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Center for Integration of Science and Industry

Comparing the social and private value created by pembrolizumab 2018-2022

HPR57

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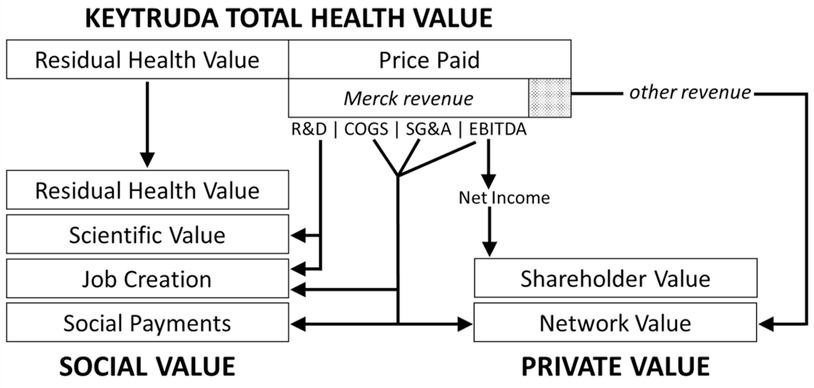
Summary. **Keytruda (pembrolizumab)** is approved for treating several forms of cancer and **has become the world's best-selling drug generating >$100 billion sales for Merck & Co., Inc. since approval in 2014 with expectations for $31 billion sales in 2025.** Pembrolizumab was developed by Merck based on $2.9 billion in NIH funding for related basic or applied research. Despite substantial health benefits provided by the drug, Merck faces criticism and congressional inquiry for its pricing[1] and patent[2] strategies that delay the introduction of more affordable biosimilar products. **This work assesses the value created through commercialization of pembrolizumab for both industry (private value) and for society (social value) using an accounting-based model of value creation. We argue that both public and private investments in new drugs require appropriate returns on investment.**

Accounting for social and private value.

Our model posits that the value created by a drug is the health value provided to those who use the product ("total health value") that is distributed between social and private sectors through the price and use of the associated revenues.



The model treats "residual health value" (net price paid, analogous to surplus) as the operable measure of social value along with R&D spending, job creation, and payments to public sector institutions. Private value includes shareholder value and payment to other private firms (network value).

Total health value

is estimated as the health benefit accruing to individuals using the drug (in QALYs), number of users, and the willingness-to-pay (WTP) for one year of healthy life (WTP/QALY). **This report considers the value created for US patients using pembrolizumab from 2018-22** using a WTP/QALY of $104K (US average). Residual health value is total health value minus price paid (from IQVIA/NSP) reflecting the negative impact of high prices on social determinants of health.

Pembrolizumab Users	843,062
QALYs gained/person	1.15
WTP/QALY	$104K
Total Health Value	$100.8
Pembrolizumab Sales	$49.0
Residual Health Value	$51.9

Merck's financial data

are from Compustat with pembrolizumab sales obtained from 10-K filings. The fraction of expenses attributable to pembrolizumab revenues in each fiscal year was inferred by polynomial regression of the association between revenue and expenses in 143 companies with drug sales.

Financial Metrics (2018-22)	Merck (Compustat)	Fraction from pembrolizumab*
Revenue	$220.7	$21.0
Expense Related Metrics		
Cost of Goods Sold	$47.0	$5.6
Depreciation and Amortization	$16.3	$2.0
Income Taxes	$8.5	$0.76
R&D Expense (without RDIP)	$51.2	$2.9
SG&A Expense (recalculated)	$41.1	$6.2
Other Metrics		
Change Market Capitalization	$43.9	$14.0
Dividends	$28.2	$2.3
Stock Buybacks	$15.1	$0.76
Employees *(thousands)*	351	42.2

*includes estimated rebates from Merck's Pricing Action Transparency Report.

Social and private value created by pembrolizumab.

Pembrolizumab sales generated 969,450 QALYs of health benefit and a total health value of $100.8 billion from 2018-22. This total was distributed between $61.4 billion of social value and $52.9 billion of private value.

Components of Value	Social Value	Private Value
Total Health Value	$100.8	
Residual Health Value	$51.9	
Scientific Value	$2.9	
Job Creation	$5.8	
Social Payments	$0.8	
Shareholder Value		$15.9
Network Value		$37.0
TOTAL	$61.4	$52.9

USD (billions) and inflation-adjusted to 2016.

Conclusion.

This study describes a balance between the social and private value created through commercialization of pembrolizumab 2018-22. While results do not obviate concerns regarding the availability or affordability, the totals could be applied to calculate social and private returns on R&D investments in this product and should be considered in assessing a "maximum fair price" for pembrolizumab under the Inflation Reduction Act.

Policy implications.

Commercialization of innovative drugs developed from government-funded basic or applied science is intended to provide both social and private (economic) benefits. Drug price alters the balance of value creation and needs to be considered for equitable balance.[3]

References:
1. "Senators Warren, Sanders, Representatives Jayapal and Porter Urge USPTO to Scrutinize Merck's Abuse of Patent Applications for Cancer Drug Keytruda." (press release) 2023.
2. "Overpatented, Overpriced Keytruda's Patent Wall." (I-MAK Policy analysis). 2021.
3. "How Should the Government Negotiate Medicare Drug Prices? A Guide for the Perplexed." Fred Ledley, Institute for New Economic Thinking. March 4, 2024
Note: QALY data obtained from "Cost-effectiveness Analysis (CEA) Registry," Center for Evaluation of Value and Risk, Tufts. (accessed October 2021).

The Center for Integration of Science and Industry is funded by a grant from the National Biomedical Research Foundation