHARMACEUTICAL INDUSTRY HAS A MAJOR IMPACT ON ECONOMIES

Jobs across the US, EU5, Japan, Korea, Mexico, Canada, and Australia

1,600,000
direct jobs



Innovative
Biopharmaceutical
Industry

6,400,000
jobs downstream



Vendors
and Suppliers

8 million
TOTAL JOBS

US
4,500,000
jobs

JAPAN
630,000
jobs

MEXICO
680,000
jobs

AUSTRALIA
64,000
jobs

EU5
1,700,000
jobs

KOREA
440,000
jobs

CANADA
80,000
jobs

Source: PhRMA. Prescription Medicines: International Costs in Context. 2017. <http://phrma-docs.phrma.org/files/dmfile/PhRMA-International-Costs-in-Context-2017-03-011.pdf>. Accessed 7/20/17

THE COST OF INNOVATION



12 years at ~\$2.6B

It takes an average of 12 years¹ at an investment of almost \$2.6 billion² to advance one potential new medicine from research concept to an FDA-approved treatment.



~90% drugs fail in clinical development

As of 2015, one in every 10 drugs that enter clinical trials successfully make it to market,³ leaving many multi-million investments on the drawing board.



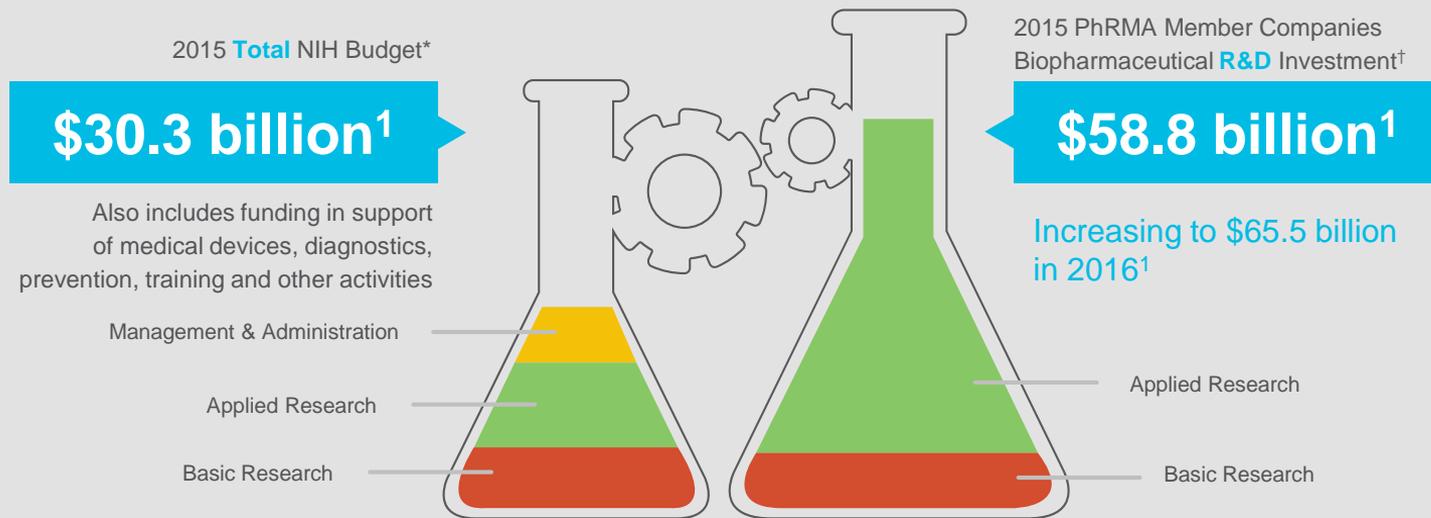
~58% of Ph III drugs are submitted for approval

This low success rate is concerning because 35% of all R&D spending is for Ph III development – which account for 60% of all clinical trial costs³

Sources: 1. Van Norman, G. Drugs, Devices, and the FDA: Part 1. JACC: Basic to Translational Science. 2016;1(3):170-179. 2. DiMasi J, Gradowski H, Hansen R. Innovation in the pharmaceutical industry: New estimates of R&D costs. Journal of Health Economics. 2016;47:20-33. 3. BIO. Clinical Development Success Rates 2006-2015. 2016. <https://www.bio.org/sites/default/files/Clinical%20Development%20Success%20Rates%202006-2015%20-%20BIO,%20Biomedtracker,%20Amplion%202016.pdf>. Accessed 10/3/17.

BIOPHARMACEUTICAL COMPANIES DO THE VAST MAJORITY OF RESEARCH TO TRANSLATE BASIC SCIENCE INTO NEW MEDICINES

Biopharmaceutical R&D Investment in the United States, 2015



While basic science is often initiated in academia, biopharmaceutical firms provide the necessary critical mass, expertise, and experience needed to develop new medicines

**Total NIH spending is for fiscal year 2015. †PhRMA member companies' R&D spending is estimated for calendar year 2015. PhRMA member companies account for the majority of private biopharmaceutical R&D spending. Nonmember company data are not included.*

Sources: 1. PhRMA. Prescription Medicines: International Costs in Context. 2017. phrma-docs.phrma.org/files/dmfile/PhRMA-International-Costs-in-Context-2017-03-011.pdf. Accessed 7/20/17.

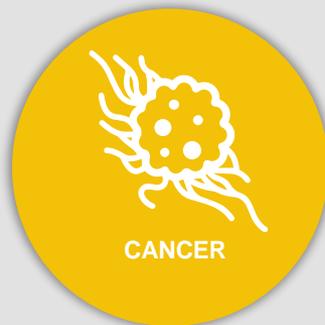
WE NEED TO ADDRESS THE RISING COST OF THE MOST COMMON DISEASES



CARDIOVASCULAR
DISEASE

#1 KILLER

in the U.S. with 1 DEATH
EVERY 40 SECONDS¹



CANCER

2nd

LEADING CAUSE
OF DEATH in the U.S.²



ALZHEIMER'S
DISEASE

5.5 MILLION

AMERICANS
IMPACTED⁴

Estimated to cost the U.S.
more than \$900B by 2030¹

Every 1% reduction in the
long-term cancer-related death
rate yields \$500B for society³

Projected to cost more
than \$1.1T by 2050⁵

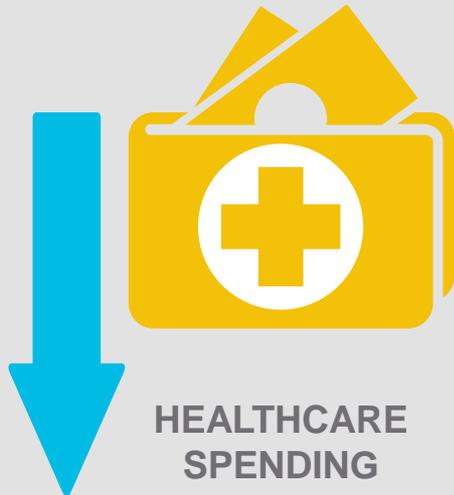
Sources: 1. Benjamin E, et al. *Circulation*. 2017;135:e1-e458. 2. Centers for Disease Control and Prevention. www.cdc.gov/nchs/fastats/leading-causes-of-death.htm2016. Accessed July 17, 2017. 3. Murphy KM, et al. *J Political Econ*. 2006;114(5):871-904. 4. Alzheimer's Association. 2017 Alzheimer's Disease Fact and Figures. Available at: https://www.alz.org/documents_custom/2017-facts-and-figures.pdf. Accessed July 28, 2017. 5. Alzheimer's Association. Changing the Trajectory of Alzheimer's Disease: How a Treatment by 2025 Saves Lives and Dollars. 2015. https://www.alz.org/documents_custom/trajectory.pdf. Accessed July 28, 2017.



MEDICINES ARE PART OF THE SOLUTION TO ADDRESS INCREASING HEALTHCARE SPENDING



=



ADHERENCE TO
VASCULAR
MEDICINES

HEALTHCARE
SPENDING

For every **additional dollar** spent on medicines for patients with congestive heart failure, high blood pressure, diabetes and high cholesterol

\$3-\$10

Savings generated on ER visits and inpatient hospitalizations¹

- ~\$10 per hypertension patient
- ~\$8 per congestive heart failure patient
- ~\$7 per diabetes patient
- ~\$3 per dyslipidemia patient

Congressional Budget Office Includes Medical Cost Offsets Due to Prescription Drugs in Medicare²

Sources: 1. Roebuck C, et al. Medication Adherence Leads to Lower Health Care Use And Costs Despite Increased Drug Spending. *Health Affairs*. 2011;30(1):91-99.
2. Congressional Budget Office. Offsetting Effects of Prescription Drug Use on Medicare's Spending for Medical Services. Report, November 29, 2012. www.cbo.gov/sites/default/files/cbofiles/attachments/43741-MedicalOffsets-11-29-12.pdf. Accessed 7/17/17.

NEW MEDICINES ARE PART OF THE SOLUTION TO HOLD DOWN FUTURE HEALTHCARE COSTS



United States

\$376 billion

Costs avoided by 2050 from the development of a new medicine that delays the onset of Alzheimer's disease¹ by

just five years



England

In the UK, a treatment delaying the onset of dementia by 5 years* would result in:

666,000

fewer people with dementia

566,000

fewer informal cares required

£21.2 billion

reduction in the cost of dementia²



Germany

€22 billion

savings in Germany by 2040 from the development of new medicine that **halts the progression** of Parkinson's Disease (PD)³

€3.9 billion

savings if medicine **slows progression by 20%**

*Study duration and savings modeled through 2050 for an intervention that would delay the onset of dementia by 5 years and would become available in 2020.

Sources: 1. PhRMA. Prescription Medicines: International Costs in Context. 2017. phrma-docs.phrma.org/files/dmfile/PhRMA-International-Costs-in-Context-2017-03-011.pdf. Accessed 7/20/17. 2. Alzheimer's Research UK. Defeat dementia: The evidence and a vision for action. 2014. www.alzheimersresearchuk.org/wp-content/uploads/2015/01/Defeat-Dementia-policy-report.pdf. Accessed 7/17/17. 3. Johnson S, et al. *Value in Health*. 2012;15:A277-1575.



IN THE 1980S, HIV OUTCOMES WERE DISMAL WITH DAUNTING FINANCIAL BURDEN ON SOCIETY



“Survival after an AIDS diagnosis was measured in **weeks** to **months**”

Anthony D. Fauci, MD and
Carl W. Dieffenback, PhD,
Ann Intern Med, 2011



“AIDS Treatment Costs Put at **\$5 Billion a Year**”

New York Times,
September 1989



“Experts estimate the AIDS deal will reach total annual costs of **\$66.5 billion** by 1991 – a figure that could bankrupt the healthcare system”

Washington Post,
June 1988

Sources: 1. Dieffenbach CW, et al. *Ann Intern Med*. 2011;154(11):766-771. 2. Hiltz PJ. AIDS Treatment Costs Put at \$5 Billion a Year. New York Times. September 1989. <http://www.nytimes.com/1989/09/15/us/aids-treatment-costs-put-at-5-billion-a-year.html?mcubz=0>. Accessed 9/27/17. 3. Kawata P. The Big Deal about AIDS. Washington Post. June 1988. https://www.washingtonpost.com/archive/opinions/1988/06/13/the-big-deal-about-aids/364fef4c-5aaf-4b78-9532-7b412645233f/?utm_term=.a96059d11d09. Accessed 9/27/17.

TODAY REPRESENTS DRAMATIC PROGRESS IN THE HIV TREATMENT LANDSCAPE



83%¹

FOR THOSE AGED 25-44 YEARS
FROM 1987 TO 2013



2.9 MILLION

LIFE-YEARS GAINED
FROM 1989-2003²



\$1.3 TRILLION

ECONOMIC VALUE TO SOCIETY²

“If a person aged 20 years is newly infected with HIV today they will live at least an additional 50 years.”³

- Anthony D. Fauci, MD & Carl W. Dieffenback, PhD

“We used to think HIV costs would overwhelm us... but we figured it out and let drug development progress.”⁴

-Ira Klein, MD, MBA, FACP, Aetna

Sources: 1. National Center for Health Statistics. Health, United States, 2014: With Special Feature on Adults Aged 55–64. 2014. www.cdc.gov/nchs/data/health/2014.pdf. Accessed 11/15/16. 2. Walensky RP, et al. Cost-Effectiveness of HIV Testing and Treatment in the United States. *The Journal of Infectious Diseases*. 2007;45:S248–54. 3. Dieffenbach CW, et al. Thirty Years of HIV and AIDS: Future Challenges and Opportunities. *Ann Intern Med*. 2011;154(11):766-771. 4. Personalized Medicine Coalition. *The Case for Personalized Medicine*, 4th Edition. 2014. <http://docplayer.net/7213848-The-case-for-personalized-medicine-4-th-edition.html>. Accessed 10.3.17.



MEDICINES ARE SOME OF THE MOST POWERFUL TOOLS TO TREAT AND CURE DEADLY DISEASES



HEPATITIS C VIRUS

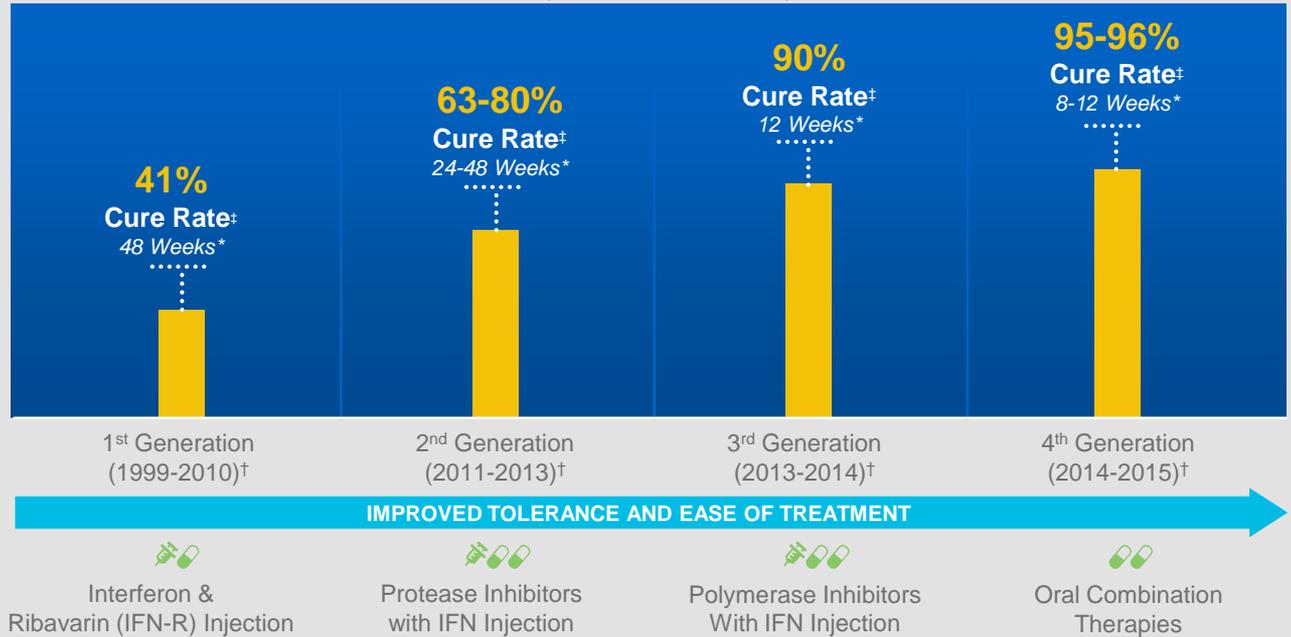
...the leading cause of liver transplants and the reason liver cancer is on the rise

Now curable in more than



of treated patients
with only 8-12 weeks of treatment

+133% cure rate increase for patients in Europe¹

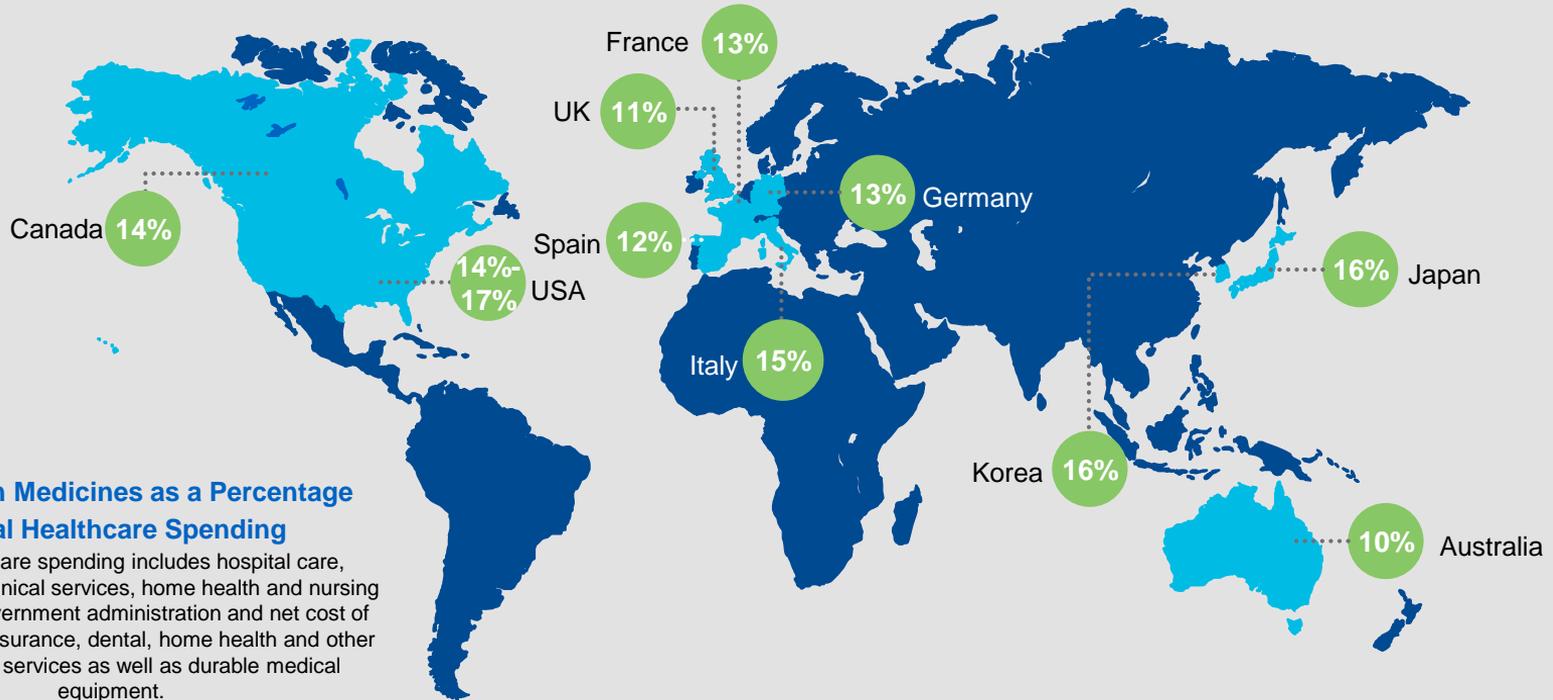


^{*}Treatment duration. [†]European Medicines Agency approval dates. [‡]Cure rates based upon clinical trial results reported in US Food and Drug Administration labels for: interferon; telaprevir; boceprevir; simeprevir; sofosbuvir; sofosbuvir and ledipasvir combination; and ombitasvir, paritaprevir, ritonavir, and dasabuvir combination.

Sources: 1. PhRMA. Twenty-Five Years of Progress Against Hepatitis C: Setbacks and Stepping Stones. 2014. phrma-docs.phrma.org/sites/default/files/pdf/Hep-C-Report-2014-Stepping-Stones.pdf. Accessed 7/17/17. 2. PhRMA. Biopharmaceutical Research Industry profile. 2015. phrma-docs.phrma.org/sites/default/files/pdf/2015_phrma_profile.pdf. 7/17/17.



SPENDING ON PRESCRIPTION MEDICINES IS A SMALL SHARE OF TOTAL HEALTHCARE SPENDING



Source: PhRMA. Prescription Medicines: International Costs in Context. 2017. <http://phrma-docs.phrma.org/files/dmfile/PhRMA-International-Costs-in-Context-2017-03-011.pdf>. Accessed 7/20/17

PUTTING SPENDING ON PRESCRIPTION MEDICINES IN PERSPECTIVE ACROSS KEY DEVELOPED MARKETS

	 USA	 Japan	 Germany	 France	 UK	 Italy	 Canada	 Spain
Total Spending on Hospital Care, 2014	\$1,786B	\$271B	\$191B	\$124B	\$117B	\$92B	\$70B	\$73B
Total Spending on Prescription Medicines, 2014	\$277B	\$82B	\$49B	\$34B	\$29B	\$29B	\$22B	\$16B
Ratio (Hospital Care / Prescription Medicines)	6.4	3.3	3.9	3.6	4.0	3.2	3.2	4.6

SPENDING ON
**Prescription
Medicines**



SPENDING ON
Hospital Care

Expenditure on hospital care across countries is

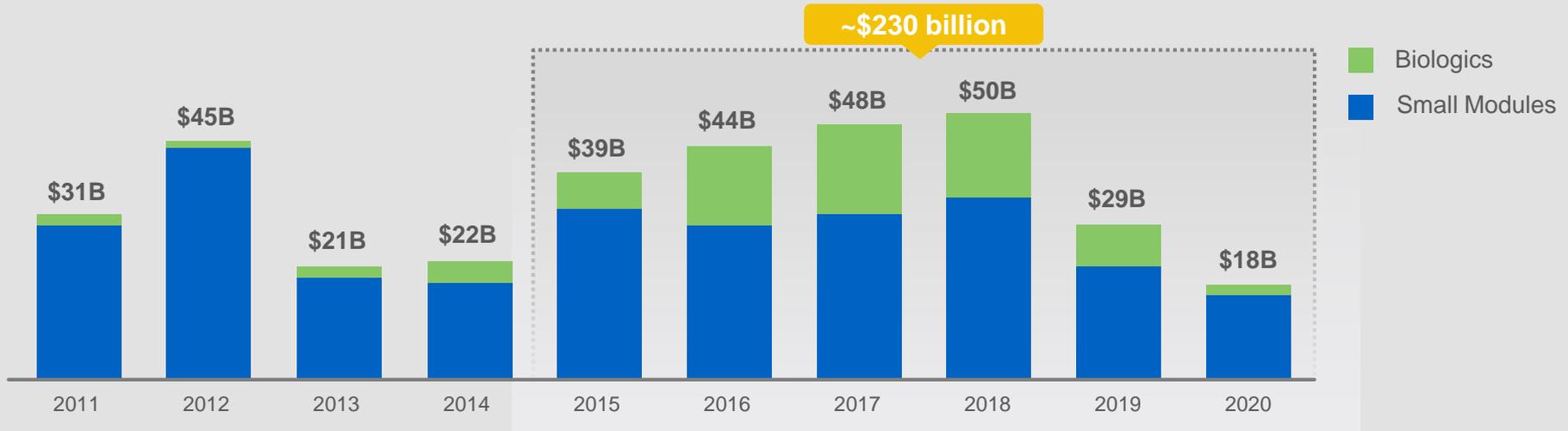
3-6 times the total spending
on prescription medicines

Note: Top seven countries ranked by total healthcare spending in the OECD. Hospital care includes all curative and rehabilitative care. Pharmaceutical spending for Japan is from 2013, the most recent year reported.

Source: PhRMA. Prescription Medicines: International Costs in Context. 2017. <http://phrma-docs.phrma.org/files/dmfile/PhRMA-International-Costs-in-Context-2017-03-011.pdf>. Accessed July 27, 2017

\$230 BILLION OF DEVELOPED MARKET BRAND SALES ARE PROJECTED TO FACE GENERIC COMPETITION FROM 2015 TO 2020

Projections underscore cost savings from the pharmaceutical lifecycle



Note: Pre-expiry spending is the actual and estimated spending in the 12 months prior to loss of exclusivity (LOE) and is shown for developed markets only. Estimates are based on patent expiry dates or expected generic and biosimilar availability, and historic analogues where available. Biologics and small molecules are modeled separately. Biologic brand losses are based on any non-original biologic competitor, regardless of approval type.

Source: IMS Institute. Global Medicines Use in 2020: Outlook and implications. 2015. s3.amazonaws.com/assets.fiercemarkets.net/public/005-LifeSciences/imsglobalreport.pdf. Accessed November, 15, 2016.

DEFINING THE VALUE OF MEDICINE

Amgen Believes the Value of a Medicine Should Reflect:

Ability to Reduce the Suffering from Disease

- Clinical benefits of decreasing symptoms, complications, side-effects of treatments
- Reduction of the toll of the disease on physical and psychosocial well-being, and productivity
- Prolonged length and quality of life
- Impact on a patient's ability to function and lead a normal life
- Improved patient experience and outcomes through better adherence to medicine

Ability to Reduce the Burden of Disease

- Reduction in the overall cost of disease by reducing the use of other healthcare services
- Relieving the burden on caregivers and family
- Innovation in therapy that results in subsequent breakthroughs to further reduce the burden of the disease

Our data is publicly available via congresses, peer-reviewed journals, and our medical information team.

MEDICINES ARE PART OF THE SOLUTION AND MORE CAN BE DONE TOGETHER

Governments, Providers and Payers

Improve Efficiency

Look at all healthcare costs, reduce administrative costs and waste, and improve efficiency

Pay for Value

Support evidence-based care and empowered patients and providers, backed by sound research and quality measures

Find Solutions

Avoid blanket policies that chill investment, and collaborate to find new approaches

Biopharmaceutical Companies

Continue developing innovative therapies, promote medication adherence, and maintain efforts to support broad patient access

