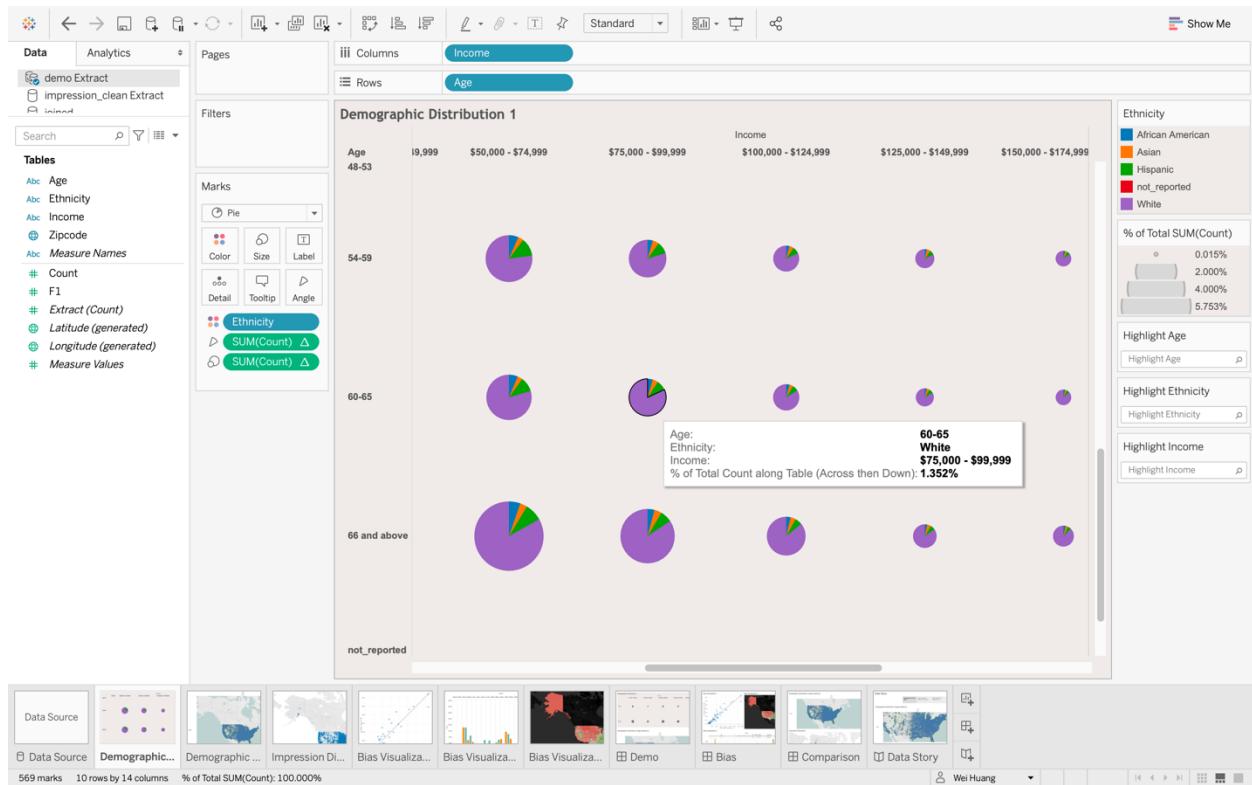


- We did the data extract step and extracted the data sources of demo, impression, joined we would use into here.

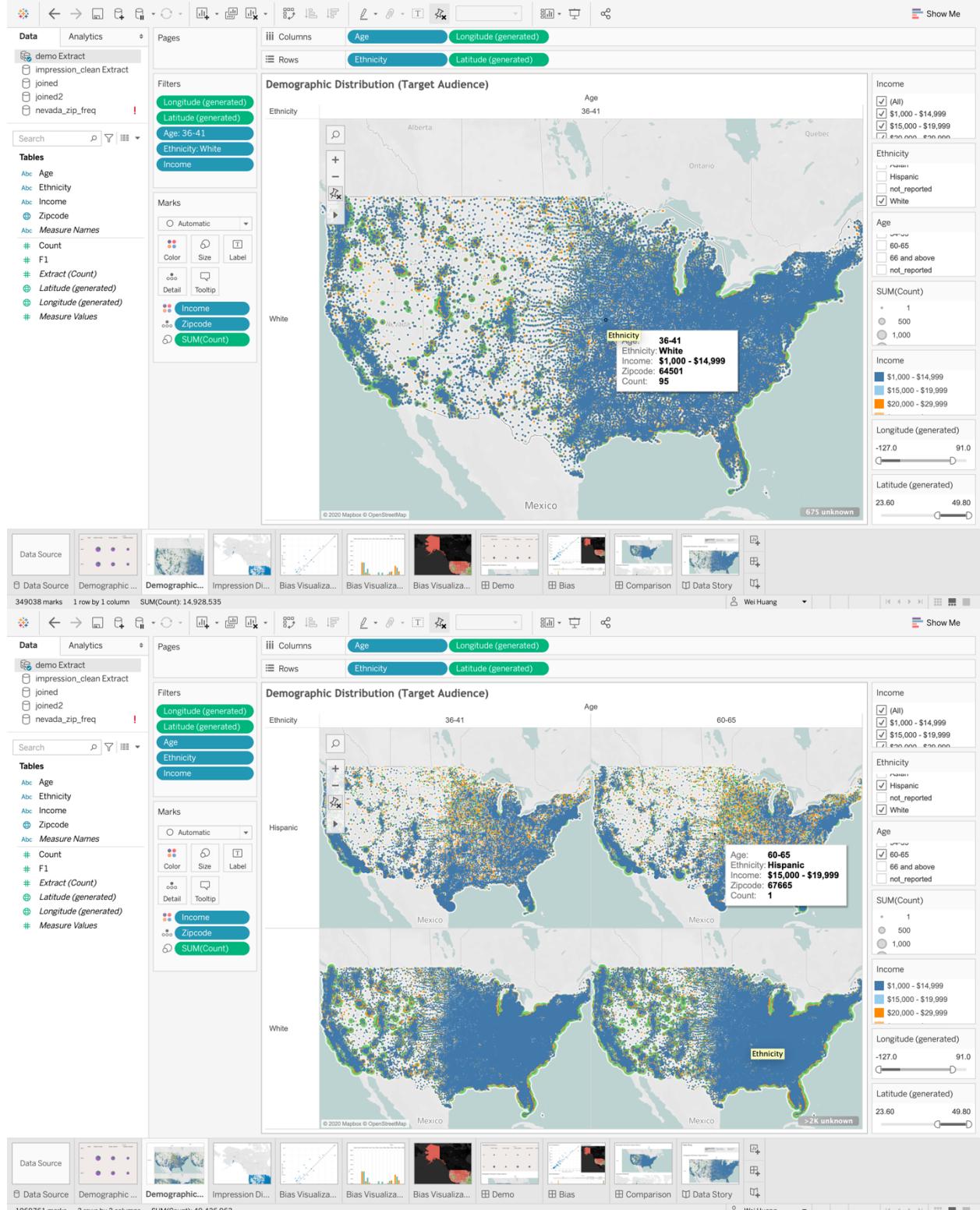
The screenshot shows the Tableau Data Extract interface. In the top left, under 'Connections', 'demo' is selected. A dropdown menu shows other connections: 'impression\_clean Extract joined joined2 nevada\_zip\_freq'. Below this is a 'New Data Source' button. The top right shows connection status: 'Live' (radio button), 'Extract' (selected), 'Edit', 'Refresh', and filters: '0 | Add'. It also notes 'Extract includes all data. 12/9/2020 10:30:10 AM'. The main area displays a table titled 'Extract (Extract.Extract)'. The table has columns: '# demo.csv F1', 'demo.csv Zipcode', 'Age', 'Ethnicity', 'Income', and '# demo.csv Count'. The preview shows 10 rows of data. At the bottom, there's a toolbar with various data source and visualization icons, and the name 'Wei Huang'.

| # demo.csv F1 | demo.csv Zipcode | Age   | Ethnicity        | Income             | # demo.csv Count |
|---------------|------------------|-------|------------------|--------------------|------------------|
| 6,499         | 00725            | 18-23 | African American | \$1,000 - \$14,999 | 1                |
| 7,514         | 00735            | 18-23 | African American | \$1,000 - \$14,999 | 1                |
| 13,596        | 00919            | 18-23 | African American | \$1,000 - \$14,999 | 1                |
| 1,930         | 01022            | 18-23 | African American | \$1,000 - \$14,999 | 1                |
| 5,461         | 01041            | 18-23 | African American | \$1,000 - \$14,999 | 1                |
| 6,096         | 01056            | 18-23 | African American | \$1,000 - \$14,999 | 1                |
| 10,073        | 01082            | 18-23 | African American | \$1,000 - \$14,999 | 1                |
| 17,185        | 01139            | 18-23 | African American | \$1,000 - \$14,999 | 1                |
| 8,544         | 01440            | 18-23 | African American | \$1,000 - \$14,999 | 1                |
| 12,722        | 01475            | 18-23 | African American | \$1,000 - \$14,999 | 1                |
| 19,111        | 01535            | 18-23 | African American | \$1,000 - \$14,999 | 1                |
| 9,767         | 01613            | 18-23 | African American | \$1,000 - \$14,999 | 1                |

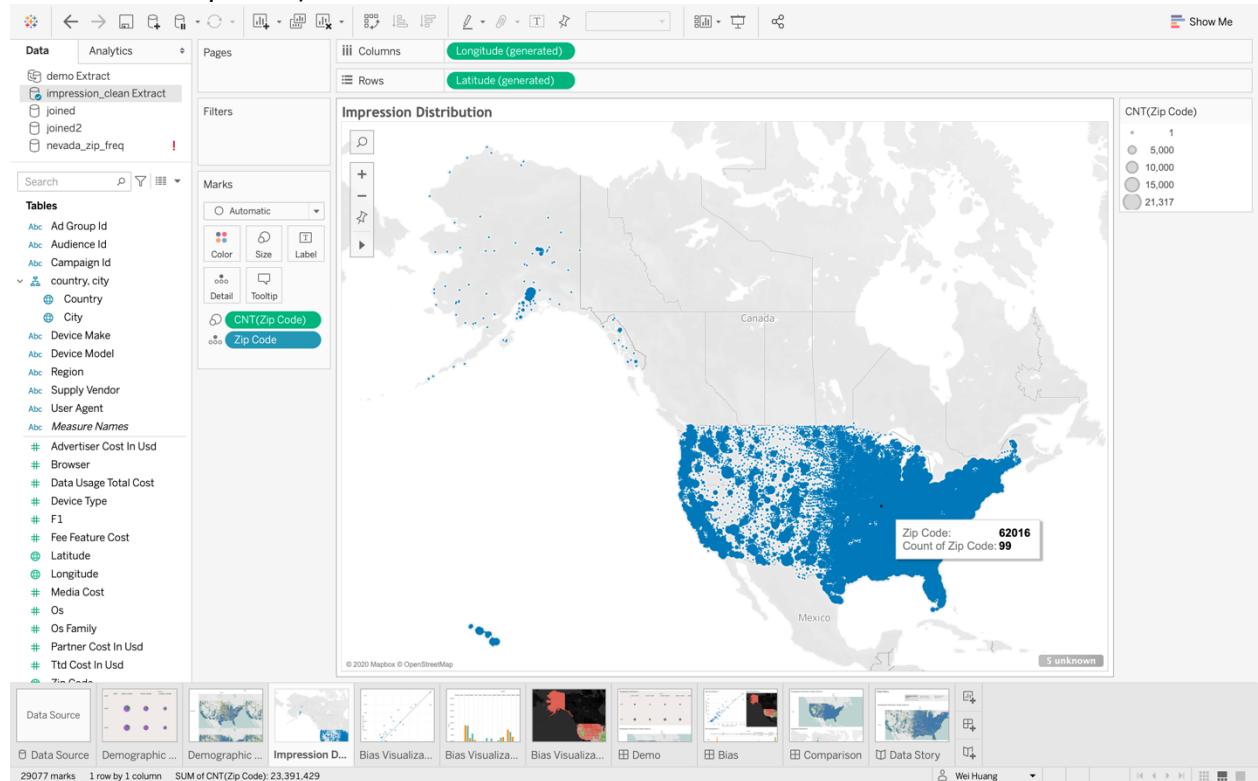
2. Visualize the demographic distribution (target audience) in terms of income, age and ethnicity below. With just one move to your interested target audience group in this diagram, you will see the detailed information as well as the percentage of its count in the whole. You could also see their relative size which indicates the comparison of different groups' count.



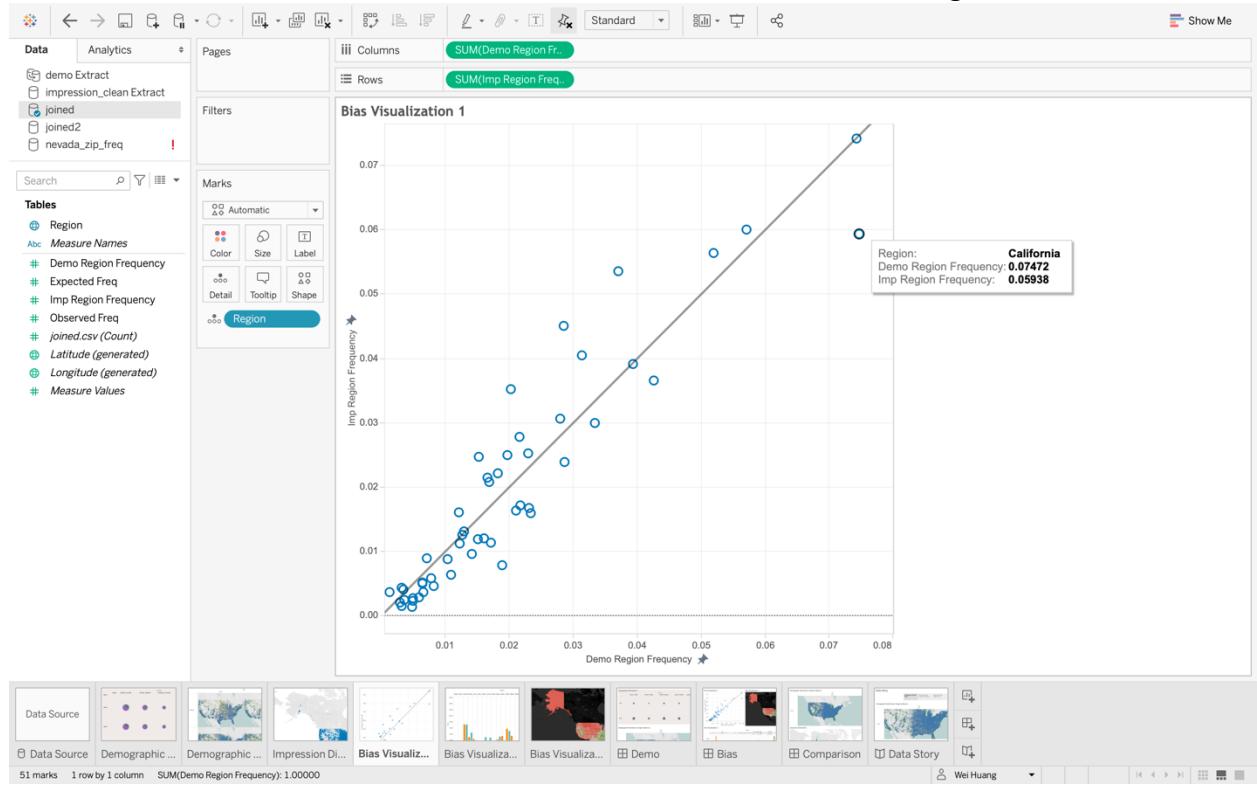
3. This is a User Interface that our customers can play with to see all of their target audiences' distributions in their desired features by just clicking the right column including different scopes of income, ethnicity, age, region. And you will also see the information of that group by moving on the map with the count information.



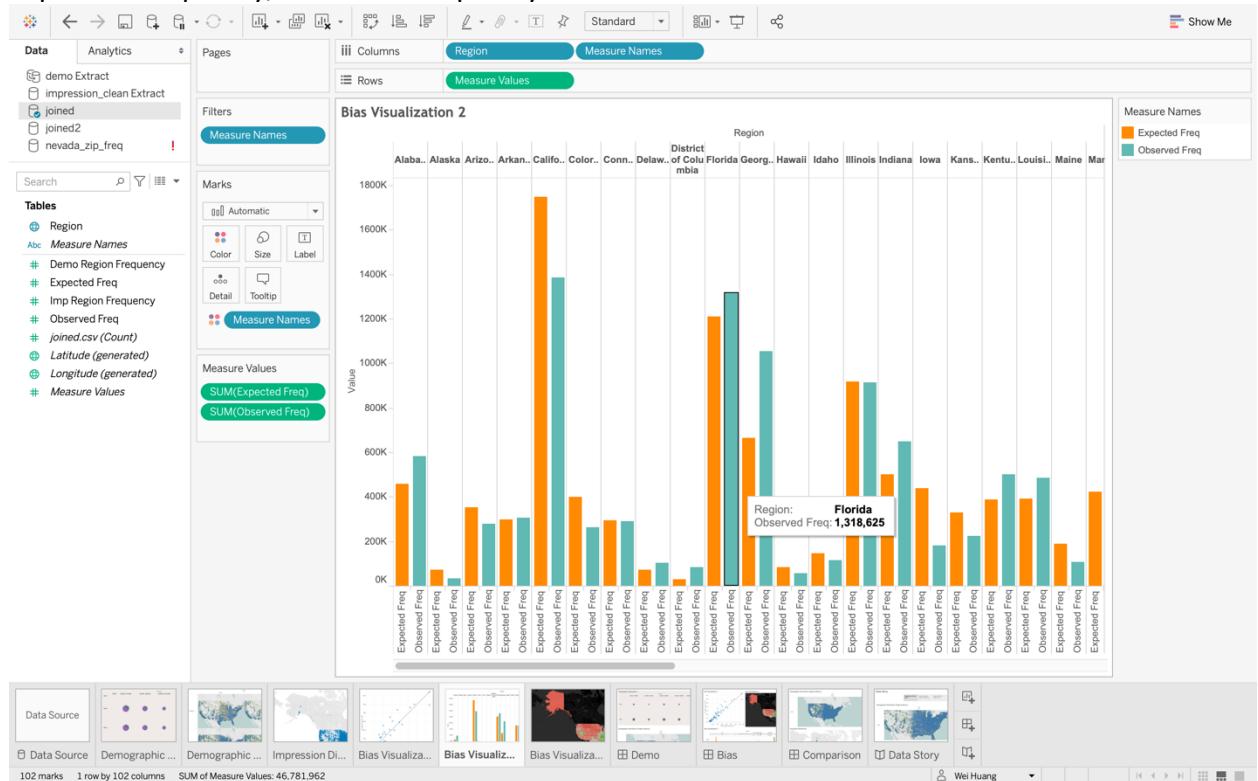
4. This is a brief visualization of impression distribution (reached audience) across US (the feature is zip-code)



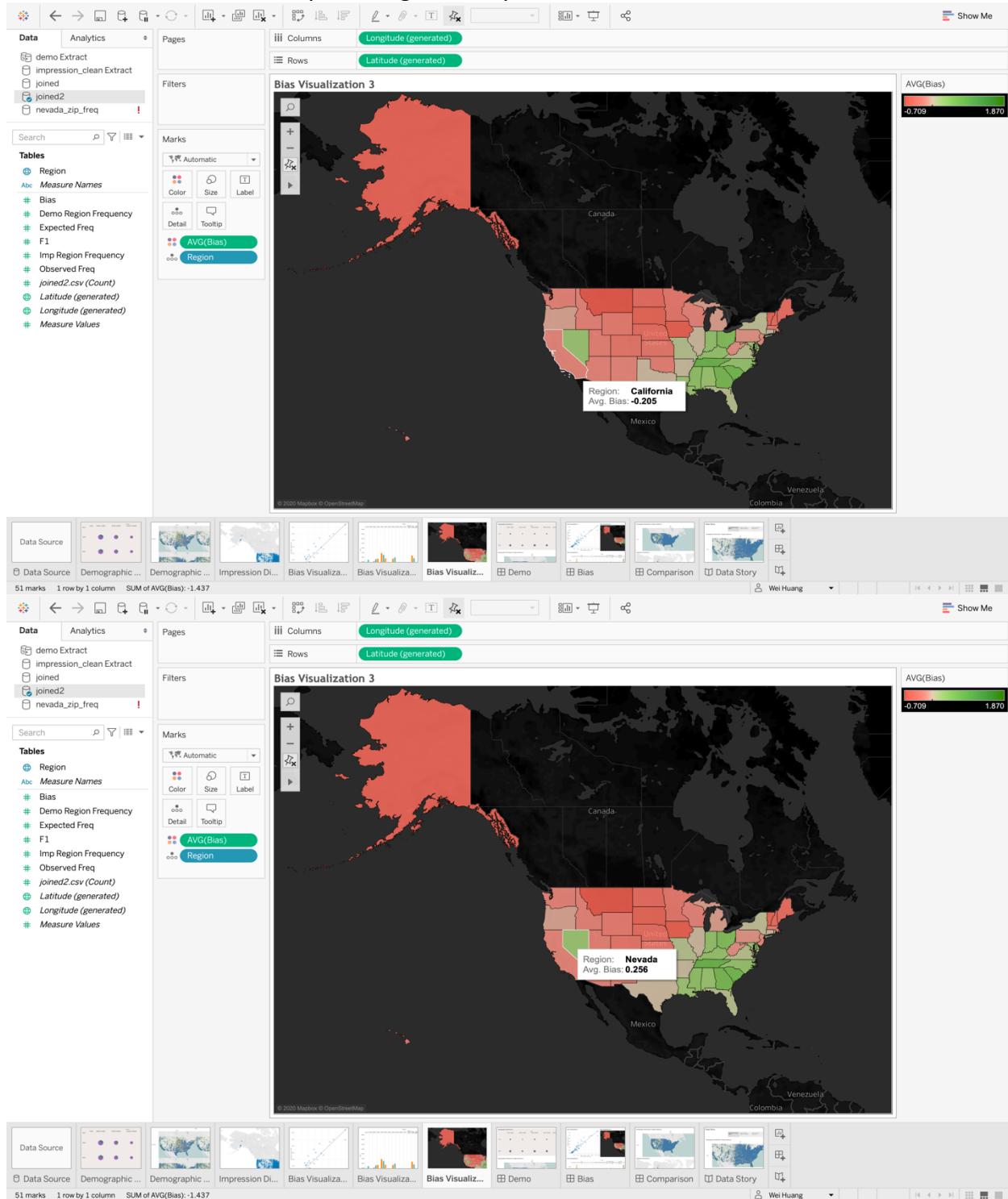
5. Then, you will see the below bias diagram, impression region frequency-demographic region frequency of the 50 states in America. With the trend line, you could easily find which states are over-biased and which are under-biased from this figure.



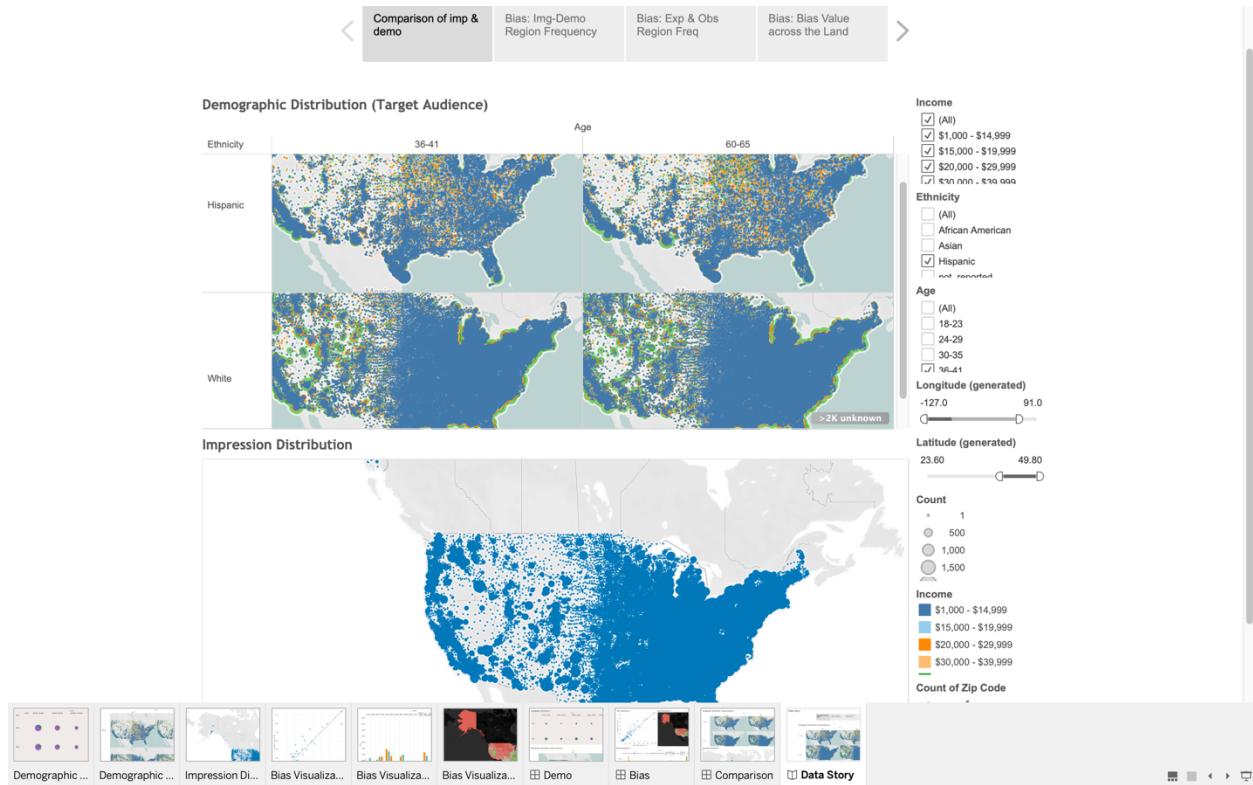
6. Similarly, the relative bias could also be measure from another two parameters, expected frequency, observed frequency.



7. After having calculated the bias value using our algorithm, we visualize them in a map with just one bias value in each state across the 50 states in America. From this diagram, with the indicating color as the legend bar on the right, you could directly get the information of the whether the states are under-represented or over-represented, which would be a very amazing tool for you to do business determination.



8. To warp up, we connected these valuable dots, creating the story or the journey of our data.



If you have more questions or any interesting thoughts, please feel free to contact Huang, Wei  
to explore more about this amazing work!

Contact: [wei\\_huang@berkeley.edu](mailto:wei_huang@berkeley.edu)