# Rx for Insight: Analyzing Medicare Part B Drug Spending

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**Rx for Insight: Analyzing Medicare Part B Drug Spending**

As of 2022, a total of 59,482,817 beneficiaries are enrolled in the Medicare Part B (Part B) program (The Centers for Medicare and Medicaid Services [CMS], 2024). This is a voluntary program that impacts healthcare coverage for Americans who are age 65 and older, disabled, or have End-Stage Renal Disease (ESRD). These beneficiaries pay monthly premiums to remain eligible for Part B. This analysis will focus specifically on Immune Globulin (IgG) drugs for beneficiaries that have been diagnosed with primary immune deficiency deficiency and those requiring prevention of Rh-negative sensitization during pregnancy by assessing how Part B's coverage and premiums impact these beneficiaries' and their access to these medications. This analysis may assist in lower cost options to ensure affordability of these critical medications.

By focusing on the spending metrics, this study aims to provide recommendations to CMS to reduce the financial burden to beneficiaries for high-cost drugs, while ensuring the program's sustainability. Findings from this study may help encourage CMS to evaluate policies with the aim of reducing out-of-pocket expenses and allow those in lower income brackets to be able to afford these lifesaving drugs. By forecasting trends, this study will determine whether an upward trend is detected in order to create policies that establish price ceilings for pharmaceutical companies. Next, the study identifies high-cost IgG drugs and organizes them into therapeutic categories based on their medical purposes. This categorization highlights cost-effective alternatives within each group, aiming to reduce financial burdens while maintaining effective treatment options for patients. Lastly, the findings from the benchmark spending analysis can emphasize the need for policy intervention to reduce the spending of CMS and vulnerable beneficiaries.

**Data**

For this study, an analysis of the 'Medicare Part B Spending by Drug' data set was conducted. This data set, which was collected by CMS, includes information on drug spending by doctors' offices and other outpatient settings to Part B beneficiaries. An IgG drug subset was calculated using SAS Enterprise Guide (SAS) for 363,092 Part B beneficiaries that have utilized these drugs between 2019-2022. According to Lu et al. (2020), the market for therapeutic antibody drugs, such as IgG, have become the best-selling drugs in the pharmaceutical market due to approval by the U.S. Food and Drug Administration (FDA) to treat many diseases such as cancers, autoimmune deficiencies, metabolic and infectious diseases.

The dataset contains key metrics from 2018 to 2022 such as the total spending and average dosage units, claims, and beneficiaries. Utilizing these metrics, tests were conducted to prove the fixes stated above are reasonable.

**Problem**

The objective of this study is to better understand how Part B spending on IgG drugs has changed over the five-year period. Are there particular IgG drugs with consistently high or increasing total spending? Why is this? Could doctors begin to prescribe generic versions of brand name drugs? Addressing these questions is critical for understanding the economic impact of IgG therapies for Part B beneficiaries and offers opportunities for advising CMS of potential areas for cost reduction and policy development.

**Data Cleaning/Validation**

To begin our analysis, the data was imported by using the 'Import Data' task. The resulting data set (*Medicare_Filtered*) made up of 26 observations after filtering for 'Immune Globulin' in the `HCPCS_Desc` column and only retaining non-missing data based on the 'Total Spending' values. Columns were stacked by total spending years and grouped by brand names for easier analysis and interpretation, resulting in a data set with 105 observations (*Medicare_Stacked*). With the stacked data, the format of year was altered to show only the year value and removed the 'Tot_Spndng_' prefix. For the Spending column, the appropriate currency format (DOLLAR17.2) was applied. These steps resulted in a data set which will be referred to as *Medicare_Stacked_Formatted*.

**Analysis**

Using *Medicare_Stacked_Formatted*, along with the originally imported data, *Medicare*, a new table was compiled called *Medicare_Filtered_All*. Using this data set, the total number of Medicare beneficiaries from 2018-2022 that utilized IgG drugs were calculated. Using Query Builder, a computed column called 'Total Beneficiaries' was created by summing the 'Tot_Benes_' from 2018 through 2022. Next, the Brnd_name from *Medicare_Stacked_Formatted*, which ensured the data only included the IgG drugs, grouped the data. This resulted in a table (*Total_Beneficiaries*) that totaled the number of beneficiaries by year and by brand of IgG drug . From *Total_Beneficiaries*, a summary table was created called 'Total Beneficiaries Who Use IgG Drugs'. This calculated the total number of beneficiaries for every brand, and yielded a total of 363,092 beneficiaries.

Next, the forecast trends for the top five brands with the highest average spending was created. To find these brands, PROC SQL was used to create a table called *Brand_Avg_Spending*, which included the mean of Spending (`Avg_Spending`), was grouped by Brnd_Name, and then sorted in descending order using PROC SORT. *Brand_Avg_Spending* presented Gammagard Liquid, Gammaked*, Privigen, Octagam, and Hizentra as the brands with the highest average spending from 2018-2022.

To create accurate forecasting trends, a Month and Day column was added to *Medicare_Stacked_Formatted* with a value of 1 to have the appropriate variables necessary to create the Time ID in the 'Basic Forecasting' task. A forecast was created for each of the top five brands detected by *Brand_Avg_Spending* (Figure 1). As only five observations were present per Brnd_Name, the forecast generated was not distinct or reliable enough for accurate predictions. However, one can assume that the general upward trend (represented by the blue line marked `FORECAST`) detected by all of the forecasts is a reliable outcome given the shortage of plasma supply after the COVID-19 pandemic. Plasma supply is critical in the creation of IgG drugs as they rely on plasma by-products to be manufactured (Hartmann & Klein, 2020).

To better understand the spending dynamics and recommend policy changes for CMS, the analysis was focused on identifying high-demand drugs that significantly impact beneficiary expenses in 2022. This was done by analyzing the filtered IgG dataset and calculating the claim contribution percentage for each drug (total claims for a specific IgG drug divided by total claims for all IgG drugs, multiplied by 100). This revealed that five brands — Gammagard Liquid (31%), Gammaked (20%), Privigen (16%), Octagam (14%), and Hizentra (10%) – accounted for many IgG drug claims in 2022. These findings suggest that policy interventions targeting these high-demand drugs could result in substantial cost savings for CMS beneficiaries.

The bar plot (Figure 2) further highlights the popularity of these drugs in terms of claims, emphasizing their dominance in the IgG drug market.

To illustrate the spending patterns for both beneficiaries and CMS for IgG drugs in 2022, scatter plots were generated. The Claim Contribution vs. Average Spending Per Beneficiary plot (Figure 3) demonstrates that drugs such as Gammagard Liquid, Gammaked, and Privigen have both high claim contributions and high average spending per beneficiary, underscoring the financial burden on beneficiaries. Similarly, the Claim Contribution vs. Average Spending Per Claim plot (Figure 3) highlights that high-cost brands not only contribute significantly to the total claims, but also exhibit elevated spending per claim. These patterns reinforce the role of these brands in driving up CMS expenses.

As identified in the previous figures, patterns were observed noting some common drugs share the same characteristics: high average spending. As a result, the spending ratio was analyzed (Figure 4). Here, the figures identified a key insight – that higher spending ratios are observed for these high-cost drugs. The linear trend suggests that patients often face disproportionately higher out-of-pocket expenses for these expensive medications.

To provide recommendations for cost-saving strategies on IgG drugs to both beneficiaries and CMS, the IgG drugs were sorted and categorized into two groups (i.e., Intravenous Immune Globulins (IVIG) and Rho(D) Immune Globulins for Rh-negative pregnant women) based on their intended medical purposes and generic names (Figure 5). This categorization allowed the comparison of medication within the same therapeutic category to identify possible cost-effective alternatives. By analyzing the average spending per claim and beneficiary, alternative drug suggestions to beneficiaries and healthcare providers could provide options for drugs with the same therapeutic purpose but at a lower cost.

For instance, within the Rho(D) Immune Globulin category, Hyperrho S-D (J2790) is the lower-cost alternative compared to Winrho SDF, with an approximate difference of $22,000 in average spending per beneficiary. Similarly, in the IVIG group, Gammaplex* and Gammaked* demonstrated significantly lower average spending compared to high-cost drugs like Cuvitru and Bivigam. Notably, Gammaked* accounts for 20% of the IgG drug market. Recommendations for the use of this alternative could reduce the financial burden on both beneficiaries and CMS, while maintaining the quality of care.

To further analyze which brands were driving increased costs, a benchmark of the average spending of each brand against the overall average spending for all IgG drugs was completed. The analysis indicates that four brands have significantly higher-than-average spending and were flagged as high-cost brands. These brands are: Gammagard Liquid with an average spending of $452,720,839.05, Gammaked* at $398,440,146.94, Privigen at $317,992,637.16, and Octagam at $200,263,936.44. These brands are potential targets for cost-reduction strategies.

To illustrate the differences in spending, Figure 6 and Figure 7 show a scatterplot that highlights the brands flagged as high-cost. Gammagard Liquid, Gammaked*, Privigen, and Octagam clearly stand out from the other brands, with spending well above the overall average. Most other brands cluster near the lower spending range.

Figure 8 shows a combined box-and-whisker plot of average spending for all brands. Gammagard Liquid not only has high spending but also significant variability, as represented by its wide interquartile range and several outliers. Figure 9 highlights that Hizentra and Octagam show some variability as well. Most other brands show consistently low spending and therefore, are not the major factors in the overall high spending.

For more detailed analysis, Figure 10 shows box-and-whisker plots of average spending for all brands over the four years. Gammagard Liquid had significant variation over the years, making it a good target for cost stabilization. Hizentra and Octagam have been stable over the years, and the consistency indicates the prices are more predictable, though significantly higher. Privigen was constant as well, except the outlier in 2018. This could be due to the shortages of plasma-derived coagulation factors and albumin concentrates needed to produce plasma-based drugs such as Privigen (Hartmann & Klein, 2020). Lastly, Gammaked exhibited relatively high variability as well, marking it as another contributor to the overall costs.

**Suggestions for Future Studies**

Using the techniques presented in this project highlights the need for future research on alternatives to high-cost drugs and offers cost containment strategies for beneficiaries and CMS. As more data is collected each year, a more accurate forecast can be calculated, which can provide more detailed information as to how spending will change rather than just showing an upward trend. A time series analysis can also be used to see the effect of any policies that are implemented to minimize excessive costs for these drugs, which could potentially decrease Part B spending. Observing such a time series can indicate points of increased or decreased pricing, which can then be attributed to economic developments such as inflation or recession.

Future studies could analyze how IgG spending trends affect specific Part B subpopulations such as those with lower socioeconomic status or populations in rural areas with lack of medical resources. Lastly, additional research could impact the implementation of policies and be helpful in determining whether they are influential to Part B beneficiaries while also keeping CMS financially sustainable.

## Conclusion

The study of Part B spending on IgG highlighted critical issues related to affordability and utilization on specific drugs. Increased spending over the years, utilization of high-cost drugs such as Gammagard Liquid and Gammaked*, and presence of high spending by beneficiaries can determine which policies CMS needs to focus on to increase affordability for their beneficiaries. Identification of cost-effective alternatives within therapeutic groups will allow CMS to provide this information to healthcare professionals and help alleviate the financial burden faced by its users.

Implementing policy changes such as price ceilings, promotion of generic medication alternatives, and ensuring that plasma supply chains are stable will allow for CMS to improve affordability and accessibility for their beneficiaries without compromising their financial stability.

**References**

Hartmann, J., & Klein, H. G. (2020, September 09). Supply and demand for plasma-derived medicinal products - A critical reassessment amid the COVID-19 pandemic. *Transfusion 60*(11), 2748-2752. https://pmc.ncbi.nlm.nih.gov/articles/PMC7460929/

Lu, R., Hwang, Y., Liu, I., Lee, C., Tsai, H., Li, H., & Wu, H. (2020, January 02). Development of therapeutic antibodies for the treatment of diseases. *Journal of Biomedical Science, 27*(1). https://jbiomedsci.biomedcentral.com/articles/10.1186/s12929-019-0592-z

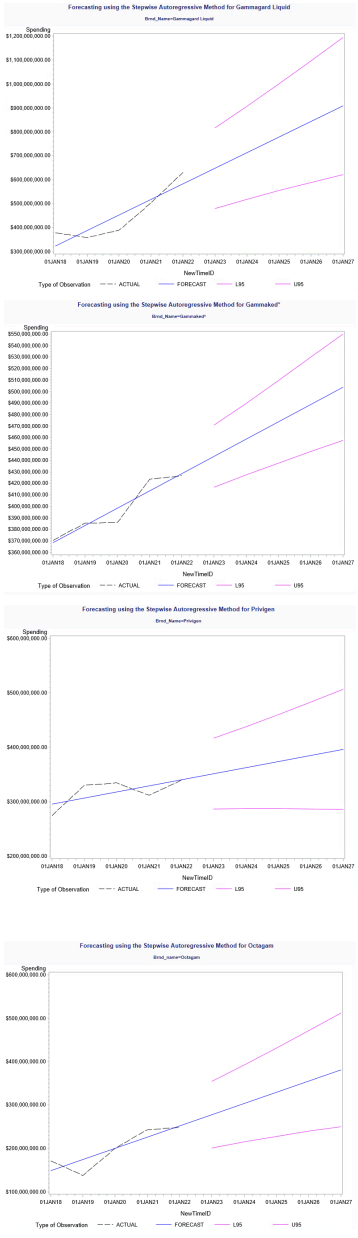
The Centers for Medicare and Medicaid Services. (2024, March 4). *Medicare Part B Spending by Drug*. Centers for Medicare & Medicaid Services Data. https://data.cms.gov/summary-statistics-on-use-and-payments/medicare-medicaid-spending-by-drug/medicare-part-b-spending-by-drug

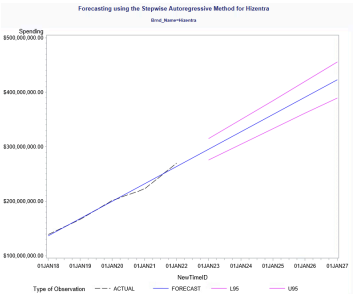
The Centers for Medicare and Medicaid Services. (2024, July). *Medicare monthly enrollment.* https://data.cms.gov/summary-statistics-on-beneficiary-enrollment/medicare-and-medicaid-reports/medicare-monthly-enrollment/data?query=%7B%22filters%22%3A%7B%22list%22%3A%5B%7B%22conditions%22%3A%5B%7B%22column%22%3A%7B%22value%22%3A%22YEAR%22%7D%2C%22comparator%22%3A%7B%22value%22%3A%22%3D%22%7D%2C%22filterValue%22%3A%5B%222018%22%5D%7D%5D%7D%5D%2C%22rootConjunction%22%3A%7B%22value%22%3A%22AND%22%7D%7D%2C%22keywords%22%3A%22%22%2C%22offset%22%3A0%2C%22limit%22%3A10%2C%22sort%22%3A%7B%22sortBy%22%3Anull%2C%22sortOrder%22%3Anull%7D%2C%22columns%22%3A%5B%22YEAR%22%2C%22B_TOT_BENES%22%5D%7D

# Appendix

## Figure 1

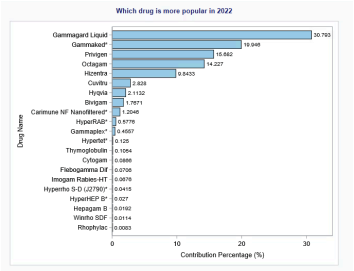
*Forecasts for the Top 5 Brands indicating an upward trend*



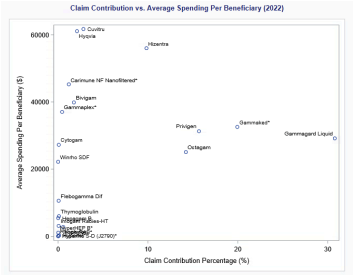

## Figure 2

*Drug Popularity of all IgG drugs in 2022*



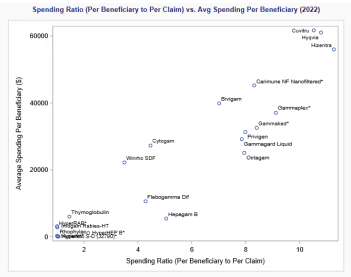

## Figure 3

*Claim Contribution vs. Average Spending Per Beneficiary* and *Claim Contribution vs. Average Spending Per Claim (2022)*




## Figure 4

*Spending Ratio vs. Average Spending Per Beneficiary (2022)*




## Figure 5

*Claim Contribution vs. Average Spending Per Beneficiary and Claim Contribution vs. Average Spending Per Claim of two IgG drug groups (2022)*

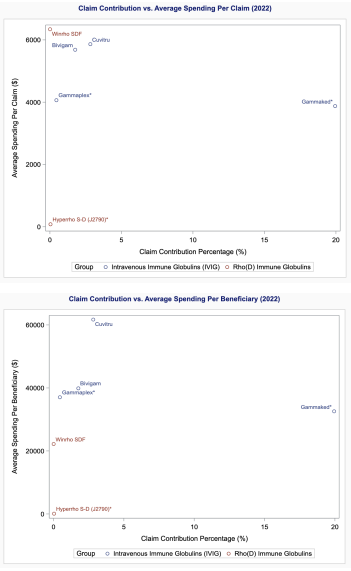


**Figure 6**

*High-Cost Brands*

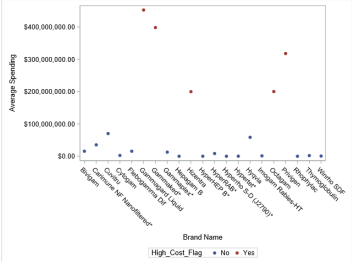



**Figure 7**

*High-Cost Brands (filtered for highest spending)*

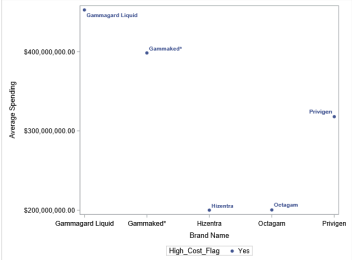



**Figure 8**

*Combined Box-and-Whisker Plot of Average Spending for Each Brand (2018-2022)*

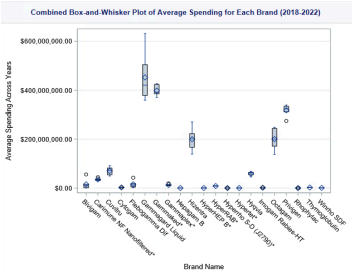



**Figure 9**

*Box-and-Whisker Plot of Average Spending for Top 5 Brands (2018-2022)*

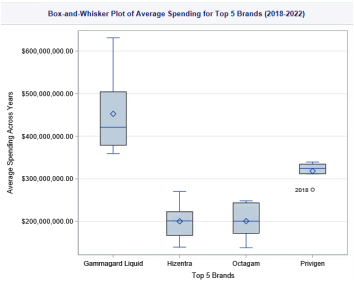



**Figure 10**

*Boxplots of Spending per Brand Over the Years*