# CHEMICALS IN COSMETICS

## Group 9

## *Title:*

The primary purpose of these is to collect information on hazardous and potentially hazardous ingredients in cosmetic products sold in California and to make this information available to the public. We have identified different ingredients in different products that can harm us in day to day life.

## *Introduction:*

Health and living a healthy life have the priority in today's world, but some are lean towards giving beauty, attractiveness, looks, their priority. Here, we undertook a project to find the toxins of the product everyone of us maybe using in day-to-day life and they are cosmetics.

- These data reflect information that has been reported to the California Safe Cosmetics Program (CSCP) in the California Department of Public Health (CDPH).
- The primary purpose of the CSCP is to collect information on hazardous and potentially hazardous ingredients in cosmetic products sold in California and to make this information available to the public.
- Companies with reportable ingredients in their products must submit information to the California Safe Cosmetics Program if the company:

Has annual aggregate sales of cosmetic products of one million dollars or more, and.

Has sold cosmetic products in California on or after January 1, 2007.

## *Related work:*

Raji Rai a UA Developer at Oracle did same work with same data we got what should be looking for from this data in this project and was an example to look for, we did some work with tableau which was not done here.

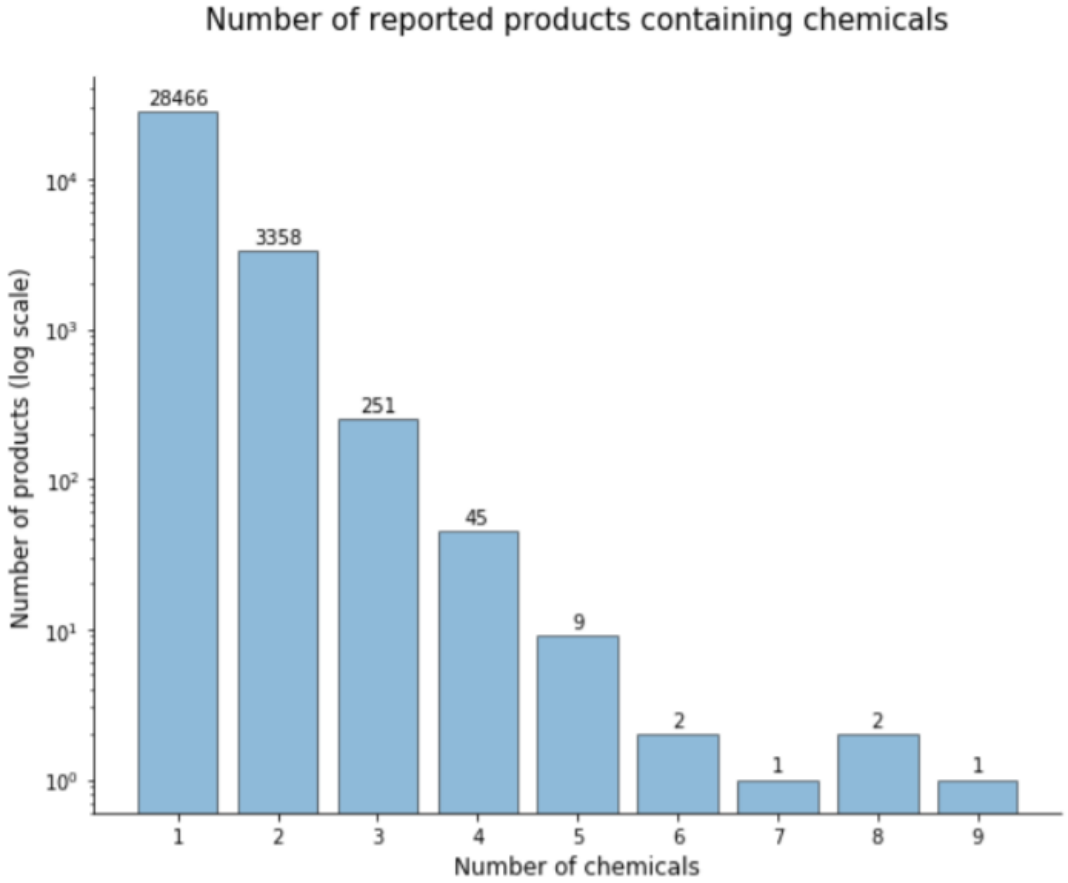
## *Methods:*

To get started with the data we first needed to explore the data and do some cleaning as well for null, false and duplicate values if any as they could affect our result. To initiate, we first found how many rows and columns are present in our date and we found there are 114046 rows and 22 columns. Out of these rows we again looked for the duplicate rows and came with the answer that there are 1104046 rows and 22 columns which are unique.

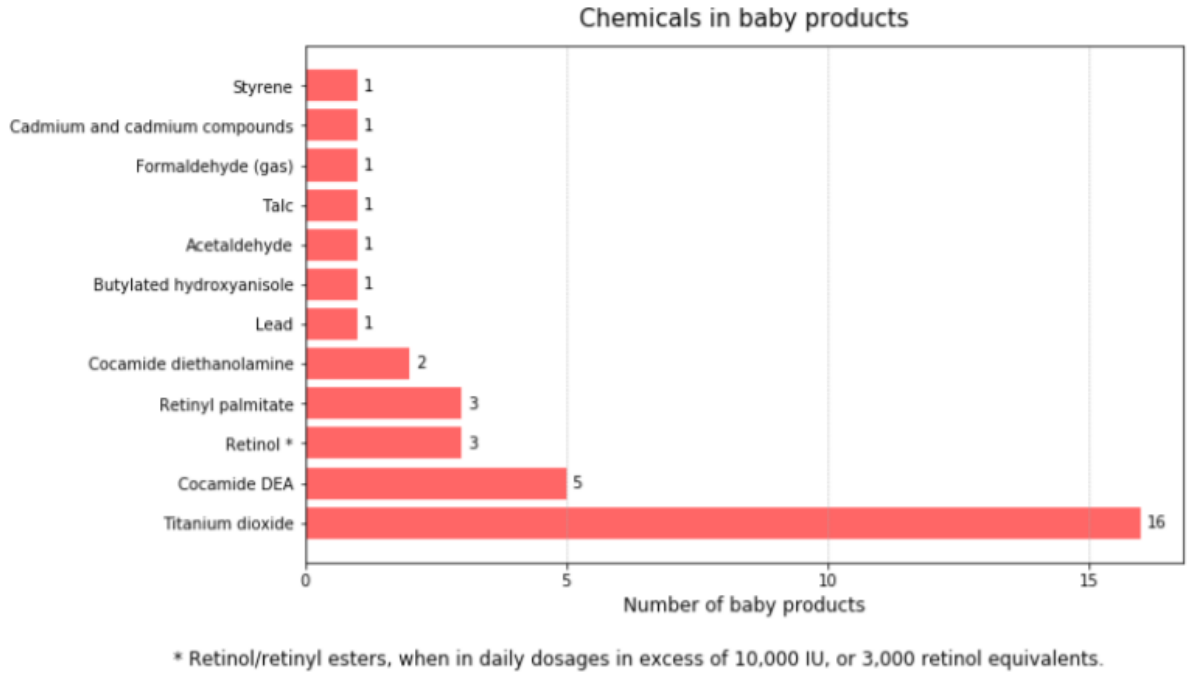
Further, to move forward we wanted to know how many different chemicals are present in our data and came to know that there are 123 different chemicals in the whole dataset. And with the use of .describe() we looked at the datatype which was float.

However, in our data we found that if the number of chemicals being used equal to zero means that chemicals were removed from the product, and to verify that we checked for NaN values in the Column “ChemicalDateremoved” and we got output as False which means there are no NaN values. From this we got curious about how many most number chemicals present in one product and which are those products so we looked for the answer and got that at most there are 9 chemicals in a product and the same product was listed nine times in data with different chemicals.

To get clearer about the data we plotted a bar graph showing no of chemicals used with product count below is the outcome.



Well, that was all about all the products and while going through data we noticed there were some baby products in the data too so planned to plot a graph to look for chemicals present in baby products. The graph shows which are the chemicals present in what number of baby products. The results were surprising as there were in total 12 chemicals present in the baby products and their count was 36. That is 36 baby products were in this dataset which include chemicals and all of them were the chemicals found to be causing cancer, later in this project.

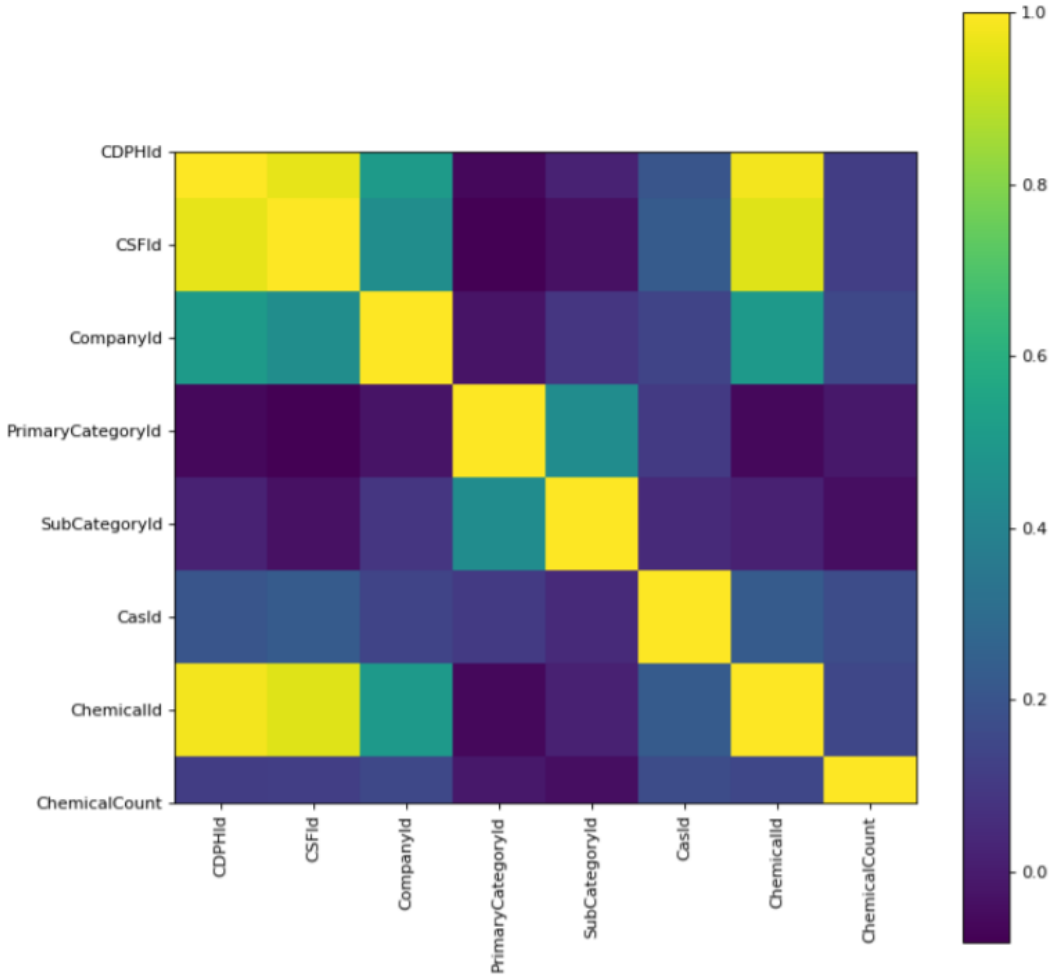


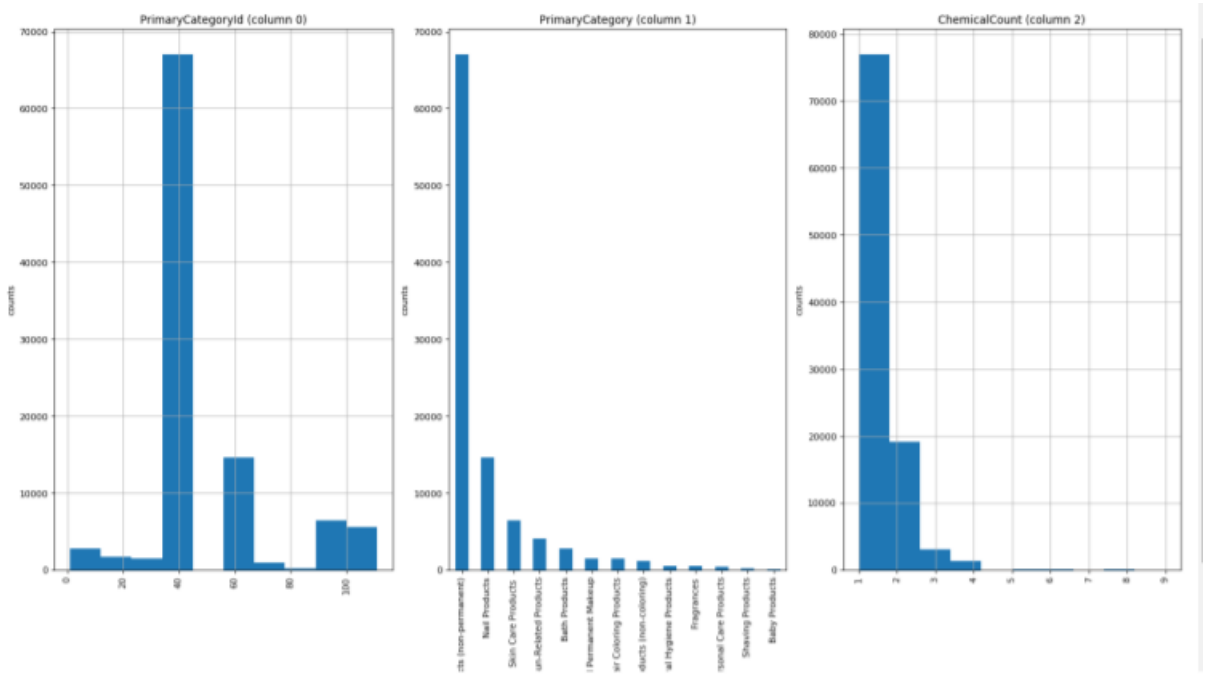

* Retinol/retinyl esters, when in daily dosages in excess of 10,000 IU, or 3,000 retinol equivalents.

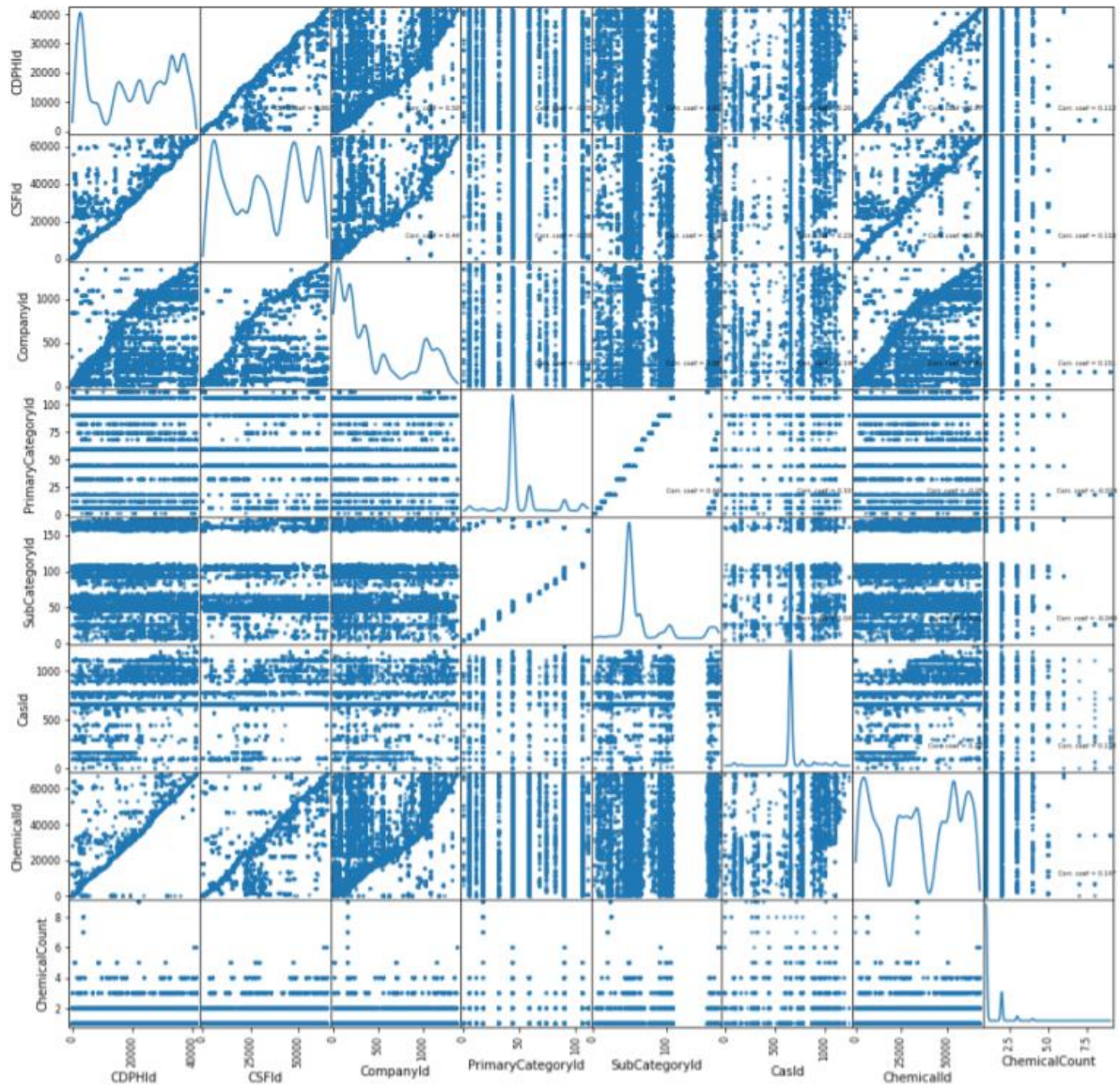
Let us see which are the baby products that contain chemicals in a list view to get proper knowledge about them:

| Baby product | Company | Type of product |
|---|---|---|
| Baby Don't Cry Shampoo | John Paul Mitchell Systems | Baby Shampoos |
| Baby Dream Bath, Baby Wash, Baby Shampoo | Delon Laboratories (1990) Inc | Baby Shampoos |
| Johnson's Baby Creamy Oil Aloe & Vitamin E | Johnson & Johnson Consumer Companies | Baby Skin Care |
| Johnson's Baby Bar | Johnson & Johnson Consumer Companies | Baby Skin Care |
| Vitamin C Serum | Perfect Angel Cosmetics & Health Co., Limited | Baby Skin Care |
| Vitamin E Baby Oil Cream | Vi-Jon, Inc | Baby Skin Care |
| Burt's Bees Baby Nourishing Mineral Sunscreen SPF 30 | Burt's Bees Inc. | Baby Skin Care |
| Pure & Free Baby Stick SPF60 | Johnson & Johnson Consumer Companies | Baby Skin Care |
| Baby Natural Protection Stick SPF50+ | Johnson & Johnson Consumer Companies | Baby Skin Care |
| Pure & Free Baby Faces Ultra Gentle SPF45 | Johnson & Johnson Consumer Companies | Baby Skin Care |
| Baby Powder- Original | Johnson & Johnson Consumer Companies | Baby Skin Care |
| J00750 Non-Petroleum Jelly | The Hain Celestial Group, Inc | Baby Skin Care |
| SPF 30+ Summer Blend Sunscreen Lotion | California Baby | Baby Skin Care |
| A-alpha-C (2-Amino-9H-pyrido[2,3-b]indole) | Test | Baby Skin Care |
| SPF 30+ No Fragrance Sunscreen Lotion | California Baby | Baby Skin Care |
| Harmon Zinc Oxide Ointment 2oz | Harmon Stores Inc. | Baby Skin Care |
| Harmon Zinc Oxide Ointment 2oz | Harmon Stores Inc. | Baby Skin Care |
| Balmex Prevention Baby Powder | Chattem, Inc. | Baby Skin Care |
| SPF 30+ Everyday Sunscreen Lotion | California Baby | Baby Skin Care |
| JOHNSON&#65533;S BABY CREAMY OIL | Johnson & Johnson Consumer Companies | Baby Skin Care |
| Moist Diane Body Soap (White Floral) | Oceana USA, Inc. | Baby Wash/Soap |
| Moist Diane Body Soap (Tiara Floral) | Oceana USA, Inc. | Baby Wash/Soap |
| Moist Diane Body Soap (Cassis & Pear) | Oceana USA, Inc. | Baby Wash/Soap |
| Burt&#65533;s Bees Baby Buttermilk Soap | Burt's Bees Inc. | Baby Wash/Soap |
| Baby Bath Baby Bar | Johnson & Johnson Consumer Companies | Baby Wash/Soap |
| Sweetleaf Baby Bar Soap | Thymes LLC | Baby Wash/Soap |
| Baby Dream Bath, Baby Wash, Baby Shampoo | Delon Laboratories (1990) Inc | Baby Wash/Soap |
| Moist Diane Oil in Body Soap (Chardonnay) | Oceana USA, Inc. | Baby Wash/Soap |
| Alkmaar Soap | Lush Manufacturing Ltd. | Baby Wash/Soap |
| Moist Diane Oil in Body Soap (Citrus Bouquet) | Oceana USA, Inc. | Baby Wash/Soap |
| Balmex Prevention Baby Powder | Chattem, Inc. | Diaper Rash Treatment |
| Balmex Multi-Purpose Healing Ointment | Chattem, Inc. | Diaper Rash Treatment |
| J00704 Diaper Relief Aloe | The Hain Celestial Group, Inc | Diaper Rash Treatment |
| AV37110 Zinc Diaper Balm | The Hain Celestial Group, Inc | Diaper Rash Treatment |
| Baby Barrier Cream | Philosophy | Diaper Rash Treatment |
| Desitin Maximum Strength/ Desitin Original Diaper Rash Ointment | Johnson & Johnson Consumer Companies | Diaper Rash Treatment |

Moreover, we also plotted a correlation heatmap, Distribution graph of data column wise, Scatter and density plots.


CDPHId
CSFId
CompanyId
PrimaryCategoryId
SubCategoryId
CasId
ChemicalId
ChemicalCount
1.0
0.8
0.6
0.4
0.2
0.0


PrimaryCategoryId (column 0)
PrimaryCategory (column 1)
ChemicalCount (column 2)
counts




Lastly, our team did some research and was able to find foxiness of every chemicals in this which we further attached to data where 0 means not dangerous to skin and 5 means most dangerous to skin and other values in between the scale likewise.

The other column, which is “Carcinogenesis” give detain about that is the chemical present can cause cancer if used and the values here is 0 and 1, 0 means cannot cause cancer and 1 means can cause cancer.

Well, this both columns were created while keeping visualization in mind and to find answer to question we all were curious about after going through this data and looking what all things are included in this dataset.

## ***Results:***

The questions which arise in our mind after working with this data was

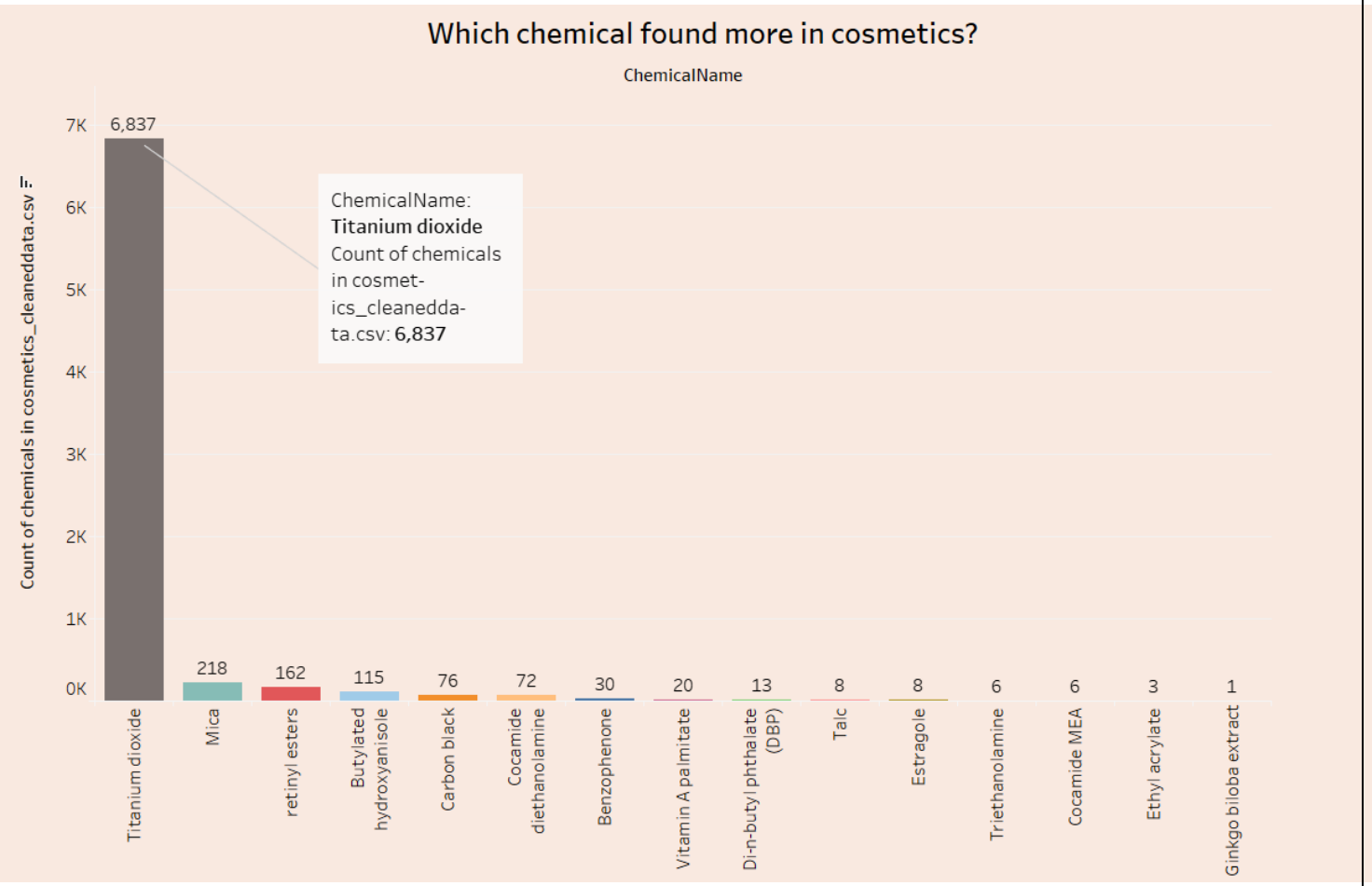
- Should we be worried of those chemicals?
- Can these chemicals cause cancer or any skin related diseases?
- Babies too must be kept away from those products.

Answers to all these questions is just one word “Yes” and there were many things to find from these data which could be helpful to people who consumes these products in their everyday life and all those answers are further given by visualizations and chart made by using tableau.

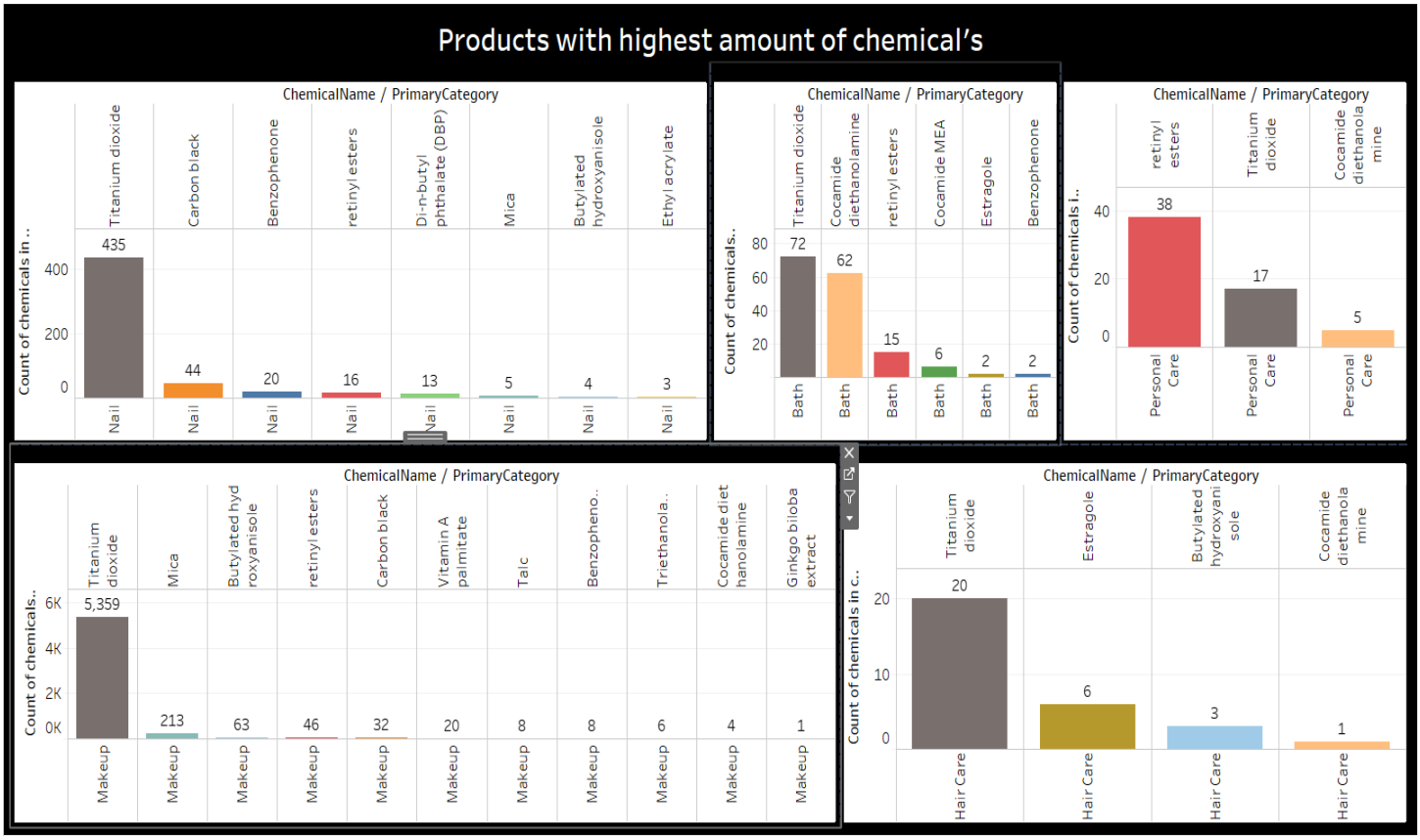
## ***Discussion***

Now, for further clarity we added the dataset in tableau software which is a software for analyzing the data by plotting the data graphically. So, by using Tableau we got some result which are mentioned in this section.

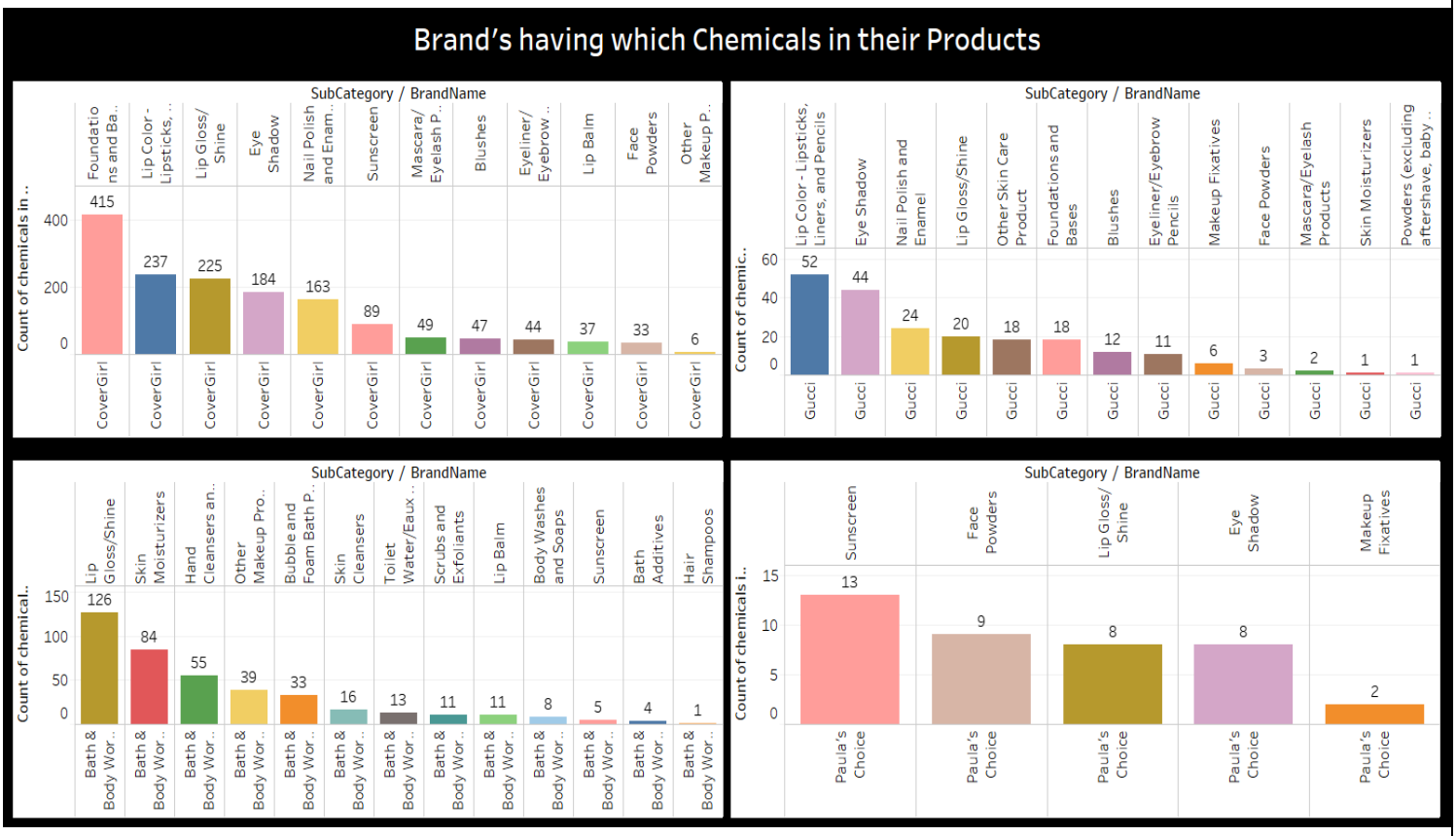
Firstly, we are going to talk about which chemicals are found more in cosmetics. From the graph we can say that “Titanium dioxide” is the most commonly used chemical in the cosmetics nowadays. And further talking about other chemicals “Mica” is the second most used chemical ion cosmetics. While, the least used chemical is “Ginkgo biloba extract”.


Which chemical found more in cosmetics?
ChemicalName
Count of chemicals in cosmetics_cleaneddata.csv
7K
6K
5K
4K
3K
2K
1K
0K
6,837
218
162
115
76
72
30
20
13
8
8
6
6
3
1
ChemicalName:
Titanium dioxide
Count of chemicals in cosmet-ics_cleanedda-ta.csv: 6,837
Titanium dioxide
Mica
retinyl esters
Butylated hydroxyanisole
Carbon black
Cocamide diethanolamine
Benzophenone
Vitamin A palmitate
Di-n-butyl phthalate (DBP)
Talc
Estragole
Triethanolamine
Cocamide MEA
Ethyl acrylate
Ginkgo biloba extract

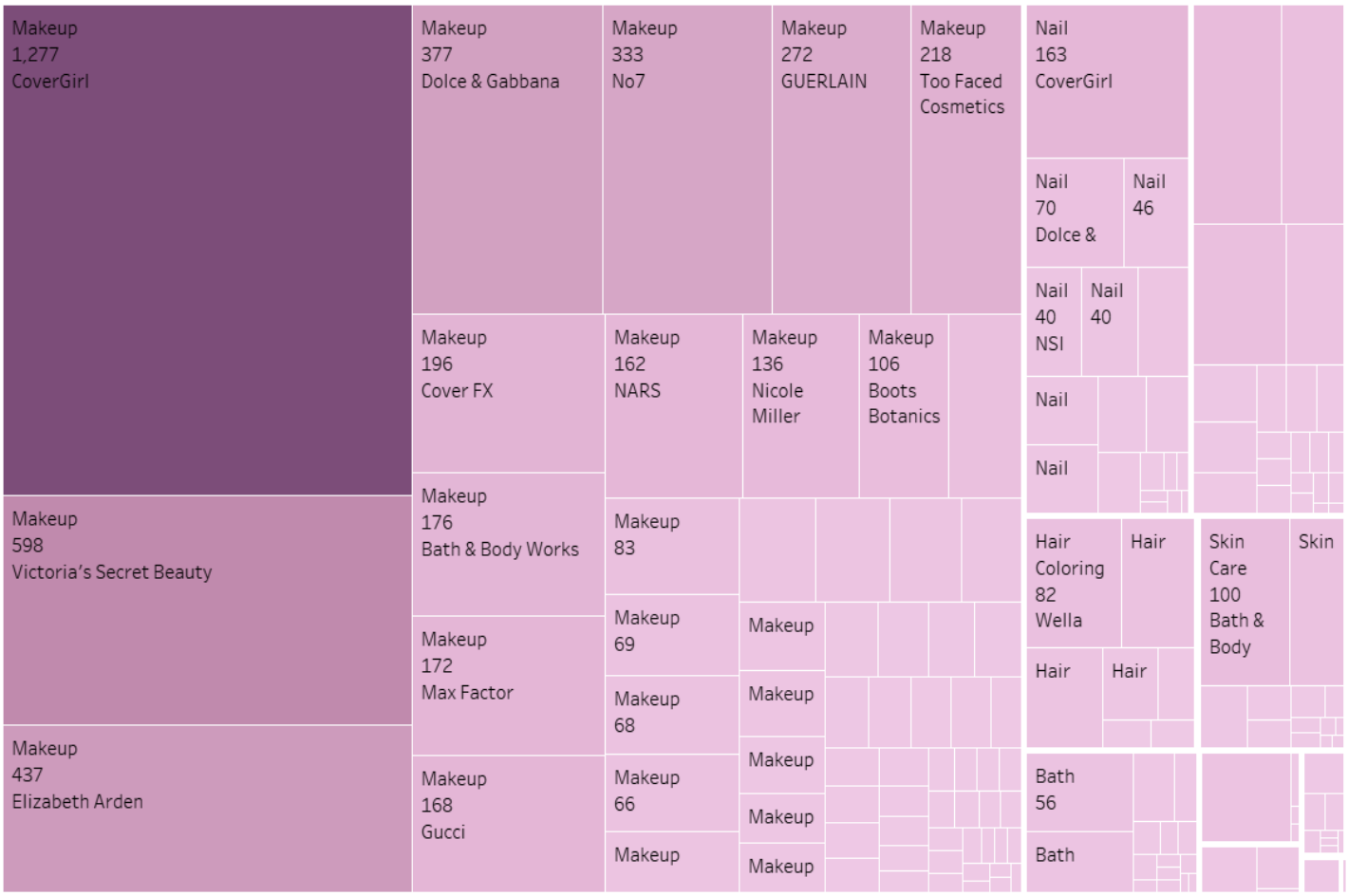
Then, we thought that we should analyze the data on the basis of product type (i.e. Products with highest amount of chemicals). From the graphs it can be concluded that “Titanium dioxide” is the chemical which is mostly used in all the products. Moreover, it can be said that Makeup is the product which uses “Titanium dioxide” with the chemical count of 5,359. And on the other hand Personal Care products contains “Retinyl esters” .From all the graphs, we can finally say that chemicals such as Titanium dioxide are not that harmful as they protect our skin from UV radiation which will burn out skin and can also cause skin diseases.




For more analysis, we analyzed the data based on brands using chemicals in their products. So, we choose some of the most used brands and from the below graph it can be said that “Covergirl” brand uses most of the chemicals in their foundation products and uses least number of chemicals in their makeup products. Talking about Bath and Body works they uses the highest number of chemicals in their lip Gloss/shine products and uses the least number of chemicals in their Hair shampoo’s. Similarly, Gucci uses the highest number of chemicals in their lip color- lipsticks, liner and pencil products and on the other hand it uses least number of chemicals in their powder products. And Paula’s Choice uses most of chemicals in their sunscreens and uses least number of chemicals in their makeup products.

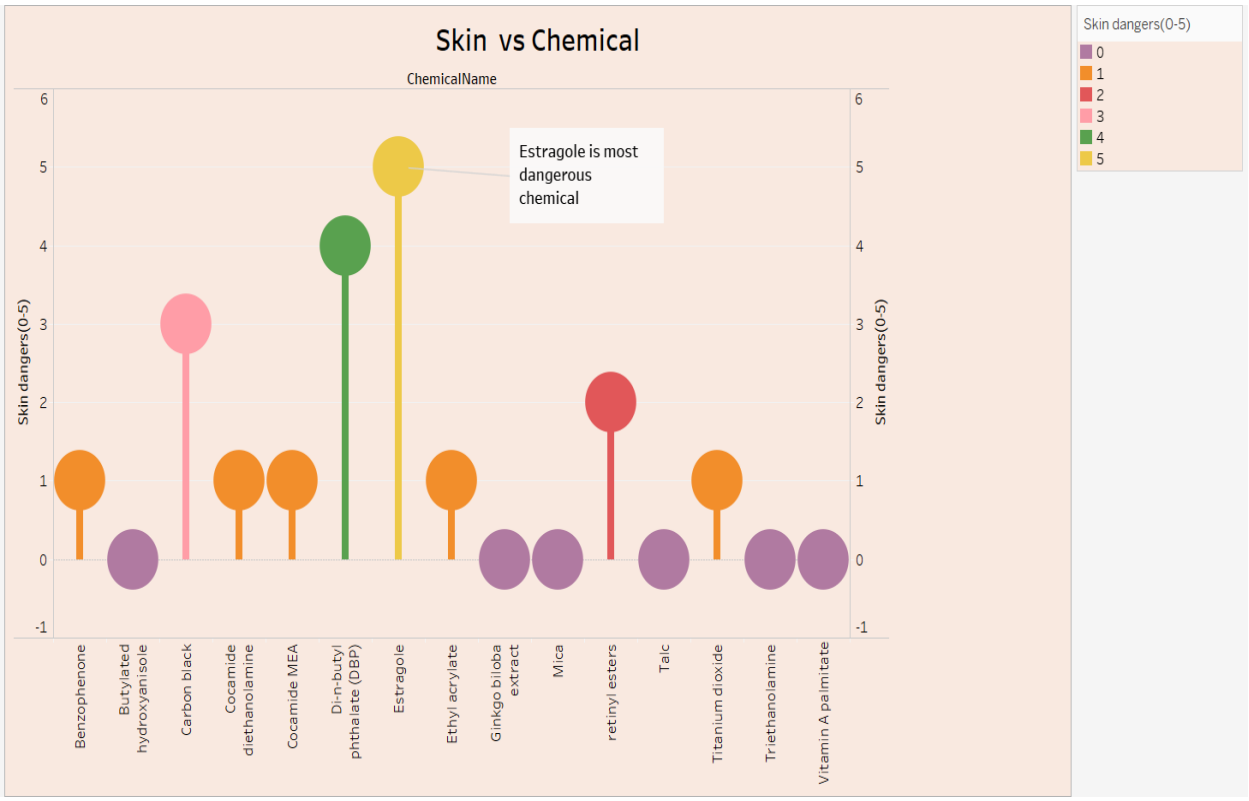



Then the other analysis we did is based on product category. And we found it that the make up is the product in which most of the chemicals are used and specially “CoverGirl” is the brand which uses chemicals in their makeup products. Then Nail related products are the products which uses most of chemicals and specially “CoverGirl” is the company which uses most chemicals in their nail related products and so on for other products.




Furthermore, our team did analysis based on skin vs Chemical. In that we created a scale range of 0 to 5 (i.e. 0 means less dangerous and 5 means highly dangerous). So, from the graph it can be said that Estragole is the most dangerous chemical used in cosmetics while Butylated hydroxy anisole, Mica, Talc, Titanium dioxide, Ginkgo biloba extract, Vitamin A palmitate and Triethanolamine are the least dangerous chemical which are being used in cosmetics.

B




## *Conclusion*

All in all, it can be concluded that some the chemicals used in cosmetics are very harmful and the companies should not use it in their product. Chemicals such as “Estragole” which are very dangerous for the skin as they can cause skin cancer. While on the other hand it can be said that chemicals such as “Titanium dioxide”, “Mica”, “Talc” etc. are not that harmful. So, limited use of this chemicals are not an offence. Companies such as “CoverGirl”, “Bath and Body Works” etc. should reduce the use of harmfull chemicals in their products specially in their Makeup products as makeup is applied on the face and chemicals can cause allergy and many more problems. Lastly, it can be said that usage of some chemicals in cosmetics are useful and on the other hand it is harmful too.

## *Contributions*

All team members have contributed equally to this project. Cleaning the data, adding new columns were done by Parth and Darshan. Visualization and Presentation was done by Ruchita. Helping with python coding was done by Rushil and darshan. Report writing was divided between all but mainly Anant and Parth has major roles.

## *References*


- *https://healthdata.gov/dataset/chemicals-cosmetics*

- *List of reportable ingredients: www.cdph.ca.gov/ReportableIngredientsList*
- *https://prhe.ucsf.edu/sites/g/files/tkssra341/f/CA%20Safe%20Cosmetics%20Program%20Report.pdf*
- *http://www.safecosmetics.org/get-the-facts/chemicals-of-concern/known-carcinogens/*
- *https://www.businessinsider.com/dangerous-chemicals-in-beauty-products-makeup-list-2019-6?amp*


## ***Appendices:***

- Python file along with the pdf of the code and output as well as the csv file of data will be submitted along with this report as the code doesn't fit properly here.