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Course: Data Visualization CSCI 627  
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## **PROJECT REPORT**

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- V. How Visualization Answers the Tasks/Questions

### **I. Goal of Project-**

To create a web based, interactive Data visualization for the NADAC Dataset using D3 Framework.

### **II. Dataset Used -**

- **Name** – NADAC (National Average Drug Acquisition Cost)

**URL-**

<https://data.medicaid.gov/Drug-Pricing-and-Payment/NADAC-National-Average-Drug-Acquisition-Cost-/a4y5-998d>

- **NADAC Data Fields URL** –

<https://www.medicaid.gov/medicaid-chip-program-information/by-topics/prescription-drugs/ful-nadac-downloads/nadacdatadefinitions.pdf>

- **Filtered Data -**

For my project, I have extracted only the common Over the counter (OTC) drugs which are covered under Medicaid. These includes the – Analgesics, Cough Cold, Anti-diarrheal, Vitamins, Decongestant, Sore Throat Drugs categories.

URL referred for creating these categories –

<https://www.bmchp.org/-/media/3ac207406b49402c9e24ecb61eb6b19e.ashx>

Below is the list of drugnames covered in each category –

### **Over-the-counter Drug Category and Drugs List [Reference link](#)**

OTC_Drug_Type Drugs	
Analgesics	ACETAMINOPHEN,ASPIRIN,IBUPROFEN,NAPROXEN
Cough Cold	LORATADINE,FEXOFENADINE,DIPHENHYDRAMINE,DOXYLAMINE,GUAIFENESIN
Anti-Diarrheal	LOPERAMIDE,ZANTAC
Vitamins	NIACIN,RENO CAPS
Decongestant	NASAL DECONGESTANT
Sore Throat	CEPACOL

- **JSON File for this OTC category list –**  
[https://raw.githubusercontent.com/snehalutage/dvrepo/main/Data/OTC\\_list.json](https://raw.githubusercontent.com/snehalutage/dvrepo/main/Data/OTC_list.json)
- Filtered the NADAC Dataset with the NDC description as the Drugs name using the API provided on the NADAC website and kept the same on GitHub.  
**Final Filtered Data Used URL –**  
<https://raw.githubusercontent.com/snehalutage/dvrepo/main/Data/data.json>

### **III. Tasks/Questions Visualization Answers –**

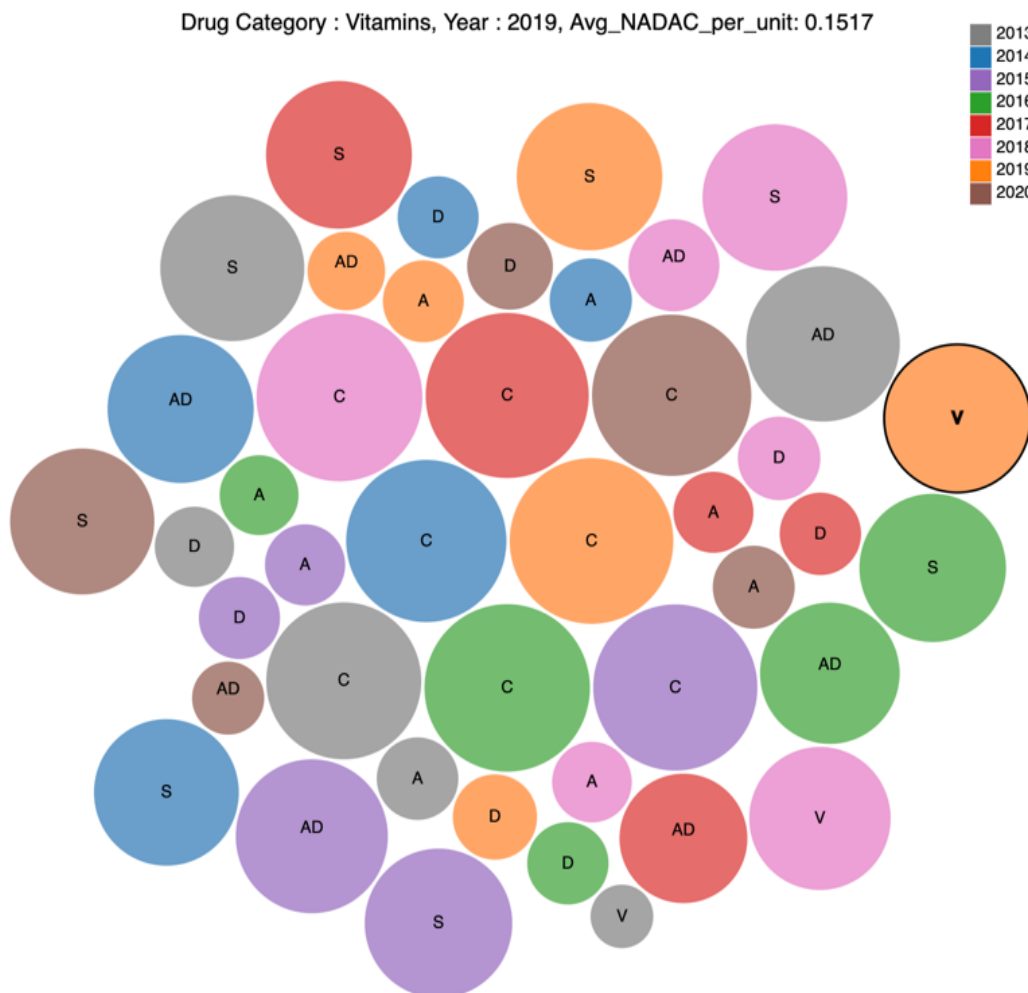
- Trends of the NADAC prices for all the OTC category drugs from 2013 to 2020.
- Which drug category prices were maximum and minimum in a particular year?
- What was the NADAC drug price for particular drug?

### **IV. Visualization description –**

- Visualized circle packed bubble chart to show the Aggregated NADAC prices of all the common OTC categories (Analgesics, Cold Cough, etc.) from 2013 – 2020. User can see the bubbles for each category with the legend.
- Shown a table containing the details of the OTC categories and the respective drug names included in each category for the user.
- Shown the line chart for all the OTC categories, so user can see the trends on the line chart for each OTC category.
- For filtering the data – Created checkboxes to select the drug categories to be filtered out on the bubble chart and the line chart
- To see each of the drugs prices included in different OTC categories given a radio button for the user to select. On clicking the radio button user can see the bubble chart for the selected category for all the drugs included in that category and the list of checkboxes for each drug name is updated for the selected OTC drug category.
- User can filter out the drugs using the checkbox.
- Linked Highlighting – Used linked highlighting between the bubble chart, line chart and the tabular data so user can see for which drug category the particular bubble is or the line is.
- Added tooltip so user can see the exact avg NADAC Price.
- Legend to show the year.

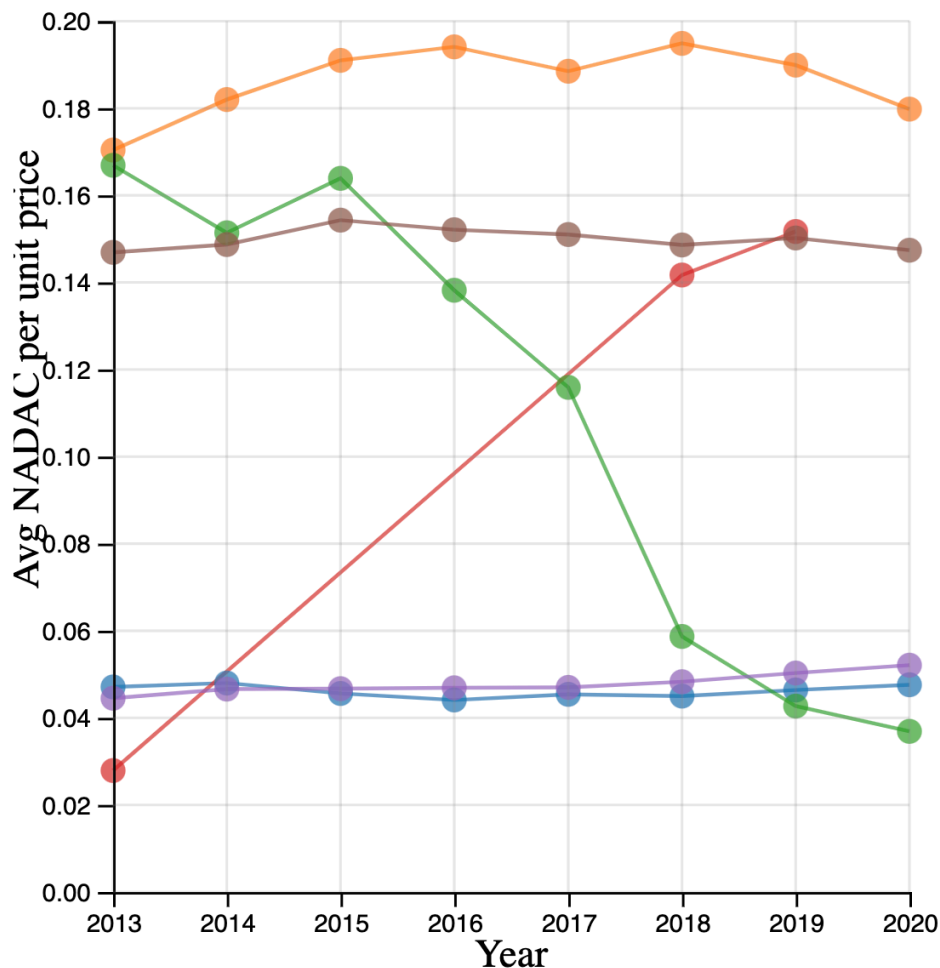
- **Design updates –**
  - Earlier only thought of creating the packed bubble chart to show the NADAC prices trends, but as most of the drug prices have almost same prices and very less difference it was not easy to compare the area of bubbles easily.
  - Updated the design to show the bubble chart along with the line chart side by side so user can see the bubble and its respective drugs trends on the Line chart.
- **Marks and channels used –**
  - **Bubble Chart –**
    - Mark – Circles/Bubbles
    - Channel – Circle area - Shows the Average NADAC price per unit,
    - Color – Year,
    - Text/Label – Name of the Drug

### NADAC prices for OTC Drug Categories (2013-2020)



- **Line Chart –**
  - Mark – Lines - show the trends, circles on the line to show exact values
  - Channels – Position(points/circles) – show the magnitude (avg NADAC price),
  - Color - Show each drug type

## OTC Drugs Category Trends



- **Techniques –**
  - **Aggregation –** Used to aggregate the data and show the bubbles and the line chart.
  - **Filtering –** Used checkboxes to filter the OTC Category

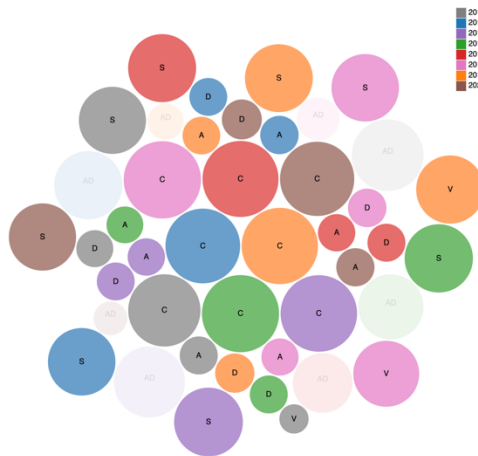
### Filter OTC Drug Category

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> Analgesics (A)   | <input checked="" type="checkbox"/> Cough Cold (C)  |
| <input type="checkbox"/> Anti-Diarrheal (AD)         | <input checked="" type="checkbox"/> Vitamins (V)    |
| <input checked="" type="checkbox"/> Decongestant (D) | <input checked="" type="checkbox"/> Sore Throat (S) |

Filter OTC Drug Category

- ☒ Analgesics (A)
 ☒ Cough Cold (C)
 ☒ Anti-Diarrheal (AD)
 ☒ Vitamins (V)
 ☒ Decongestant (D)
 ☒ Sore Throat (S)

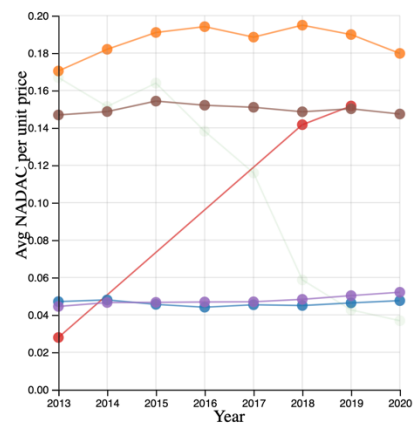
NADAC prices for OTC Drug Categories (2013-2020)



Over-the-counter Drug Category and Drugs List Reference link

OTC Drug Category	Drugs List
Analgesics	ACETAMINOPHEN, ASPIRIN, IBUPROFEN, NAPROXEN
Cough Cold	LORATADINE, FEXOFENADINE, DIPHENHYDRAMINE, DOXYLAMINE, GUAFENESIN
Anti-Diarrheal	LOPERAMIDE, ZANTAC
Vitamins	NACIN, RENO CAPS
Decongestant	NASAL DECONGESTANT
Sore Throat	CEPACOL

OTC Drugs Category Trends



Used Radio Buttons to select the category

Select the Drug Category

- Analgesics ☒
 Cough Cold ☐
 Anti-Diarrheal ☐
 Vitamins ☐
 Decongestant ☐
 Sore Throat ☐

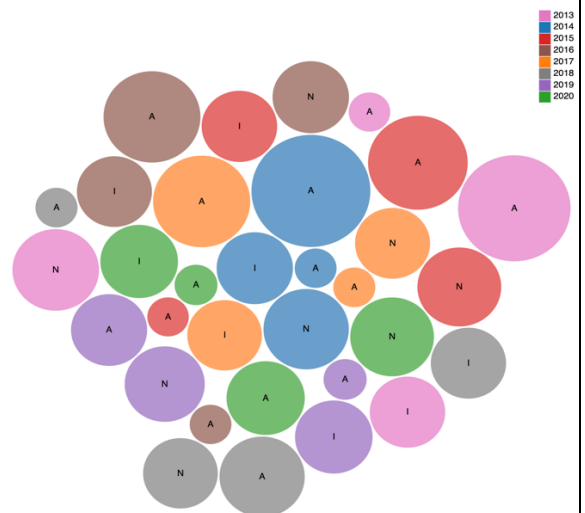
Select the Drug Category

- Analgesics ☒
 Cough Cold ☐
 Anti-Diarrheal ☐
 Vitamins ☐
 Decongestant ☐
 Sore Throat ☐

Filter the Drug Name

- ☒ ACETAMINOPHEN
 ☒ ASPIRIN
 ☒ IBUPROFEN
 ☒ NAPROXEN

Drugwise Trends



### Filter the Drug Name

☐ ACETAMINOPHEN  
☒ IBUPROFEN

☒ ASPIRIN  
☒ NAPROXEN

### Select the Drug Category

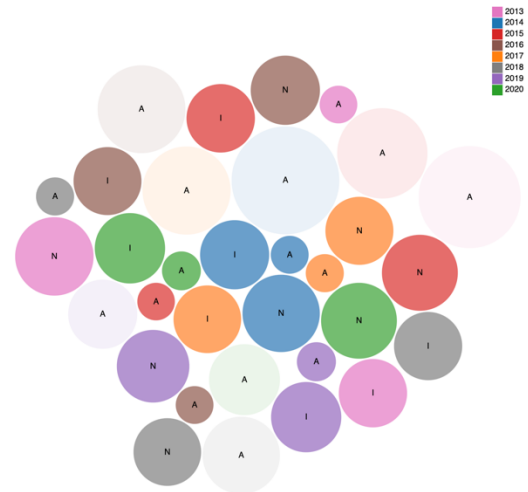
☒ Analgesics  
☐ Cough Cold  
☐ Anti-Diarrheal  
☐ Vitamins  
☐ Decongestant  
☐ Sore Throat

### Filter the Drug Name

☐ ACETAMINOPHEN  
☒ IBUPROFEN

☒ ASPIRIN  
☒ NAPROXEN

### Drugwise Trends



- **Linked Highlighting -**  
**A. Between Table, Bubble Chart and Line Chart**  
**On bubble chart bubble/circle mouseover**  
 Circle stroke – black  
 Table row – Highlighted,  
 Line – Stroke-width increased

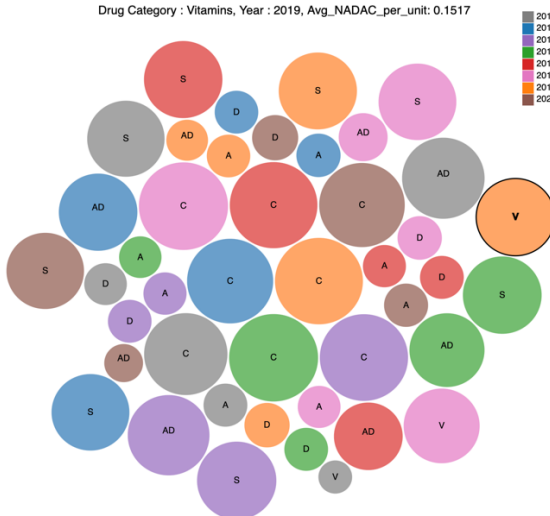
### Filter OTC Drug Category

☒ Analgesics (A)  
☒ Anti-Diarrheal (AD)  
☒ Decongestant (D)

☒ Cough Cold (C)  
☒ Vitamins (V)  
☒ Sore Throat (S)

### NADAC prices for OTC Drug Categories (2013-2020)

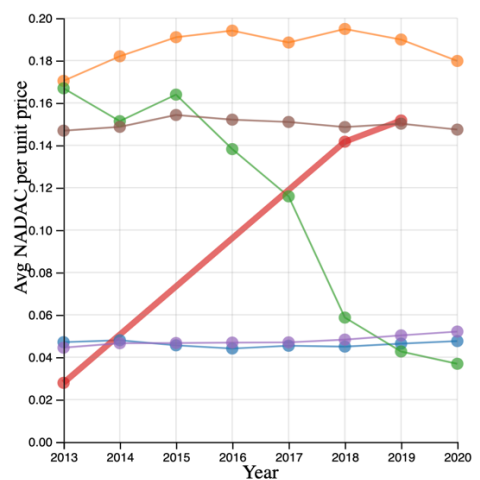
Drug Category : Vitamins, Year : 2019, Avg\_NADAC\_per\_unit: 0.1517



### Over-the-counter Drug Category and Drugs List Reference link

OTC Drug Type	Drugs
Analgesics	ACETAMINOPHEN, ASPIRIN, IBUPROFEN, NAPROXEN
Cough Cold	LOPRATADINE, FEXOFENADINE, DIPHENHYDRAMINE, DOXYLAMINE, GUAFENESIN
Anti-Diarrheal	LOPERAMIDE, ZANTAC
Vitamins	NIACIN, RENO CAPS
Decongestant	NASAL DECONGESTANT
Sore Throat	CEPACOL

### OTC Drugs Category Trends



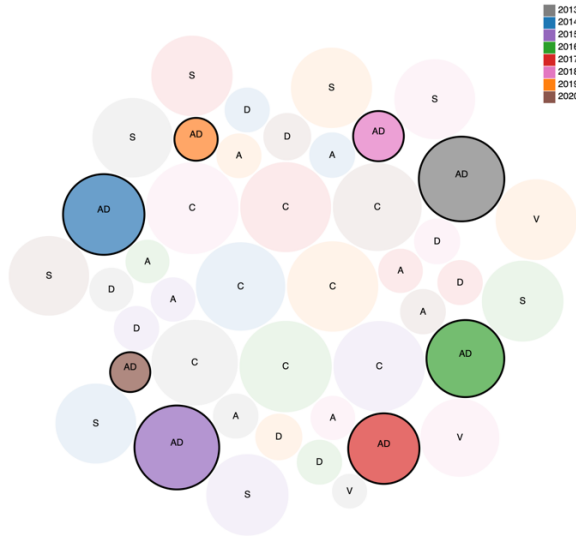
On table row mouseover

Circle stroke – black, other circle – opacity is decreased, Table row – Highlighted  
Line – Stroke-width increased

#### Filter OTC Drug Category

- ☒ Analgesics (A) ☒ Cough Cold (C)
- ☒ Anti-Diarrheal (AD) ☒ Vitamins (V)
- ☒ Decongestant (D) ☒ Sore Throat (S)

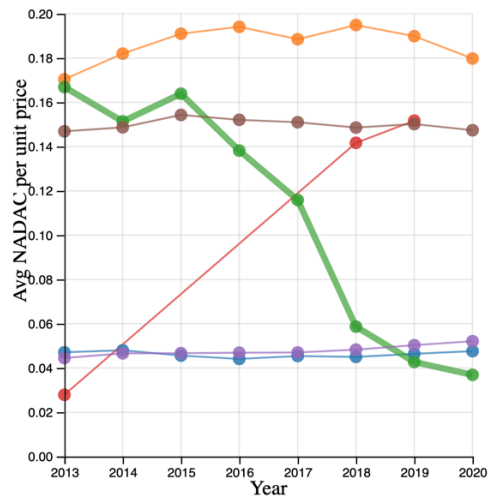
#### NADAC prices for OTC Drug Categories (2013-2020)



#### Over-the-counter Drug Category and Drugs List Reference link

OTC Drug	Type/Drug
Analgesics	ACETAMINOPHEN, ASPIRIN, IBUPROFEN, NAPROXEN
Cough Cold	LORATADINE, FEXOFENADINE, DIPHENHYDRAMINE, DOXYLAMINE, GUAIFENESIN
Anti-Diarrheal	LOPERAMIDE, ZANTAC
Vitamins	NIACIN, PENO CAPS
Decongestant	NASAL DECONGESTANT
Sore Throat	CEPACOL

#### OTC Drugs Category Trends



## B. Between the Checkboxes of Drug names and the bubble Chart

Checkbox label – Highlight

Circle stroke - Black

#### Select the Drug Category

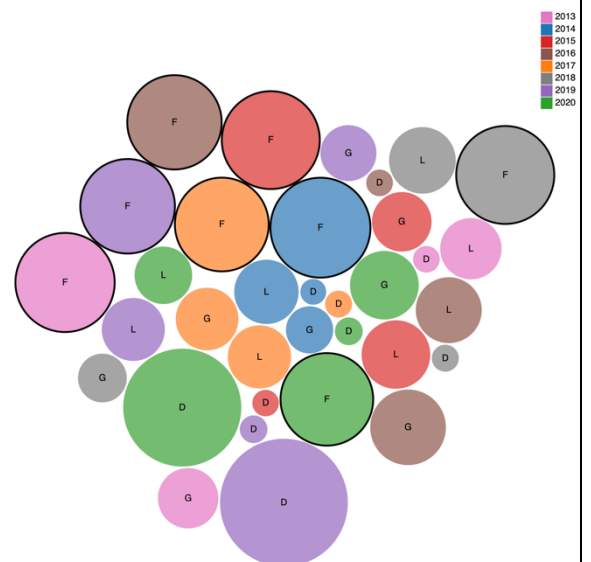
- ☐ Analgesics
- ☒ Cough Cold
- ☐ Anti-Diarrheal
- ☐ Vitamins
- ☐ Decongestant
- ☐ Sore Throat

#### Filter the Drug Name

- ☒ LORATADINE
- ☒ DIPHENHYDRAMINE
- ☒ GUAIFENESIN

- ☒ FEXOFENADINE
- ☒ DOXYLAMINE

#### Drugwise Trends



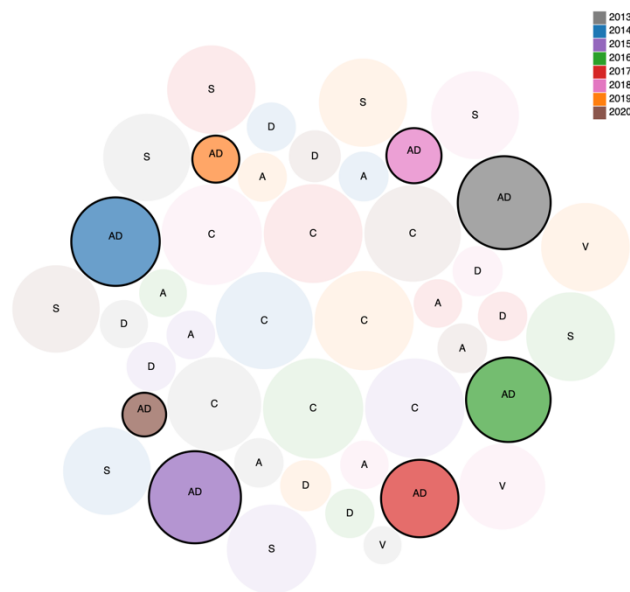
## V. How visualization answers the question?

- Using the bubble chart and the line chart user can see the trends for each category by hovering the table entry, that highlights the data for that category on the bubble chart and the line chart.
- From below screenshot we can see that the NADAC price trends of the Anti-Diarrheal Drug Category over the year and say that it has decreased from 2013 to 2020.

### Filter OTC Drug Category

- ☐ Analgesics (A)
- ☐ Anti-Diarrheal (AD)
- ☐ Decongestant (D)
- ☐ Cough Cold (C)
- ☐ Vitamins (V)
- ☐ Sore Throat (S)

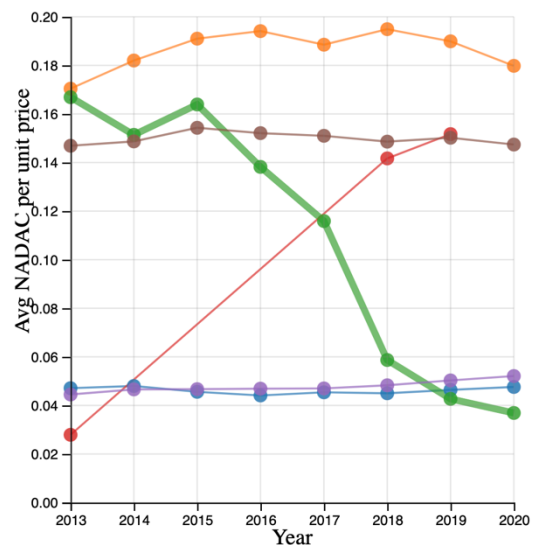
### NADAC prices for OTC Drug Categories (2013-2020)



### Over-the-counter Drug Category and Drugs List Reference link

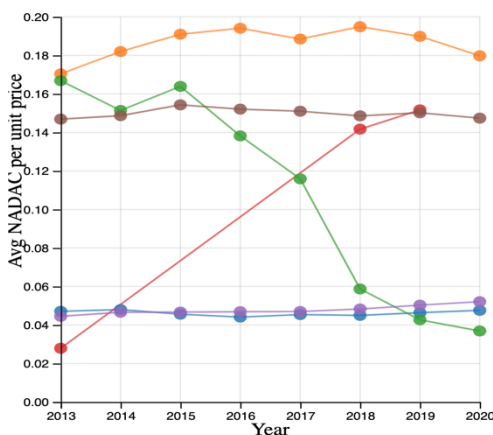
OTC Drug Type	Drugs
Analgesics	ACETAMINOPHEN, ASPIRIN, IBUPROFEN, NAPROXEN
Cough Cold	LORATADINE, FEXOFENADINE, DIPHENHYDRAMINE, DOXYLAMINE, GUAIFENESIN
Anti-Diarrheal	LOPERAMIDE, ZANTAC
Vitamins	NIACIN, RENO CAPS
Decongestant	NASAL DECONGESTANT
Sore Throat	CEPACOL

### OTC Drugs Category Trends

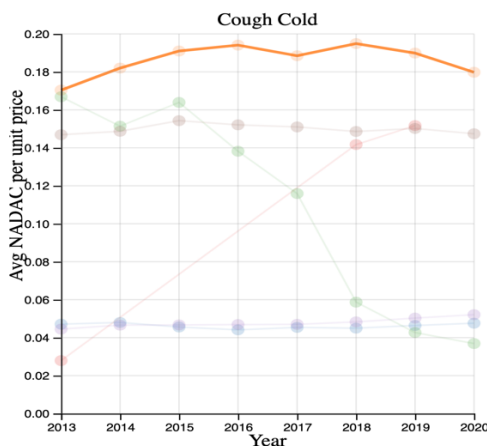


- The Line Chart shows the price for which drug category was maximum in a particular year. For below – We can say the Cough cold drugs had the maximum prices over the years 2013-2020.
- On selecting the line on the Line chart, we can see the exact OTC category

### OTC Drugs Category Trends



### OTC Drugs Category Trends





- From the bubble chart for specific drugs we can see the exact price in each year by selecting the category and further filtering.

Select the Drug Category

Analgesics ☐  
Cough Cold ☐  
Anti-Diarrheal ☒  
Vitamins ☐  
Decongestant ☐  
Sore Throat ☐

Filter the Drug Name

☒ LOPERAMIDE

☒ ZANTAC

Drugwise Trends

