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Trends in Plastic Surgery in Relation to United States Demographics

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I. Abstract

In the United States, surgical and minimally invasive cosmetic procedures have been on the rise over the past 5 years. As plastic surgery grows to become more common throughout our society, it will be useful to know what areas or regions have demographics that are more likely to undergo a procedure. This information will be useful for surgeons, clinic locations, marketing, and potential patients. In order to define regions that are most likely to have people interested in plastic surgery, we combined data from American Society of Plastic Surgeons (ASPS) and the U.S. Census. The data was taken from 2010 to 2018 that combined the total number of surgical and minimally invasive procedures and demographic data from predefined regions. Based on the outcomes of a cluster analysis, we built personas that would be most likely to partake in plastic surgery. These personas outlined the geographical areas, gender, employment status, and age for surgeons to know who their target audiences are. With this knowledge, surgeons have a better idea of how best to locate themselves, market their practice, and can focus on procedures that are relevant for the audience they best serve.

II. Introduction

The world of plastic surgery can be elusive, with thoughts jumping to celebrities and Beverly Hills. However, there are many other people across the country who partake in these elective surgeries. It is a quiet field due to the confidential nature, which is why we do not have as clear of an idea of the industry outside the known California hotspots. Also, due to the evolution of science and ever changing beauty trends, we never know who is turning more to elective procedures and where. The goal of our research is to examine trends in plastic surgery and the demographics of those who opt for these surgeries.

We are curious to see the trends in who and where these procedures are taking place most often. By identifying the key demographic factors, we can draw a stronger conclusion of market segments for plastic surgeons to be informed of. Surgeons can know who their real audience is. To add, the rise of social media worldwide has created several changes to individuals' body image mentality. By analyzing the demographics of these patients, there is a possibility of finding a correlation that explains the growth in popularity of cosmetic procedures.

The findings from this study have the ability to impact a variety of stakeholders. From a surgeon's perspective, investigating which demographic are their main audience would allow them to market more effectively by targeting the proper audience. If they know that older women are more likely to have plastic surgery than younger, they would know to focus marketing campaigns more to Facebook and print ads than Snapchat. Armed with this knowledge, surgeons can better target their audiences in order to create a larger customer base. Additionally, surgeons can better know where to place their practices, whether it be major cities or further into the suburbs. They could even know whether to focus more on anti-aging procedures or lip fillers. The information could be invaluable. Lastly, as there is not extensive research done on this specific topic, hopefully the findings will provide a solid foundation for further work.

III. Literature Review

As cosmetic surgeries are on the rise, there has been an increase in the number of modern plastic surgery research spanning a wide variety of topics. One of particular interest to the focus

of our study is “Factors Influencing Patient Interest in Plastic Surgery and the Process of Selecting a Surgeon.” This study aims to understand patient interest and defining factors that lead to a surgeon and procedure decision. The areas of the study that aided in our research was the demographic data collected. Data was collected by a survey that was distributed to 96 individuals in waiting rooms in nonsurgical clinics. They were asked several questions pertaining to age, income, marital status, gender, and interest in cosmetic surgery. According to Galanis et al., “The average respondent was 34.5 years, 84% were women and 15% were men. Average annual income was around \$90,000 and 56% were married” (1). At the time the study was conducted, 19.8% of the respondents were interested in receiving cosmetic surgery. Though the study took one step further and investigated other influential factors of choosing a surgeon and procedure, our interest lies in the demographic data and how this can impact the number of procedures. Similar to this study, we believe that understanding public interest and specific demographics that govern the decision to undergo cosmetic surgery will be beneficial for practicing surgeons and clinics.

The American Society of Plastic Surgeons (ASPS) was a great source of information when researching the topic of plastic surgery and in determining what question to ask and what variables to dig deeper into. The ASPS, founded in 1931, is the largest organization specific to the plastic surgery industry in the entire world. According to the ASPS website, their mission has always been “to advance quality care to plastic surgery patients by encouraging high standards of training, ethics, physician practice and research in plastic surgery” and they offer services such

as “education, advocacy, practice support, and enhanced public awareness of the value of plastic surgery, while fostering the highest professional, ethical and quality standards”. The society is currently representative of 93% of board-certified plastic surgeons in the United States and has relationships with over 8,000 surgeons across the world. Based on this background, we believe the ASPS to be a useful and reliable resource with the most current and representative data.

IV. Data Collection

The data used in this study was obtained from the ASPS database. According to the ASPS website, “ASPS has partnered with Data Harbor Solutions, a health care industry data management and technology development company, to ensure objectivity in the gathering, analysis, and publication of its procedural statistics” (1). Data on cosmetic and reconstructive plastic surgery procedures have been collected since 2000. All procedures included are those that are performed by ASPS Member Surgeons and all have been certified by the American Board of Medical Specialties (ABMS). In order to gather reliable statistics, an annual questionnaire is distributed to around 24,500 ABMS board-certified physicians. As of the most recent statistics (2018), about 724 active physicians were included in the 2018 final sample. In addition to the questionnaire, data is combined with the Tracking and Operations and Outcomes for Plastics Surgeons. This ensures that the returned numbers from the questionnaire are cross-checked against a similar dataset. Finally, as stated by ASPS, “Results of the survey are based on a 95 percent confidence level with a ± 4.12 percent margin of error” (1). This has resulted in reliable data collected since 2000.

For the specifics of our study, we took data from ASPS from 2010 to 2018. The data from ASPS that was relevant to our study was the total number of surgical and minimally invasive surgeries for each region. The United States was divided into 5 regions (See Figure 1).



Figure 1. The 5 regions broken down to show corresponding states

Based off of the regions, the United States Census provided demographic data that was matched to each region. The regions defined in ASPS were identical to the regions defined in the U.S. census. Demographic data used was median income, male, female, median age, employment rate, and percentage of white or black races. See Table 1 for a glimpse of the data we compiled from ASPS and the U.S census. The data integrated from the two sources were formatted as a flat table so that it would be readable in SPSS Statistics. A main benefit of a flat table is that it is easier and faster for statistic programs to navigate and find outcomes.

	A	B	C	D	E	F	G	H	I	J	K
1	Region	Year	Procedure Type	# of Procedures	Median Income	Male	Female	Median Age	Employment Rate	White	Black
2	Region 1	2018	Surgical	343642	\$70,531.50	13,676,967	14,378,573	40.5	0.58	0.77	0.12
3	Region 1	2018	Minimally-Invasive	3538206	\$70,531.50	13,676,967	14,378,573	40.5	0.58	0.77	0.12
4	Region 2	2018	Surgical	288057	\$59,825.00	16,860,856	17,293,519	48.5	0.59	0.84	0.11
5	Region 2	2018	Minimally-Invasive	2234609	\$59,825.00	16,860,856	17,293,519	48.5	0.59	0.84	0.11
6	Region 3	2018	Surgical	337304	\$59,681.00	31,863,794	33,458,614	39.6	0.54	0.70	0.24
7	Region 3	2018	Minimally-Invasive	3418302	\$59,681.00	31,863,794	33,458,614	39.6	0.54	0.70	0.24
8	Region 4	2018	Surgical	300986	\$50,244.00	14,635,391	15,080,379	37.2	0.51	0.76	0.22
9	Region 4	2018	Minimally-Invasive	2091743	\$50,244.00	14,635,391	15,080,379	37.2	0.51	0.76	0.22
10	Region 5	2018	Surgical	541751	\$67,736.50	26,614,011	19,542,867	36.95	0.55	0.75	0.06
11	Region 5	2018	Minimally-Invasive	4627071	\$67,736.50	26,614,011	19,542,867	36.95	0.55	0.75	0.06
12	Region 1	2017	Surgical	341220	\$68,514.50	13,766,347	14,468,944	41.5	0.58	0.78	0.12
13	Region 1	2017	Minimally-Invasive	12714118	\$68,514.50	13,766,347	14,468,944	41.5	0.58	0.78	0.12
14	Region 2	2017	Surgical	285538	\$58,304.00	16,831,125	17,258,551	38.25	0.58	0.84	0.11
15	Region 2	2017	Minimally-Invasive	2203157	\$58,304.00	16,831,125	17,258,551	38.25	0.58	0.84	0.11
16	Region 3	2017	Surgical	332264	\$57,339.00	31,551,774	33,153,774	39.4	0.54	0.70	0.24
17	Region 3	2017	Minimally-Invasive	3389179	\$57,339.00	31,551,774	33,153,774	39.4	0.54	0.70	0.24
18	Region 4	2017	Surgical	296211	\$48,731.00	14,527,209	14,949,337	37	0.51	0.76	0.22
19	Region 4	2017	Minimally-Invasive	2051052	\$48,731.00	14,527,209	14,949,337	37	0.51	0.76	0.22
20	Region 5	2017	Surgical	535599	\$65,291.50	19,300,692	19,404,619	36.8	0.55	0.75	0.06
21	Region 5	2017	Minimally-Invasive	4565830	\$65,291.50	19,300,692	19,404,619	36.8	0.55	0.75	0.06
22	Region 1	2016	Surgical	340076	\$68,460.50	13,700,379	14,404,377	40	0.57	0.78	0.12

Table 1. Sample of the dataset created from ASPS and U.S Census

V. Data Modeling

Based on the purpose of our study and the structure of our dataset, cluster analysis posed to be the best modeling method. The purpose of a cluster analysis is to explore the data and identify structures within it; this technique tries to identify homogeneous groups of cases if the grouping is not previously known. According to StatisticsSolutions, “ Specifically in SPSS, there are three methods for cluster analysis: K-Means cluster, Hierarchical Cluster, and Two-Step Cluster” (1). After running an auto-cluster on our dataset, it recommended a K-Means cluster analysis. Additionally, based on our interpretation of the data this gave us the most meaningful results. We used 10 out of the 11 inputs. Year was not included as this was a qualitative input and we wanted our results to not be contingent on time. The results obtained from this method were five clusters with a fair quality around .4. The sizes ranged from 7 to 36 with a ratio 5.14 (See Figure 2). Only the top three largest clusters were used for the remainder of our study because these were the strongest of our results (See Figure 3)

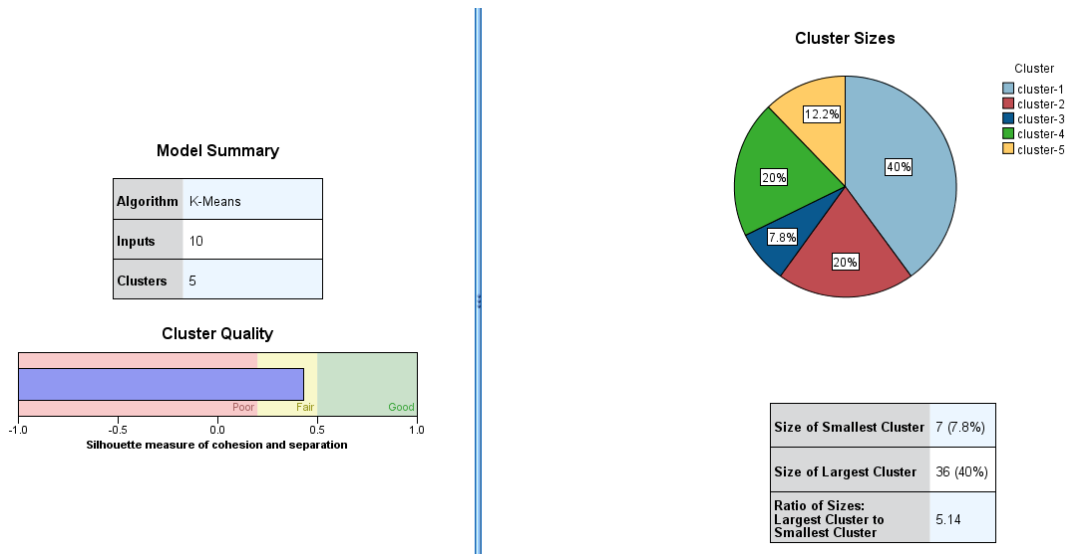


Figure 2. Summary of K-Means Cluster Analysis Model (SPSS)

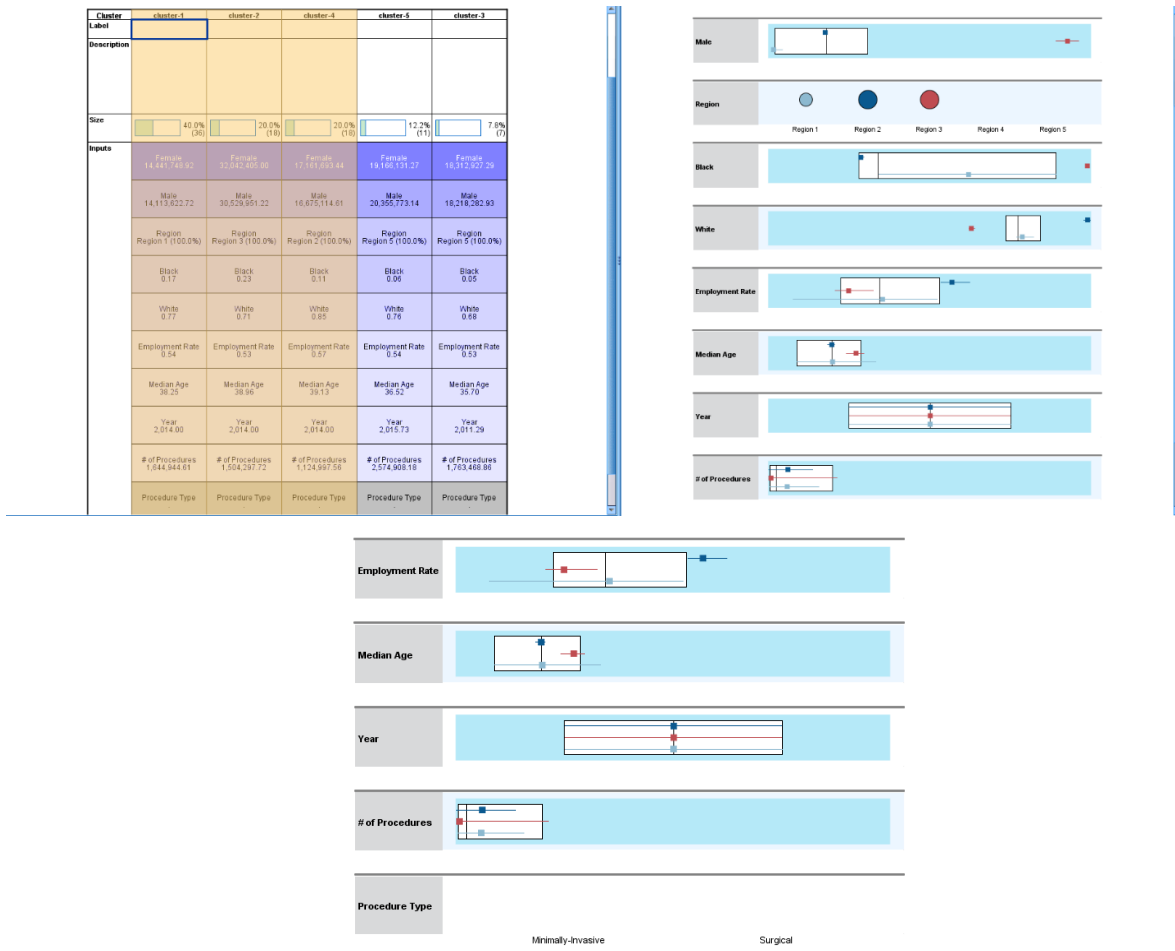


Figure 3. Further breakdown of all clusters and variables analyzed (SPSS)

breakdown of all

VI. Results and Discussion

After conducting a cluster analysis we were able to determine the three strongest groupings of personal characteristics to determine what segments of people are most likely to receive plastic surgery. To break down our results, we first generally define each cluster using data obtained from the analysis. See Table 2. Each cluster is assigned a region, which are predetermined by the ASPS. Refer to Figure 1 for a mapping showing which states are included in each region.

Characteristics	Cluster 1	Cluster 2	Cluster 3

<i>White</i>	77%	71%	85%
<i>Black</i>	17%	23%	6%
<i>Other</i>	6%	6%	9%
<i>Employment Rate</i>	.54	.53	.51
<i>Median Age</i>	38.25	38.96	36.60
<i>Male</i>	49%	49%	49%
<i>Female</i>	51%	51%	51%
<i># of Procedures</i>	1,644,944.61	1,504,297.72	1,124,997.56
<i>Region</i>	New England & Middle Atlantic	South Atlantic	Midwest

Table 2. Results of cluster analysis model

Cluster 1, the largest and possibly most reliable cluster makes up 40% of the population studied and is generally located in the northern part of the east coast, including the New England and the Middle Atlantic regions. This cluster is characterized by having an employment rate of 54% and being around 38 years old. While the gender distribution is pretty evenly split for this cluster, there is a 1% higher chance that this person is a female. The population that makes up this cluster is predominantly white however, there is a 23% chance of them being of a different race. Based on this information we are able to create Persona A, a white female in her late 30’s who is employed and lives in the northern part of the east coast. Out of the three clusters chosen, Cluster 1 has the highest number of procedures and therefore we can predict that Persona A is the most likely to undergo cosmetic procedures.

Making up 20% of the total population studied, Cluster 2 is characterized by an employment rate of .53 and a median age of 38.96. Additionally, the population is predominantly white, but has the highest black population compared to the other clusters. While gender is split

almost equally, females are 2% more common. This cluster can be found in the South Atlantic region including Florida, Georgia, and the Californias. Specifically, Persona B is a white female who most likely is employed. She is around 38 years old and lives in the South Atlantic Region.

Cluster 3 makes up 20% of the population we studied. There is an 85% chance they are white and slightly more likely to be female. Their median age is 36.6 years old, making them the youngest cluster. They are also slightly more likely to be employed. Based on these facts, if Persona C was a person they would be a 36 year old white woman who probably has a job. She lives in a Midwestern or Plains state (Illinois, Indiana, Michigan, Ohio, Wisconsin, West Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota). Considering there is only a 1% higher chance they are employed compared to not, we would not weigh employment too heavily in any marketing decisions.

Based on our findings, these personas can be used to identify areas where plastic surgeries would succeed best and where to focus marketing strategies. The three descriptions help identify the target audience and narrow down people and places that would most likely participate in a procedure. Knowing who their target audience is will help surgeons plan their practice and marketing efforts immensely. This information will allow them to implement more targeted marketing tactics using the characteristics studied such as geographical location, age group, and racial background. By specifying these variables in a paid advertising campaign, the technology is able to show the advertisements to only the specified audience by using their previous search data to determine who they are. Not only will they be able to use these findings to create more targeted marketing strategies, but they will also be able to create content that is more curated to a very specific audience, therefore increasing the chances that the marketing will have the intended effect on the consumer. Overall, marketing tends to become significantly more

valuable when there is more information available to make decisions regarding who to target and what strategies to use for targeting them. The findings will be helpful for plastic surgeons trying to expand their customer base and reach as well, since they can know who is outside their target to try to appeal to them more. They can also target the regions most associated with a larger number of procedures if there is not as high of a demand in their area.

VII. Limitations and Recommendations for Future Research

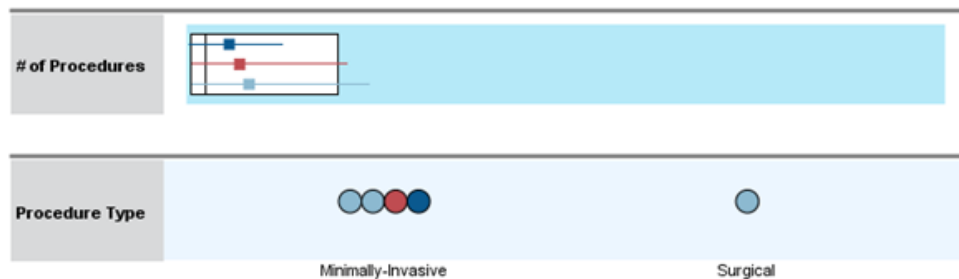
By compiling data from the ASPS and running it through a cluster analysis, we were able to determine three distinct personas for plastic surgeons to target when they are deciding where to open their practice. While our clusters were complete with demographic characteristics as well as specific regions where each persona is most likely to be found, our clusters did not indicate what types of procedures, surgical vs. nonsurgical, these personas may be looking for. It is our belief that including procedure type as a variable for the cluster would be especially valuable to determine what type of practice to open in addition to our regional and demographic recommendations.

Though the models used in the study do not match a specific plastic surgery to each persona, we experimented during the modeling phase to determine if our data would give us more insight into this variable. When setting the region to “none” and running the cluster analysis, meaning that region was not considered when determining the clusters, it gave us clusters with a specified preference of surgery type. We found that this resulted in each cluster having a characteristic of either more minimally invasive versus surgical. See Figure 4. This does not give a specific procedure but it does break down the nature of plastic surgery. We did not include this modeling technique in our study because we wanted to have the region assigned to a cluster to better create our personas. While this information was great to have, we did not believe

the clusters were as valuable without any insight as to what region the consumer could be found in. We are aware that this information could be very useful and should try to be included in future research. We believe that if our time was not cut short in the classroom we would have been better equipped to play with our data in SPSS modular and incorporate both region and procedure type data.

Figure 4. Clusters with insight into Procedure Type (with region set to “none”)

Another limitation to this study is the broadness of the defined regions. The regions associated with the data used were predetermined by ASPS, which did not give any background information as to how these regions were divided or chosen. Visually, one can see that the regions are not equal in land mass or in the number of states. A recommendation for future research would be to dig deeper into the regional data to determine more specific regions to open practice. We believe it would be useful to either break the five predefined regions into smaller, more specific areas, or to focus on more concentrated cities in order to make the results more



reliable. In order to do this, however, it would require that the researchers collect their own data from individual cities which could be a tremendous effort.

VIII. References

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