

## Special Topic

# A 16-Year Analysis of Aesthetic Surgery Volume and Its Association With US Economic Performance

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Aesthetic Surgery Journal Open Forum 2024, ojae019

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## Abstract

Historically, demand for plastic surgery has been associated with the performance of the US economy. This study evaluates the relationship between economic performance indicators and the popularity and profitability of aesthetic surgery from 2006 to 2022, considering several recessions and the rise of social media. The data were collected from the Aesthetic Society's (AS) Aesthetic Plastic Surgery National Databank and the American Society of Plastic Surgeons' (ASPS) Plastic Surgery Statistics Report from 2006 to 2022. Procedures analyzed included the most performed cosmetic surgeries, as well as neuromodulator injections and dermal fillers. Pearson correlation tests were used to analyze the strength of association between 8 financial indicators and case volumes and expenditures for each procedure. From 2006 to 2020, ASPS data demonstrated gross domestic product (GDP) per capita year-over-year (YOY) change that was positively correlated with case volume and expenditures across 13 out of the 24 different procedure metrics (54.2%). From 2006 to 2016, AS data were positively correlated with the YOY change of the National Association of Securities Dealers Automated Quotations (NASDAQ), Standard and Poor's 500, and Dow Jones in 12 of the 24 variables (50%). This was followed by GDP YOY change, with positive correlations to 11 variables (45.8%). YOY changes of consumer-level finances and inflation indicators were less frequently associated among both datasets. In conclusion, our study shows that aesthetic plastic surgery procedures and expenditures correlate with GDP. Although aesthetic surgery demand may be difficult to anticipate, this study elucidates several factors plastic surgeons may use as a bellwether for their practices.

## Level of Evidence: 5

Editorial Decision date: March 7, 2024; online publish-ahead-of-print March 27, 2024.



Since the COVID-19 pandemic, the United States has witnessed rising inflation rates. In June 2022, the consumer price index (CPI), an inflation indicator, had its highest year-over-year (YOY) increase for all goods in 3 decades.<sup>1</sup> In July 2023, consumer prices were 3.2% higher than in 2022.<sup>2</sup> Concurrently, postpandemic interest in aesthetic

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surgery has surged, with 76% of surveyed American Society of Plastic Surgeons (ASPS) board-certified plastic surgeons reporting improved business in 2022 compared with prepandemic times.<sup>3</sup>

Although previous studies have shown a positive association between plastic surgery case volumes and economic performance,<sup>4,6</sup> the unprecedented inflation following the COVID-19 pandemic, coupled with increased interest in plastic surgery, challenges these historical trends. Prior literature has failed to examine the effects of inflation and disposable income on prospective aesthetic surgery patients or to qualitatively characterize quantitative correlations in the context of broader cultural trends. Thus, in this analysis, we seek to provide updated insights into how national economic performance impacts aesthetic plastic surgery practices, considering both quantitative financial indicators like CPI and qualitative trends such as the influence of social media.

## METHODS

Data from the Aesthetic Society (AS) and the ASPS annual reports on plastic surgery statistics were collected from 2006 to 2022.<sup>7,8</sup> ASPS did not have 2021 data. Survey methods changed 3 times between 2006 and 2022 for AS data, so it was grouped by survey method into 3 periods for consistency: 2006 through 2016, 2017 through 2018, and 2019 through 2022. Due to limited data availability between 2017 and 2018, this period was excluded from the analysis.

Except for breast reduction, case volumes and expenditures were collected for consistently reported surgical and nonsurgical procedures from 2006 to 2022. Despite ASPS only having breast reduction data beginning in 2012, we decided to include this procedure given its high incidence in plastic surgery. Surgical procedures analyzed included breast augmentation, breast reduction, mastopexy, abdominoplasty, liposuction, blepharoplasty, facelift, and rhinoplasty. Nonsurgical procedures included neuromodulator injections (NIs) and dermal fillers (DFs). A total of 24 variables were examined, including case volumes and patient expenditures of the 10 procedures mentioned above and of 2 composite variables—total surgical procedures and total injectables. Relative change values were calculated for all variables and analyzed for consistency in comparisons. Disposable income per capita was collected from the United States Bureau of Economic Analysis.<sup>9</sup> CPI information was collected from the United States Bureau of Labor Statistics.<sup>10</sup> In addition to general CPI, CPI values specific to medical care and its component, medical care services, were collected. The annual average closing prices of the National Association of Securities Dealers Automated Quotations (NASDAQ), Standard and Poor's 500 (S&P

**Table 1.** Top Aesthetic Procedures, Aesthetic Society Data 2006-2022

Ranking	Procedure	Case volume
Nonsurgical procedures		
1	Neuromodulator injections	51.7 M
2	Dermal fillers	24.4 M
Surgical procedures		
1	Liposuction	5.96 M
2	Breast augmentation	5.34 M
3	Abdominoplasty	2.81 M
4	Blepharoplasty	2.54 M
5	Breast lift	2.20 M
Postpandemic 2020-2022		
Nonsurgical procedures		
1	Neuromodulator injections	9.72 M
2	Dermal fillers	1.87 M
Surgical procedures		
1	Liposuction	1.19 M
2	Breast augmentation	816 K
3	Abdominoplasty	609 K
4	Breast lift	382 K
5	Blepharoplasty	286 K

<sup>a</sup>K, thousand; M, million.

500), and Dow Jones (DOW) were collected from Macrotrends.<sup>11-13</sup> Average gross domestic product per capita (GDP) was collected from the World Bank.<sup>14</sup>

## Statistical Analysis

Statistical analysis was conducted with R (version 4.3.1, R Foundation for Statistical Computing, Vienna, Austria). Pearson correlation tests analyzed the relationship between financial indicators and the 24 surgical variables. The significance of these correlations was evaluated based on the associated *P*-values. For all tests, a *P*-value less than .05 was considered statistically significant.

## RESULTS

### Top Procedures

By volume, the all-time top 5 surgical procedures were liposuction, breast augmentation, abdominoplasty,

**Table 2.** Top Aesthetic Procedures, American Society of Plastic Surgeons Data 2006-2022

Ranking	Procedure	Case volume <sup>a</sup>
Nonsurgical procedures		
1	Neuromodulator injections	95.4 M
2	Dermal fillers	39.6 M
Surgical procedures		
1	Breast augmentation	4.70 M
2	Rhinoplasty	3.94 M
3	Liposuction	3.83 M
4	Blepharoplasty	3.55 M
5	Face lift	2.13 M
Postpandemic 2020-2022 <sup>b</sup>		
Nonsurgical procedures		
1	Neuromodulator injections	13.1 M
2	Dermal fillers	9.15 M
Surgical procedures		
1	Liposuction	537 K
2	Breast augmentation	492 K
3	Blepharoplasty	440 K
4	Rhinoplasty	397 K
5	Face lift	307 K

<sup>a</sup>K, thousand; M, million. <sup>b</sup>Data from 2021 unavailable.

blepharoplasty, and mastopexy, according to AS data. In comparison, ASPS data report breast augmentation, rhinoplasty, liposuction, blepharoplasty, and facelift as the top 5. From 2020 to 2022, the top surgical procedures remained consistent across their respective datasets. Regarding nonsurgical procedures, NIs were consistently more popular than DF in both datasets. Furthermore, AS and ASPS data report NI as the cosmetic procedure with the all-time greatest case volume across surgical and nonsurgical interventions. The top procedures can be referenced for AS data in [Table 1](#) and ASPS data in [Table 2](#).

### Case Volume Over Time

Based on ASPS data, between 2006 and 2022, NI and DF experienced the greatest case volume increases among examined procedures at 113.6% and 365.5%, respectively. In comparison, breast augmentation experienced a 9.4% decrease in case volume. All other procedures had positive case volume growth between 2006 and 2020. Regarding

**Table 3.** Percent Change 2020 vs 2006, American Society of Plastic Surgeons Data

Procedure	% Difference volume	% Difference expenditures
Nonsurgical procedures		
Dermal fillers	366	265
Neuromodulator injections	114	20
Surgical procedures		
Face lift	125	271
Rhinoplasty	14.7	63.8
Breast augmentation	-9.4	-26.5
Breast reduction	62.5	-10.2
Breast lift	38.1	-0.40
Blepharoplasty	39.4	99.6
Liposuction	7.6	-7.8
Abdominoplasty	10.7	-18.6

expenditures from 2006 to 2020, DF had the greatest increase at 260%, and breast augmentation had the greatest decrease at 9.4%. These numbers are referenced in [Table 3](#).

Based on AS data, in the postpandemic (2020-2022) era, NI had the most significant increase in case volume at 52.5%. Of surgical procedures, blepharoplasty had the highest increase in incidence at 41.8%. Expenditures on blepharoplasty also increased the most at 63.9%. Despite rhinoplasty being the only procedure to see a decrease in volume at -16.9%, expenditures on rhinoplasty increased by 5.3%. These numbers are referenced in [Table 4](#).

### Gross Domestic Product (GDP) and Stock Market Data

Between 2006 and 2020, ASPS data showed GDP YOY change to be the indicator most frequently correlated with case volume and expenditure numbers ( $n = 13$ , 54.2%). YOY changes in GDP and stock market data are depicted in [Figures 1](#) and [2](#), respectively. [Figure 3](#) graphically depicts GDP percent change vs all procedures case percent change. Alternatively, between 2006 and 2016, AS data were most frequently correlated with NASDAQ, S&P 500, and DOW ( $n = 12$ , 50%). GDP YOY change followed with positive correlations to 11 variables (45.8%). A visual representation of this data is shown in [Figure 4](#). Between 2019 and 2022, NASDAQ was the most frequent correlator ( $n = 3$ , 12.5%), with positive correlations, as seen in [Figure 5](#). Specific variable correlation coefficients and their  $P$ -values are summarized in [Supplemental Tables 1-3](#).

**Table 4.** Percent Change 2022 vs 2020, Aesthetic Society Data

Procedure	% Difference volume	% Difference expenditures
Nonsurgical procedures		
Dermal fillers	0.30	-6.6
Neuromodulator injections	52.5	35
Surgical procedures		
Face lift	41.9	60.3
Rhinoplasty	-16.9	5.3
Breast augmentation	2.5	13.1
Breast reduction	38.1	66.8
Breast lift	36.4	60.9
Blepharoplasty	41.8	63.9
Liposuction	26.6	39.9
Abdominoplasty	22.1	41.7

## Inflation and Disposable Income Data

Annualized changes in CPI and disposable income are depicted in [Figure 1](#). YOY change of CPI and disposable income were less frequently associated between the datasets. In the ASPS dataset, YOY Medical Services CPI change was associated with 5 out of 24 variables (20.8%; abdominoplasty case count, mastopexy case count and patient expenditures, and breast reduction case count and patient expenditures). These associations were all with negative correlation coefficients, indicating that procedures and expenditures decreased as Medical Services inflation increased. Disposable income YOY change, however, was not significantly associated with any variables. In the AS dataset between 2006 and 2016, CPI YOY change was not significantly associated with any variables and disposable income YOY change with 1 variable (breast augmentation patient expenditures). From 2019 to 2022, CPI YOY change was significantly associated with DF case count, and disposable YOY change was significantly associated with rhinoplasty case count and patient expenditures. Again, specific variable correlation coefficients and their *P*-values are summarized in the [supplemental tables](#).

## DISCUSSION

Our study suggests that aesthetic plastic surgery procedures and expenditures positively correlate with the financial indicators, GDP, NASDAQ, S&P 500, and DOW, and,

therefore, with the performance of the US economy. Inflation indicators were also significantly associated but with fewer case volume and expenditure variables. The correlation between plastic surgery demand and the US economy may be better appreciated with graphical presentation with [Figures 3-5](#). Our study is not the first to associate financial indicators with the plastic surgery market,<sup>15,16</sup> but we are the only study to investigate the impacts of inflation and the COVID-19 pandemic. We have provided quantitative correlations of available plastic surgery data to economic performance indicators; however, it is vital to illustrate these trends in the context of specific economic cycles over the past 2 decades to understand how future economic events may impact aesthetic surgery demand.

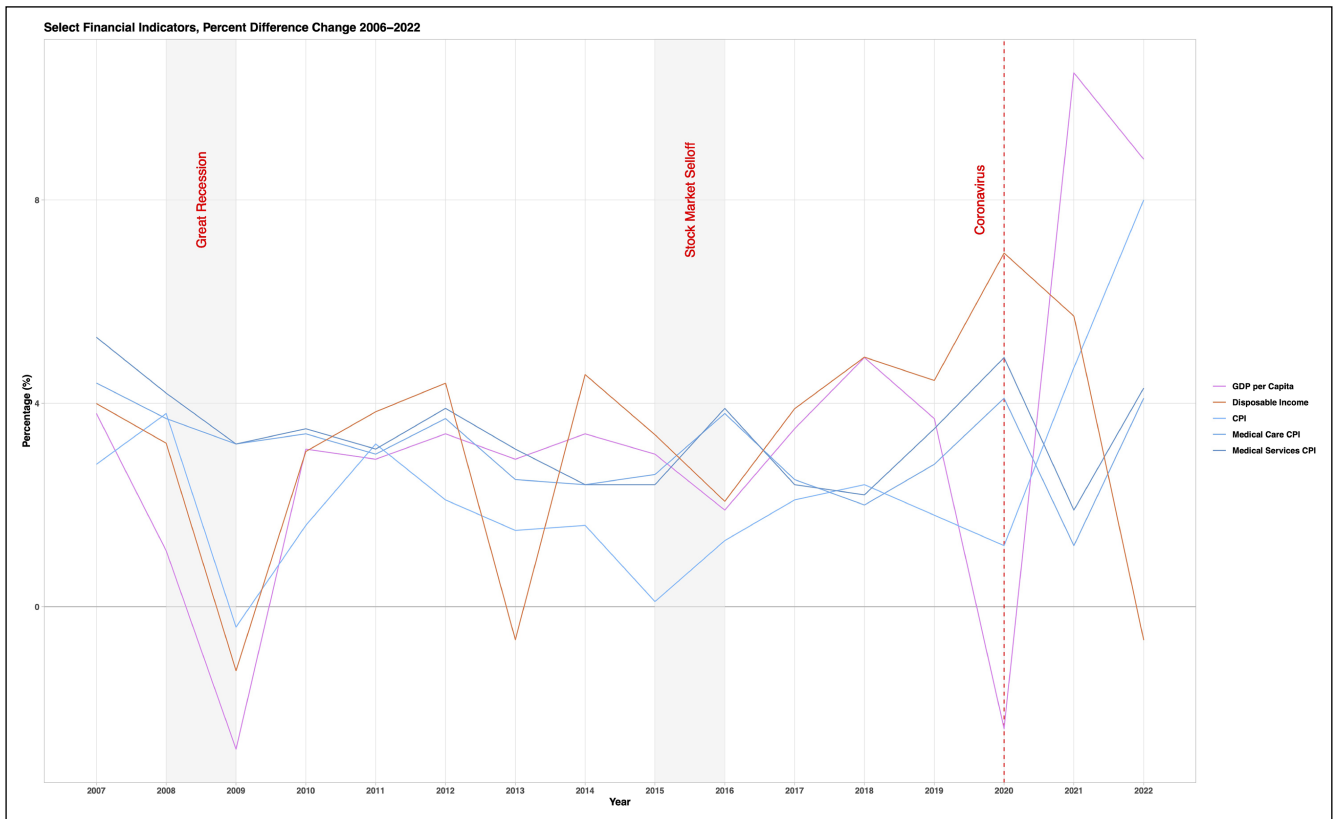
Since 2006, the US has experienced 2 financial recessions and a stock market selloff. From the National Bureau of Economic Research, a recession is defined as a significant decline in economic activity that is spread across the economy and lasts more than a few months. It describes the time period between an economic peak and trough.<sup>17</sup> A common rule of thumb is that 2 consecutive quarters of negative GDP growth mean a recession. Although recessions are painful for consumers, they are a natural step of the economic cycle, which describes an economy's alternation between growth and contraction.<sup>18</sup>

## The Great Recession (2007-2009)

The Great Recession, lasting from December 2007 to June 2009, resulted from excessive mortgage lending. Between 1998 and 2006, the average home price more than doubled,<sup>19</sup> peaking at the beginning of 2007. During this time, the housing market was propped up on high-risk, or "subprime," mortgages that banks offered to Americans eager to purchase a home, including those with poor credit history. From 2004 to 2006, mortgage interest rates increased, and monthly payments became too expensive for borrowers.<sup>20</sup> Foreclosures swept the nation, crashing the mortgage-backed securities market and triggering massive losses for banks, investment firms, and borrowers.

The housing market crash rippled throughout the US economy. During the Great Recession, the unemployment rate grew from 5% to 10%.<sup>19</sup> Inflation indicators increased, and personal disposable incomes decreased. With many Americans struggling with employment, lost savings, and the stresses of financial insecurity, the aesthetic surgery market responded in kind; both case volumes and expenditures witnessed a decline across all procedures except, notably, DF.

The resilience of DF during the Great Recession may be attributable to a few factors. From 2003 to 2008, more than a dozen filling agents were FDA approved, including Juvederm, Radiesse, Restylane, and Sculptra.<sup>21</sup> By 2008, these products had been popularized through direct-



**Figure 1.** Select financial indicators, percent difference change 2006-2022. A graph that depicts annual change in gross domestic product per capita, disposable income, consumer price index (CPI), medical care CPI, and medical services CPI from 2006 to 2022. GDP, Gross Domestic Product.

to-consumer advertising and makeover television shows.<sup>22</sup> For the average American, injectables were a more affordable aesthetic intervention than surgical procedures.<sup>23</sup> Lastly, DF may have been a more desirable purchase over NI during the Great Recession because of their longer lasting effects, providing justification for the expense.

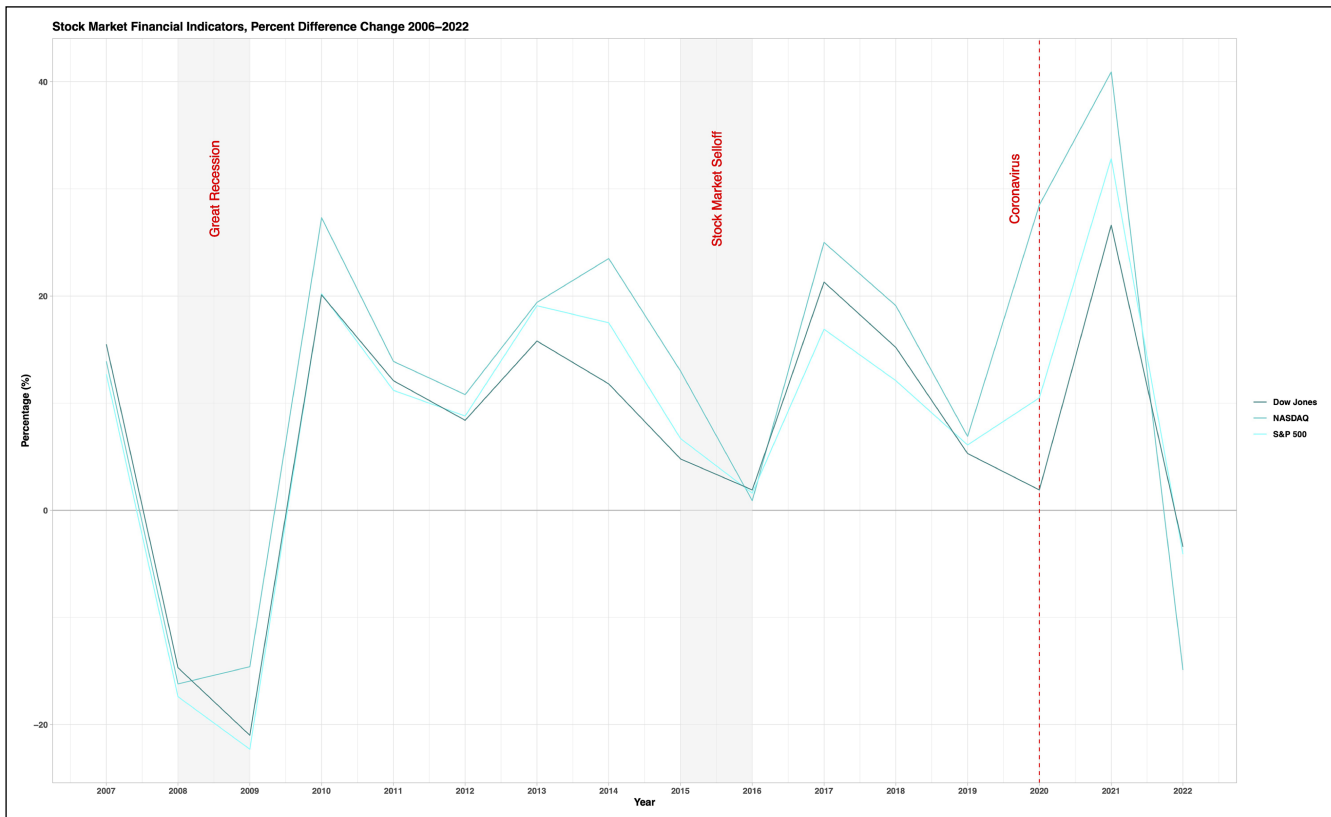
### Post-Great Recession (2009-2014)

After the Great Recession, the aesthetic surgery market was revived not only by the financial recovery of the general population but also by the rise of social media. From 2009 to 2014, case volumes and expenditures on aesthetic procedures increased by 12.2% and 15.9%, respectively. Stock market indicators increased substantially, with the NASDAQ and S&P 500 more than doubling. Concurrently, Instagram was released in 2010,<sup>24</sup> and the first #selfie was tagged in 2011.<sup>25</sup> Selfies quickly became a way for patients to hyperfocus on features they did not find aesthetically pleasing, consequently driving more business to plastic surgeons.<sup>26,27</sup> The introduction of Snapchat filters in 2015 furthered this demand.<sup>28</sup> Moreover, celebrities and influencers normalized aesthetic procedures. In 2015, Kylie Jenner admitted to using

lip fillers.<sup>29</sup> Her celebrity status inspired many to follow suit.<sup>30</sup> Alicia Keys’s 2016 #NoMakeup trend popularized the “natural beauty” concept, paradoxically drawing attention to the many surgical and nonsurgical methods celebrities use to look “flawless” without makeup.<sup>31</sup> Marketing science research has shown that #NoMakeup increased interest and consumption in beauty enhancement practices, such as injectables.<sup>32</sup>

### Global Stock Market Selloff (2015-2016)

The stock market selloff of 2015-2016 was a series of global financial events that impacted the United States at a level not readily noticeable to the everyday consumer. Several notable international events prompted this year of economic downturn: slowing growth of China’s GDP, falling petroleum prices, the Greek debt default, the United Kingdom’s European Union membership referendum, and the effects of quantitative easing—a financial recovery strategy implemented by the US post-Great Recession.<sup>33</sup> As a result of the economic uncertainty sparked by these events, stock prices declined globally.



**Figure 2.** Stock market financial indicators, percent difference change, 2006-2022. A graph that depicts annual change in the Dow Jones Industrial Average (Dow Jones), National Association of Securities Dealers Automated Quotations (NASDAQ), and Standard and Poor's 500 (S&P 500).

Both AS and ASPS datasets suggest accelerated growth during this period. Per AS data, surgical procedures increased by 2.9%, and injectable procedures increased by 10.1%. ASPS data show these volumes increased by 3.2% and 5.0%, respectively. From 2015 to 2016, stock market indicators, GDP, and disposable income stagnated, and inflation increased, but the immediate financial impact on the average American was minimal. The difference between the 2 datasets can be accounted for by normal market variation in accordance with a steady American market and distinct sampling strategies.

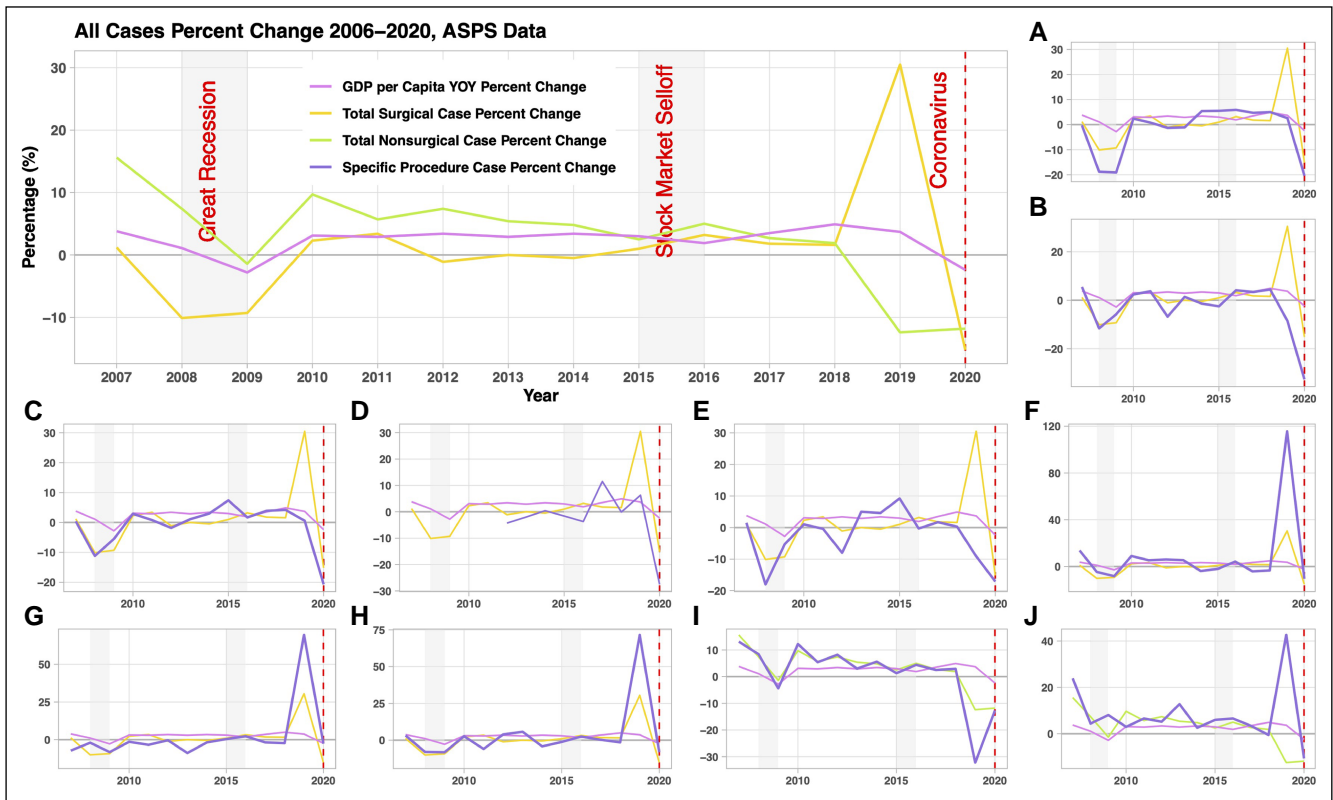
### COVID-19 Pandemic (2020-2022)

The COVID-19 pandemic was an international event that sparked economic shock and a 2-month recession (March and April) with reverberating financial impacts. The pandemic resulted in nationwide shutdowns, leading to an unemployment rate as high as 13% and a GDP decrease of 10% below its level at the start of the Pandemic Recession.<sup>34</sup> However, the Pandemic Recession was brief, and social distancing restrictions lifted as early as May, thus restarting the economy, reopening businesses, and

returning jobs to those who were unemployed. By the third quarter of 2020, the GDP had recovered to just below 2% from its peak.<sup>34</sup>

The ASPS and AS data tell 2 different stories for 2020. Surprisingly, AS data showed an increase in total surgical case count by 16.9% and expenditures by 18.2%, although nonsurgical cases decreased by 20.6% and related expenditures decreased by 20.7%. ASPS data, however, showed that surgical procedures saw reductions in case counts by 15.2% and patient expenditures by 15.2% and that nonsurgical cases decreased by 11.8% and expenditures decreased by 13.5%, similar to previous studies.<sup>35-37</sup> Regardless, a Google Trends analysis found public interest in plastic surgery reached 2-year peaks in the middle of 2020.<sup>38</sup>

Evaluating the differences in sampling methods between ASPS and AS may help us interpret the impact of the pandemic and unprecedented public interest on the aesthetic surgery industry immediately following the lifting of the lockdown (May 2020-2021). From 2019, the AS has captured data from participating AS members' practices through its Aesthetic Neural Network, which retrieves billing data from practice management systems.<sup>8</sup> ASPS samples its data from ASPS member surgeons and other physicians most



**Figure 3.** All cases percent change 2006-2020, American Society of Plastic Surgeons’ (ASPS) data. A composite figure depicting annual change for all procedures from 2006 to 2020 using American Society of Plastic Surgeons’ data. (A) Liposuction; (B) breast augmentation; (C) mastopexy; (D) breast reduction; (E) abdominoplasty; (F) facelift; (g) rhinoplasty; (h) blepharoplasty; (I) neuromodulator injections; (J) dermal fillers. GDP, Gross Domestic Product; YOY, year-over-year.

likely to perform plastic surgery through questionnaire. Their responses are combined with data collected through ASPS’s Tracking Operations and Outcomes for Plastic Surgeons database.<sup>7</sup> Both organizations aggregate and extrapolate their datasets to provide a snapshot of national plastic surgery activity. AS data may best capture private plastic surgery practices, although ASPS data also incorporates academic plastic surgeons who perform cosmetic procedures in the hospital setting. Additionally, the primary setting of procedure may have impacted aesthetic surgery demand. Levy et al and Aktas et al report decreased case volumes during 2020, with both sampling from their respective institutions’ elective inpatient populations.<sup>35,37</sup> These hospitals may have had decreased bed availability and constrained resources for noncritical care due to the pandemic,<sup>39</sup> restrictive policies,<sup>36</sup> or elective patients unwilling to risk COVID-19 exposure. Such barriers may have been less of a problem for private practices, allowing for a faster return to business. Ultimately, more granular data would permit a more comprehensive, accurate analysis.

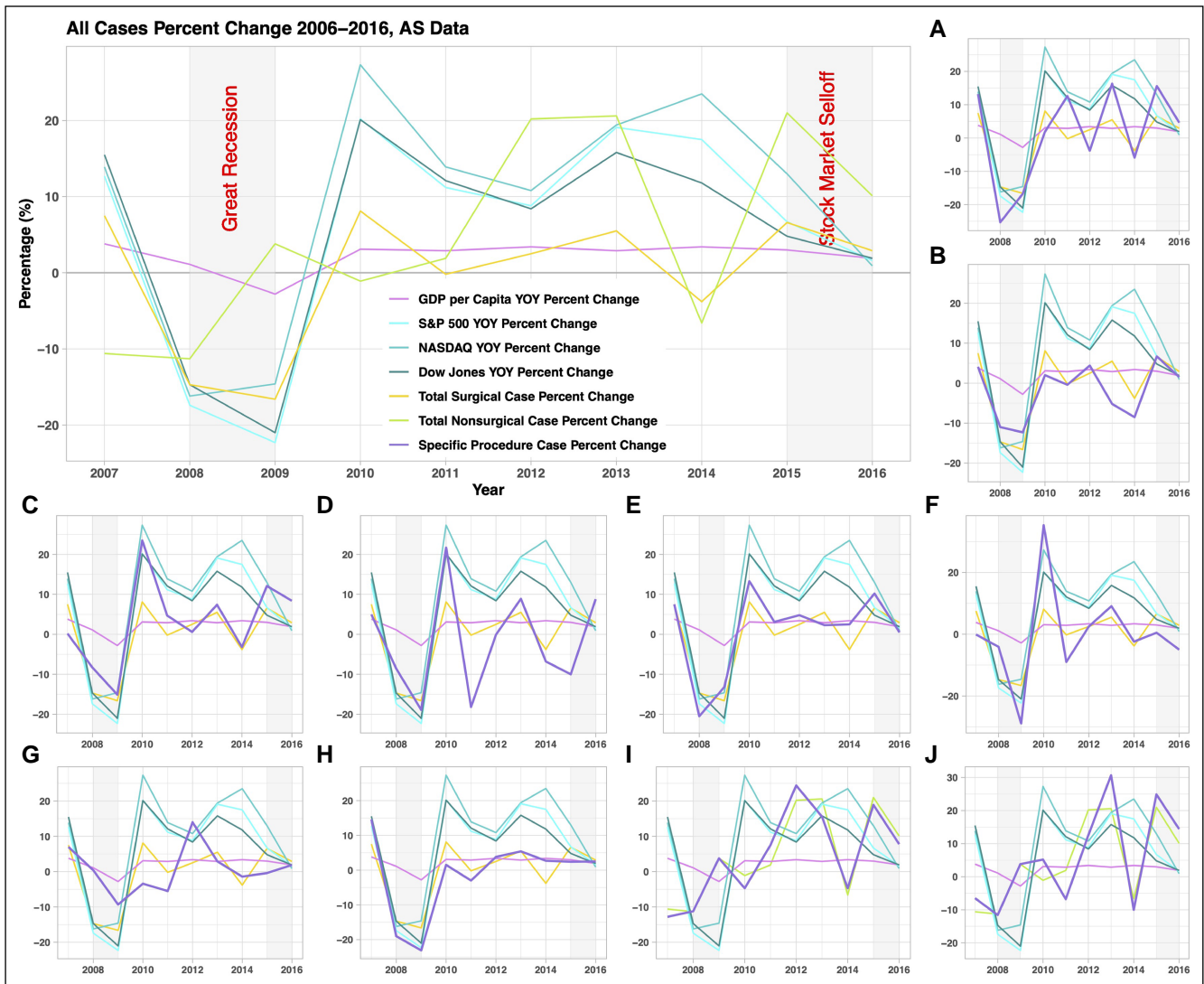
Both datasets, however, show an overall recovery from the pandemic. The widespread adoption of video calling during the pandemic has been cited as a driving factor

behind greater acceptance for aesthetic surgery and toward proceeding with intervention.<sup>40</sup> Just as employment rates have since surpassed prepandemic levels,<sup>34</sup> so too have aesthetic surgery case volumes and expenditures.

### Post-Pandemic Recession and Beyond

It is unclear how long this growth in plastic surgery can be sustained. Since the Pandemic Recession, inflation has also surged, reaching a peak average increase of 8.0% in 2022, the most remarkable change seen since 1981.<sup>10</sup> Furthermore, AS data depict a noticeable retraction in growth for surgical procedures between 2021 and 2022. It remains too early to tell if the effects of inflation on consumer spending patterns will drastically alter aesthetic surgery expenditures, especially given now decreasing inflation,<sup>10</sup> a brewing housing bubble,<sup>41</sup> a global energy crisis,<sup>42</sup> and dwindling pandemic savings.<sup>43</sup>

There are several ways plastic surgeons can financially protect themselves. First, according to AS data, injectables have consistently remained in high demand, having seen case volume growth even during the Great Recession and Pandemic Recession. If not already a part of their practice,



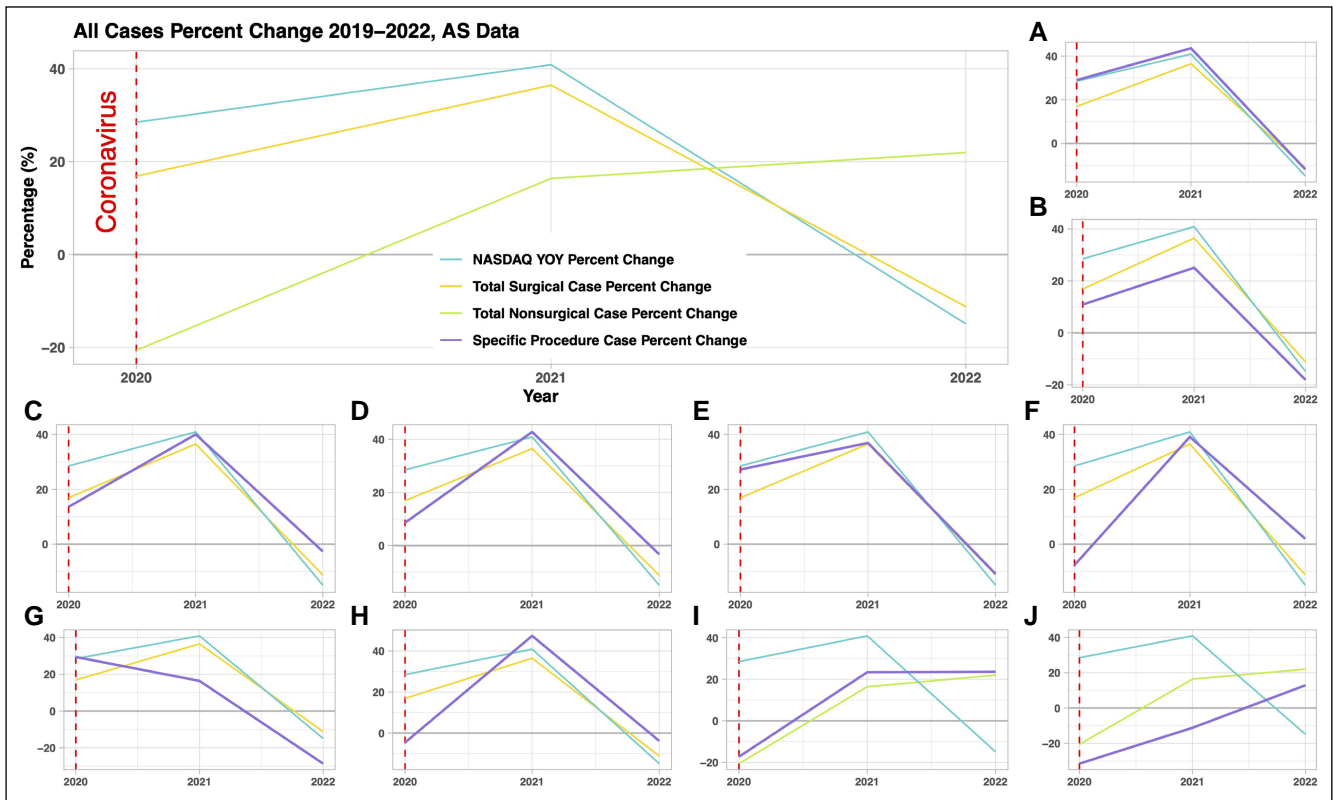
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plastic surgeons may consider offering injectable services, and ensuring such services are optimized for business during economic downturns. Second, our study showed that GDP, NASDAQ, S&P 500, and DOW were the financial indicators most strongly linked to the performance of the plastic surgery industry. Inflation indicators and disposable income demonstrated a lower degree of association. In practice, we recommend plastic surgeons remain up to date with current events and stock market performance to best protect their practice’s finances. Aesthetic plastic surgeons must remember that our services are a luxury good, and luxury goods are not recession proof.<sup>44</sup>

As presented in this article, popular culture also heavily influences aesthetic surgery procedures. We suggest

surgeons regularly survey their patients’ interest in services and aesthetic inspirations to inform pricing and offering of procedures. For example, understanding how patients perceive topics such as “Ozempic Face” and AI-powered TikTok filters may prompt marketing campaigns advertising DF services. Following celebrity news may also provide foresight into the latest aesthetic trends. Recently, celebrities such as Doja Cat and Chrissy Teigen have disclosed their breast reduction and implant explantation procedures, respectively.<sup>29</sup> Recognizing their place in the broader timeline of the slimmed down, natural beauty trend<sup>45</sup> can perhaps explain why breast augmentation has experienced declining case volumes recently.





**Figure 5.** All cases percent change 2019-2022, Aesthetic Society (AS) data. A composite figure depicting annual change for all procedures from 2019 to 2022 using AS data. (A) Liposuction; (B) breast augmentation; (C) mastopexy; (D) breast reduction; (E) abdominoplasty; (F) facelift; (G) rhinoplasty; (H) blepharoplasty; (I) neuromodulator injections; (J) dermal fillers. NASDAQ, National Association of Securities Dealers Automated Quotations; YOY, year-over-year.

### Limitations

There are several limitations to this study. The inconsistencies in ASPS and AS data collection restricted the ability to uniformly analyze data. In the case of AS data, the changes to survey methodology limited an already limited dataset. As a result, our analyses are likely underpowered and increase the likelihood of a Type II error. Finally, this study utilizes the most readily available economic indices to consumers. More rigorous economic analysis and identification of confounding variables may result in different interpretations of the data. However, our goal was to identify an easy, reproducible metric that may be readily utilized by practicing plastic surgeons to anticipate and respond to the changing demand for aesthetic plastic surgery.

### CONCLUSION

This study contributes a comprehensive analysis of the aesthetic surgery industry’s performance against national economic indicators. Changes in GDP, NASDAQ, S&P 500, and DOW were more frequently significantly correlated with changes in case volumes and expenditures, although

inflation indicators and disposable income were less often significantly correlated. Qualitatively, the aesthetic surgery industry has been responsive to past major financial events and consumer trends. Yet, recent success in the post-Pandemic Recession era has defied historical patterns and the current economic situation. Plastic surgeons should stay vigilant, considering economic indicators and cultural trends in their practice management.

### Supplemental Material

This article contains [supplemental material](http://www.asjopenforum.com) located online at [www.asjopenforum.com](http://www.asjopenforum.com).

### Disclosures

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

### Funding

The authors received no financial support for the research, authorship, and publication of this article, including payment of the article processing charge.

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