

R&D cost of cancer medicines: How does it compare with sales income?

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Disclaimer in the article



The conclusions in the article are the authors' as individuals and do not represent the World Health Organization Policy

About the study

Resolution WHA70.12 requested a technical report

On pricing approaches and their impact on availability and affordability of cancer medicines



ACCESS TO MEDICINES, VACCINES AND PHARMACEUTICALS

TECHNICAL REPORT

Pricing of cancer medicines and its impacts

A comprehensive technical report for the World Health Assembly Resolution 70.12 Operative paragraph 2.9 on pricing approaches and their impacts on availability and affordability of medicines for the prevention and treatment of cancer ... the relationship between inputs throughout the value chain and price setting



Network Open.

Original Investigation | Health Policy

Comparison of Sales Income and Research and Development Costs for FDA-Approved Cancer Drugs Sold by Originator Drug Companies NUTRYTECHTC. Adde Basel. No. Supervise. HEL. PTO

Abstract

IMPORTANCE High costs and risks of research and development (R&D) have been used to justify the high prices of cancer drugs. However, what the return on R&D investment is, and by extension what a justifiable price might be, is unclear.

OBJECTIVE To compare incomes from the sales of cancer drugs with the estimated R&D costs.

EXEGUATION, AND INIT COMMITS This characterized insulty and global phermatenetical indexprovements of the second start terms and presented from the site of career doing to indexprove the that have held patterns or marking gipting longitudes compareds. All career doing segment by hevel LSC and and Day administration from 1988 to 2010 were listed from them Used Starter food and Day Administration without and Hamman. Itemated product submit the Used Starter food and Day Administration without and Hamman. Itemated product submit day material product systems, additional data was cought from other public neuroses, or when encessary attimuted values from thom reported values (or gave need-staft effort wave mining data for half or more of the years sites approval. Data analysis was conducted from May 2018 to 2004br 2018.

MAIN OUTCOMES AND MEASURES Sales data were expressed in 2017 US dollars with adjustments for inflation. Cumulative incomes from the sales of these drugs were compared against the R&D costs estimated in the literature, which had been adjusted for the costs of capital and trial failure (risk adjusted).

RESULTS C104 to EU.57 cod and Drug Administration-approval carver drug isterifield, 20 drugs (EU.53) but data for server shart lift of the years integraphical period and period period and period. There was a median of D years (maps, 128) years of raise data with 1040 data points. 70 CHI of which was estimated, compared with the tast and Audoted 800 cod 71 John millon (maps, 2322) 2511 million) per medicine settimated in the literature, by the word of 2010; the modulin (high more the manual compared have the tast and the data points. 70 John of the high more the manual more than the settime, by the word of 2010; the moduline 2010; the more than the manual period of 2010; the settime of the settime period of the 2010; the more the manual provide line adjusted for the data points. The 2010 period of adjust 122 CHI and the settime period of 2010; the moduline and year (maps) 210 years n = 50. Cancer drugs continued to pannerate billion doils met turn for the originator

CONCLUSIONS AND RELEVANCE Cancer drugs, through high prices, have generated returns for the originator companies far in excess of possible RBD costs. Lowering prices of cancer drugs and facilitating greater competition are essential for improving patient access, health system's financial sustainability, and future innovation.

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Key Points

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Question How does income from the sales of carcer drugs compare with the costs of research and development? Findings in this observational study of 90 cancer drugs approved by the FDA from 1899 to 2017, the makini income return by the end of 2017 wars (fand) to be \$45.50 (arage, \$3.30.55510) for every \$1 research and development sponding. Many drugs, particularly biologics, continues to generate high calcular marking rights.

Meaning Cancer drugs, through high prices, have generated incomes for the companies far in excess of research and development costs, lowering prices of cancer drugs and facilitating greater competition are essential for improving patient access, health system's finundial sustainability, and future innovation.

 Supplemental content
Author affiliations and article information are listed at the end of this article.

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Rationale and study objective

High costs and high risks of R&D have been presented to justify high medicine prices

Stakeholders have noted "generous" profit for some medicines

- e.g. imatinib, enzalutamide
- Assessments were not comprehensive only showing "successful drugs are successful"

Estimated R&D costs are highly variable: \$100-150m to \$4-6bn

- Needs to cover for the risks of failure
- Needs to cover for the costs of capital
- Different (and non-transparent) methodologies

🧭 Study objective

To systematically compare sales incomes of cancer drugs approved by FDA with the R&D costs

Method (1)



Observational study: Reported sales income of individual cancer medicines compared to the estimated overall R&D costs reported in the literature

Scope: Medicines approved by FDA (1989-2017) for any cancer-related indications

Sales income to the end of 2017: Net of rebates and discounts but not expenses & taxes

Data

Sources: sales data from originator companies' consolidated financial reports; risk-adjusted R&D cost from Prasad and Mailankody (2017)

Missing data: growth rates, other sources, or estimated from known reported values if required

Exclusion: Medicines with missing data for than half or more of the years since approval



Analysis

Standardization: All data expressed in 2017 US dollars with adjustments for inflation

Descriptive statistics: Average and cumulative sales incomes, and return-on-investment (ROI)

Uncertainty & assumptions

Non-cancer indications: No adjustment for data if not disaggregated

Three sensitivity analyses

- Indication extension: Incorporated costs of up to 5 post-approval Phase I-III trials
- **Excluded medicines**: Incorporated R&D costs with accrual of \$0 revenue
- Higher than average R&D costs: 2 x base-case R&D cost estimates (\$1.6b; \$438m-\$5.6b)



Sales incomes greatly exceeded R&D costs



Sales income by 2017

Average income/yr since approval: \$3m to \$5.9b

% 'blockbuster' drugs: 33.3%

Nr with total income \geq \$50 bn: 5

Revenue ROI

Base case: \$14.50 (\$3.30-\$55.10)

Time to cover max R&D costs (2.8b) 5 years (2-10 yrs) R&D costs x2: \$6.70 (\$1.20-\$27.10)

Costs but no accrual of revenue for excluded meds: \$8.80 (\$1.70-\$34.40)



High prices of medicines are impacting all countries alike

Access to cancer medicines globally remain low

Low availability

- Countries with lower national income had lower availability of cancer medicines
- Low availability of essential medicine list cancer medicines in LMIC and LIC

High out-of-pocket payments

• When available, prices are higher than deemed affordable

Impairing the sustainability of health systems

Growing number of unaffordable medicines with annual costs at least in the tens of thousands

Expenditure impact: exclude patients from coverage, restrict access, impose high out of pocket

Can 'value' justify the prices & returns of cancer drugs?

Treatment with some cancer medicines clearly leads to substantial improvements in health outcomes

Imatinib, trastuzumab, rituximab

Inadequate evidence base

Only one-third of FDA approved cancer medicines (2008-2012) showed prolonged overall survival

Modest survival gains for drugs that improved survival

Progression-free survival = 2.5 months Overall survival gains = 2.1 months

Many drugs have safety concerns

Risk of 'toxic death' and treatment discontinuation were greater for newer targeted drugs

"No value in a medicine that is too expensive and sits on the shelf."

Supernormal returns may distort investment

Seemingly higher risks

Lower probability of success 12.1% (nononcology) vs 6.7% (oncology)

Higher costs: e.g. for pivotal trials US\$ 45.4m (oncology) vs US\$8.8-29.4m (non-onco ex CVD)





Inefficiency and "me-too mentality"

"Enormous redundancy in these studies [on checkpoint immunetherapeutics], as many pharmaceutical companies perform similar trials with comparable drugs" (Workman 2017)



"Trial redundancy [in oncology] is blatantly evident..... quite often these trials do not arrive at the same conclusion or fail to provide a definitive, practice-changing outcome" (Hutchinson 2015)



Returns are far in excess of possible R&D costs

C Cancer drugs, through their high prices, have generated substantial financial returns for the originator companies

Existing approaches to managing the prices of cancer medicines have not resulted in outcomes that meet health and economic objectives



Lowering drug prices through competition and regulations