



› Investigative Report

# The Pharmaceutical Triple Aim

Higher Medication Adherence Increases Revenue and EPS for Pharma, Improves Patient Outcomes and Lowers Healthcare Costs

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# Executive Summary

**E**very year, pharmaceutical companies lose \$637 billion in revenue due to medication non-adherence. This tremendous loss of revenue represents the business world's largest last-mile problem. After investing heavily in bringing a drug to market, and then investing even more in getting scripts for that drug written, pharmaceutical companies largely ignore the drug's end user – the patient. Taking a strategic, enterprise approach to patient support with a focus on medication adherence can give pharmaceutical companies an immediate and unparalleled opportunity to increase revenue and earnings per share (EPS), while improving outcomes and reducing the overall cost of healthcare.

Research undertaken by Credit Suisse in March 2018 that was based on relatively conservative assumptions found that increased adherence at the enterprise level could materially increase revenue and EPS for all seven large-cap pharmaceutical companies that it looked at, annually from 2020–2026. In Fall 2018, HealthPrize Technologies partnered with CEEK Enterprises to extend the analysis to an additional 14 pharmaceutical companies, and consistent with the analysis undertaken by Credit Suisse, found a positive impact on revenue and EPS for each company analyzed.

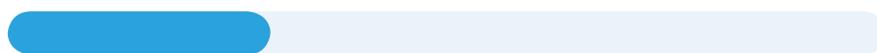
For pharmaceutical executives and boards concerned with achieving sustainable financial growth, keeping healthcare costs in check, and improving patient outcomes, adherence can no longer be ignored as an enterprise and societal value driver.

## > Adherence Is a Problem with Significant Implications

Pharmaceutical companies lose hundreds of billions of dollars every year due to one of the most serious problems in healthcare: medication non-adherence.



Up to 30% of prescriptions are never filled.



Thereafter, 20 – 80% of patients diagnosed with a chronic condition who do fill their first script stop taking their medications within the first year. Every prescription that isn't filled represents lost revenue for the pharmaceutical industry and a lost chance for the patient to receive the health benefits of the medication.

The financial impact of this non-adherence is far from trivial. According to a report by Capgemini and HealthPrize Technologies conducted in 2016, medication non-adherence costs the pharmaceutical industry \$637 billion in lost revenue each year worldwide, and \$250 billion in the U.S. alone.

**If adherence to drugs for chronic diseases were improved, pharmaceutical companies would make a potential additional \$637 billion dollars a year, which can have a significant impact on earnings per share (EPS) growth, while contributing to improved patient outcomes.**

# ➤ Adherence Is a Key Component in the Pharmaceutical Value Chain

Adherence stands as one of four ways that a pharmaceutical company can make money with their present business model. They can:

## 1 Bring a new product to market or get a new indication for an existing drug.

Bringing new products to market is increasingly difficult and expensive. It costs an estimated \$2.7 billion, according to the Tufts Center for the Study of Drug Development, to bring a new product to market and the problems being targeted – e.g. Alzheimer's, Parkinson's, and cancer – are extremely difficult to solve. There are no “easy wins” or “low-hanging fruit” left for the pharmaceutical industry to grab.

## 2 Raise prices.

This strategy works in the short term, but it is not a sustainable strategy in today's political environment. An April 2017 report by Credit Suisse, spearheaded by Vamil Divan, MD, found that 100% of the pharmaceutical industry's EPS growth in 2016 was due to price increases. No other industry charges more and more money every year for the exact same product. Pharmaceutical companies will face a continuing backlash from the public, payers, and the government if they don't find sustainable and consistent models for business growth that contribute to decreased overall cost of care and improved patient outcomes.

## 3 Get doctors to write more prescriptions.

This was a viable strategy when the pharmaceutical industry was dominated by blockbuster primary care medications. However, in the specialty care world, every patient matters from an economic perspective. And because nearly half of all U.S. physicians place restrictions on visits from pharmaceutical sales representatives, direct promotion to healthcare practitioners will no longer be as effective a strategy.

## 4 Get patients to take more of their medications.

For pharmaceutical companies that want to generate more revenue and demonstrate growth, that leaves only one option: adherence. The only question then becomes: how best to enable it across the enterprise and at scale?

## ➤ Adherence Has Key Underlying Drivers

According to the World Health Organization, adherence to medications for chronic disease is a primary determinant of the effectiveness of those treatments because poor adherence attenuates optimum clinical benefit. In other words, the best thing that patients can do with their medication is to actually take it.

**Adherence, in stark contrast to other revenue-generating options that are available to pharmaceutical companies, like raising prices, is the only approach that meets the pharmaceutical triple aim of increased revenue, improved patient outcomes, and lower overall healthcare costs.**



Medication non-adherence has typically been viewed through the lenses of cost or forgetfulness to try to explain the choices patients make around their medications. If cost is thought to be a critical factor, pharmaceutical companies will utilize co-pay cards, rebates, and other financial programs to motivate adherence. If forgetfulness is thought to be the main culprit, reminders can be utilized.

Unfortunately, research has shown that neither of these approaches has a substantial effect on long-term medication adherence. For example, a study on myocardial infarction medication in the *New England Journal of Medicine* found that patients who had previously suffered a heart attack and had received medication at no cost only had 4 to 6 percent greater adherence to treatment versus patients who did not receive free medication, lifting their adherence from 39% to 43 – 45%.

Similarly, reminder apps have not been shown to have a significant impact on long-term medication adherence. The REMIND randomized clinical trial, which assessed the effect of three reminder devices in 53,000 patients, found no statistically significant difference in the odds of optimal adherence between the control and any of the devices.

The problem around non-adherence, then, cannot be attributed principally to cost or forgetfulness. To be truly effective, an adherence initiative needs to approach the challenge of medication non-adherence from the perspective of the value patients place on taking their medication.

In a diversity of cases, human psychology is largely the culprit for poor medication adherence, and specifically “present bias,” or the preference for short-term rewards over longer-term gains. This is particularly problematic in the case of asymptomatic conditions, where the payoff may be years down the line in the form of decreasing a risk for heart attack or stroke; however, high rates of non-adherence are also seen in medications for life-threatening conditions.

Successful adherence interventions require greater understanding of human psychology, leveraging short-term motivators to counteract present bias, and education specifically tailored toward an internalization of the longer-term health and wellness benefits of greater adherence.

Despite the outcomes and revenue potential of adherence, however, not a single pharmaceutical company has a Chief Adherence Officer. Approaches to adherence, when attempted, have tended to be tactical and brand-by-brand rather than strategic because adherence is not viewed as a driver of earnings growth.

To the contrary, research by analysts from Credit Suisse has demonstrated that adherence has the potential to be one of the pharmaceutical industry’s most important growth drivers.



**Pharmaceutical companies can no longer ignore the value of increased medication adherence to both patients and their own bottom lines.**

## ➤ Adherence Is Correlated to EPS

Two separate studies have been conducted to understand the impact that increasing adherence can have on revenue and EPS.

Limiting their analyses to medications that patients take at home for chronic conditions, each of the studies looked at the core marketed and pipeline products for 21 pharmaceutical companies to see how improved adherence could impact those companies' top and bottom lines.

In all instances, the data showed a positive impact on revenue and EPS.

In the first study – presented in a March 2018 investors note – Credit Suisse analysts Vamil Diwan, M.D., Michael Morabito, Ph.D. and Barbara Kotei analyzed seven large-cap pharmaceutical companies' core marketed and pipeline products. These companies included: AbbVie, Allergan, Bristol Myers Squibb, Johnson & Johnson, Lilly, Merck, and Pfizer.

The Credit Suisse analysts found that implementing adherence programs systematically across the product portfolio can have a major impact on top and bottom lines.



**“Relatively modest increases in adherence could meaningfully increase ... sales and earnings going forward, with the DCF valuations for some of our companies increasing by as much as 20 percent, depending on the product portfolio at a given company.”**

*– Diwan, Morabito and Kotei*

According to the analysts, implementing adherence programs with modest assumptions for impact increased revenue and EPS for all 7 companies, for every single year dating from 2020–2026, with the highest degree of yearly growth occurring with Lilly (LLY) at 29.5 percent in 2026.

## ➤ Summary of Credit Suisse Analysis:

### The Impact Improved Adherence Could Have on Pharmaceutical Companies' Sales and Earnings

Percentage Revenue Increase with Higher Adherence							
Company	2020	2021	2022	2023	2024	2025	2026
AbbVie	3.0%	6.0%	9.0%	12.0%	15.0%	15.0%	14.0%
Allergan	2.0%	3.0%	5.0%	8.0%	10.0%	10.0%	10.0%
Bristol Myers Squibb	3.0%	5.0%	8.0%	10.0%	13.0%	12.0%	9.0%
Johnson & Johnson	1.4%	2.9%	4.4%	5.9%	7.0%	6.0%	5.3%
Lilly	3.7%	7.2%	10.7%	14.0%	17.1%	16.9%	16.9%
Merck	0.9%	1.7%	2.1%	2.1%	2.2%	2.0%	2.0%
Pfizer	1.2%	2.4%	3.5%	4.5%	5.6%	5.4%	5.0%

Percentage EPS Increase with Higher Adherence							
Company	2020	2021	2022	2023	2024	2025	2026
AbbVie	4.2%	8.0%	11.3%	14.6%	17.7%	17.4%	17.2%
Allergan	2.0%	4.0%	7.0%	10.0%	12.0%	12.0%	12.0%
Bristol Myers Squibb	4.0%	8.0%	12.0%	15.0%	18.0%	17.0%	14.0%
Johnson & Johnson	2.5%	5.0%	7.5%	10.1%	11.8%	10.0%	8.6%
Lilly	6.8%	12.8%	19.3%	24.8%	30.0%	29.6%	29.5%
Merck	1.4%	2.8%	3.4%	3.4%	3.5%	3.3%	3.2%
Pfizer	1.7%	3.4%	4.9%	6.2%	7.6%	7.3%	6.9%

In Summer 2018, HealthPrize Technologies – a provider of patient experience and adherence programs for the pharmaceutical industry – partnered with CEEK Enterprises, a healthcare-focused consultancy, to extend the analysis to an additional 14 pharmaceutical companies to understand the impact of adherence on revenue and EPS for the larger group. We jointly analyzed the following 14 companies: Amgen, Astellas, AstraZeneca, Bayer, Biogen, Celgene, Gilead, GSK, Novartis, Novo Nordisk, Roche, Sanofi, Shire, and Takeda.

Percentage Revenue Increase with Higher Adherence							
Company	2020	2021	2022	2023	2024	2025	2026
<b>Amgen</b>	1.6%	3.0%	4.3%	5.6%	6.7%	6.5%	6.5%
<b>Astellas</b>	1.8%	3.5%	5.4%	7.5%	–	–	–
<b>AstraZeneca</b>	2.4%	4.5%	6.3%	8.6%	10.8%	10.7%	10.9%
<b>Bayer</b>	2.0%	4.2%	6.5%	7.2%	6.5%	2.3%	2.5%
<b>Biogen</b>	3.4%	5.9%	8.3%	10.3%	12.0%	11.2%	10.5%
<b>Celgene</b>	2.3%	4.5%	6.6%	9.0%	11.4%	11.6%	11.8%
<b>Gilead</b>	2.1%	4.2%	5.4%	7.6%	9.9%	10.0%	10.1%
<b>GSK</b>	1.4%	3.0%	4.7%	6.3%	7.5%	7.6%	7.6%
<b>Novartis</b>	2.6%	5.2%	7.5%	8.7%	10.7%	10.2%	9.5%
<b>Novo Nordisk</b>	5.7%	11.5%	17.3%	22.5%	28.4%	28.6%	28.7%
<b>Roche</b>	0.5%	1.3%	2.3%	3.6%	4.8%	5.0%	4.9%
<b>Sanofi</b>	2.2%	4.7%	7.2%	9.8%	12.4%	12.0%	12.0%
<b>Shire</b>	2.6%	5.0%	7.6%	8.3%	8.8%	7.4%	7.5%
<b>Takeda</b>	1.3%	2.5%	3.6%	–	–	–	–

The data from our report show the estimated revenue increases and EPS growth that adherence initiatives can have for these 14 companies in the years 2020–2026. While some of the impacts are small, some are quite large – and in all cases, without exception, there is a positive impact or increase.

Percentage EPS Increase with Higher Adherence							
Company	2020	2021	2022	2023	2024	2025	2026
<b>Amgen</b>	2.0%	3.9%	5.4%	6.7%	7.8%	7.5%	7.4%
<b>Astellas</b>	5.7%	10.2%	15.2%	20.9%	–	–	–
<b>AstraZeneca</b>	5.2%	9.1%	12.0%	15.3%	18.3%	16.9%	16.2%
<b>Bayer</b>	1.6%	3.2%	4.7%	4.4%	3.3%	1.0%	1.0%
<b>Biogen</b>	3.4%	5.8%	8.1%	9.7%	11.0%	9.9%	9.0%
<b>Celgene</b>	3.4%	6.6%	9.7%	13.1%	16.6%	16.9%	17.2%
<b>Gilead</b>	2.6%	5.0%	6.3%	8.6%	11.3%	11.4%	11.4%
<b>GSK</b>	2.4%	4.5%	7.5%	9.8%	11.4%	11.0%	11.1%
<b>Novartis</b>	3.7%	7.0%	10.0%	11.2%	13.3%	12.1%	10.7%
<b>Novo Nordisk</b>	8.5%	17.2%	26.3%	34.3%	43.8%	44.6%	45.3%
<b>Roche</b>	0.6%	1.5%	2.8%	4.2%	5.5%	5.5%	5.3%
<b>Sanofi</b>	3.8%	7.8%	12.0%	16.1%	20.1%	19.3%	19.2%
<b>Shire</b>	3.7%	7.0%	10.7%	11.5%	12.0%	10.1%	9.9%
<b>Takeda</b>	3.5%	6.2%	8.1%	–	–	–	–

Taking a closer look at the data makes it readily apparent that adherence initiatives can have a significant impact at companies with a substantial portfolio of drugs for chronic conditions. As discussed earlier, a well-designed adherence program is particularly effective at using an understanding of human psychology to change the value that a patient places on taking medication for chronic conditions, where the payoff might be years down the road rather than immediate. Sanofi, for example, has 11 drugs for chronic conditions and is predicted to experience up to 12% greater revenue and 20% higher EPS with higher adherence.

Additionally, for companies offering diabetes drugs – which are well-known to have a low adherence rate – a large boost in revenue and EPS growth is a given. This is the case with Novo Nordisk, which is predicted to experience up to 29% greater revenue and 45% higher EPS with higher adherence. In this case, the adherence revenue may help offset forecasted declines in product franchises due to increased competition or patent expirations.

It should be noted that the results can be just as substantial for companies that have a few drugs in the chronic space, like Celgene. With four drugs for chronic conditions, Celgene is estimated to experience up to 12% greater revenue and 17% higher EPS with higher adherence – a double-digit jump in each category.



**The numbers tell the story: higher adherence can have a significant impact on EPS, and it can do so relatively quickly, as the findings demonstrate.**

## > Conclusion

Adopting a corporate-wide, strategic focus on adherence can improve health outcomes and have meaningful financial upside in terms of revenue and EPS growth based upon analyses of medications for chronic conditions.

Pharmaceutical executives would do well to remember that the financial rewards of adopting an enterprise-level adherence program far outweigh the investment. A dollar in revenue from increased drug utilization represents one of the highest-margin dollars the pharmaceutical industry can generate. Because the medication is already FDA-approved and the initial script written, there are no technical, regulatory, or clinical risks, and no marketing costs to bear. The only costs are the manufacturing of the products and the adherence program itself.

Increased adherence contributes to increased revenues and greater EPS – and it does so without resorting to unsustainable methods like price increases that do not contribute to improved outcomes or lower overall healthcare costs. Adherence's ability to address this triple aim is particularly important as the pharmaceutical industry faces pressures to justify drug pricing with health outcomes data. And in today's highly charged political environment, adherence programs become a powerful and non-controversial tool to drive business growth.

Credit Suisse's original research, combined with our research, establish the positive impact of higher adherence for 21 pharmaceutical companies, many of whom can experience a significant lift in their revenue and EPS forecast.



**These findings send a clear message to the C-suite, the board of directors, and anybody who cares about shareholder value at pharmaceutical companies that adherence as an enterprise value driver can no longer be ignored.**



## About HealthPrize Technologies

HealthPrize Technologies is the leading patient experience and adherence platform for life science companies. The HealthPrize platform uses gamification, behavioral economics and loyalty marketing to improve patients' adherence to branded and generic medications across all diseases, drugs, demographics and dosages.

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## About CEEK Enterprises

CEEK is a specialized management consultancy focused on the biopharma and medical technology industries. With clients ranging from "Top 5" biopharma companies to start-up organizations seeking financing, our breadth and depth of expertise allows CEEK to help clients address critical corporate / commercial / medical / and clinical issues and drive value creation.

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## About the Authors

- **Tom Kottler** is CEO and Co-founder of HealthPrize Technologies
- **Angus Bromley** is a Senior Principal at CEEK
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# Appendix A

Impact of Improved Adherence on  
Pharmaceutical Companies' Sales and EPS

## ➤ Amgen Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>21,886</b>	<b>22,629</b>	<b>24,116</b>	<b>25,860</b>	<b>27,230</b>	<b>28,120</b>	<b>28,140</b>
Total Rev. w/ Base Case	21,549	21,969	23,114	24,493	25,509	26,396	26,427
# Diff. from Base Case	337	660	1,002	1,367	1,721	1,724	1,713
% Diff. from Base Case	1.6%	3.0%	4.3%	5.6%	6.7%	6.5%	6.5%

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>5,142</b>	<b>5,055</b>	<b>4,975</b>	<b>5,000</b>	<b>5,024</b>	<b>4,885</b>	<b>4,826</b>
SG&A Exp. w/ Base Case	5,075	4,923	4,775	4,727	4,680	4,540	4,483
# Diff. from Base Case	67	132	200	273	344	345	343
% Diff. from Base Case	1.3%	2.7%	4.2%	5.8%	7.4%	7.6%	7.7%

<b>EPS w/ Higher Adherence</b>	<b>\$15.10</b>	<b>\$16.09</b>	<b>\$18.22</b>	<b>\$20.55</b>	<b>\$22.68</b>	<b>\$24.05</b>	<b>\$24.62</b>
EPS w/ Base Case	\$14.80	\$15.49	\$17.29	\$19.26	\$21.03	\$22.37	\$22.93
# Diff. from Base Case	\$0.30	\$0.60	\$0.93	\$1.29	\$1.65	\$1.68	\$1.69
% Diff. from Base Case	2.0%	3.9%	5.4%	6.7%	7.8%	7.5%	7.4%

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ Astellas Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>11,249</b>	<b>11,739</b>	<b>12,219</b>	<b>12,280</b>	–	–	–
<b>Total Rev. w/ Base Case</b>	<b>11,050</b>	<b>11,339</b>	<b>11,598</b>	<b>11,427</b>	–	–	–
# Diff. from Base Case	199	400	621	854	–	–	–
% Diff. from Base Case	1.8%	3.5%	5.4%	7.5%	–	–	–

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>4,451</b>	<b>4,593</b>	<b>4,694</b>	<b>4,702</b>	–	–	–
<b>SG&amp;A Exp. w/ Base Case</b>	<b>4,412</b>	<b>4,513</b>	<b>4,570</b>	<b>4,531</b>	–	–	–
# Diff. from Base Case	40	80	124	171	–	–	–
% Diff. from Base Case	.90%	1.8%	2.7%	3.8%	–	–	–

<b>EPS w/ Higher Adherence</b>	<b>\$0.93</b>	<b>\$1.07</b>	<b>\$1.21</b>	<b>\$1.32</b>	–	–	–
<b>EPS w/ Base Case</b>	<b>\$0.88</b>	<b>\$0.98</b>	<b>\$1.05</b>	<b>\$1.10</b>	–	–	–
# Diff. from Base Case	\$0.05	\$0.10	\$0.16	\$0.23	–	–	–
% Diff. from Base Case	5.7%	10.2%	15.2%	20.9%	–	–	–

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ AstraZeneca Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>26,978</b>	<b>28,711</b>	<b>29,984</b>	<b>31,123</b>	<b>31,859</b>	<b>31,344</b>	<b>31,265</b>
Total Rev. w/ Base Case	26,344	27,477	28,208	28,671	28,754	28,320	28,188
# Diff. from Base Case	634	1,234	1,776	2,452	3,105	3,024	3,077
% Diff. from Base Case	2.4%	4.5%	6.3%	8.6%	10.8%	10.7%	10.9%

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>9,980</b>	<b>10,523</b>	<b>10,905</b>	<b>11,213</b>	<b>11,375</b>	<b>11,196</b>	<b>11,158</b>
SG&A Exp. w/ Base Case	9,853	10,276	10,550	10,723	10,754	10,592	10,542
# Diff. from Base Case	127	247	355	490	621	605	615
% Diff. from Base Case	1.3%	2.4%	3.4%	4.6%	5.8%	5.7%	5.8%

<b>EPS w/ Higher Adherence</b>	<b>\$5.05</b>	<b>\$5.86</b>	<b>\$6.62</b>	<b>\$7.38</b>	<b>\$8.08</b>	<b>\$8.39</b>	<b>\$8.84</b>
EPS w/ Base Case	\$4.80	\$5.37	\$5.91	\$6.40	\$6.84	\$7.17	\$7.61
# Diff. from Base Case	\$0.25	\$0.49	\$0.71	\$0.98	\$1.25	\$1.21	\$1.23
% Diff. from Base Case	5.2%	9.1%	12.0%	15.3%	18.3%	16.9%	16.2%

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ Bayer Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>21,939</b>	<b>23,214</b>	<b>24,371</b>	<b>22,159</b>	<b>19,868</b>	<b>17,436</b>	<b>16,365</b>
Total Rev. w/ Base Case	21,511	22,274	22,877	20,676	18,648	17,042	15,960
# Diff. from Base Case	428	940	1,494	1,483	1,220	394	406
% Diff. from Base Case	2.0%	4.2%	6.5%	7.2%	6.5%	2.3%	2.5%

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>7,528</b>	<b>7,761</b>	<b>7,963</b>	<b>7,223</b>	<b>6,491</b>	<b>5,788</b>	<b>5,428</b>
SG&A Exp. w/ Base Case	7,443	7,573	7,664	6,926	6,247	5,709	5,346
# Diff. from Base Case	86	188	299	297	244	79	81
% Diff. from Base Case	1.2%	2.5%	3.9%	4.3%	3.9%	1.4%	1.5%

<b>EPS w/ Higher Adherence</b>	<b>\$10.15</b>	<b>\$11.35</b>	<b>\$12.35</b>	<b>\$13.15</b>	<b>\$13.94</b>	<b>\$14.69</b>	<b>\$16.00</b>
EPS w/ Base Case	\$9.99	\$11.01	\$11.80	\$12.60	\$13.49	\$14.55	\$15.85
# Diff. from Base Case	\$0.16	\$0.35	\$0.55	\$0.55	\$0.45	\$0.15	\$0.15
% Diff. from Base Case	1.6%	3.2%	4.7%	4.4%	3.3%	1.0%	1.0%

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ Biogen Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>12,166</b>	<b>13,908</b>	<b>14,918</b>	<b>15,945</b>	<b>16,992</b>	<b>17,704</b>	<b>18,456</b>
Total Rev. w/ Base Case	11,771	13,132	13,780	14,460	15,173	15,922	16,707
# Diff. from Base Case	395	776	1,138	1,485	1,819	1,783	1,749
% Diff. from Base Case	3.4%	5.9%	8.3%	10.3%	12.0%	11.2%	10.5%

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>1,884</b>	<b>2,217</b>	<b>2,377</b>	<b>2,553</b>	<b>2,731</b>	<b>2,840</b>	<b>2,956</b>
SG&A Exp. w/ Base Case	1,805	2,062	2,150	2,256	2,367	2,484	2,606
# Diff. from Base Case	79	155	228	297	364	357	350
% Diff. from Base Case	4.4%	7.5%	10.6%	13.2%	15.4%	14.4%	13.4%

<b>EPS w/ Higher Adherence</b>	<b>\$31.56</b>	<b>\$37.11</b>	<b>\$39.81</b>	<b>\$43.78</b>	<b>\$47.97</b>	<b>\$51.50</b>	<b>\$55.34</b>
EPS w/ Base Case	\$30.53	\$35.09	\$36.83	\$39.89	\$43.22	\$46.84	\$50.77
# Diff. from Base Case	\$1.03	\$2.03	\$2.98	\$3.88	\$4.75	\$4.66	\$4.57
% Diff. from Base Case	3.4%	5.8%	8.1%	9.7%	11.0%	9.9%	9.0%

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ Celgene Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>20,281</b>	<b>22,686</b>	<b>24,980</b>	<b>26,391</b>	<b>28,047</b>	<b>28,600</b>	<b>29,175</b>
Total Rev. w/ Base Case	19,829	21,712	23,430	24,210	25,172	25,624	26,085
# Diff. from Base Case	452	974	1,550	2,181	2,875	2,975	3,090
% Diff. from Base Case	2.3%	4.5%	6.6%	9.0%	11.4%	11.6%	11.8%

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>3,719</b>	<b>4,103</b>	<b>4,527</b>	<b>4,794</b>	<b>5,106</b>	<b>5,207</b>	<b>5,313</b>
SG&A Exp. w/ Base Case	3,629	3,908	4,217	4,358	4,531	4,612	4,695
# Diff. from Base Case	90	195	310	436	575	595	618
% Diff. from Base Case	2.5%	5.0%	7.4%	10.0%	12.7%	12.9%	13.2%

<b>EPS w/ Higher Adherence</b>	<b>\$11.58</b>	<b>\$13.48</b>	<b>\$15.08</b>	<b>\$16.10</b>	<b>\$17.28</b>	<b>\$17.65</b>	<b>\$18.02</b>
EPS w/ Base Case	\$11.20	\$12.65	\$13.75	\$14.23	\$14.82	\$15.10	\$15.37
# Diff. from Base Case	\$0.38	\$0.83	\$1.33	\$1.87	\$2.46	\$2.55	\$2.64
% Diff. from Base Case	3.4%	6.6%	9.7%	13.1%	16.6%	16.9%	17.2%

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ Gilead Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>23,114</b>	<b>24,572</b>	<b>25,902</b>	<b>27,814</b>	<b>29,908</b>	<b>29,975</b>	<b>29,600</b>
Total Rev. w/ Base Case	22,635	23,580	24,565	25,850	27,225	27,250	26,890
# Diff. from Base Case	479	992	1,337	1,964	2,683	2,725	2,710
% Diff. from Base Case	2.1%	4.2%	5.4%	7.6%	9.9%	10.0%	10.1%

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>3,996</b>	<b>4,298</b>	<b>4,567</b>	<b>4,893</b>	<b>5,272</b>	<b>5,285</b>	<b>5,222</b>
SG&A Exp. w/ Base Case	3,900	4,100	4,300	4,500	4,735	4,740	4,680
# Diff. from Base Case	96	198	267	393	537	545	542
% Diff. from Base Case	2.5%	4.8%	6.2%	8.7%	11.3%	11.5%	11.6%

<b>EPS w/ Higher Adherence</b>	<b>\$7.41</b>	<b>\$8.14</b>	<b>\$8.90</b>	<b>\$9.84</b>	<b>\$10.66</b>	<b>\$10.69</b>	<b>\$10.58</b>
EPS w/ Base Case	\$7.22	\$7.75	\$8.36	\$9.05	\$9.58	\$9.60	\$9.50
# Diff. from Base Case	\$0.19	\$0.39	\$0.53	\$0.78	\$1.08	\$1.09	\$1.08
% Diff. from Base Case	2.6%	5.0%	6.3%	8.6%	11.3%	11.4%	11.4%

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ GSK Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>33,700</b>	<b>35,796</b>	<b>37,535</b>	<b>38,669</b>	<b>39,781</b>	<b>40,340</b>	<b>40,785</b>
Total Rev. w/ Base Case	33,224	34,757	35,866	36,394	37,014	37,495	37,894
# Diff. from Base Case	476	1,039	1,669	2,275	2,766	2,845	2,891
% Diff. from Base Case	1.4%	3.0%	4.7%	6.3%	7.5%	7.6%	7.6%

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>10,328</b>	<b>10,913</b>	<b>11,381</b>	<b>11,664</b>	<b>11,954</b>	<b>12,117</b>	<b>12,250</b>
SG&A Exp. w/ Base Case	10,233	10,705	11,047	11,209	11,400	11,548	11,671
# Diff. from Base Case	95	208	334	455	553	569	578
% Diff. from Base Case	0.9%	1.9%	3.0%	4.1%	4.9%	4.9%	5.0%

<b>EPS w/ Higher Adherence</b>	<b>\$1.68</b>	<b>\$1.84</b>	<b>\$2.00</b>	<b>\$2.12</b>	<b>\$2.24</b>	<b>\$2.32</b>	<b>\$2.40</b>
EPS w/ Base Case	\$1.64	\$1.76	\$1.86	\$1.93	\$2.01	\$2.09	\$2.16
# Diff. from Base Case	\$0.04	\$0.08	\$0.14	\$0.19	\$0.23	\$0.23	\$0.24
% Diff. from Base Case	2.4%	4.5%	7.5%	9.8%	11.4%	11.0%	11.1%

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ Novartis Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>36,035</b>	<b>37,603</b>	<b>39,010</b>	<b>38,231</b>	<b>38,192</b>	<b>36,192</b>	<b>34,402</b>
Total Rev. w/ Base Case	35,114	35,758	36,286	35,179	34,487	32,841	31,418
# Diff. from Base Case	921	1,845	2,724	3,052	3,705	3,351	2,984
% Diff. from Base Case	2.6%	5.2%	7.5%	8.7%	10.7%	10.2%	9.5%

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>10,894</b>	<b>11,275</b>	<b>11,612</b>	<b>11,340</b>	<b>11,260</b>	<b>10,687</b>	<b>10,180</b>
SG&A Exp. w/ Base Case	10,710	10,906	11,067	10,730	10,519	10,017	9,583
# Diff. from Base Case	184	369	545	610	741	670	597
% Diff. from Base Case	1.7%	3.4%	4.9%	5.7%	7.0%	6.7%	6.2%

<b>EPS w/ Higher Adherence</b>	<b>\$5.96</b>	<b>\$6.53</b>	<b>\$7.01</b>	<b>\$7.14</b>	<b>\$7.39</b>	<b>\$7.31</b>	<b>\$7.24</b>
EPS w/ Base Case	\$5.75	\$6.10	\$6.37	\$6.42	\$6.52	\$6.52	\$6.54
# Diff. from Base Case	\$0.21	\$0.43	\$0.64	\$0.72	\$0.87	\$0.79	\$0.70
% Diff. from Base Case	3.7%	7.0%	10.0%	11.2%	13.3%	12.1%	10.7%

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ Novo Nordisk Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>19,049</b>	<b>20,790</b>	<b>22,618</b>	<b>22,397</b>	<b>23,328</b>	<b>24,093</b>	<b>24,914</b>
Total Rev. w/ Base Case	18,018	18,649	19,288	18,289	18,163	18,736	19,359
# Diff. from Base Case	1,031	2,141	3,330	4,108	5,165	5,356	5,555
% Diff. from Base Case	5.7%	11.5%	17.3%	22.5%	28.4%	28.6%	28.7%

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>5,577</b>	<b>6,034</b>	<b>6,512</b>	<b>6,385</b>	<b>6,589</b>	<b>6,846</b>	<b>7,123</b>
SG&A Exp. w/ Base Case	5,370	5,606	5,846	5,563	5,556	5,775	6,012
# Diff. from Base Case	206	428	666	822	1,033	1,071	1,111
% Diff. from Base Case	3.8%	7.6%	11.4%	14.8%	18.6%	18.5%	18.5%

<b>EPS w/ Higher Adherence</b>	<b>\$2.81</b>	<b>\$3.20</b>	<b>\$3.65</b>	<b>\$3.64</b>	<b>\$3.82</b>	<b>\$3.91</b>	<b>\$4.01</b>
EPS w/ Base Case	\$2.59	\$2.73	\$2.89	\$2.71	\$2.65	\$2.71	\$2.76
# Diff. from Base Case	\$0.22	\$0.47	\$0.76	\$0.93	\$1.16	\$1.21	\$1.25
% Diff. from Base Case	8.5%	17.2%	26.3%	34.3%	43.8%	44.6%	45.3%

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ Roche Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>44,160</b>	<b>45,107</b>	<b>45,874</b>	<b>46,465</b>	<b>46,431</b>	<b>45,364</b>	<b>43,273</b>
Total Rev. w/ Base Case	43,946	44,547	44,845	44,871	44,295	43,212	41,246
# Diff. from Base Case	214	560	1,029	1,594	2,137	2,153	2,026
% Diff. from Base Case	0.5%	1.3%	2.3%	3.6%	4.8%	5.0%	4.9%

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>8,392</b>	<b>8,576</b>	<b>8,682</b>	<b>8,754</b>	<b>8,710</b>	<b>8,468</b>	<b>8,036</b>
SG&A Exp. w/ Base Case	8,350	8,464	8,476	8,436	8,283	8,038	7,631
# Diff. from Base Case	43	112	206	319	427	431	405
% Diff. from Base Case	0.5%	1.3%	2.4%	3.8%	5.2%	5.4%	5.3%

<b>EPS w/ Higher Adherence</b>	<b>\$19.60</b>	<b>\$21.05</b>	<b>\$22.63</b>	<b>\$23.53</b>	<b>\$24.20</b>	<b>\$24.38</b>	<b>\$24.15</b>
EPS w/ Base Case	\$19.48	\$20.73	\$22.02	\$22.58	\$22.93	\$23.10	\$22.95
# Diff. from Base Case	\$0.12	\$0.32	\$0.61	\$0.95	\$1.27	\$1.28	\$1.21
% Diff. from Base Case	0.6%	1.5%	2.8%	4.2%	5.5%	5.5%	5.3%

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ Sanofi Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>30,717</b>	<b>31,869</b>	<b>32,228</b>	<b>32,862</b>	<b>33,360</b>	<b>32,828</b>	<b>32,138</b>
Total Rev. w/ Base Case	30,041	30,439	30,062	29,936	29,685	29,309	28,681
# Diff. from Base Case	675	1,430	2,165	2,927	3,675	3,520	3,457
% Diff. from Base Case	2.2%	4.7%	7.2%	9.8%	12.4%	12.0%	12.0%

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>6,714</b>	<b>6,892</b>	<b>6,896</b>	<b>7,022</b>	<b>7,118</b>	<b>7,006</b>	<b>6,858</b>
SG&A Exp. w/ Base Case	6,579	6,606	6,463	6,437	6,383	6,302	6,166
# Diff. from Base Case	135	286	433	585	735	704	691
% Diff. from Base Case	2.1%	4.3%	6.7%	9.1%	11.5%	11.2%	11.2%

<b>EPS w/ Higher Adherence</b>	<b>\$7.02</b>	<b>\$7.44</b>	<b>\$7.76</b>	<b>\$8.08</b>	<b>\$8.36</b>	<b>\$8.28</b>	<b>\$8.20</b>
EPS w/ Base Case	\$6.76	\$6.90	\$6.93	\$6.96	\$6.96	\$6.94	\$6.88
# Diff. from Base Case	\$0.26	\$0.54	\$0.83	\$1.12	\$1.40	\$1.34	\$1.32
% Diff. from Base Case	3.8%	7.8%	12.0%	16.1%	20.1%	19.3%	19.2%

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ Shire Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>16,199</b>	<b>16,694</b>	<b>17,290</b>	<b>16,419</b>	<b>15,226</b>	<b>14,828</b>	<b>14,666</b>
Total Rev. w/ Base Case	15,791	15,905	16,074	15,167	13,994	13,800	13,649
# Diff. from Base Case	408	789	1,216	1,252	1,232	1,028	1,017
% Diff. from Base Case	2.6%	5.0%	7.6%	8.3%	8.8%	7.4%	7.5%

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>3,445</b>	<b>3,546</b>	<b>3,667</b>	<b>3,481</b>	<b>3,227</b>	<b>3,145</b>	<b>3,111</b>
SG&A Exp. w/ Base Case	3,363	3,388	3,424	3,231	2,981	2,939	2,907
# Diff. from Base Case	82	158	243	250	246	206	203
% Diff. from Base Case	2.4%	4.7%	7.1%	7.7%	8.3%	7.0%	7.0%

<b>EPS w/ Higher Adherence</b>	<b>\$16.68</b>	<b>\$17.34</b>	<b>\$18.27</b>	<b>\$17.61</b>	<b>\$16.57</b>	<b>\$16.26</b>	<b>\$16.27</b>
EPS w/ Base Case	\$16.09	\$16.20	\$16.51	\$15.80	\$14.79	\$14.77	\$14.80
# Diff. from Base Case	\$0.59	\$1.14	\$1.76	\$1.81	\$1.78	\$1.49	\$1.47
% Diff. from Base Case	3.7%	7.0%	10.7%	11.5%	12.0%	10.1%	9.9%

Revenue and SG&A expense reflect pharmaceutical products only.

## ➤ Takeda Summary of Analysis

US Dollars, Millions, Ex-Per Share Data	2020	2021	2022	2023	2024	2025	2026
<b>Total Rev. w/ Higher Adherence</b>	<b>16,966</b>	<b>17,343</b>	<b>17,694</b>	–	–	–	–
<b>Total Rev. w/ Base Case</b>	<b>16,755</b>	<b>16,922</b>	<b>17,083</b>	–	–	–	–
# Diff. from Base Case	211	421	611	–	–	–	–
% Diff. from Base Case	1.3%	2.5%	3.6%	–	–	–	–

<b>SG&amp;A Exp. w/ Higher Adherence</b>	<b>5,332</b>	<b>5,185</b>	<b>5,177</b>	–	–	–	–
<b>SG&amp;A Exp. w/ Base Case</b>	<b>5,290</b>	<b>5,101</b>	<b>5,054</b>	–	–	–	–
# Diff. from Base Case	42	84	122	–	–	–	–
% Diff. from Base Case	.80%	1.6%	2.4%	–	–	–	–

<b>EPS w/ Higher Adherence</b>	<b>\$3.24</b>	<b>\$3.79</b>	<b>\$4.26</b>	–	–	–	–
<b>EPS w/ Base Case</b>	<b>\$3.13</b>	<b>\$3.57</b>	<b>\$3.94</b>	–	–	–	–
# Diff. from Base Case	\$0.11	\$0.22	\$0.32	–	–	–	–
% Diff. from Base Case	3.5%	6.2%	8.1%	–	–	–	–

Revenue and SG&A expense reflect pharmaceutical products only.

# Appendix B

Methodologies Used

**In their analysis of pharmaceutical companies' core marketed and pipeline products and how improved adherence could impact those companies' top and bottom lines, Credit Suisse employed the following methodology:**

- Limited the analysis to medications that patients take at home for chronic conditions.
- Classified the core marketed and pipeline products that the companies have for chronic conditions into three buckets: drugs for life-threatening conditions; drugs for generally symptomatic conditions; and drugs for generally asymptomatic conditions.
- For each category of chronic drugs, assessed how increasing global sales by relatively modest amounts over current forecasts would increase each company's total revenues.
- On a company-wide basis, assumed strategic programs aimed at increasing adherence have a cost in terms of incremental Selling, General & Administrative Expense (SG&A) that is equal to ~20% of the added revenues that the company generated.

**Our analysis of 14 additional pharmaceutical companies utilized a similar methodology as Credit Suisse.**

We identified recent 3rd-party Investment Research Analyst models from major banks for each of the 14 companies and used these "Analyst models" as the base case revenue and EPS impact analysis from implementation of adherence programs. Models were selected based on providing sufficient product revenue forecasts to apply differential adherence program impact rates to products for asymptomatic, symptomatic and life-threatening conditions.

- We selected products to be appropriate for adherence analysis based on a review of the product portfolio. Only products with >\$250M in annual sales forecast that are chronic medications taken at home were analyzed – similar to the Credit Suisse methodology. Where identifiable, we did forecast revenue increase for any products in years after patent expiry for individual products.
- The adherence program revenue increase rates for symptomatic, asymptomatic, and life-threatening conditions were taken from the Credit Suisse Report.
- To estimate increase in net income and earnings per share (EPS) from adherence programs, we assumed that the adherence-related revenues – less cost of goods sold (COGS), less adherence-related SG&A – will be pre-tax profit.
- We then applied the corporate tax rate from the Analyst model to calculate net income.
- The net income was then divided by the fully diluted share base of the company, as reported in the Analyst model, to arrive at EPS.
- We assumed the number of shares outstanding stayed the same as the last year of data found in the Analyst model for subsequent years up to 2026.

One limitation of the Analyst models is that they typically project EPS for up to a five-year period in the published model (2022). Thus, the baseline EPS for pharmaceutical companies from 2023-2026 needed to be estimated to be able to show the percentage impact of the adherence program.

These estimates were made by calculating the Net Income compound annual growth rate (CAGR) for each company from 2018-2022. This CAGR was then applied to grow net income from 2022 to 2026 at the same rate. The estimated baseline net income was then divided by the shares outstanding (held constant) to calculate the baseline EPS.

In addition to the limitation related to EPS forecast noted above, the analysis was subject to the following limitations:

**The analysis was completed “as of” the publication date of the base Analyst model for the forecast period. While all reports are from 2018, there may be material changes to the product portfolio of each pharmaceutical company that have occurred since the publication of the report that are not captured in the analysis.**

- We used peak revenue to determine whether a product would have sufficient value for a pharmaceutical company to invest in an adherence program. Alternative methods may drive product selection for adherence program applications that we did not factor, such as priority in the “sales bag,” co-promotes due to licensing arrangements, or regional variations in the application of programs (e.g. adherence applied only to U.S. sales).
- We utilized one analyst model per pharmaceutical company. While we expect the models to be directionally similar across multiple Investment Analysts, there will be variation in the calculations based upon the specific Analyst model that was chosen as the starting point for analysis.
- We assumed all pre-tax net income from adherence programs will flow directly to net income (after appropriate tax consideration is applied), without any adjustments in research and development (R&D) expenses or other expense categories.
- We relied solely on the Analyst model for each company to assess future pipeline impact to the profit and loss (P&L) forecast. Since adherence programs are applied on a product-by-product basis, a change in pipeline mix that is forecasted by Investment Analysts could have a significant impact on the adherence analysis.



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