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Original Article

Trends in Drug Revenue Among Major Pharmaceutical Companies: A 2010-2019 Cohort Study

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BACKGROUND: Over the past 2 decades there has been a substantial increase in the number of new cancer medicines; this has been accompanied by a dramatic rise in drug costs. It is unknown how these trends impact the revenue of the pharmaceutical sector. **METHODS:** Retrospective cohort study to characterize temporal trends of revenue generated from cancer medicines as a proportion of total drug revenue among 10 large pharmaceutical companies from 2010 to 2019. Itemized product-sales data publicly available through company websites or annual filings were used to identify annual drug revenue. Revenue data were adjusted for inflation and converted to 2019 US dollars. **RESULTS:** During the study period, cumulative annual revenue generated from cancer drugs increased by 70%: from $55.8 billion to $95.1 billion, while cumulative revenue from nononcology drugs decreased 18%: from $342.2 billion to $281.5 billion. The proportion of total drug revenue generated from oncology drugs increased substantially over the study period: from 14% in 2010 to 25% in 2019 ($\tau = 1.0$, $P < .001$). **CONCLUSIONS:** Among 10 of the world's largest pharmaceutical companies, revenues generated from the sale of cancer drugs have increased by 70% over the past decade, while revenues from other medicines have decreased by 18%. Revenues from cancer drugs now account for one-quarter of the net revenues from these companies. Further work is needed to understand if this increase in sales revenue reflects industry profit, and to what extent increased spending has translated into improvements in patient and population outcomes. ***Cancer* 2022;128:311-316**. © *2021 American Cancer Society*.

KEYWORDS: cancer economics, cancer policy, drug revenue, financial toxicity, health services research, health spending.

INTRODUCTION

In the early years of the 21st century, the pharmaceutical industry had cause for concern. Several blockbuster drugs, including those for gastroesophageal reflux disease and hypertension, would soon come off patent protection.[1] Around that time, the industry moved its research and development focus from medicines that would be widely prescribed to "niche" precision medicines with smaller patient populations, including cancer.[2] The financial impact of the decrease in breadth could only be offset by rising drug prices.[3]

Since 2010, there has been approximately 70% growth in the number of clinical trials within oncology.[4] Cancer drugs now account for approximately 27% of new drug approvals in the United States compared to 4% in the 1980s.[5] During this period, there has also been a substantial increase in the price of cancer medicines.[6,7] We are not aware of any studies that explore the extent to which these trends have impacted industry revenue for cancer and noncancer medicines. Most research has tended to focus on the industry in generic terms around financing and sustainability in terms of business models (ie, share buyback), rather than exploring revenues in terms of therapeutic areas. To address this gap in knowledge, we undertook a retrospective cohort study to understand temporal trends in revenue of the world's major pharmaceutical companies.

MATERIALS AND METHODS

This retrospective cohort study describes trends in net annual revenue from 2010 to 2019 for the 10 pharmaceutical companies with the highest annual revenue in 2010.[8] We used consolidated annual financial reports from the websites of each company or annual filings with the US Securities and Exchange Commission (ie, 10-K/20-F forms). We extracted annual data for net revenue from the pharmaceutical segment and itemized sales data for drugs falling within the oncology portfolio of each company's annual reports. These two data points were used to estimate the amount of annual nononcology

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drug revenue. If unavailable as an aggregate, individual cancer medicines were defined as those with a Food and Drug Administration (FDA)-approved indication for the treatment of hematological or solid-tumor cancers, as well as those used in oncology supportive care. All sales data were converted to US dollars based on the corresponding annual exchange rates, then adjusted to a 2019 value based on worldwide inflation in consumer prices.[9] Revenues generated from company segments devoted to consumer health products, nutraceuticals, nonhuman health products, medical devices, and diagnostic tools were excluded.

The data were captured by a single author (D.E.M.). For each company, 1 year was selected using a random number generator from 10 to 19, and both total and oncology-specific revenues were recorded. As such n = 20 data points or 10% of the total sample was collected in duplicate by a second author (K.W.) to ensure data quality.

The primary results are presented as descriptive data. Trends in the percentage of company sales accounted for by cancer drugs were assessed with the Kendall-Mann test. *P* values were adjusted for multiple hypotheses testing using the Benjamini-Hochberg method; values <.05 were considered statistically significant. Analyses were performed using R version 4.0.0.[10] The initial study data were captured between November 15, 2020 and December 30, 2020 with additional data collection in July 2021 after editorial review. Institutional review board approval was not required because all data were obtained from publicly available records and did not include individual-level information.

RESULTS

Among the study cohort, cumulative annual revenue from cancer medicines increased by 70%: from $55.8 billion in 2010 to $95.1 billion in 2019 (Fig. 1). During the same period, the cumulative revenue from nononcology medicines decreased 18%: from $342.2 billion to $281.5 billion, and net revenues decreased by 5%: from $397.9 billion to $376.6 billion. The proportion of total revenue from cancer medicines grew significantly over the study period, from 14% in 2010 to 25% in 2019 ($\tau = 1.0$, $P < .001$; Table 1).

The majority of oncology revenue growth occurred between 2015 and 2019 (57% increase, from $60.7 billion to $95.1 billion). During this same period, nononcology revenues remained stagnant (mean $282.1 billion); however, total revenues grew by 11%: from $340.0 billion to $376.6 billion.

Of the 10 companies included in the analysis, 5 saw significant upward trends in the proportion of revenue generated by cancer drugs between 2010 and 2019 (Table 1). During the study period, Roche had both the highest net revenue: 23.9 billion in 2010 and $27.7 billion in 2019 and the highest proportion of revenue: 57% in 2010 and 2019, from cancer drugs among all companies. Merck had substantial growth in revenue from 2016: $2.4 billion cancer sales (6% of total revenue) to 2019: $12.3 billion (30% of total revenue)—driven largely by their drug Pembrolizumab, which generated $11.1 billion in 2019—12% of total oncology revenue and 3% of all drug revenue.

DISCUSSION

In the context of rising costs of cancer drugs and the greater proportion of regulatory approvals received by these agents, we sought to characterize trends in cancer drug revenue over the past decade in contrast to noncancer drugs among 10 of the largest biopharmaceutical companies. Despite fears a decade ago that the fall of blockbuster medications would lead to an erosion in global sales, we found the pharmaceutical industry has largely preserved revenue—possibly because of increased development, regulatory approval, and sale of cancer drugs. Although targeted for smaller markets, the lofty price of these medications has likely closed the gap. We found that the proportion of total net revenue accounted for by cancer medicines has grown significantly among the 10 companies of interest: from 14% in 2010 to 25% in 2019, representing a growth in excess of $40 billion, a 70% relative increase. The growth in revenues generated from cancer drugs is in stark contrast to noncancer medicines, which decreased by 18% over the same period. Although net revenues were 5% less in 2019 than in 2010, the net revenue between 2015 and 2019 actually increased by 11%. This period of net growth was highlighted by a 57% increase in oncology revenues, while revenues from noncancer medicines remained stagnant.

In light of these findings, it is worth considering who benefits. From an industry perspective, as we only captured data on revenue, we are unable to make conclusions about whether increased revenues among cancer drugs contribute to increased profitability of each company, although it is highly likely to be the case. Recent data suggest median earnings for pharmaceutical companies are nearly double that of nonpharmaceutical companies.[11] It is also known that temporal increases in cancer drug costs outpace inflation,[12] and although research

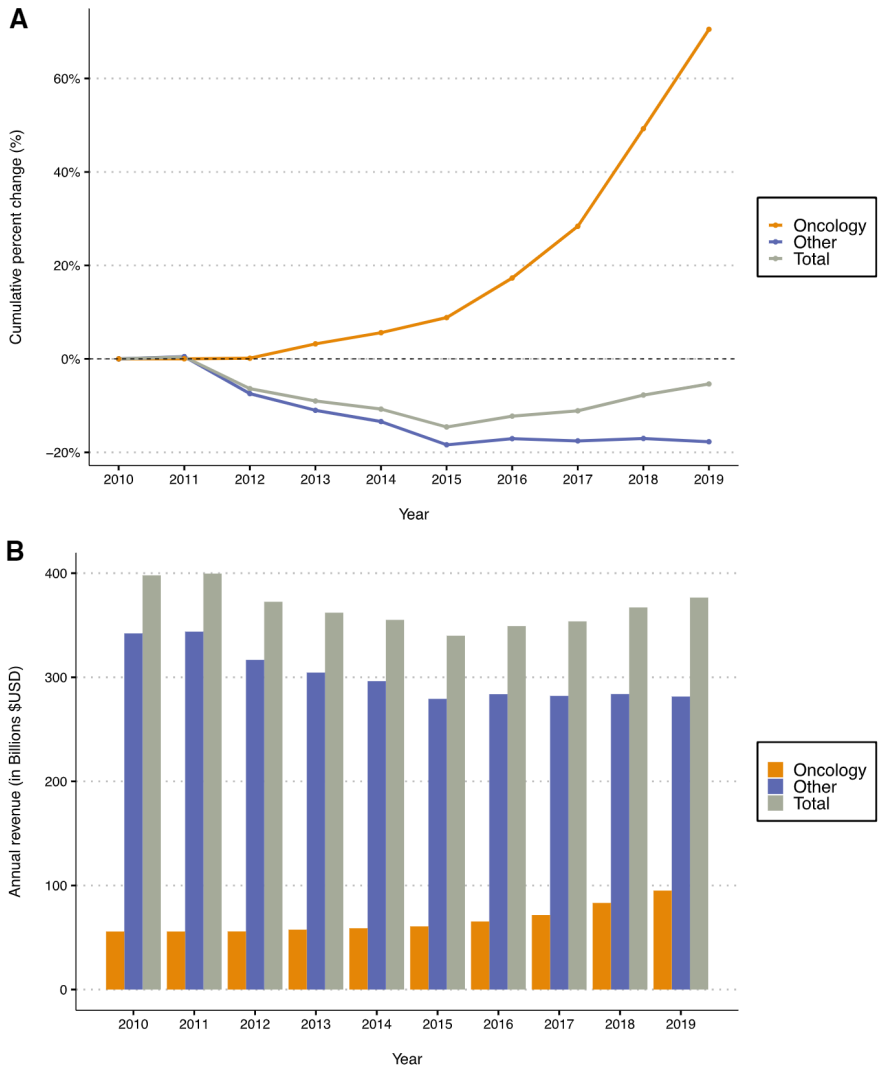

Figure 1. Trends in net revenue from cancer and noncancer drugs from 10 pharmaceutical companies between 2010 and 2019. (A) Relative change. (B) Absolute change.

and development (R&D) costs have been used to justify the high prices of cancer drugs, data would suggest that companies earn $15 for every $1 spent on R&D.[13] Finally, the House Committee on Oversight and Reform recently released a report that suggested leading drug companies spent $56 billion more on stock buybacks and dividends than they did on R&D.[14] Taken together, these data support the notion that industry prioritizes the financial interests of shareholders and that the rising cost of cancer medicines cannot be justified by upstream R&D costs.

From a patient/societal perspective, 2021 data from the American Cancer Society suggest an average annual decline of 1.7% in cancer-related mortality over the past decade.[15] Although encouraging, the decline is largely driven by lung cancer mortality that may primarily reflect changes in smoking habits. Although there have been a handful of new cancer medicines that have radically changed outcomes for patients, data from US,[16] European,[17] and Canadian[18] health systems suggest that, on average, the benefits are modest. Unfortunately, there are limited data describing the longitudinal impact of cancer drug development on population mortality rates; these data would be crucial to make conclusions about whether the implied financial benefit seen by industry is justified by net societal benefit.[7] However, there is a notion within biomedicine that rising corporate profitability may not translate into proportional societal gains.[19] This

TABLE 1. Trends in Total Revenue (US$ Billions), Revenue From Cancer Medicines (US$ Billions), and the Proportion of Revenue From Cancer Medicines Among 10 Pharmaceutical Companies Between 2010 and 2019

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	τ	*P*
AbbVie[a]												
Total	18.3	19.8	20.5	20.6	21.6	24.7	27.3	29.4	33.3	33.3		
Oncology	0.0	0.0	0.0	0.0	0.0	0.8	2.0	2.8	4.0	5.5		
% Oncology	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	7.2%	9.6%	12.0%	16.4%	0.88	.002
AstraZeneca												
Total	39.0	38.2	31.1	28.2	28.2	26.7	24.5	23.4	22.5	24.4		
Oncology	4.7	4.2	3.9	3.5	3.3	3.0	3.6	4.2	6.1	8.7		
% Oncology	12.2%	11.0%	12.5%	12.4%	11.6%	11.4%	14.7%	17.9%	27.3%	35.5%	0.60	.03
Eli Lilly												
Total	25.4	25.7	22.9	23.0	18.6	18.1	19.2	20.6	21.8	22.3		
Oncology	4.4	3.8	3.7	3.6	3.7	3.8	4.0	4.0	4.3	4.6		
% Oncology	17.3%	14.7%	16.0%	15.6%	19.6%	20.9%	20.6%	19.3%	19.9%	20.7%	0.51	.07
GSK[b]												
Total	42.4	40.5	37.6	36.6	33.2	29.4	29.9	30.2	31.5	31.6		
Oncology	1.2	1.3	1.4	1.7	2.1	0.4	0.2	0.0	0.0	0.3		
% Oncology	2.9%	3.1%	3.7%	4.5%	6.4%	1.4%	0.8%	0.0%	0.0%	0.9%	−0.4	.14
J & J												
Total	26.3	27.7	28.2	30.9	34.9	33.9	35.6	37.8	41.5	42.2		
Oncology	1.7	2.3	2.9	4.1	4.8	5.1	6.2	7.6	10.0	10.7		
% Oncology	6.5%	8.4%	10.4%	13.4%	13.8%	14.9%	17.4%	20.0%	24.2%	25.3%	1.0	<.001
Merck												
Total	46.7	46.9	45.2	41.1	38.9	37.5	37.4	36.9	38.4	41.8		
Oncology	2.3	1.8	1.6	1.3	1.0	1.5	2.4	4.8	8.4	12.3		
% Oncology	4.9%	3.7%	3.5%	3.2%	2.7%	4.1%	6.4%	13.1%	21.9%	29.5%	0.51	.07
Novartis												
Total	45.8	47.7	45.5	45.4	46.3	42.7	45.5	44.9	45.6	47.4		
Oncology	11.8	12.1	12.2	12.3	12.6	14.5	13.6	12.8	13.7	14.4		
% Oncology	25.7%	25.4%	26.7%	27.1%	27.3%	34.0%	29.9%	28.5%	30.0%	30.3%	0.73	.01
Pfizer												
Total	68.6	65.6	57.0	52.5	49.4	48.1	51.4	51.1	50.9	49.7		
Oncology	1.7	1.5	1.5	2.2	2.4	3.2	4.9	6.3	7.6	9.0		
% Oncology	2.4%	2.3%	2.6%	4.1%	4.9%	6.6%	9.5%	12.4%	14.9%	18.2%	0.96	<.001
Roche												
Total	41.6	42.1	41.8	43.0	43.3	41.8	42.3	43.7	45.8	48.8		
Oncology	23.9	24.6	25.3	26.7	26.9	26.5	26.9	27.3	27.2	27.7		
% Oncology	57.3%	58.6%	60.6%	62.1%	62.1%	63.4%	63.5%	62.5%	59.6%	56.8%	0.24	.37
Sanofi												
Total	43.8	45.4	42.6	40.8	40.7	37.2	36.0	35.6	35.9	35.2		
Oncology	4.1	4.2	3.4	2.1	2.0	1.8	1.7	1.8	1.8	1.9		
% Oncology	9.3%	9.2%	8.0%	5.2%	4.9%	4.8%	4.8%	5.0%	5.0%	5.4%	−0.47	.09
Net revenue												
Total	397.9	399.6	372.6	362.1	355.2	340.0	349.2	353.7	367.1	376.6		
Oncology	55.8	55.8	55.8	57.5	58.9	60.7	65.4	71.6	83.2	95.1		
% Oncology	14.0%	14.0%	15.0%	15.9%	16.6%	17.9%	18.7%	20.2%	22.7%	25.2%	1.0	<.001

Abbreviations: GSK, GlaxoSmithKline; J & J, Johnson & Johnson.
[a]AbbVie originated as a spinoff company of Abbott Laboratories in 2013. Sales prior to this time were under the Abbott Laboratories umbrella.
[b]GSK sold its oncology portfolio to Novartis in 2014.

is indirectly supported by data within oncology by Saluja and colleagues who have found a rising cost in novel cancer drugs without a proportional increase in clinical benefit.[6] We hope that the abundance of new cancer drugs have improved patient- and population-level outcomes over the past decade; however, there is surprisingly little data to support this notion.

Our study has important limitations. First, because we used data from 10 companies, these data may not be representative of the entire biopharmaceutical industry. Second, itemized sales data were not available for every company in each year studied. Therefore, cancer drugs with smaller relative contributions to overall revenue totals may not have been captured as part of the oncology revenues if the company did not predefine revenue streams by class of drugs. Third, although the US market accounts for nearly 50% of global oncology drug revenues,[20] our data do not differentiate reported revenues by geographic region and thus cannot be used to inform country-specific policy. Fourth, as our data were derived from a manual review of financial statements, it is possible that the exact proportions of cancer/noncancer revenue differ slightly from actual sales figures. However, among the 10% of data points (n = 20) that were captured in duplicate, we identified identical results for 85% (17/20) and small differences in the remaining 3 data points (2%, 5%, and 10% discordance).

In conclusion, among 10 of the world's largest pharmaceutical companies, revenues generated from the sale of cancer drugs have increased by 70% over the past decade, while revenues from other medicines have decreased by 18%. Revenues from cancer drugs accounted for 25% of the net revenues generated in 2019, up from 14% in 2010. With the cost of cancer drugs rapidly rising, further work is needed to understand how this increase in sales revenue reflects industry profit, and how this is linked (or not) to improvements in patient and population outcomes.

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CONFLICT OF INTEREST DISCLOSURES

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AUTHOR CONTRIBUTIONS

Daniel E. Meyers: Conceptualization, data curation, investigation, methodology, visualization, and writing–original draft. **Benjamin S. Meyers:** Data curation, formal analysis, investigation, methodology, visualization, and writing–review and editing. **Timothy M. Chisamore:** Formal analysis, methodology, visualization, and writing–review and editing. **Kristin Wright:** Data curation, investigation, validation, and writing–review and editing. **Bishal Gyawali:** Project administration, and writing–review and editing. **Vinay Prasad:** Project administration, conceptualization, and writing–review and editing. **Richard Sullivan:** Project administration, and writing–review and editing. **Christopher M. Booth:** Conceptualization, methodology, project administration, supervision, and writing–review and editing.

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