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

21 March 2019

Dr Kiu Tay-Teo, WHO, Essential Medicines and Health Products

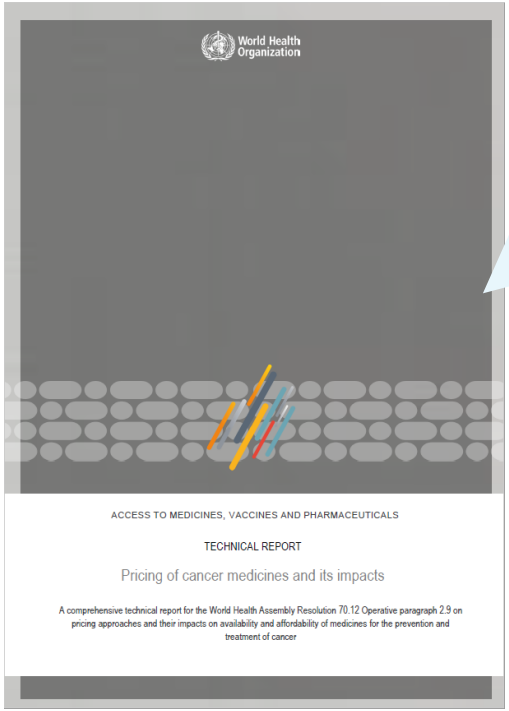
Disclaimer in the article

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



… the relationship between inputs throughout the value chain and price setting

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)

Design

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

Method (2)

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

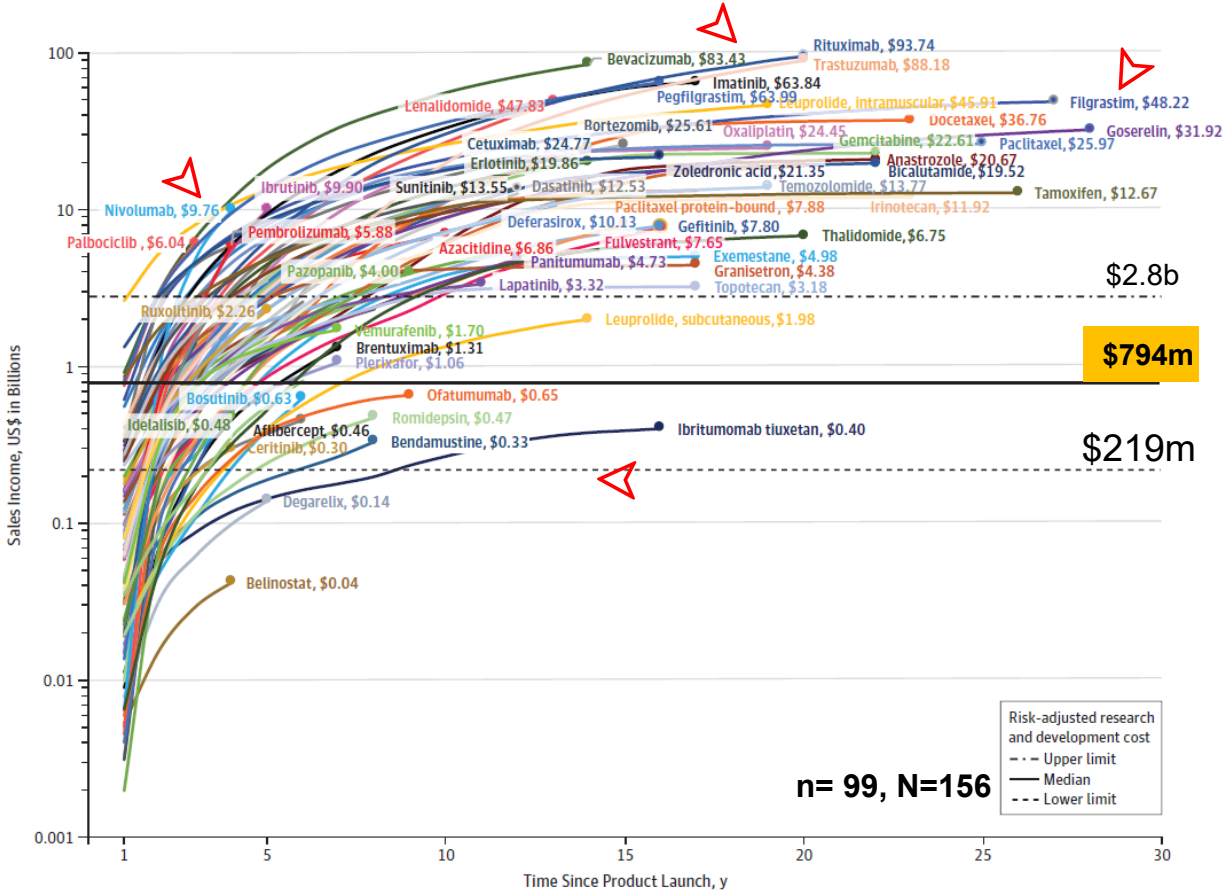
Non-cancer indications: No adjustment for data if not disaggregated

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)

Findings

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 ≥$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)

Discussion

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.”

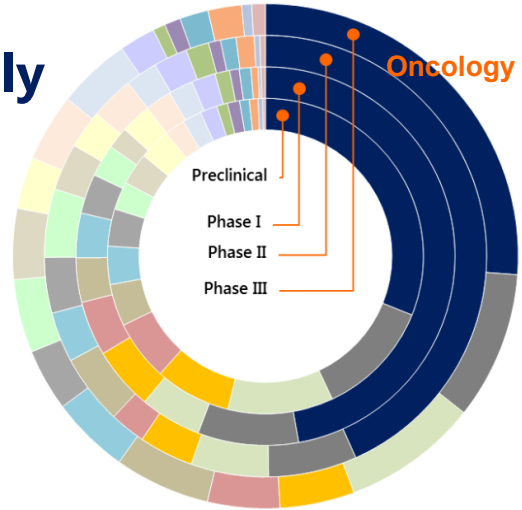
Supernormal returns may distort investment

Seemingly higher risks

Lower probability of success 12.1% (non-oncology) 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)

But significantly higher level of investment



Inefficiency and "me-too mentality"

"Enormous redundancy in these studies [on checkpoint immune-therapeutics], 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)

Conclusions

Returns are far in excess of possible R&D costs

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