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Changes in public interest in plastic surgery over time: A comprehensive global perspective using google trends. No job, Yes Aesthetics?

Plastik cerrahiye olan kamuoyu ilgisindeki zaman içindeki değişimler: Google trends kullanılarak kapsamlı bir küresel araştırma "iş yok, ama estetik var" mı?

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ABSTRACT

Aim: Google Trends has become an essential resource in health research, providing valuable insights into evolving public interest patterns. Social media platforms significantly influence public interest in cosmetic surgery, with effects observed across age groups. Research shows a clear connection between social media exposure and heightened public interest, serving as a means for surgeons to educate patients and market their services.

Material and Methods: This study uses Google Trends data to analyze changes in interest in plastic surgery from 2004 to 2025. We investigated the correlation of these trends with social, economic, technological, and global health events, focusing on how these factors have shaped public curiosity and demand.

Results: Our analyses reveal a marked increase in interest, particularly during the global health crisis, with procedure-specific associations with unemployment rates (significant for Botox and breast augmentation, while other procedures were not statistically significant).

Conclusions: We discuss the implications of these trends for healthcare providers and policymakers, offering practical insights into how digital trends can inform health service planning and public health strategies.

Keywords: Beauty, employment, socioeconomic factors, time factors.

ÖZ

Amaç: *Google Trends, sağlık araştırmalarında önemli bir kaynak haline gelmiş olup, kamuoyunun ilgi kalıplarındaki değişimlere dair değerli bilgiler sunmaktadır. Sosyal medya platformları, estetik cerrahiye olan kamuoyu ilgisini önemli ölçüde etkilemektedir. Bu etkiler tüm yaş gruplarında gözlemlenmektedir. Araştırmalar, sosyal medya maruziyeti ile artan kamuoyu ilgisi arasında açık bir bağlantı olduğunu göstermekte ve bu durum cerrahlar için hastaları bilgilendirme ve hizmetlerini pazarlama aracı olarak işlev görmektedir.*

Gereç ve Yöntem: *Bu çalışma, 2004'ten 2025'e kadar estetik cerrahiye olan ilgideki değişiklikleri analiz etmek için Google Trends ve Dünya Bankası verilerini kullanmaktadır. Bu eğilimlerin sosyal, ekonomik, teknolojik ve küresel sağlık olaylarıyla ilişkisi araştırılmış ve bu faktörlerin kamuoyunun merakını ve talebini nasıl şekillendirdiğine odaklanılmıştır.*

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Bulgular: *Analizler, özellikle küresel sağlık krizi sırasında ilgide belirgin bir artış olduğunu ve işleme özgü olarak işsizlik oranlarıyla ilişkiler bulunduğunu ortaya koymaktadır (Botoks ve meme büyütme için anlamlı iken, diğer işlemler için istatistiksel olarak anlamlı değildir).*

Sonuç: *Bu çalışmada, söz konusu eğilimlerin sağlık hizmeti sağlayıcıları ve politika yapıcılar için doğuracağı sonuçları ele alınmıştır.*

Bu bilgiler, aynı zamanda dijital trendlerin sağlık hizmeti planlaması ve halk sağlığı stratejilerine nasıl katkı sağlayabileceğine dair pratik bilgiler sunabilir.

Anahtar Sözcükler: *Güzellik, istihdam, sosyoekonomik faktörler, zaman faktörleri.*

INTRODUCTION

Plastic surgery has witnessed an unprecedented surge in interest in aesthetic and reconstructive procedures over the past decades, a trend that we have thoroughly explored. This surge may be driven by individuals seeking to fulfill esteem needs related to self-perception and confidence (1–3). This is reflected in the significant rise in both surgical and nonsurgical aesthetic procedures worldwide, with an overall 40% increase over the last 4 years (2). This growth prompts an exploration into the underlying social, economic, technological, and psychological drivers, as understanding these can significantly benefit healthcare professionals in tailoring services and policymakers in crafting effective health strategies (1).

Google Trends has emerged as a vital tool in health research, offering insights into patterns of public interest over time. Social media platforms have profoundly influenced interest in cosmetic surgery, with this influence observed across various age demographics[4]. Studies indicate a direct correlation between social media exposure and increased public interest, with social media serving as a tool for both patient education and surgeons' marketing (3,5). This is further supported by recent research showing a strong positive correlation between social media use and consideration of aesthetic procedures (6).

Economic factors play a pivotal role, with individual prosperity influencing investment in aesthetic enhancements, alongside broader healthcare system considerations of value, cost-effectiveness, and resource allocation in plastic surgery. The aim of this study is to examine temporal changes in global public interest in selected cosmetic procedures using Google Trends data and to assess whether these trends were associated with macroeconomic indicators, particularly GDP growth and unemployment rates. We hypothesized that public interest would vary over time and that economic indicators would show procedure-specific associations with search interest.

MATERIALS and METHODS

The study covers more than 20 years from January 1, 2004, to April 1, 2025. This period marks a time when the effects of technological advancements and the widespread adoption of social media in cosmetic surgery become more clearly evident. Google Trends was queried for worldwide web search interest using the terms "Rhinoplasty," "Liposuction," "Breast Augmentation," "Botox," and "Cosmetic Surgery." Monthly relative search interest data were collected in April 2025 for the study period. Because World Bank economic indicators are reported annually, monthly Google Trends values were aggregated into annual measures for years with complete monthly observations.

Statistical analyses were performed in RStudio (version 2023.12.1+402) using relevant packages (e.g., *tidyverse, forecast, corrplot, lubridate*). The null hypothesis posited no significant linear relationship between the economic indicators and the search interest for the mentioned keywords. In contrast, the alternative hypotheses posited a significant linear relationship. Significance level (α) of 0.05 was adopted for all statistical tests. Linear regression models were constructed for each cosmetic procedure, with GDP growth and unemployment rate serving as separate predictors. Linear regression models were constructed for each procedure, with GDP growth and unemployment rate entered as separate predictors. The null hypothesis was that there was no linear relationship between economic indicators and search interest.

To address the temporal disparity between monthly search data and yearly economic data, monthly search values were aggregated to annual totals for 2004–2024 (years with complete monthly data). Pearson correlation analysis was conducted to investigate the relationships between search trends for different types of

cosmetic surgery. Correlation coefficients indicate the direction (positive or negative) and strength (between -1 and +1) of these relationships. A correlation matrix was used to visualize these relationships. Linear regression models were constructed for each cosmetic procedure, with GDP growth and unemployment rates (World Bank) serving as separate predictors.

Time series analysis was applied to identify patterns, trends, and seasonal fluctuations in search trends for each type of cosmetic surgery. ARIMA (*Autoregressive Integrated Moving Average*) models were used to model these time series and predict future trends. The selection and parameter determination of ARIMA models were performed following the Box-Jenkins methodology. This methodology includes stationarity tests of the time series (e.g., the Augmented Dickey-Fuller test), examination of autocorrelation and partial autocorrelation functions, and model identification stages. The optimal ARIMA models were determined using statistical criteria such as AIC (*Akaike Information Criterion*), AICc (*Corrected AIC*), and BIC (*Bayesian Information Criterion*). These criteria help select the best model by balancing model complexity and goodness of fit.

RESULTS

Correlation analysis showed significant relationships between interest in different types of plastic surgery. This suggests that as general interest in cosmetic surgery increases, interest in these types also rises strongly, which may indicate a future increase in demand for these procedures. There was a high positive correlation between Breast Augmentation and Liposuction ($r = 0.774$). Negative correlations were observed between Botox interest and Breast Augmentation ($r = -0.731$) and cosmetic surgery ($r = -0.618$). This indicates a potential competition or inverse demand trend between these types. The outcomes of the linear regression analyses revealed varying relationships between the economic indicators and the search interest for the cosmetic procedures.

The regression model for “Rhinoplasty” with GDP growth as the predictor yielded a positive but statistically insignificant coefficient ($\beta = 0.782$, $p = 0.639$). The model with the unemployment rate as the predictor showed a negative coefficient ($\beta = -13.210$) that approached, but did not reach, statistical significance at the 0.05 level ($p = 0.062$). The regression analysis for “Liposuction” with GDP growth showed a positive, but statistically nonsignificant, coefficient ($\beta = 4.515$, $p = 0.139$). The model with the unemployment rate as the predictor also yielded a positive, but statistically insignificant, coefficient ($\beta = 19.85$, $p = 0.135$). The regression model for “Breast Augmentation” with GDP growth yielded a positive, statistically nonsignificant coefficient ($\beta = 4.316$, $p = 0.302$). In contrast, the unemployment rate model demonstrated a statistically significant positive coefficient ($\beta = 42.87$, $p = 0.014$). The regression analysis for “Botox” and GDP growth produced a negative, statistically non-significant coefficient ($\beta = -5.138$, $p = 0.848$). The model with the unemployment rate as the predictor showed a statistically significant negative coefficient ($\beta = -370.61$, $p < 0.001$). The regression model for “Cosmetic Surgery” with GDP growth yielded a positive, but statistically insignificant, coefficient ($\beta = 7.482$, $p = 0.295$). The unemployment rate model indicated a positive coefficient ($\beta = 52.69$) that approached but did not reach statistical significance at the 0.05 level ($p = 0.082$). (Figure-1, Table-1)

The time series analysis revealed distinct temporal dynamics and patterns for each type of cosmetic surgery examined. Rhinoplasty searches generally showed a more stable pattern, with short-term fluctuations and slight increases during specific periods (e.g., summer months). The ARIMA (0,1,2)(2,0,0)[12] model best modeled this time series. (Figure-2B) Liposuction searches exhibited a more pronounced seasonality. There was a tendency for searches to increase in the summer and decrease in the winter. The ARIMA (2,1,4)(2,1,1)[12] model successfully captured these seasonal patterns and long-term trends. (Figure-3A) Breast augmentation searches increased in parallel with the general interest in cosmetic surgery. The ARIMA (1,1,1)(2,1,2)[12] model modeled this increase and seasonal fluctuations. (Figure-3B) Botox searches showed a clear long-term upward trend and seasonal fluctuations. The ARIMA (4,1,1)(1,0,1)[12] model was effective in capturing this trend and fluctuations. General cosmetic surgery searches showed strong relationships with other types. The ARIMA (0,1,2)(2,1,1)[12] model was used to model this time series.

ARIMA models were generally successful at capturing time-series patterns, but prediction accuracy varied across types. Model selection criteria (AIC, AICc, BIC) played an essential role in determining the optimal models. ARIMA models generally captured trend and seasonality patterns, although forecast performance varied by

procedure. Model selection was guided by AIC/AICc/BIC, with a limited portion of the variance in search interest for the respective cosmetic procedures.

Table-1. Results of the regression analysis, which shows significant associations between unemployment rates and searches for Botox and Breast augmentation. (β = -370.61, p < 0.001 and β = 42.87, p < 0.05, respectively).

Dependent Variable	Independent Variable	Coefficient (β)	Standard Error	t-value	p-value	R-squared	Adjusted R-squared
Rhinoplasty	GDP Growth Rate (%)	0.782	1.640	0.477	0.639	0.012	-0.042
	Unemployment Rate (%)	-13.210	6.671	-1.980	0.062	0.171	0.127
Liposuction	GDP Growth Rate (%)	4.515	2.914	1.549	0.139	0.118	0.069
	Unemployment Rate (%)	19.85	12.72	1.561	0.135	0.114	0.067
Breast Augmentation	GDP Growth Rate (%)	4.316	4.061	1.063	0.302	0.059	0.007
	Unemployment Rate (%)	42.87	15.76	2.720	0.014	0.28	0.242
Botox	GDP Growth Rate (%)	-5.138	26.404	-0.195	0.848	0.002	-0.053
	Unemployment Rate (%)	-370.61	92.52	-4.006	<0.001	0.458	0.429
Cosmetic Surgery	GDP Growth Rate (%)	7.482	6.938	1.079	0.295	0.061	0.009
	Unemployment Rate (%)	52.69	28.68	1.837	0.082	0.151	0.106

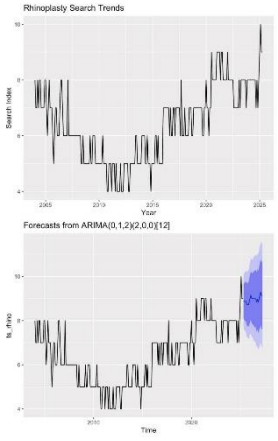

Figure-1. The correlation matrix for various plastic surgery procedures, revealing interrelations that may indicate shared public perceptions or marketing influences.

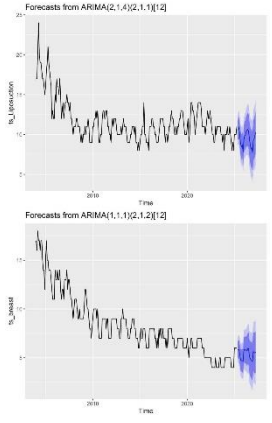

Figure-2. A) Trend in searches for rhinoplasty in time. It shows a consistent upward trajectory over the past two decades, with an increase around 2020, coinciding with the global health crisis. This increase might reflect a shift in public behavior towards seeking personal enhancement during lockdown periods. B) Chart of the ARIMA forecast model.

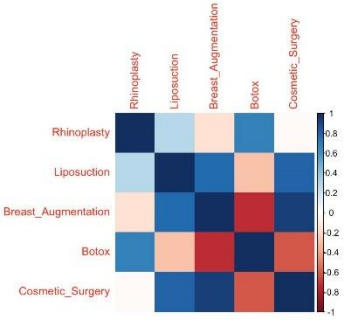

Figure-3. ARIMA analysis for A) Liposuction and B) Breast Augmentation searches. Note the similarity of curves and seasonal changes as mentioned in the text.

DISCUSSION

In this study, public interest in cosmetic procedures generally grew over time, with noticeable differences across procedure types. Among the macroeconomic indicators analyzed, unemployment showed significant links to Botox and breast augmentation, while GDP growth was not significantly related to search interest. Additionally, correlation and time-series analyses indicated that different procedures followed unique temporal trends.

The increased screen time during the pandemic has heightened awareness of appearance

concerns across age groups, potentially contributing to the interest in various cosmetic procedures (3,4). Firstly, the lockdown measures during the pandemic increased screen time, with many individuals spending more time on video calls and social media, potentially heightening their awareness of their appearance. Increased use of virtual platforms and video calls has contributed to a heightened awareness of facial aging, driving interest in procedures aimed at rejuvenation (4,7).

Secondly, with traditional social interactions limited, people might have turned to personal enhancement as a form of self-care or to boost self-esteem during isolating times. The increased interest in procedures like rhinoplasty during the pandemic might reflect a broader societal shift towards introspection and self-care during times of global stress (2). (Figure-2) This trend may indicate a psychological response in which individuals confined to their homes and with limited social interaction turn inward, focusing on personal improvement to cope or maintain morale (3,5,7). This phenomenon warrants further psychological research to understand how external global events influence personal health decisions, particularly in elective fields like plastic surgery.

Our regression analysis confirms that economic growth has no significant effect, whereas the unemployment rate shows significant associations with specific procedures (notably Botox and breast augmentation), whereas associations for other procedures are not statistically significant. (Table-1) This finding is crucial for understanding the economic elasticity of demand for elective procedures.

In times of economic prosperity, individuals would be expected to invest in personal enhancement, seeing it as a luxury they can afford. Conversely, economic downturns may diminish such interests, influencing plastic surgery practices in planning their business strategies. The regression analysis revealed a correlation with insignificant differences between most patterns. Indeed, the search for these procedures does not necessarily mean that individuals will ultimately undergo this surgery. Even without significance, the analysis of how public interest in plastic surgery evolves with economic cycles opens up a discussion on the cyclical nature of elective medical procedures. During economic booms, a clear trend towards luxury and self-improvement may emerge, with plastic surgery often viewed as a personal investment. Conversely, during economic downturns, there may be a shift towards more conservative spending, which may affect the plastic surgery sector unless practices adapt by offering more affordable or non-surgical options. On the other hand, our analysis, showing increased unemployment rates with higher rates of breast augmentation searches and decreased unemployment rates with higher rates of Botox searches, presents an unexpected trend that needs to be scrutinized from a socio-economic perspective. Furthermore, considering the psychological impact of economic conditions on individuals' decisions to undergo plastic surgery adds another layer of complexity.

The correlation between liposuction and breast augmentation searches suggests these procedures may be part of a broader trend toward body contouring and enhancement. (Figure-1) Fashion trends, celebrity influences, or the normalization of these procedures through media exposure may drive this (3,5). Interestingly, while these procedures are often sought for different reasons, their search trends align, indicating a shared demographic interest or marketing strategy. The proliferation of filters and technologies enables individuals to alter and even 'purchase' specific body parts, contributing to a fragmented view of the self (8).

The correlation between liposuction and breast augmentation may also be explored through the lens of body image trends (2,5). (Figure-1) Over the decade, there has been a shift towards body positivity, yet paradoxically, there is also an increase in procedures aimed at body contouring (2,3). This dichotomy might reflect a nuanced understanding of body positivity where individuals seek enhancement not out of dissatisfaction but as a form of self-expression or empowerment[1,5].

Moreover, the role of digital media, especially social media, cannot be understated. Platforms like Instagram and TikTok have become virtual galleries for before-and-after transformations, influencing public perception and normalizing cosmetic procedures among younger demographics (5,6,8). This digital influence suggests that future research should also consider the psychological and sociological impacts of social media on body image and the decision to undergo plastic surgery (6).

The correlation matrix provides deeper insight into how different plastic surgery procedures are perceived and whether they should be marketed separately (Figure-1). For instance, the high

negative correlation between searches for "Botox" and "Cosmetic Surgery" might indicate that non-surgical enhancements are often considered apart from surgical options. This pattern may suggest that interest in minimally invasive procedures and surgical procedures can follow different decision pathways. The observed correlations may inform how procedures are positioned in public communication and marketing strategies. In fact, with proper canalization, these patients may be referred for more extensive cosmetic work (5). It also suggests marketing cooperation among various cosmetic procedures. For instance, the correlation between Botox and cosmetic surgery searches may indicate a marketing strategy in which non-surgical options are presented as entry points into the realm of cosmetic enhancement, potentially leading to less invasive procedures over time. This marketing dynamic can be examined to understand how industry practices influence consumer behavior in cosmetic surgery (6).

Health policy also shapes demand. The regression analysis results underscore the economic sensitivity of the plastic surgery market. (Table-1) This sensitivity suggests that plastic surgery practices should develop economic forecasting models to anticipate demand fluctuations and potentially integrate economic indicators into their business strategies. Such models may aid resource allocation, staffing, and even decisions about when to launch promotional campaigns or introduce new services. However, Google Trends data should be interpreted carefully. They show relative online search interest rather than actual patient demand, procedure volume, or clinical decision-making. Future studies that combine digital search data with clinical or survey-based datasets may offer a more complete understanding of these patterns.

The limitations of using Google Trends data for health research must be acknowledged. While it provides a broad overview of public interest, it fails to capture the nuanced decision-making process behind seeking plastic surgery. Future studies could incorporate qualitative methods, such as interviews or focus groups, to explore personal motivations, fears, and expectations, thereby providing a richer context for the observed quantitative trends.

This data-driven insight into market trends can guide practice management, marketing, and service development for plastic surgeons and clinics, ensuring they remain relevant and responsive to public needs. For policymakers, these findings underscore the importance of developing nuanced health policies that account for economic accessibility, cultural sensitivity, and individuals' psychological well-being. According to Maslow's theory, cosmetic procedures can be viewed as satisfying specific psychological needs, thereby contributing to an individual's overall sense of well-being and self-acceptance (1). However, while Google Trends is an effective tool for gauging interest, it is essential to correlate this data with real-world surgical statistics to validate trends and understand actual demand. It has to be kept in mind that Google Trends data reflect relative online search interest and should not be interpreted as a direct measure of actual patient demand, procedure volume, or clinical decision-making. This would provide a more solid foundation for decision-making in both clinical practice and policy.

CONCLUSION

In conclusion, public interest in cosmetic procedures changed substantially over time and differed across procedure types. Among the macroeconomic indicators examined, unemployment showed procedure-specific associations, whereas GDP growth was not consistently associated with search interest. These findings suggest that online public interest in cosmetic surgery is dynamic and may be shaped by broader social and economic factors; however, Google Trends should be interpreted as a measure of search behavior rather than actual clinical demand.

Ethical Approval: This study utilized publicly available data from Google Trends and the World Bank. Thus, ethical approval was unnecessary. However, adherence to data usage policies was ensured.

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Conflicts of interest: Authors declared no conflict of interest.

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