

Societal Benefits from Pharmaceutical Innovation Far Surpass Benefits to Manufacturers

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SUMMARY: We estimated that manufacturers retain 4-16% of total surplus generated during the last two decades by pharmaceutical innovation in the care of three prevalent chronic diseases, while society gets 84-96% of the benefits.

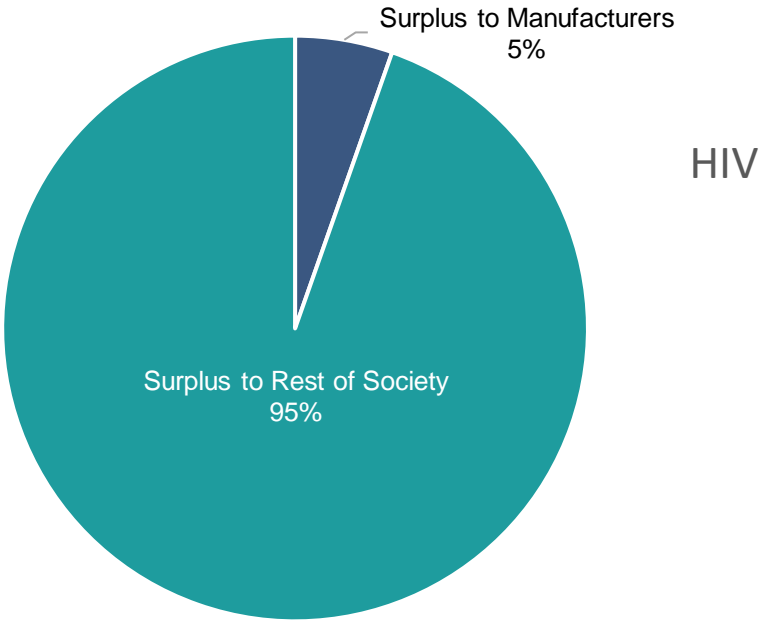
BACKGROUND: The value that the pharmaceutical industry provides to both patients and society is often lost in the public debate surrounding medicine prices. Novel pharmaceuticals improve the lives of millions of Americans by extending lives, improving the quality of life, and allowing patients to continue engaging in their desired activities. Yet, these societal benefits are commonly overlooked.

Previous research has found that in HIV, pharmaceutical manufacturers received only 5% of the benefits arising from new technologies, with the remaining 95% being realized by society in the form of additional life years and improved clinical outcomes.¹ To assess the generalizability of the findings, we analyzed further therapeutic areas that have seen notable advancements in order to quantify the total surplus generated and compared them to producer benefits.

FINDINGS: We estimated the societal and manufacturer surplus generated by pharmaceutical innovations in the last few decades in the areas of HIV, myocardial infarction (MI), and stroke care, and found that society gets 84-96% of the benefit of new therapies. Our results confirm the finding of Philipson and Jena, that between 1990 and 2017 only 5% of the total surplus generated in HIV care was retained by manufacturers ([Figure 1](#)).¹ HIV treatment advances saved 32,481,864 life years since 1990, or an estimated \$3.25 trillion, while total manufacturer surplus during this period was about \$0.18 trillion.

¹ Philipson, Tomas, and Anupam B. Jena. "Who Benefits from New Medical Technologies? Estimates of Consumer and Producer Surpluses for Hiv/Aids Drugs." *NBER Working Paper w11810* (2005).

Figure 1: Surplus appropriation in HIV, 1990-2017



Similar analyses in MI and stroke care highlighted that for every \$100 of surplus generated, only \$4 and \$16, respectively, are kept by manufacturers (Figure 2 and Figure 3). Particularly, the value of total life saved by new MI treatments was \$4.3 trillion with the corresponding manufacturer surplus of \$0.19 trillion. For stroke, these figures were estimated to be \$1.6 trillion and \$0.2 trillion, respectively.

Figure 2: Surplus appropriation in MI care, 1990-2017

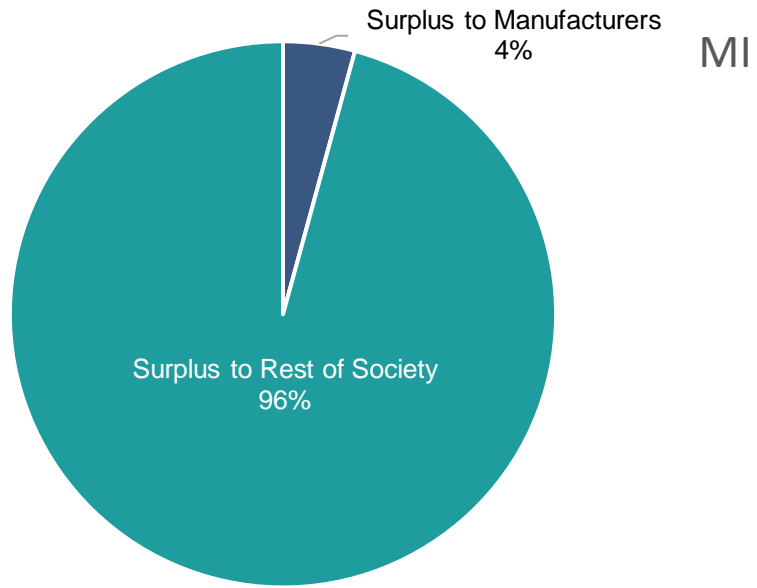
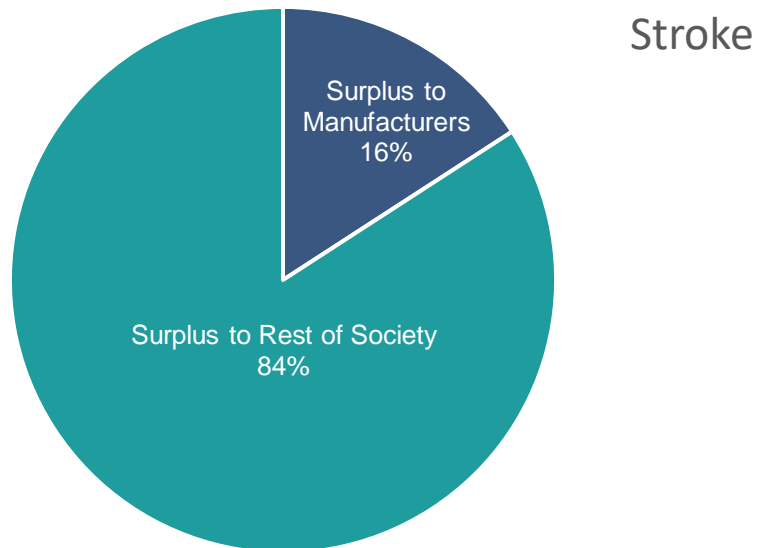


Figure 3: Surplus appropriation in Stroke care, 1990-2017



METHODS: We investigated the surplus generated from pharmaceutical innovations in three common conditions: HIV, MI, and stroke. We estimated the total benefits associated with innovation and divided the total into the revenue to manufacturers and the benefits to society in terms of additional life years lived.

To estimate the total benefits of pharmaceutical innovations, we first identified the prevalence of each condition in 1990, as well as the projected life years lost due to the condition, as reported by the Global Burden of Disease Study.² Dividing the total life years lost by the number of patients, we estimated the average years of life lost for patients with each condition. Over time, as the population with each condition changed, we estimated the expected years of life lost if the per-patient average was held constant. We also identified the actual years of life lost each year as reported in the Global Burden of Disease. The difference between the total expected and total actual years of life lost were deemed total benefit. To monetize these benefits, we multiplied by the total life years gained by a willingness to pay \$100,000 per life year. We then compared this total to the revenues from drug sales within each disease area, as reported by IQVIA³, after adjusting for the manufacturing costs.⁴

To assess the sensitivity of our estimates to model parameters, we varied (i) the value of statistical life year, (ii) the % of clinical benefit attributable to pharmaceutical innovation and (iii) the % of manufacturer revenue covering manufacturing costs. In each of these three scenarios, we recalculated the shares of manufacturer and societal surpluses.

SENSITIVITY ANALYSES: Manufacturers' share of total surplus ranged from 3.7% to 10.2% for HIV (base case = 5.4%), 2.9% to 8.2% for MI (base case = 4.3%) and 11.2% to 27.4% for stroke care (base case = 15.9%) as the value of statistical life year ranged from \$50,000 to \$150,000 (Table 1). If only 50% of improvements in life expectancy is attributed to pharmaceutical innovation, the manufacturers' share of total surplus generated were estimated to be 10.2%, 8.2% and 27.4% for HIV, MI and stroke care, respectively. Finally, as the % of revenue to cover manufacturer's costs varied between 5% - 25%, the manufacturers' share of total surplus ranged from 4.8% to 6% for HIV, 3.8% to 4.7% for MI, and 14.3% to 17.4% for stroke care.

² Global Burden of Disease Project. Global Health Data Exchange. University of Washington. <http://ghdx.healthdata.org/gbd-results-tool>. Accessed 12/1/2020.

³ PhRMA Data on File. Analysis of IQVIA historical prescription sales data.

⁴ Philipson, Tomas, and Anupam B. Jena. "Who Benefits from New Medical Technologies? Estimates of Consumer and Producer Surpluses for Hiv/Aids Drugs." *NBER Working Paper w11810* (2005).

Table 1: Sensitivity Analyses: Proportion of Benefits Retained by Manufacturers

	Value of a statistical life year			% of benefits attributable to pharmaceutical			% of manufacturer revenue covering costs		
	Base case	SA	SA	Base case	SA	SA	Base case	SA	SA
	\$100,000	\$50,000	\$150,000	100%	50%	75%	15%	5%	25%
HIV	5.4%	10.2%	3.7%	5.4%	10.2%	7.0%	5.4%	6.0%	4.8%
MI	4.3%	8.2%	2.9%	4.3%	8.2%	5.6%	4.3%	4.7%	3.8%
Stroke	15.9%	27.4%	11.2%	15.9%	27.4%	20.1%	15.9%	17.4%	14.3%

MI, myocardial infarction; SA, sensitivity analysis.

LIMITATIONS: Despite efforts to use the best available data in conducting this analysis, limitations exist. The increase in life expectancy attributable to pharmaceutical innovations, as opposed to behavioral or other changes, is uncertain. However, sensitivity analyses suggest that even if pharmaceuticals are only responsible for half the gains, the benefits to patients still far surpass the benefits retained by manufacturers. Moreover, in our analysis we only considered the value of extended life and did not attempt to measure the value that new treatments bring in terms of improved quality of life, productivity for patients, insurance for people at risk, and scientific spillovers.⁵ This conservative assumption would lead to an overestimate of proportion of benefits retained by manufacturers.

CONCLUSIONS: This analysis confirms earlier work within HIV, and shows that the findings that society has substantial gains from pharmaceutical interventions far surpassing the gains to manufacturers, extends to two other common conditions as well. When considering drug spending, the values such innovations bring to patients should not be underestimated.

⁵ Lakdawalla, Darius N., et al. "Defining elements of value in health care—a health economics approach: an ISPOR Special Task Force report [3]." *Value in Health* 21.2 (2018): 131-139.