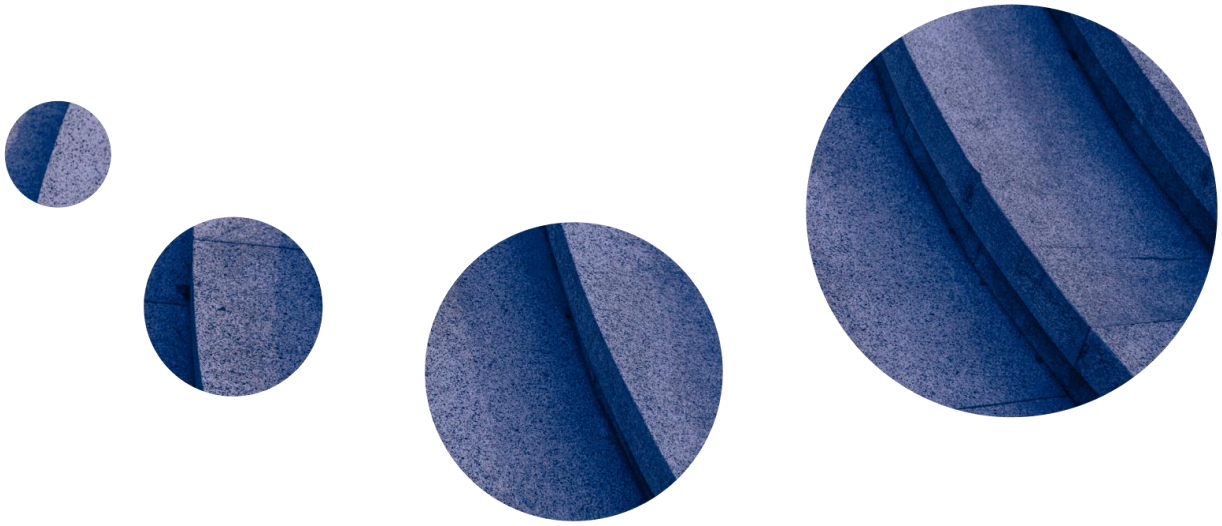

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Group: DATA - ASU Capstone Project
Sponsored By: Yanbor LLC
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OUReport.net

Matrix Balancing Report
Youth Tobacco Usage

Preview:

Tobacco use among youth is a critical public health concern, with significant implications for both current and future generations. The dataset provided captures key information on tobacco use patterns among adolescents across various demographics, **including location, gender, race, age, and education.** The data spans multiple years, offering a comprehensive view of the evolving landscape of youth tobacco consumption. The data was sourced from Data.Gov (https://catalog.data.gov/dataset/youth-tobacco-survey-yts-data).

In this comprehensive report, we undertake a rigorous analysis of youth tobacco usage data through a series of distinct analytical scenarios: Scenarios 2a, 2b, 2c, 3a, 3b, 3c, 4a, and 4b. The data we analyze spans the years 1999 to 2017 and originates from the Centers for Disease Control and Prevention (CDC). It is part of the State Tobacco Activities Tracking and Evaluation (STATE) System, specifically the Youth Tobacco Survey (YTS) data.

In the pursuit of our analytical objectives, each of the specified scenarios is meticulously applied. Our aspiration is to undertake a thorough and all-encompassing analysis, leaving no stone unturned. The objective is to reveal the intricacies and subtleties hidden within the dataset, ultimately leading to the illumination of valuable insights. The results of these analytical endeavors are presented with precision, fostering a deeper comprehension of the dataset and its underlying patterns.

Scenarios:

Scenario 2a: In this scenario, we embark on the task of constructing the Starting Matrix of aggregated field1 to achieve equilibrium in the sums of rows and columns of the Target Matrix of the aggregated field2.

Scenario 2b: Our exploration continues as we determine the initial value of field2, facilitating the generation of the Starting Matrix of field1 values. We also establish the target value of field2, which in turn enables us to construct the Target Matrix. Our aim is to harmonize these Matrix by balancing the sums of selected columns.

Scenario 2c: This scenario entails the derivation of balancing coefficients for the Starting Matrix of field1. These coefficients play a pivotal role in achieving equilibrium in the sums of rows and columns, as we transition from the initial to the target values of field2.

Scenario 3a: Here, we delve into the intricacies of acquiring balancing coefficients for the Starting Matrix of aggregated values of field1. Our goal extends to handling multiple Target Matrix of aggregated selected fields, with the intention of ensuring a harmonious balance.

Scenario 3b: In this scenario, we construct the Starting Matrix, organized as rows by matrix group field for rows. Additionally, we select multiple columns for the purpose of achieving equilibrium during iterations that traverse from the starting to the target values of field2.

Scenario 3c: Our exploration continues as we seek to derive the essential balancing coefficients for the Starting Matrix, arranged as rows by matrix group field, and spanning rows and columns from selected multiple fields. This meticulous process is executed across all iterations, bridging the divide between the starting and target values of field2.

Scenario 4a: This scenario is dedicated to establishing the Starting Matrix of aggregated field1. The objective is to create a balanced state in the sums of selected columns within the Target Matrix of the aggregated field2.

Scenario 4b: We venture into the complexities of determining the starting value of field2, which subsequently aids in the construction of the Starting Matrix of field1 values. We also define the target value of field2, enabling the creation of the Target Matrix. Our mission extends to achieving equilibrium by balancing the sums of selected columns.

Furthermore, our data management strategy extends to the astute utilization of the OUreports feature. This feature facilitates the seamless transfer of data into an adaptable platform, specifically Excel. By capitalizing on the capabilities of Excel, we empower ourselves to execute advanced data manipulation techniques and perform intricate calculations. This strategic use of Excel's functionalities enriches the depth and scope of our data analysis, thereby culminating in a more profound and insightful exploration of the dataset.

In essence, this report is a testament to our unwavering commitment to a meticulous and thorough analysis of data. Our journey navigates through a wealth of tobacco usage data with the ultimate aim of extracting meaningful insights that have the potential to inform decisions, enrich knowledge, and contribute to a more profound understanding of the subject matter at hand

Scenario List:

2a: Starting Matrix of aggregated field1 to balance for sums of rows and columns of the Target Matrix of the aggregated field2
2b: The starting value of field2 to get the Starting matrix of field1 values and target value of field2 to get Target matrix
2c: Get balancing coefficients for Starting Matrix of field1 for all iterations between starting and target values of the field2
3a: Get balancing coefficients for Starting Matrix of aggregated values of field1 and multiple Target Matrix of aggregated selected fields
3b: Starting Matrix as rows by matrix group field for rows and selected multiple columns to balance iterations from starting to target values of the field2
3c: Get balancing coefficients for Starting Matrix as rows by matrix group field for rows and columns from selected multiple fields, for all iterations between starting and target of the field2 values 9.
4a: Starting Matrix of aggregated field1 to balance for sums of selected columns of the Target Matrix of the aggregated field2
4b: The starting value of field2 to get the Starting matrix of field1 values and target value of field2 to get Target matrix, and balance by sums of selected columns

Scenario Implementation:

We have executed the following scenarios:

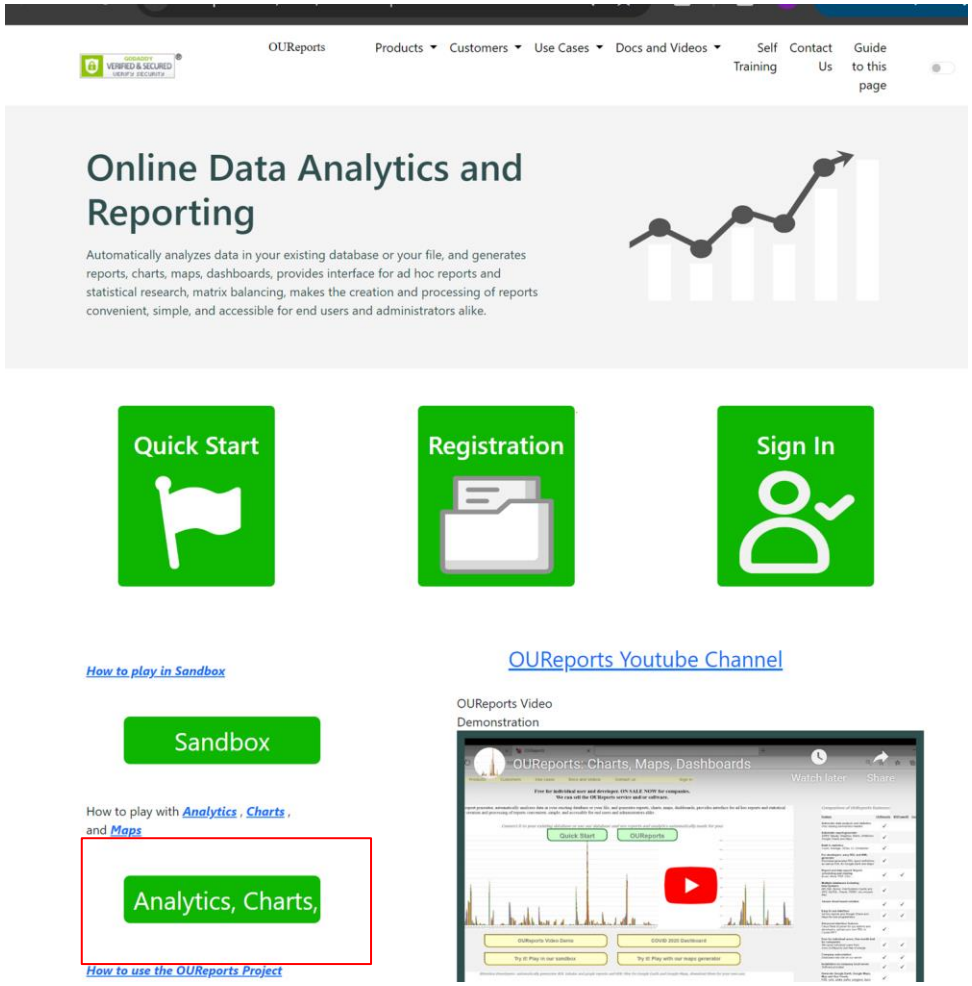
Scenario 2a
Scenario 2b
Scenario 2c
Scenario 3a
Scenario 3b
Scenario 3c
Scenario 4a

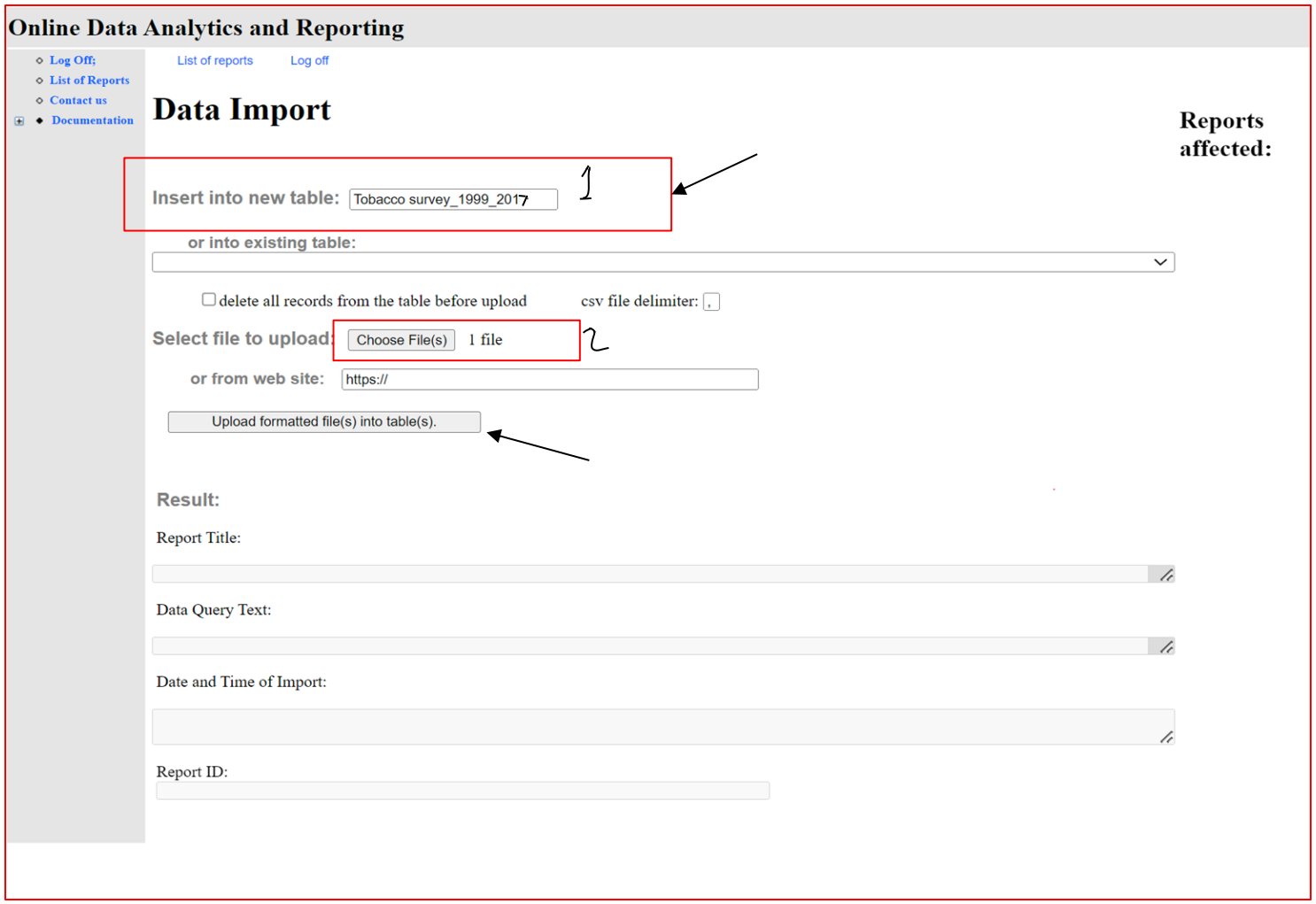
Scenario 4b

- **Data Selection:** Our dataset comprises information related to tobacco usage, encompassing factors such as Location, Year, IDs, year to date, Reporting Period and more.
- **Analysis and Comparison:** Through the application of each Scenario, we have conducted an in-depth analysis and comparison of the dataset. This includes identifying patterns, trends, and correlations within the data.
- **Excel Utilization:** To enhance our analysis capabilities, we have employed Excel's features to manipulate and transform the dataset. This allows us to perform advanced calculations and visualize results effectively

We have opted for a diverse range of data sources. For each scenario (2a- 4b), we employed the youth tobacco usage dataset as an illustrative example. Our objective is to demonstrate and evaluate the functionalities of the OUReport tools through the utilization of this dataset. With comprehensive details encompassing tobacco usage summaries, Location, Years, IDs, this dataset provides a robust context for showcasing the flexibility of the OUReport features.

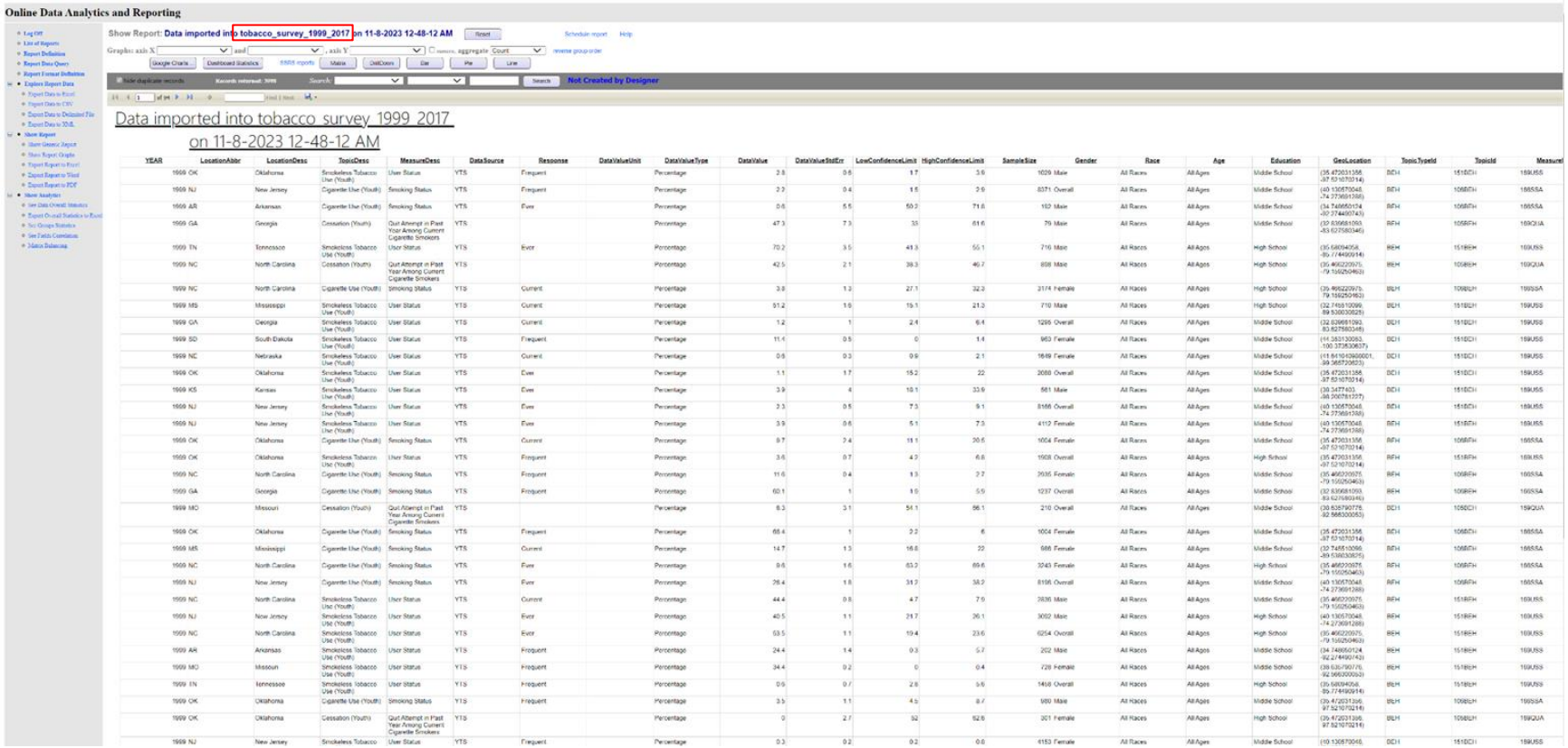
HOW TO IMPORT DATA:



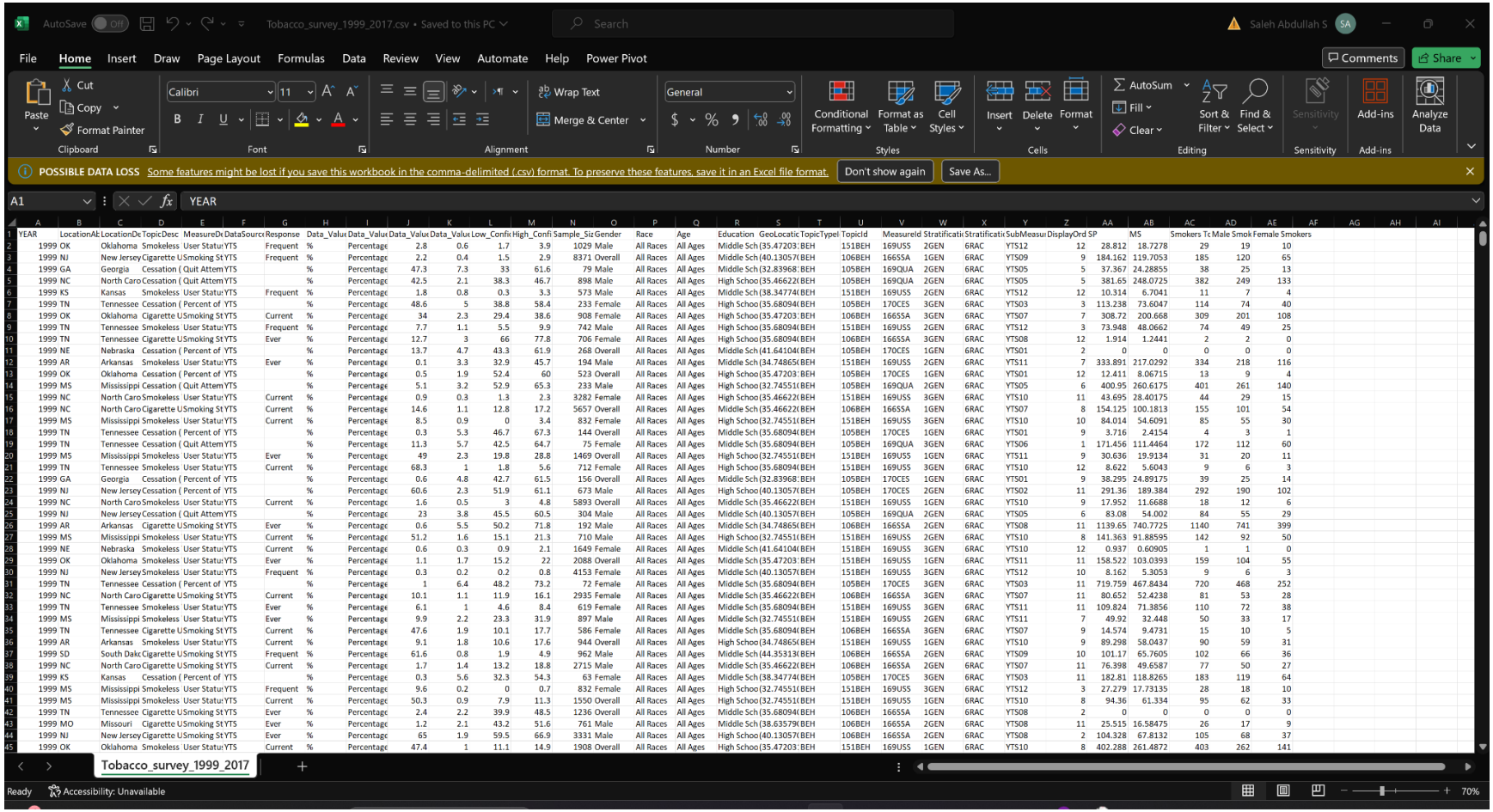


1- the name of the DATA will be shown on the “Analytics, Chart“ page

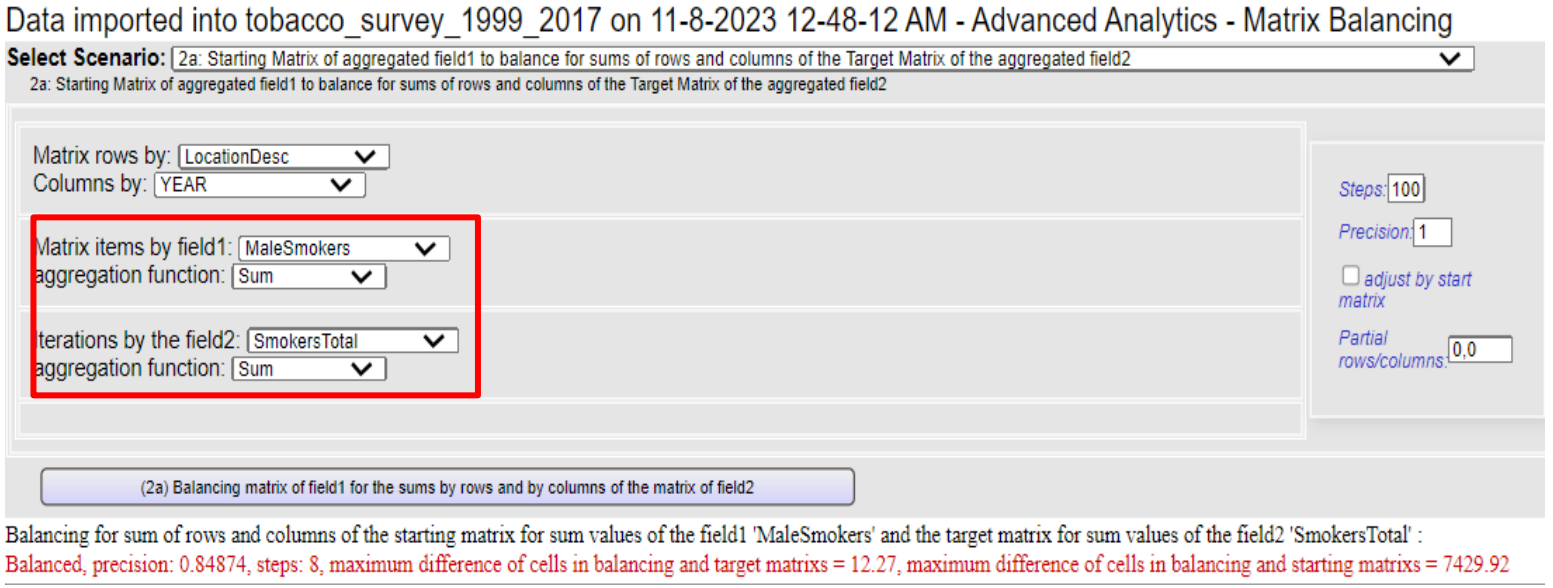
2- select the (CSV) file that you want to import. In our case, we will import the “ Tobacco survey_1999_2017.csv"


Online Data Analytics and Reporting
Show Report: Data imported into tobacco_survey_1999_2017 on 11-8-2023 12-48-12 AM
Not Created by Designer
Data imported into tobacco_survey_1999_2017
on 11-8-2023 12-48-12 AM

Here is a screenshot of our Data in Excel:



2a) Field1 to Field2 Target Matrix Balancing: The starting matrix aggregates values from field1. The balancing task is to match the sums of rows and columns to those of a target matrix that aggregates values from field2. The goal here is to balance this starting matrix to match the sums of rows and columns of a target matrix, which is aggregated from a different field (field2).



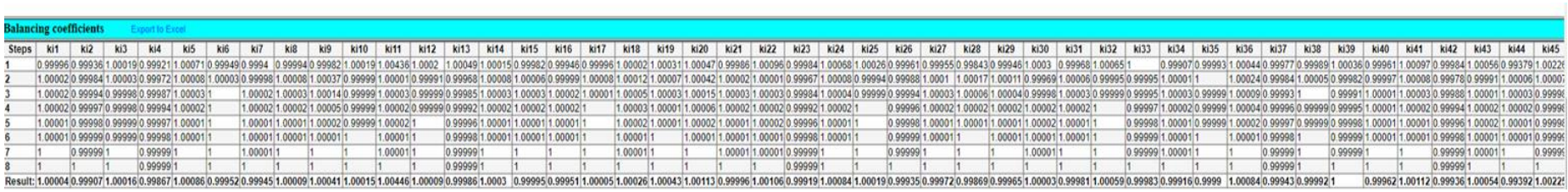
p1) Starting Matrix: The starting matrix is similar to the target matrix, but the values in the matrix are the sum of the 'MaleSmokers' multiplying column SmokersTotal. This matrix gives us a snapshot of the data value in each district, broken down by Location and year

Starting Matrix of Sum of MaleSmokers Export to Excel

LocationDesc	Sum of Sum of MaleSmokers by LocationDesc	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Alabama	17968	3573	0	0	1880	0	1771	0	2366	0	1072	0	1041	0	1924	0	2399	0	1942	0
Arizona	9145	0	692	0	0	1579	0	1237	0	2143	0	858	0	1067	0	425	0	732	0	412
Arkansas	16855	2071	1585	0	0	0	0	5536	0	4391	0	0	3272	0	0	0	0	0	0	0
California	3577	0	1117	0	0	2460	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colorado	3398	0	3398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Connecticut	15745	0	3309	0	2178	0	0	2189	0	1637	0	1356	0	2109	0	2243	0	724	0	0
Delaware	16645	0	3615	0	930	0	2817	0	0	0	955	0	1826	0	1736	0	1266	0	3500	0
District of Columbia	3603	0	3603	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Florida	4835	0	0	3575	1260	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Georgia	18727	5031	0	1402	0	0	0	3706	0	0	0	1573	0	3852	0	2069	0	964	0	130
Guam	138	0	0	0	138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hawaii	18222	0	1689	0	0	738	0	1136	0	0	0	989	0	2074	0	738	0	10858	0	0
Idaho	4647	0	0	645	0	4002	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Illinois	20296	0	0	0	9313	0	0	828	2565	0	0	0	3215	0	0	2112	0	2263	0	0
Indiana	13608	0	2758	0	0	0	2894	0	1371	0	1789	0	2194	0	0	1871	0	0	731	0
Iowa	12687	0	1360	0	2141	0	3602	0	2023	0	1551	2010	0	0	0	0	0	0	0	0
Kansas	8244	417	1101	0	746	0	0	0	0	0	0	5130	0	0	0	850	0	0	0	0
Kentucky	15760	0	1560	0	2611	0	1832	0	1910	0	4034	0	3813	0	0	0	0	0	0	0
Louisiana	24448	0	0	1489	0	0	0	0	0	0	8994	1964	0	4860	0	1700	0	5441	0	0
Maine	3471	0	580	2891	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maryland	5707	0	1222	0	4485	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Massachusetts	13809	0	0	0	13809	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Michigan	13943	0	0	732	0	11209	0	0	0	997	0	0	0	1005	0	0	0	0	0	0
Minnesota	9914	0	5823	0	1321	0	0	0	0	0	1037	0	0	0	0	0	1733	0	0	0
Mississippi	36160	2821	3411	0	2272	4755	1039	0	2310	0	816	1620	1156	0	2295	1114	2535	7234	2782	0
Missouri	12008	673	0	0	0	2229	0	2904	0	1728	0	986	0	1489	0	573	0	1426	0	0
Nebraska	10480	291	1577	0	1628	0	0	0	2057	0	0	0	0	0	602	2077	1181	1067	0	0
New Hampshire	6045	0	1035	2060	0	0	528	0	0	143	0	1246	0	1033	0	0	0	0	0	0
New Jersey	15972	2429	0	1406	0	0	1059	0	1711	0	2090	0	1072	0	235	2440	2165	1365	0	0
New Mexico	2564	0	0	0	0	0	2564	0	0	0	0	0	0	0	0	0	0	0	0	0
New York	5044	0	3355	0	1689	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Carolina	32422	13694	0	0	4935	0	1567	3178	0	0	0	3454	0	1904	0	895	0	2795	0	0
North Dakota	20420	0	0	0	0	3468	0	1584	0	4884	0	3568	0	4130	0	1966	0	820	0	0
Ohio	11950	0	1822	0	1997	0	1613	0	0	0	1828	0	1510	0	256	1043	1532	0	0	349
Oklahoma	16176	2697	1162	0	2441	0	0	1080	0	2879	0	1134	0	3286	0	978	0	0	519	0
Pennsylvania	18699	0	0	7107	2339	0	0	0	2255	0	1373	0	1331	0	0	0	2006	2288	0	0
Rhode Island	7963	0	0	1085	0	2515	0	4363	0	0	0	0	0	0	0	0	0	0	0	0
South Carolina	14092	0	0	0	0	0	0	1636	2846	1253	0	2749	0	3905	0	1107	0	596	0	0
South Dakota	13991	2462	1197	567	0	5944	0	441	0	715	0	1898	0	0	0	0	0	0	767	0
Tennessee	11342	2269	3539	0	3907	0	1627	0	0	0	0	0	0	0	0	0	0	0	0	0
Texas	3598	0	3598	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utah	7995	0	0	0	0	3296	0	2586	0	2113	0	0	0	0	0	0	0	0	0	0
Vermont	7813	0	905	0	4344	0	2564	0	0	0	0	0	0	0	0	0	0	0	0	0
Virgin Islands	258	0	241	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0
Virginia	1385	0	0	0	0	0	0	0	0	625	0	760	0	0	0	0	0	0	0	0
West Virginia	17339	0	2097	0	1571	0	0	1018	0	2451	0	4068	0	2441	0	1975	0	1718	0	0
Wisconsin	17526	0	915	0	1541	559	1990	0	2744	0	1628	0	2402	0	3587	0	0	0	2160	0
Wyoming	2974	0	2974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total: 569608	Sum of Sum of MaleSmokers by YEAR:	38428	61240	22959	69476	42754	27484	33422	24158	25959	27167	35363	22832	33155	10635	26176	14817	40291	12401	891

For example, the gray columns such as “13694” in **North Carolina** row at 1999 column shows that there was an decrease of 35% compared to the target. -35% compared to balanced.

p2) The coefficient matrix provides an insightful overview of coefficient consumption across various locations over the span of 17 years, from 1999 to 2017. In this matrix, each row corresponds to a distinct location, and the columns represent individual years. Two key fields are presented: ‘MaleSmokers’ and 'SmokersTotal’ " with the aggregation function set to "Sum" for both. This matrix helps us not only visualize the variations in sample size across the years for different locations but also the cumulative data value for coefficient consumption.



Balancing coefficients Export to Excel

Steps	ki1	ki2	ki3	ki4	ki5	ki6	ki7	ki8	ki9	ki10	ki11	ki12	ki13	ki14	ki15	ki16	ki17	ki18	ki19	ki20	ki21	ki22	ki23	ki24	ki25	ki26	ki27	ki28	ki29	ki30	ki31	ki32	ki33	ki34	ki35	ki36	ki37	ki38	ki39	ki40	ki41	ki42	ki43	ki44	ki45
1	0.99996	0.99936	1.00019	0.99921	1.00071	0.99949	0.9994	0.99994	0.99982	1.00019	1.00436	1.0002	1.00049	1.00015	0.99982	0.99946	0.99996	1.00002	1.00031	1.00047	0.99986	1.00096	0.99984	1.00068	1.00026	0.99961	0.99955	0.99843	0.99946	1.0003	0.99968	1.00065	1	0.99907	0.99993	1.00044	0.99977	0.99989	1.00036	0.99961	1.00097	0.99984	1.00056	0.99379	1.0022
2	1.00002	0.99984	1.00003	0.99972	1.00008	1.00003	0.99998	1.00008	1.00037	0.99999	1.00001	0.99991	0.99968	1.00008	1.00006	0.99999	1.00008	1.00012	1.00007	1.00042	1.00002	1.00001	0.99967	1.00008	0.99994	0.99988	1.0001	1.00017	1.00011	0.99969	1.00006	0.99995	0.99995	1.00001	1	1.00024	0.99984	1.00005	0.99982	0.99997	1.00008	0.99978	0.99991	1.00006	1.00007
3	1.00002	0.99994	0.99998	0.99987	1.00003	1	1.00002	1.00003	1.00014	0.99999	1.00003	0.99999	0.99985	1.00003	1.00003	1.00002	1.00001	1.00005	1.00003	1.00015	1.00003	1.00003	0.99984	1.00004	0.99999	0.99994	1.00003	1.00006	1.00004	0.99998	1.00003	0.99999	0.99995	1.00003	0.99999	1.00009	0.99993	1	0.99991	1.00001	1.00003	0.99988	1.00001	1.00003	0.99996
4	1.00002	0.99997	0.99998	0.99994	1.00002	1	1.00002	1.00002	1.00005	0.99999	1.00002	0.99999	0.99992	1.00002	1.00002	1.00002	1	1.00003	1.00001	1.00006	1.00002	1.00002	0.99992	1.00002	1	0.99996	1.00002	1.00002	1.00002	1.00002	1.00002	1	0.99997	1.00002	0.99999	1.00004	0.99996	0.99999	0.99995	1.00001	1.00002	0.99994	1.00002	1.00002	0.99996
5	1.00001	0.99998	0.99999	0.99997	1.00001	1	1.00001	1.00001	1.00002	0.99999	1.00002	1	0.99996	1.00001	1.00001	1.00001	1	1.00002	1.00001	1.00002	1.00001	1.00002	0.99996	1.00001	1	0.99998	1.00001	1.00001	1.00001	1.00002	1.00001	1	0.99998	1.00001	0.99999	1.00002	0.99997	0.99999	0.99998	1.00001	1.00001	0.99996	1.00002	1.00001	0.99996
6	1.00001	0.99999	0.99999	0.99998	1.00001	1	1.00001	1.00001	1.00001	1	1.00001	1	0.99998	1.00001	1.00001	1.00001	1	1.00001	1	1.00001	1.00001	1.00001	0.99998	1.00001	1	0.99999	1.00001	1	1.00001	1.00001	1.00001	1	0.99999	1.00001	1	1.00001	0.99998	1	0.99999	1.00001	1.00001	0.99998	1.00001	1.00001	0.99996
7	1	0.99999	1	0.99999	1	1	1.00001	1	1	1	1.00001	1	0.99999	1	1	1	1	1.00001	1	1	1.00001	1.00001	0.99999	1	1	0.99999	1	1	1	1.00001	1	1	0.99999	1.00001	1	1	0.99999	1	0.99999	1	1	0.99999	1.00001	1	0.99999
8	1	1	1	0.99999	1	1	1	1	1	1	1	1	0.99999	1	1	1	1	1	1	1	1	1	0.99999	1	1	1	1	1	1	1	1	1	1	1	1	1	0.99999	1	1	1	1	0.99999	1	1	1
Result:	1.00004	0.99907	1.00016	0.99867	1.00086	0.99952	0.99945	1.00009	1.00041	1.00015	1.00446	1.00009	0.99986	1.0003	0.99995	0.99951	1.00005	1.00026	1.00043	1.00113	0.99996	1.00106	0.99919	1.00084	1.00019	0.99935	0.99972	0.99869	0.99965	1.00003	0.99981	1.00059	0.99983	0.99916	0.9999	1.00084	0.99943	0.99992	1	0.99962	1.00112	0.99936	1.00054	0.99392	1.0022

p3) Target Matrix: The target matrix is a pivot table where the rows represent different Locations and the columns represent different years. The values in the matrix are the sum of the 'SmokersTotal’ value' for each combination of Location and year. This matrix gives us a snapshot of the sample size in each location, broken down by years, for the Data value.

Target Matrix of Sum of SmokersTotal Export to Excel

LocationDesc	Sum of Sum of SmokersTotal by LocationDesc	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Alabama	27608	5489	0	0	2891	0	2722	0	3635	0	1644	0	1599	0	2954	0	3689	0	2985	0
Arizona	14043	0	1059	0	0	2427	0	1900	0	3291	0	1316	0	1640	0	652	0	1124	0	634
Arkansas	25904	3182	2435	0	0	0	0	8512	0	6752	0	0	5023	0	0	0	0	0	0	0
California	5492	0	1713	0	0	3779	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colorado	5225	0	5225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Connecticut	24181	0	5081	0	3344	0	0	3367	0	2514	0	2081	0	3239	0	3446	0	1109	0	0
Delaware	25561	0	5554	0	1420	0	4329	0	0	0	1467	0	2800	0	2666	0	1943	0	5382	0
District of Columbia	5536	0	5536	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Florida	7428	0	0	5492	1936	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Georgia	28781	7740	0	2153	0	0	0	5696	0	0	0	2414	0	5920	0	3175	0	1483	0	200
Guam	213	0	0	0	213	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hawaii	28005	0	2597	0	0	1133	0	1746	0	0	0	1513	0	3183	0	1133	0	16700	0	0
Idaho	7144	0	0	990	0	6154	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Illinois	31191	0	0	0	14319	0	0	1268	3940	0	0	0	4942	0	0	3246	0	3476	0	0
Indiana	20906	0	4240	0	0	0	4448	0	2105	0	2748	0	3370	0	0	2872	0	0	1123	0
Iowa	19484	0	2089	0	3289	0	5536	0	3104	0	2378	3088	0	0	0	0	0	0	0	0
Kansas	12667	639	1692	0	1142	0	0	0	0	0	0	7887	0	0	0	1307	0	0	0	0
Kentucky	24217	0	2396	0	4009	0	2816	0	2934	0	6201	0	5861	0	0	0	0	0	0	0
Louisiana	37578	0	0	2287	0	0	0	0	0	0	13824	3015	0	7474	0	2608	0	8370	0	0
Maine	5336	0	889	4447	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maryland	8768	0	1874	0	6894	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Massachusetts	21239	0	0	0	21239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Michigan	21421	0	0	1116	0	17230	0	0	0	1532	0	0	0	1543	0	0	0	0	0	0
Minnesota	15244	0	8954	0	2033	0	0	0	0	0	1595	0	0	0	0	0	2662	0	0	0
Mississippi	55577	4339	5242	0	3489	7314	1599	0	3545	0	1253	2490	1773	0	3524	1714	3897	11123	4275	0
Missouri	18444	1032	0	0	0	3427	0	4465	0	2652	0	1515	0	2285	0	879	0	2189	0	0
Nebraska	16096	448	2424	0	2496	0	0	0	3160	0	0	0	0	0	924	3193	1813	1638	0	0
New Hampshire	9274	0	1588	3162	0	0	809	0	0	216	0	1914	0	1585	0	0	0	0	0	0
New Jersey	24529	3732	0	2155	0	0	1626	0	2628	0	3213	0	1645	0	360	3752	3327	2091	0	0
New Mexico	3941	0	0	0	0	0	3941	0	0	0	0	0	0	0	0	0	0	0	0	0
New York	7748	0	5154	0	2594	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Carolina	49851	21061	0	0	7591	0	2409	4887	0	0	0	5311	0	2926	0	1371	0	4295	0	0
North Dakota	31377	0	0	0	0	5331	0	2435	0	7505	0	5484	0	6344	0	3023	0	1255	0	0
Ohio	18345	0	2792	0	3062	0	2479	0	0	0	2806	0	2323	0	392	1603	2351	0	0	537
Oklahoma	24854	4141	1786	0	3750	0	0	1657	0	4426	0	1743	0	5052	0	1503	0	0	796	0
Pennsylvania	28745	0	0	10927	3595	0	0	0	3469	0	2108	0	2046	0	0	0	3082	3518	0	0
Rhode Island	12233	0	0	1665	0	3862	0	6706	0	0	0	0	0	0	0	0	0	0	0	0
South Carolina	21651	0	0	0	0	0	0	2510	4372	1926	0	4223	0	6006	0	1698	0	916	0	0
South Dakota	21506	3784	1842	868	0	9142	0	677	0	1100	0	2915	0	0	0	0	0	0	1178	0
Tennessee	17421	3478	5436	0	6008	0	2499	0	0	0	0	0	0	0	0	0	0	0	0	0
Texas	5534	0	5534	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utah	12283	0	0	0	0	5065	0	3975	0	3243	0	0	0	0	0	0	0	0	0	0
Vermont	12012	0	1391	0	6683	0	3938	0	0	0	0	0	0	0	0	0	0	0	0	0
Virgin Islands	394	0	368	0	0	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0
Virginia	2133	0	0	0	0	0	0	0	0	963	0	1170	0	0	0	0	0	0	0	0
West Virginia	26634	0	3224	0	2413	0	0	1561	0	3762	0	6254	0	3747	0	3033	0	2640	0	0
Wisconsin	26916	0	1402	0	2365	858	3059	0	4216	0	2499	0	3686	0	5514	0	0	0	3317	0
Wyoming	4575	0	4575	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total: 875245	Sum of Sum of SmokersTotal by YEAR:	59065	94092	35262	106775	65722	42236	51362	37108	39882	41736	54333	35068	50944	16334	40208	22764	61927	19056	1371

For example, the light gray columns such as “7740” Georgia at 1999 show that there was a increase of <1% compared to the balance. +35% compared to starting.

*p4)*Balanced Matrix: The balanced matrix is the result of balancing the sums of rows and columns of the starting matrix to match those of the target matrix. This process involves adjusting the values in the starting matrix in a way that the Data value for each Location And each Year matches the corresponding data value in the target matrix. The balanced matrix represents a transition. The balanced matrix represents the adjusted data value distribution in 1999-2017, where the data value for each Location and each Year matches the corresponding data value in the target matrix (1999-2017). This matrix represents a transition from the data value distribution in 1999-2017 to the distribution in 1999-2017, while preserving the row and column from the target matrix.

Balancing Matrix of Sum of SmokersTotal Export to Excel

LocationDesc	Sum of Sum of SmokersTotal by LocationDesc	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Alabama	27607.95	5490.9	0	0	2888.56	0	2722.09	0	3634.4	0	1646.76	0	1598.93	0	2955.76	0	3685.64	0	2984.82	0
Arizona	14043.03	0	1062.16	0	0	2426.09	0	1899.51	0	3290.09	0	1317.09	0	1638.12	0	652.29	0	1123.87	0	633.8
Arkansas	25904.03	3183.1	2435.5	0	0	0	0	8510.31	0	6748.79	0	0	5026.29	0	0	0	0	0	0	0
California	5492.02	0	1713.8	0	0	3778.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colorado	5224.99	0	5224.96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Connecticut	24181.01	0	5081.24	0	3344.66	0	0	3362.86	0	2514.35	0	2082.47	0	3239.28	0	3444.06	0	1112.08	0	0
Delaware	25560.95	0	5550.82	0	1428.08	0	4327.31	0	0	0	1466.17	0	2803.02	0	2665.39	0	1943.85	0	5376.29	0
District of Columbia	5535.99	0	5535.96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Florida	7427.99	0	0	5491.28	1936.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Georgia	28781.04	7732.58	0	2152.95	0	0	0	5697.08	0	0	0	2417.3	0	5920.26	0	3178.96	0	1481.69	0	200.2
Guam	213	0	0	0	212.97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hawaii	28005.02	0	2595.09	0	0	1135.07	0	1746.19	0	0	0	1519.73	0	3187.36	0	1133.83	0	16687.73	0	0
Idaho	7144.03	0	0	990.18	0	6153.83	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Illinois	31190.95	0	0	0	14313.02	0	0	1273.04	3941.15	0	0	0	4939.43	0	0	3245.51	0	3478.79	0	0
Indiana	20905.96	0	4237.05	0	0	0	4447.85	0	2105.83	0	2747.97	0	3369.63	0	0	2874.17	0	0	1123.45	0
Iowa	19483.97	0	2088.41	0	3287.88	0	5533.53	0	3105.91	0	2381.34	3086.88	0	0	0	0	0	0	0	0
Kansas	12667.01	640.84	1691.57	0	1146.21	0	0	0	0	0	0	7882.53	0	0	0	1305.84	0	0	0	0
Kentucky	24216.95	0	2397.29	0	4012.58	0	2816.45	0	2934.57	0	6198.18	0	5857.85	0	0	0	0	0	0	0
Louisiana	37577.99	0	0	2287.21	0	0	0	0	0	0	13821.91	3019.05	0	7471.67	0	2612.76	0	8365.37	0	0
Maine	5336	0	892.1	4443.88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maryland	8767.98	0	1877.35	0	6890.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Massachusetts	21238.95	0	0	0	21238.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Michigan	21421.1	0	0	1122.97	0	17224.17	0	0	0	1530.83	0	0	0	1543.1	0	0	0	0	0	0
Minnesota	15243.97	0	8953.71	0	2031.33	0	0	0	0	0	1594.29	0	0	0	0	0	2664.62	0	0	0
Mississippi	55576.99	4335.97	5241.44	0	3491.39	7314.12	1597.23	0	3548.93	0	1253.69	2489.6	1775.83	0	3526.26	1711.68	3895.17	11119.14	4276.53	0
Missouri	18444.05	1033.56	0	0	0	3425.78	0	4460.6	0	2653.71	0	1514.01	0	2286.65	0	879.69	0	2190.03	0	0
Nebraska	16095.98	447.06	2422.12	0	2500.57	0	0	0	3158.74	0	0	0	0	0	924.53	3189.84	1813.82	1639.28	0	0
New Hampshire	9274	0	1588.03	3158.74	0	0	810.46	0	0	219.46	0	1911.97	0	1585.32	0	0	0	0	0	0
New Jersey	24528.98	3731.46	0	2158.01	0	0	1627.1	0	2627.27	0	3209.35	0	1645.92	0	360.88	3747.11	3324.88	2096.98	0	0
New Mexico	3940.99	0	0	0	0	0	3940.96	0	0	0	0	0	0	0	0	0	0	0	0	0
New York	7747.99	0	5153.44	0	2594.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Carolina	49851.01	21056.15	0	0	7586.54	0	2409.82	4887.41	0	0	0	5310.1	0	2927.52	0	1375.71	0	4297.74	0	0
North Dakota	31377.08	0	0	0	0	5332.53	0	2434.21	0	7503.97	0	5481.29	0	6345.42	0	3019.7	0	1259.94	0	0
Ohio	18344.97	0	2796.87	0	3065.66	0	2477.08	0	0	0	2805.65	0	2317.27	0	392.94	1600.95	2351.6	0	0	536.93
Oklahoma	24854.02	4144.19	1785.05	0	3750.03	0	0	1659.81	0	4423.75	0	1742.23	0	5049.07	0	1502.29	0	0	797.59	0
Pennsylvania	28744.97	0	0	10921.19	3596.72	0	0	0	3466.7	0	2110.85	0	2046.01	0	0	0	3084.36	3519.12	0	0
Rhode Island	12233.04	0	0	1664.98	0	3865.72	0	6702.32	0	0	0	0	0	0	0	0	0	0	0	0
South Carolina	21651.02	0	0	0	0	0	0	2514.35	4371.22	1925.34	0	4223.5	0	6000.28	0	1700.47	0	915.84	0	0
South Dakota	21506.05	3783.47	1839	870.56	0	9141.33	0	677.82	0	1098.75	0	2916.29	0	0	0	0	0	0	1178.82	0
Tennessee	17420.97	3485.57	5435.08	0	6000.55	0	2499.74	0	0	0	0	0	0	0	0	0	0	0	0	0
Texas	5533.99	0	5533.96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utah	12283.05	0	0	0	0	5065.77	0	3972.23	0	3245.03	0	0	0	0	0	0	0	0	0	0
Vermont	12011.97	0	1391.14	0	6677.83	0	3942.97	0	0	0	0	0	0	0	0	0	0	0	0	0
Virgin Islands	394	0	368	0	0	0	25.97	0	0	0	0	0	0	0	0	0	0	0	0	0
Virginia	2133.01	0	0	0	0	0	0	0	0	962.61	0	1170.37	0	0	0	0	0	0	0	0
West Virginia	26634.02	0	3220.69	0	2412.95	0	0	1564.19	0	3765.29	0	6248.54	0	3749.88	0	3033.1	0	2639.36	0	0
Wisconsin	26915.95	0	1405.19	0	2366.67	859.35	3057.37	0	4213.22	0	2499.77	0	3687.76	0	5508.17	0	0	0	3318.44	0
Wyoming	4574.99	0	4574.97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total: 875243.95	Sum of Sum of SmokersTotal by YEAR:	59064.94	94091.99	35261.95	106774.94	65721.95	42235.93	51361.93	37107.94	39881.97	41735.93	54332.95	35067.94	50943.93	16333.93	40207.96	22763.94	61926.96	19055.94	1370.93

For example, Arizona in 2000 shows that around “1062” was a increase of <1% compared to the target. +35% compared to starting. In addition,New Hampshire in 2007 shows that around “219” which was <1% difference compared to the

target. +35% compared to starting.

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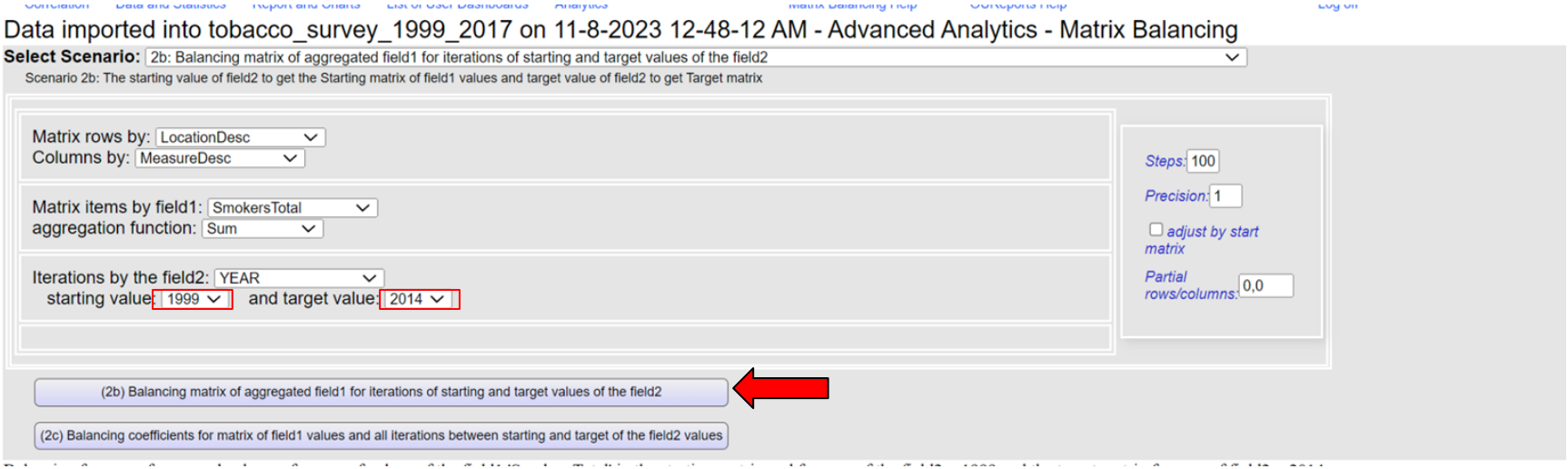
2b) Field2 Value-Based Matrix Generation: This scenario uses the initial value of field2 to generate a starting matrix of field1 values. Similarly, the target value of field2 is used to produce a target matrix.



p1) The starting balance scenario is a crucial technique for creating a matrix based on the initial and target values of field. In this specific scenario, we organize the data in rows according to different locations, and columns are structured by the measure description. The "SmokerTotal" in field 1 is used as the value of interest, and we apply the summation function to aggregate the data. The iterative aspect of this process is defined by field 2, which changes as we transition in the years 1999 and year 2014. This approach helps us balance and compare sample sizes across different locations and measure descriptions, making it a valuable tool for analyzing changes and trends over the specified time frame, ultimately aiding in data-driven decision-making and insights.

Balanced, precision: 0.84342, steps: 96, maximum difference of cells in balancing and target matrixs = 17690.98, maximum difference of cells in balancing and starting matrixs = 32146.00

Starting Matrix of Sum of SmokersTotal where YEAR='1999' Export to Excel

LocationDesc	Sum of Sum of SmokersTotal by LocationDesc	Percent of Current Smokers Who Want to Quit	Quit Attempt in Past Year Among Current Cigarette Smokers	Smoking Status	User Status
Alabama	15539	15539	0	0	0
Arkansas	8006	0	0	0	8006
Delaware	0	0	0	0	0
Georgia	28781	2234	4113	15837	6597
Kansas	12667	1407	856	5077	5327
Minnesota	0	0	0	0	0
Mississippi	47806	0	2143	18149	27514
Missouri	17006	0	1029	7267	8710
Nebraska	16096	3030	2523	3850	6693
New Jersey	24529	2180	2608	10349	9392
North Carolina	49851	3467	1728	32146	12510
Ohio	0	0	0	0	0
Oklahoma	24854	1864	2802	8881	11307
Pennsylvania	0	0	0	0	0
South Dakota	21506	684	6157	8201	6464
Tennessee	17421	2988	748	6508	7177
Total: 284062	Sum of Sum of SmokersTotal by MeasureDesc:	33393	24707	116265	109697

participants who were "currently smoking" were the majority in North Carolina in 1999

*p2)*The process of balancing coefficient levels within a dataset is essential for understanding and comparing data across different locations and measure descriptions. In this specific scenario, we organize the data with rows representing various locations, while columns are structured by measure description. The "SmokerTotal Size" in field serves as the focal point, and we apply the summation function to aggregate these values. The iterative aspect of the analysis is driven by field2, with a transition occurring in the years 1999 and year 2014. This iterative approach allows us to assess and balance coefficient levels within different locations and measure descriptions, making it a valuable technique for evaluating how coefficient-related factors change over this specific time frame. Such insights can be pivotal in understanding trends, potential issues, or areas that require attention, contributing to informed decision-making and more comprehensive data analysis.

Balancing coefficients Export to Excel

Steps	ki1	ki2	ki3	ki4	ki5	ki6	ki7	ki8	ki9	ki10	ki11	ki12	ki13	ki14	ki15	ki16	kj1	kj2	kj3	kj4	Precision
1	2.51232	0	8648657.06223	0	0	5388927.97334	1.6439	0	0.55987	1.41405	0	6485166.86374	0	10161685.55455	0	0	0.42997	0.51831	1.59205	1.16819	122805.54923
2	2.32574	0.85603	1.0786	0.7992	0.82497	1.0786	0.76925	0.76336	0.97206	0.82487	0.73118	1.0786	0.83962	1.0786	0.89263	0.85323	0.58168	0.97729	1.10106	1.12676	47022.65158
3	1.71917	0.8875	0.96933	0.92134	0.9196	0.96933	0.89917	0.90104	0.94113	0.91866	0.91442	0.96933	0.91542	0.96933	0.92049	0.92887	0.66689	1.04187	1.06741	1.07324	32002.17432
4	1.49951	0.93176	0.96168	0.94196	0.94273	0.96168	0.93452	0.93495	0.95127	0.94175	0.94008	0.96168	0.94056	0.96168	0.94016	0.9471	0.71508	1.04365	1.0532	1.05535	25528.02554
5	1.39845	0.94755	0.96291	0.95225	0.95293	0.96291	0.9486	0.94876	0.95751	0.95232	0.95138	0.96291	0.95172	0.96291	0.95111	0.95537	0.74496	1.04048	1.04542	1.04653	21933.29952
6	1.34234	0.95554	0.9648	0.95825	0.95872	0.9648	0.95609	0.95618	0.96153	0.95833	0.95775	0.9648	0.95797	0.9648	0.95751	0.96023	0.76481	1.03766	1.04063	1.0413	19701.54428
7	1.30751	0.96034	0.96641	0.96207	0.96241	0.96641	0.96067	0.96073	0.96426	0.96214	0.96175	0.96641	0.96191	0.96641	0.96158	0.96341	0.77863	1.03552	1.03746	1.0379	18215.1385
8	1.28431	0.96349	0.96769	0.96467	0.96491	0.96769	0.96371	0.96374	0.96619	0.96472	0.96445	0.96769	0.96456	0.96769	0.96432	0.9656	0.78857	1.03392	1.03526	1.03556	17177.51948
9	1.26811	0.96566	0.96867	0.9665	0.96667	0.96867	0.96581	0.96584	0.9676	0.96654	0.96634	0.96867	0.96642	0.96867	0.96624	0.96718	0.7959	1.03272	1.03368	1.03389	16428.96552
10	1.25643	0.96722	0.96944	0.96783	0.96796	0.96944	0.96733	0.96734	0.96864	0.96786	0.96772	0.96944	0.96778	0.96944	0.96764	0.96833	0.80141	1.03181	1.03251	1.03267	15875.94826
11	1.2478	0.96837	0.97003	0.96882	0.96892	0.97003	0.96845	0.96846	0.96943	0.96884	0.96874	0.97003	0.96878	0.97003	0.96868	0.9692	0.8056	1.03111	1.03163	1.03175	15460.12277
12	1.24131	0.96923	0.97049	0.96957	0.96965	0.97049	0.96929	0.96929	0.97004	0.96959	0.96951	0.97049	0.96954	0.97049	0.96946	0.96986	0.80882	1.03057	1.03097	1.03106	15143.25901
13	1.23636	0.96988	0.97085	0.97014	0.9702	0.97085	0.96992	0.96993	0.9705	0.97016	0.97009	0.97085	0.97012	0.97085	0.97006	0.97037	0.81132	1.03015	1.03045	1.03052	14899.31446
14	1.23255	0.97038	0.97113	0.97058	0.97063	0.97113	0.97042	0.97042	0.97086	0.9706	0.97055	0.97113	0.97057	0.97113	0.97052	0.97076	0.81327	1.02982	1.03006	1.03011	14709.98831
15	1.22959	0.97077	0.97136	0.97093	0.97096	0.97136	0.9708	0.9708	0.97115	0.97094	0.9709	0.97136	0.97092	0.97136	0.97088	0.97106	0.8148	1.02956	1.02975	1.02979	14562.09278
16	1.22728	0.97107	0.97153	0.9712	0.97123	0.97153	0.97109	0.9711	0.97137	0.9712	0.97117	0.97153	0.97119	0.97153	0.97116	0.9713	0.81601	1.02936	1.0295	1.02954	14445.92799
17	1.22547	0.97131	0.97167	0.97141	0.97143	0.97167	0.97133	0.97133	0.97154	0.97141	0.97139	0.97167	0.9714	0.97167	0.97138	0.97149	0.81696	1.0292	1.02931	1.02934	14354.23803
18	1.22403	0.9715	0.97178	0.97158	0.97159	0.97178	0.97151	0.97152	0.97168	0.97158	0.97156	0.97178	0.97157	0.97178	0.97155	0.97164	0.81772	1.02907	1.02916	1.02918	14281.51756
19	1.22289	0.97165	0.97187	0.97171	0.97172	0.97187	0.97166	0.97166	0.97179	0.97171	0.9717	0.97187	0.9717	0.97187	0.97169	0.97176	0.81833	1.02896	1.02904	1.02905	14223.53765
20	1.22198	0.97177	0.97195	0.97182	0.97183	0.97195	0.97178	0.97178	0.97188	0.97182	0.97181	0.97195	0.97181	0.97195	0.9718	0.97186	0.81881	1.02888	1.02894	1.02895	14177.01277
21	1.22125	0.97186	0.972	0.9719	0.97191	0.972	0.97187	0.97187	0.97195	0.9719	0.97189	0.972	0.9719	0.972	0.97189	0.97193	0.81921	1.02881	1.02886	1.02887	14139.36133
22	1.22065	0.97194	0.97205	0.97197	0.97198	0.97205	0.97194	0.97195	0.97201	0.97197	0.97196	0.97205	0.97197	0.97205	0.97196	0.972	0.81953	1.02876	1.0288	1.0288	14108.52968
23	1.22016	0.972	0.97209	0.97203	0.97203	0.97209	0.97201	0.97201	0.97206	0.97203	0.97202	0.97209	0.97202	0.97209	0.97202	0.97205	0.8198	1.02871	1.02874	1.02875	14082.85964
24	1.21975	0.97205	0.97213	0.97207	0.97208	0.97213	0.97206	0.97206	0.9721	0.97208	0.97207	0.97213	0.97207	0.97213	0.97207	0.97209	0.82003	1.02867	1.0287	1.0287	14060.98675
25	1.21939	0.9721	0.97216	0.97212	0.97212	0.97216	0.9721	0.9721	0.97214	0.97212	0.97211	0.97216	0.97211	0.97216	0.97211	0.97213	0.82023	1.02863	1.02866	1.02866	14041.75989
26	1.21907	0.97214	0.97218	0.97215	0.97215	0.97218	0.97214	0.97214	0.97217	0.97215	0.97215	0.97218	0.97215	0.97218	0.97215	0.97216	0.82041	1.0286	1.02862	1.02862	14024.17594
27	1.21877	0.97217	0.97221	0.97218	0.97219	0.97221	0.97218	0.97218	0.9722	0.97218	0.97218	0.97221	0.97218	0.97221	0.97218	0.97219	0.82059	1.02856	1.02858	1.02859	14007.32461
28	1.21848	0.97221	0.97224	0.97222	0.97222	0.97224	0.97221	0.97221	0.97223	0.97222	0.97221	0.97224	0.97222	0.97224	0.97221	0.97222	0.82077	1.02852	1.02855	1.02855	13990.33998
29	1.21818	0.97224	0.97227	0.97225	0.97225	0.97227	0.97224	0.97224	0.97226	0.97225	0.97225	0.97227	0.97225	0.97227	0.97225	0.97225	0.82096	1.02848	1.02851	1.02852	13972.35561
30	1.21785	0.97228	0.9723	0.97228	0.97228	0.9723	0.97228	0.97228	0.97229	0.97228	0.97228	0.9723	0.97228	0.9723	0.97228	0.97229	0.82117	1.02844	1.02847	1.02847	13952.46103
31	1.21748	0.97231	0.97233	0.97232	0.97232	0.97233	0.97232	0.97232	0.97233	0.97232	0.97232	0.97233	0.97232	0.97233	0.97232	0.97232	0.82141	1.02839	1.02842	1.02843	13929.65741
32	1.21705	0.97236	0.97238	0.97237	0.97237	0.97238	0.97236	0.97236	0.97237	0.97237	0.97237	0.97238	0.97237	0.97238	0.97237	0.97237	0.82169	1.02833	1.02836	1.02837	13902.81063
33	1.21654	0.97241	0.97243	0.97242	0.97242	0.97243	0.97242	0.97242	0.97242	0.97242	0.97242	0.97243	0.97242	0.97243	0.97242	0.97242	0.82203	1.02825	1.0283	1.02831	13870.60015
34	1.21592	0.97247	0.97249	0.97248	0.97248	0.97249	0.97248	0.97248	0.97248	0.97248	0.97248	0.97249	0.97248	0.97249	0.97249	0.97248	0.82244	1.02816	1.02821	1.02823	13831.46255
35	1.21516	0.97255	0.97257	0.97256	0.97256	0.97257	0.97256	0.97256	0.97256	0.97256	0.97256	0.97257	0.97256	0.97257	0.97256	0.97256	0.82295	1.02804	1.02811	1.02813	13783.52867
36	1.21424	0.97264	0.97266	0.97266	0.97265	0.97266	0.97265	0.97265	0.97266	0.97265	0.97265	0.97266	0.97265	0.97266	0.97266	0.97265	0.82357	1.0279	1.02799	1.02801	13724.55458
37	1.2131	0.97276	0.97278	0.97277	0.97277	0.97278	0.97276	0.97277	0.97277	0.97277	0.97277	0.97278	0.97277	0.97278	0.97278	0.97277	0.82434	1.02773	1.02784	1.02786	13651.84752
38	1.2117	0.9729	0.97293	0.97292	0.97291	0.97293	0.97291	0.97291	0.97291	0.97291	0.97291	0.97293	0.97291	0.97293	0.97292	0.97291	0.8253	1.02752	1.02765	1.02768	13562.18989
39	1.20997	0.97307	0.9731	0.9731	0.97309	0.9731	0.97308	0.97309	0.97309	0.97309	0.97309	0.9731	0.97309	0.9731	0.9731	0.97309	0.82647	1.02726	1.02742	1.02745	13451.76753
40	1.20785	0.97328	0.97332	0.97332	0.97331	0.97332	0.9733	0.9733	0.97331	0.97331	0.97331	0.97332	0.97331	0.97332	0.97332	0.9733	0.82792	1.02694	1.02713	1.02717	13316.11259
41	1.20526	0.97354	0.9736	0.97358	0.97357	0.9736	0.97357	0.97357	0.97358	0.97358	0.97358	0.9736	0.97357	0.9736	0.97359	0.97357	0.8297	1.02654	1.02678	1.02684	13150.07689
42	1.2021	0.97387	0.97393	0.97391	0.9739	0.97393	0.97389	0.9739	0.97391	0.9739	0.97391	0.97393	0.9739	0.97393	0.97392	0.9739	0.83188	1.02607	1.02636	1.02642	12947.8587
43	1.19828	0.97426	0.97433	0.97432	0.9743	0.97433	0.97429	0.97429	0.97431	0.9743	0.97431	0.97433	0.9743	0.97433	0.97433	0.97429	0.83453	1.0255	1.02585	1.02592	12703.11333
44	1.19369	0.97473	0.97482	0.9748	0.97478	0.97482	0.97477	0.97478	0.97479	0.97479	0.97479	0.97482	0.97478	0.97482	0.97482	0.97478	0.83774	1.02481	1.02524	1.02533	12409.18382
45	1.18823	0.9753	0.97541	0.97539	0.97536	0.97541	0.97535	0.97535	0.97537	0.97537	0.97537	0.97541	0.97536	0.97541	0.9754	0.97535	0.84159	1.024	1.02451	1.02461	12059.48941
46	1.18181	0.97598	0.97611	0.97608	0.97605	0.97611	0.97603	0.97604	0.97606	0.97606	0.97606	0.97611	0.97605	0.97611	0.9761	0.97604	0.84616	1.02306	1.02365	1.02377	11648.10049
47	1.17436	0.97678	0.97693	0.9769	0.97686	0.97693	0.97684	0.97685	0.97687	0.97687	0.97688	0.97693	0.97686	0.97693	0.97692	0.97685	0.85153	1.02197	1.02266	1.0228	11170.50312
48	1.16583	0.97771	0.97788	0.97785	0.9778	0.97788	0.97778	0.97779	0.97782	0.97782	0.97782	0.97788	0.97781	0.97788	0.97787	0.97779	0.85776	1.02074	1.02152	1.02169	10624.51034
49	1.15626	0.97877	0.97897	0.97893	0.97888	0.97897	0.97886	0.97887	0.9789	0.9789	0.9789	0.97897	0.97889	0.97897	0.97896	0.97887	0.86486	1.01938	1.02025	1.02044	10011.21117
50	1.14572	0.97997	0.98019	0.98015	0.98009	0.98019	0.98007	0.98008	0.98011	0.98011	0.98012	0.98019	0.9801	0.98019	0.98018	0.98008	0.87282	1.0179	1.01886	1.01906	9335.77796
51	1.13436	0.98129	0.98154	0.98149	0.98143	0.98154	0.9814	0.98142	0.98145	0.98145	0.98145	0.98154	0.98144	0.98154	0.98153	0.98142	0.88156	1.01634	1.01736	1.01758	8607.90405
52	1.1224	0.98272	0.98299	0.98294	0.98287	0.98299	0.98284	0.98285	0.98289	0.98289	0.9829	0.98299	0.98288	0.98299	0.98298	0.98286	0.89095	1.01472	1.01579	1.01602	7841.65598
53	1.11011	0.98423	0.98451	0.98446	0.98438	0.98451	0.98435	0.98437	0.98441	0.98441	0.98442	0.98451	0.98439	0.98451	0.9845	0.98437	0.90081	1.01308	1.01418	1.01442	7054.62125
54	1.09781	0.98579	0.98607	0.98602	0.98594	0.98607	0.98591	0.98593	0.98597	0.98597	0.98598	0.98607	0.98595	0.98607	0.98606	0.98593	0.91091	1.01148	1.01258	1.01281	6266.40593
55	1.0858	0.98735	0.98764	0.98758	0.98751	0.98764	0.98748	0.98749	0.98754	0.98753	0.98754	0.98764	0.98752	0.98764	0.98763	0.9875	0.92098	1.00995	1.01101	1.01124	5496.72972
56	1.07435	0.98888	0.98916	0.98911	0.98904	0.98916	0.989	0.98902	0.98906	0.98906	0.98907	0.98916	0.98905	0.98916	0.98915	0.98902	0.93079	1.00852	1.00953	1.00975	4763.49848
57	1.0637	0.99035	0.99061	0.99056	0.99049	0.99061	0.99046	0.99048	0.99052	0.99052	0.99052	0.99061	0.9905	0.99061	0.9906	0.99048	0.94011	1.00722	1.00815	1.00835	4081.24151
58	1.05401	0.99172	0.99196	0.99192	0.99185	0.99196	0.99182	0.99184	0.99187	0.99187	0.99188	0.99196	0.99186	0.99196	0.99195	0.99184	0.94876	1.00605	1.0069	1.00709	3460.1802
59	1.04536	0.99296	0.99319	0.99315	0.99309	0.99319	0.99306	0.99308	0.99311	0.99311	0.99311	0.99319	0.9931	0.99319	0.99318	0.99308	0.95661	1.00503	1.00579	1.00595	2906.00401
60	1.03778	0.99408	0.99428	0.99424	0.99419	0.99428	0.99417	0.99418	0.99421	0.99421	0.99422	0.99428	0.9942	0.99428	0.99427	0.99418	0.9636	1.00416	1.00482	1.00496	2420.25087
61	1.03123	0.99507	0.99524	0.99521	0.99516	0.99524	0.99514	0.99515	0.99518	0.99518	0.99518	0.99524	0.99517	0.99524	0.99523	0.99515	0.96971	1.00341	1.00398	1.0041	2001.083
62	1.02566	0.99591	0.99607	0.99604	0.996	0.99607	0.99598	0.99599	0.99601	0.99601	0.99602	0.99607	0.996	0.99607	0.99606	0.99599	0.97498	1.00278	1.00327	1.00337	1644.22839
63	1.02098	0.99664	0.99677	0.99674	0.99671	0.99677	0.9967	0.9967	0.99672	0.99672	0.99673	0.99677	0.99671	0.99677	0.99676	0.99671	0.97945	1.00226	1.00267	1.00276	1343.90172
64	1.01707	0.99725	0.99736	0.99734	0.99731	0.99736	0.9973	0.99731	0.99732	0.99732	0.99732	0.99736	0.99731	0.99736	0.99736	0.99731	0.98322	1.00183	1.00217	1.00224	1093.58799
65	1.01384	0.99776	0.99785	0.99784	0.99781	0.99785	0.9978	0.99781	0.99782	0.99782	0.99782	0.99785	0.99781	0.99781	0.99785	0.99781	0.98635	1.00148	1.00176	1.00182	886.63931

p3) The target matrix is a focused analysis of data based on location, measure descriptions, and sample sizes (field1). It utilizes a summation function to aggregate sample sizes and iteratively examines field2 during the transition in the years 1999 and year 2014. This approach offers insights into how “SmokerTotal’ changes across locations and measures descriptions during this critical period, providing valuable information for decision-making and dataset understanding.

Target Matrix of Sum of SmokersTotal where YEAR='2014'

Export to Excel

LocationDesc	Sum of Sum of SmokersTotal by LocationDesc	Percent of Current Smokers Who Want to Quit	Quit Attempt in Past Year Among Current Cigarette Smokers	Smoking Status	User Status
Alabama	27608	4963	2810	11836	7999
Arkansas	0	0	0	0	0
Delaware	24465	1275	0	12113	11077
Georgia	0	0	0	0	0
Kansas	0	0	0	0	0
Minnesota	15244	1222	595	9382	4045
Mississippi	55577	7771	2143	18149	27514
Missouri	0	0	0	0	0
Nebraska	6373	0	2523	3850	0
New Jersey	24529	2180	2608	10349	9392
North Carolina	0	0	0	0	0
Ohio	18345	1537	710	8374	7724
Oklahoma	0	0	0	0	0
Pennsylvania	28745	3706	3019	12988	9032
South Dakota	0	0	0	0	0
Tennessee	0	0	0	0	0
Total: 200886	Sum of Sum of SmokersTotal by MeasureDesc:	22654	14408	87041	76783

participants who were "currently smoking and want to quit" were the majority in Mississippi in 2014

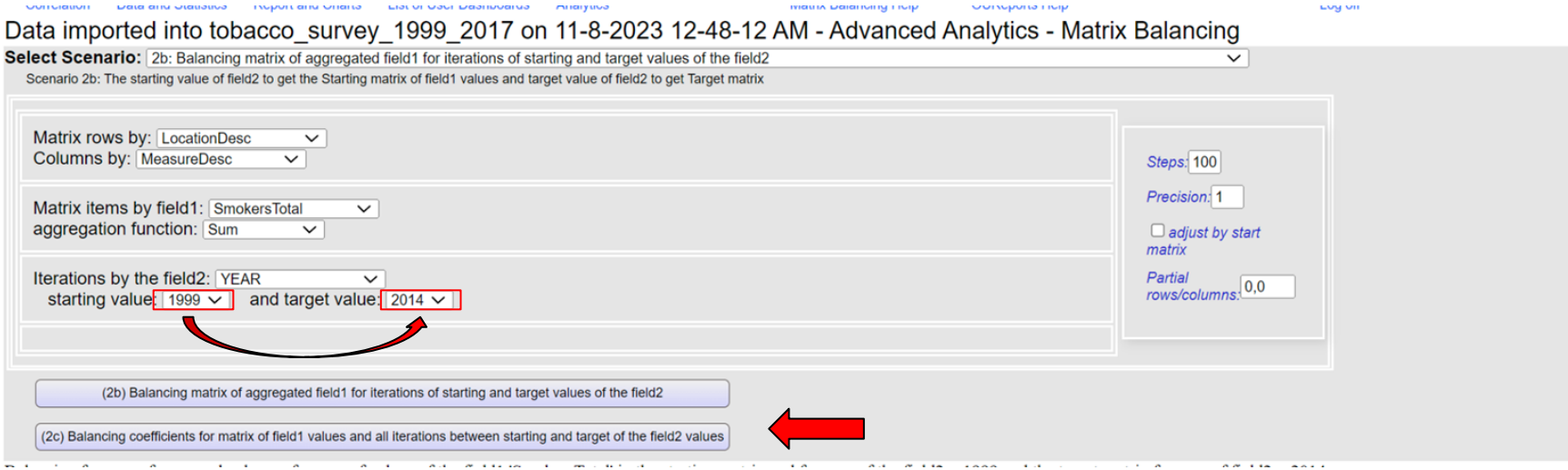
p4) The Balanced Matrix is a comprehensive analysis structured by location and measure descriptions, primarily focusing on field1 'SmokerTotal'. It employs a summation function to aggregate sample sizes while iteratively observing field2 values during the transitional period of 1999 and year 2014. This approach provides a well-balanced perspective on how 'SmokerTotal' evolves across various locations and measures descriptions within this specific timeframe. The resulting matrix offers valuable insights for decision-making and a thorough understanding of the dataset's dynamics during the critical years of 1999 and year 2014.

Balancing Matrix of Sum of SmokersTotal

Export to Excel

LocationDesc	Sum of Sum of SmokersTotal by LocationDesc	Percent of Current Smokers Who Want to Quit	Quit Attempt in Past Year Among Current Cigarette Smokers	Smoking Status	User Status
Alabama	27607.7	22653.98	658.54	2437.45	1857.73
Arkansas	0	0	0	0	0
Delaware	24465.04	0.01	3252.33	12037.9	9174.81
Georgia	0	0	0	0	0
Kansas	0	0	0	0	0
Minnesota	15244.03	0	2026.51	7500.74	5716.77
Mississippi	55577.1	0	810.57	25408.52	29358.01
Missouri	0	0	0	0	0
Nebraska	6373.01	0	450.98	2547.14	3374.89
New Jersey	24529.04	0	949.03	13938.8	9641.21
North Carolina	0	0	0	0	0
Ohio	18345.03	0.01	2438.75	9026.58	6879.7
Oklahoma	0	0	0	0	0
Pennsylvania	28745.05	0.01	3821.31	14143.85	10779.88
South Dakota	0	0	0	0	0
Tennessee	0	0	0	0	0
Total: 200886.01	Sum of Sum of SmokersTotal by MeasureDesc:	22654.01	14408.02	87040.98	76783

2c) Field2 Value-Based Matrix Generation: This scenario uses the initial value of field2 to generate a starting matrix of field1 values. Similarly, the target value of field 2 is used to produce a target matrix.



p1) The Starting Matrix, in the context of Field2 Value-Based Matrix Generation, is a key outcome that reflects the interplay between location, measure descriptions, field1 ' 'SmokerTotal' ', and the summation function. This matrix is constructed through iterative observations of field2 values spanning the years 1999 to 2014. It begins with the initial value of field2 and, based on this foundation, builds a matrix of field1 values. The Starting Matrix serves as the foundation for

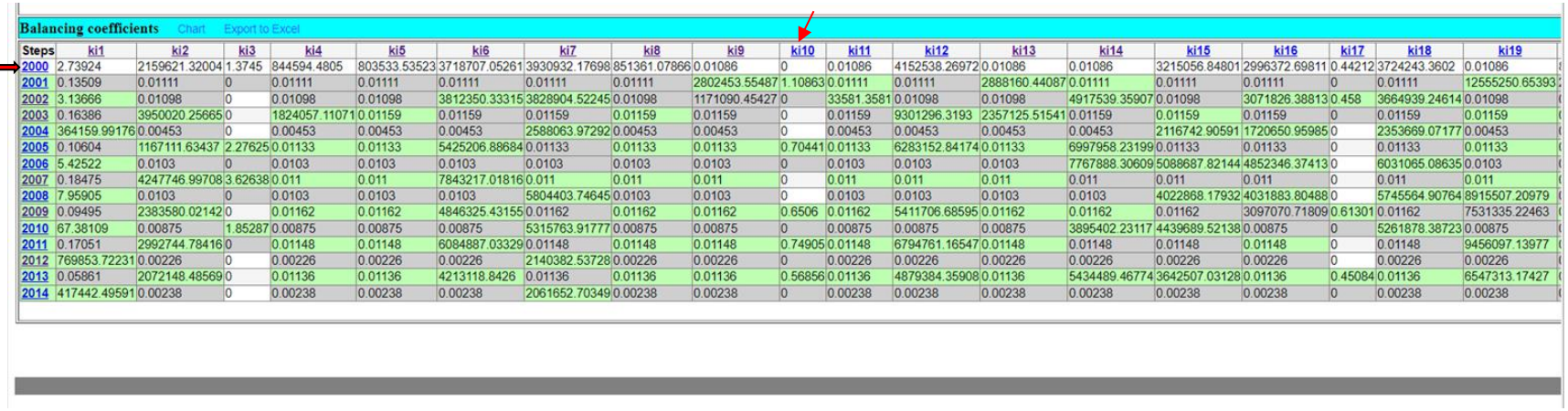
further analysis and provides insights into the relationships between location, measure descriptions, and ‘ ‘SmokerTotal’ in response to changes in field2 values over this *15-year period*. It forms the basis for a deeper understanding of the dataset dynamics and can be a valuable tool for decision-making and trend analysis.

Done!

Starting Matrix of Sum of SmokersTotal where YEAR='1999' Export to Excel

LocationDesc	Sum of Sum of SmokersTotal by LocationDesc	Percent of Current Smokers Who Want to Quit	Quit Attempt in Past Year Among Current Cigarette Smokers	Smoking Status	User Status
Alabama	15539	15539	0	0	0
Arizona	0	0	0	0	0
Arkansas	8006	0	0	0	8006
California	0	0	0	0	0
Colorado	0	0	0	0	0
Connecticut	0	0	0	0	0
Delaware	0	0	0	0	0
District of Columbia	0	0	0	0	0
Florida	0	0	0	0	0
Georgia	28781	2234	4113	15837	6597
Guam	0	0	0	0	0
Hawaii	0	0	0	0	0
Idaho	0	0	0	0	0
Illinois	0	0	0	0	0
Indiana	0	0	0	0	0
Iowa	0	0	0	0	0
Kansas	12667	1407	856	5077	5327
Kentucky	0	0	0	0	0
Louisiana	0	0	0	0	0
Maine	0	0	0	0	0
Maryland	0	0	0	0	0
Massachusetts	0	0	0	0	0
Michigan	0	0	0	0	0
Minnesota	0	0	0	0	0
Mississippi	47806	0	2143	18149	27514
Missouri	17006	0	1029	7267	8710
Nebraska	16096	3030	2523	3850	6693
New Hampshire	0	0	0	0	0
New Jersey	24529	2180	2608	10349	9392
New Mexico	0	0	0	0	0
New York	0	0	0	0	0
North Carolina	49851	3467	1728	32146	12510
North Dakota	0	0	0	0	0
Ohio	0	0	0	0	0
Oklahoma	24854	1864	2802	8881	11307
Pennsylvania	0	0	0	0	0
Rhode Island	0	0	0	0	0
South Carolina	0	0	0	0	0
South Dakota	21506	684	6157	8201	6464
Tennessee	17421	2988	748	6508	7177
Texas	0	0	0	0	0
Utah	0	0	0	0	0
Vermont	0	0	0	0	0
Virgin Islands	0	0	0	0	0
Virginia	0	0	0	0	0
West Virginia	0	0	0	0	0
Wisconsin	0	0	0	0	0
Wyoming	0	0	0	0	0
Total: 284062	Sum of Sum of SmokersTotal by MeasureDesc:	33393	24707	116265	109697

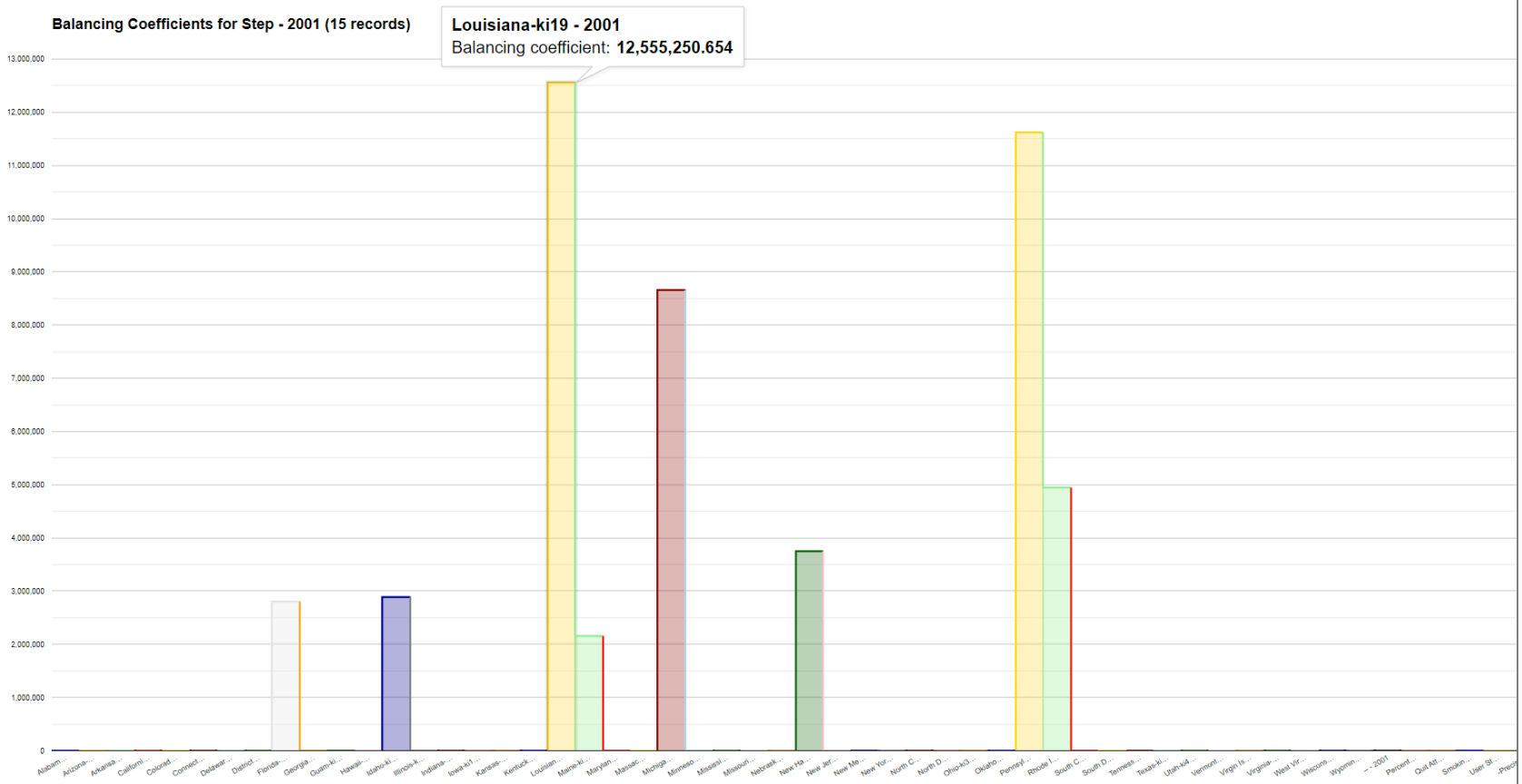
p2) Coefficient Balancing I is a result derived from the Field2 Value-Based Matrix Generation scenario. In this analysis, the focus is on balancing the coefficient -related data, particularly when considering location, measure descriptions, field1 ‘‘SmokerTotal’ , and the summation function across the years from 1999 to 2014. It involves an iterative process that aims to harmonize and align the field1 values based on the changes in field2 over this *15-year period*. This balancing helps uncover trends and patterns in coefficient -related data and ensures that the information remains consistent and reliable across different measures and locations. coefficient Balancing I provides a crucial step in refining the dataset and making it more suitable for in-depth analysis and decision-making.



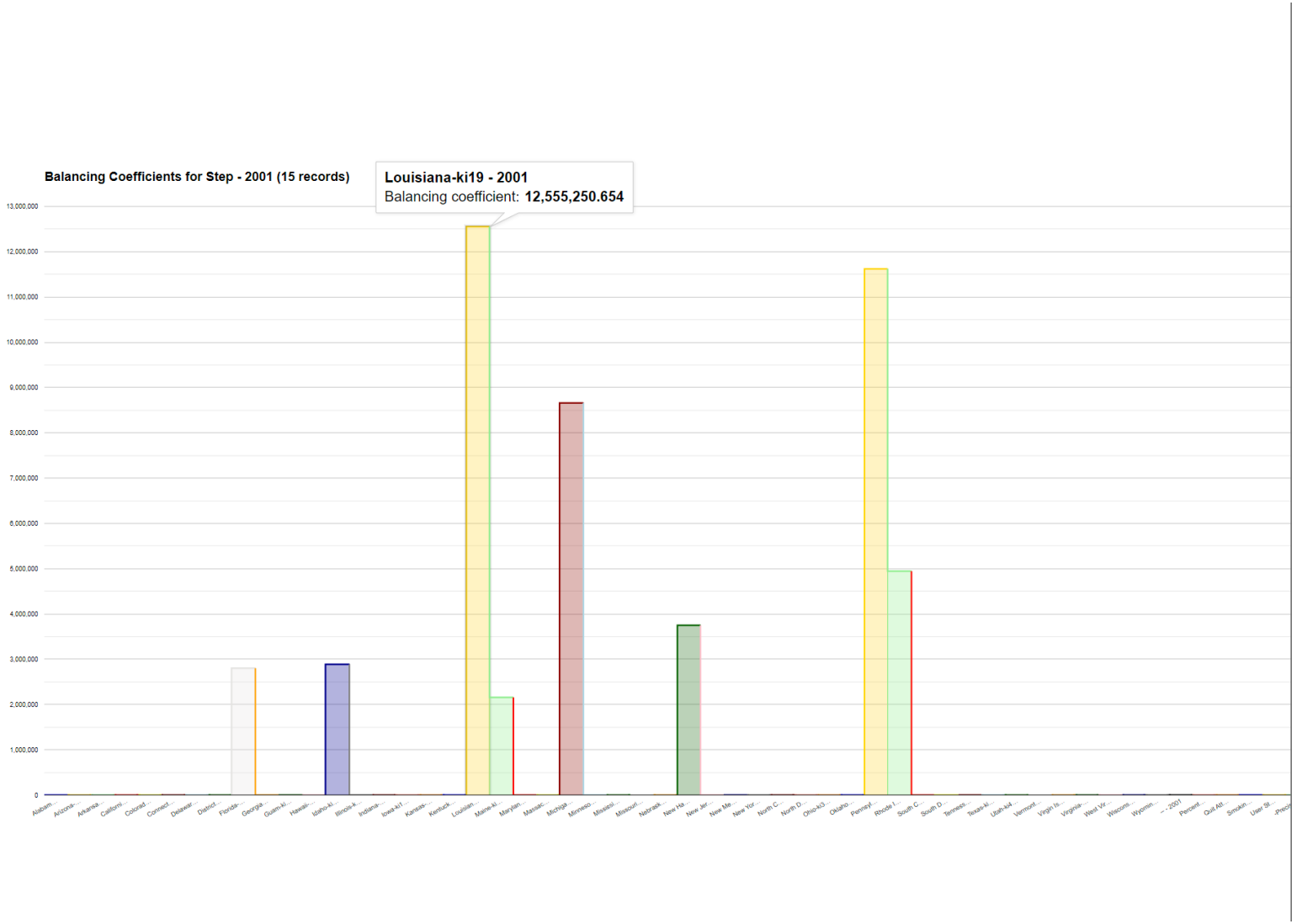
Balancing coefficients Chart Export to Excel

Steps	ki1	ki2	ki3	ki4	ki5	ki6	ki7	ki8	ki9	ki10	ki11	ki12	ki13	ki14	ki15	ki16	ki17	ki18	ki19
2000	2.73924	2159621.32004	1.3745	844594.4805	803533.53523	3718707.05261	3930932.17698	851361.07866	0.01086	0	0.01086	4152538.26972	0.01086	0.01086	3215056.84801	2996372.69811	0.44212	3724243.3602	0.01086
2001	0.13509	0.01111	0	0.01111	0.01111	0.01111	0.01111	0.01111	2802453.55487	1.10863	0.01111	0.01111	2888160.44087	0.01111	0.01111	0.01111	0	0.01111	12555250.65393
2002	3.13666	0.01098	0	0.01098	0.01098	3812350.33315	3828904.52245	0.01098	1171090.45427	0	33581.3581	0.01098	0.01098	4917539.35907	0.01098	3071826.38813	0.458	3664939.24614	0.01098
2003	0.16386	3950020.25665	0	1824057.11071	0.01159	0.01159	0.01159	0.01159	0.01159	0	0.01159	9301296.3193	2357125.51541	0.01159	0.01159	0.01159	0	0.01159	0.01159
2004	364159.99176	0.00453	0	0.00453	0.00453	0.00453	2588063.97292	0.00453	0.00453	0	0.00453	0.00453	0.00453	0.00453	2116742.90591	1720650.95985	0	2353669.07177	0.00453
2005	0.10604	1167111.63437	2.27625	0.01133	0.01133	5425206.88684	0.01133	0.01133	0.01133	0.70441	0.01133	6283152.84174	0.01133	6997958.23199	0.01133	0.01133	0	0.01133	0.01133
2006	5.42522	0.0103	0	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103	0	0.0103	0.0103	0.0103	7767888.30609	5088687.82144	4852346.37413	0	6031065.08635	0.0103
2007	0.18475	4247746.99708	3.62638	0.011	0.011	7843217.01816	0.011	0.011	0.011	0	0.011	0.011	0.011	0.011	0.011	0.011	0	0.011	0.011
2008	7.95905	0.0103	0	0.0103	0.0103	0.0103	5804403.74645	0.0103	0.0103	0	0.0103	0.0103	0.0103	0.0103	4022868.17932	4031883.80488	0	5745564.90764	8915507.20979
2009	0.09495	2383580.02142	0	0.01162	0.01162	4846325.43155	0.01162	0.01162	0.01162	0.6506	0.01162	5411706.68595	0.01162	0.01162	0.01162	3097070.71809	0.61301	0.01162	7531335.22463
2010	67.38109	0.00875	1.85287	0.00875	0.00875	0.00875	5315763.91777	0.00875	0.00875	0	0.00875	0.00875	0.00875	3895402.23117	4439689.52138	0.00875	0	5261878.38723	0.00875
2011	0.17051	2992744.78416	0	0.01148	0.01148	6084887.03329	0.01148	0.01148	0.01148	0.74905	0.01148	6794761.16547	0.01148	0.01148	0.01148	0.01148	0	0.01148	9456097.13977
2012	769853.72231	0.00226	0	0.00226	0.00226	0.00226	2140382.53728	0.00226	0.00226	0	0.00226	0.00226	0.00226	0.00226	0.00226	0.00226	0	0.00226	0.00226
2013	0.05861	2072148.48569	0	0.01136	0.01136	4213118.8426	0.01136	0.01136	0.01136	0.56856	0.01136	4879384.35908	0.01136	5434489.46774	3642507.03128	0.01136	0.45084	0.01136	6547313.17427
2014	417442.49591	0.00238	0	0.00238	0.00238	0.00238	2061652.70349	0.00238	0.00238	0	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0	0.00238	0.00238

This matrix serves as a critical snapshot, offering a comprehensive overview of the initial distribution of Data value within the specified district. By breaking down the data into categories and Years, it provides a detailed understanding of how data are allocated across different educational facets. The starting matrix serves as the foundational representation upon which further analysis and exploration are built. It is a pivotal component in our journey to unravel meaningful insights within the dataset.

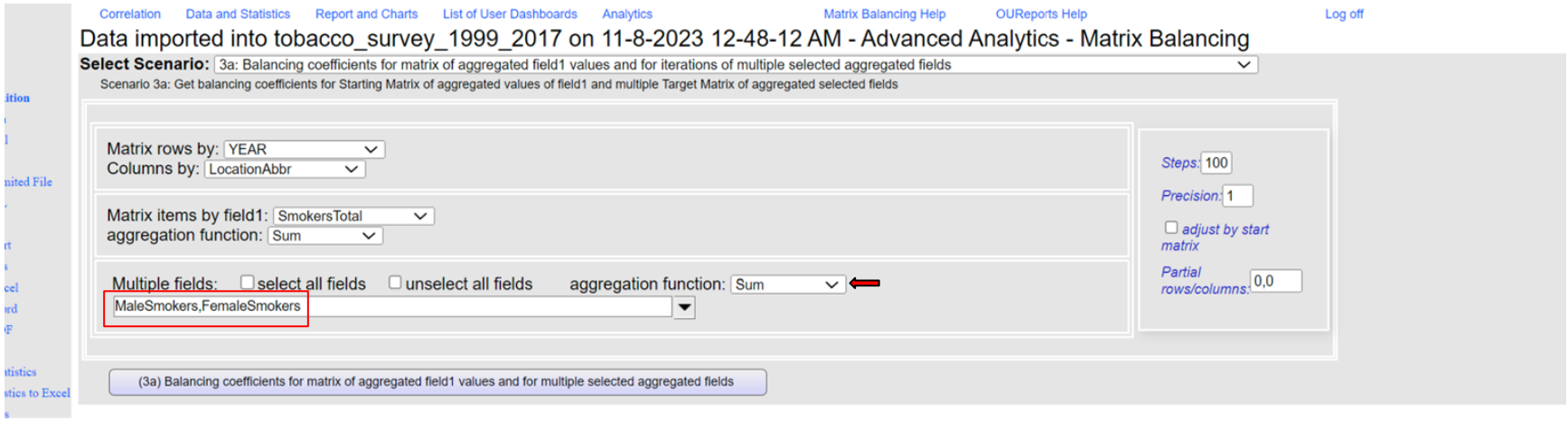


For example, in 2001, Louisiana showed the highest coefficients among other states.



Another example, As “ki10” shows for Georgia , it had the highest coefficient in 2001 and which was around “1.109”

3a)Multiple Target Matrix Coefficient Determination: This scenario seeks to find the balancing coefficients for a starting matrix that aggregates values from field1. The balancing is done against multiple target Matrix that aggregate selected fields.

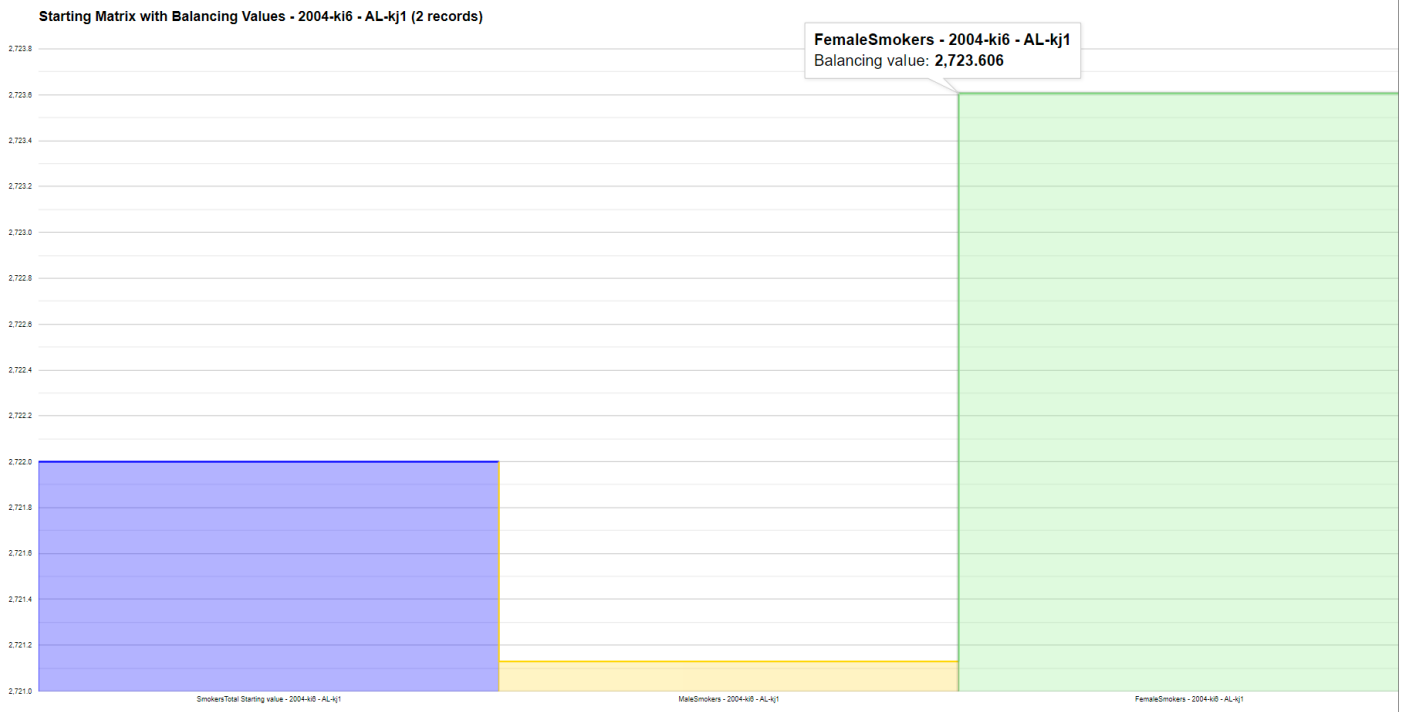


p1) Starting Matrix: The starting matrix is a pivot table created from the original data frame where the index is the 'Year', the columns are 'Locationname', and the values are the sum of the '1999-2017' data value' for all districts. This matrix represents the initial distribution of Data value across different Years and districts. We have multiple selected fields (MaleSmokers, FemaleSmokers)

Done!

Starting Matrix of Sum of SmokersTotal Export to Excel

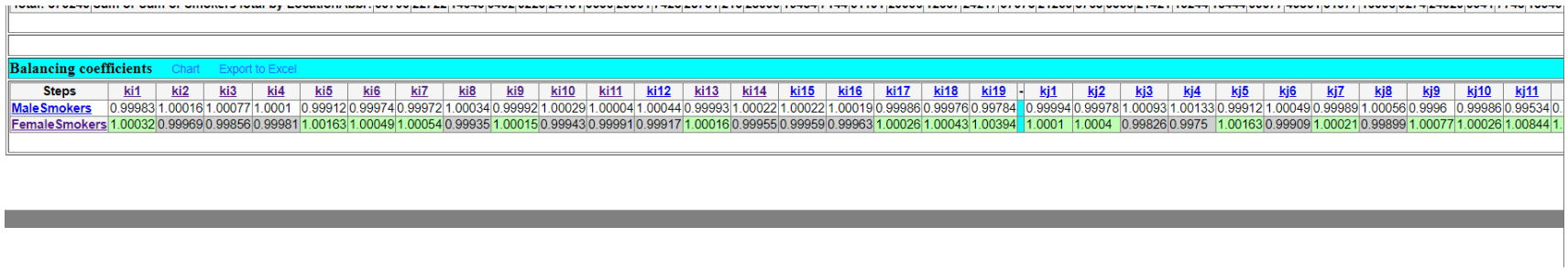
YEAR	Sum of Sum of SmokersTotal by YEAR	AL	AR	AZ	CA	CO	CT	DC	DE	FL	GA	GU	HI	IA	ID	IL	IN	KS	KY	LA	MA	MD	ME	MI	MN	MO	MS	NC	ND	NE	NH	NJ	NM	NY	OH	OK
1999	53576	3182	0	0	0	0	0	0	0	0	7740	0	0	0	0	0	0	639	0	0	0	0	0	0	0	1032	4339	21061	0	448	0	3732	0	0	0	4141
2000	99581	5489	2435	1059	1713	5225	5081	5536	5554	0	0	0	2597	2089	0	0	4240	1692	2396	0	0	1874	889	0	8954	0	5242	0	0	2424	1588	0	0	5154	2792	1786
2001	35262	0	0	0	0	0	0	0	0	5492	2153	0	0	0	990	0	0	0	0	2287	0	0	4447	1116	0	0	0	0	0	0	3162	2155	0	0	0	0
2002	106775	2891	0	0	0	0	3344	0	1420	1936	0	213	0	3289	0	14319	0	1142	4009	0	21239	6894	0	0	2033	0	3489	7591	0	2496	0	0	0	2594	3062	3750
2003	65722	0	0	2427	3779	0	0	0	0	0	0	0	1133	0	6154	0	0	0	0	0	0	0	0	17230	0	3427	7314	0	5331	0	0	0	0	0	0	0
2004	42236	2722	0	0	0	0	0	0	4329	0	0	0	0	5536	0	0	4448	0	2816	0	0	0	0	0	0	0	1599	2409	0	0	809	1626	3941	0	2479	0	0
2005	51362	0	8512	1900	0	0	3367	0	0	0	5696	0	1746	0	0	1268	0	0	0	0	0	0	0	0	0	4465	0	4887	2435	0	0	0	0	0	0	1657	0
2006	37108	3635	0	0	0	0	0	0	0	0	0	0	0	3104	0	3940	2105	0	2934	0	0	0	0	0	0	0	3545	0	0	3160	0	2628	0	0	0	0	3
2007	39882	0	6752	3291	0	0	2514	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1532	0	2652	0	0	7505	0	216	0	0	0	0	4426	0
2008	41736	1644	0	0	0	0	0	0	1467	0	0	0	0	2378	0	0	2748	0	6201	13824	0	0	0	0	1595	0	1253	0	0	0	0	3213	0	0	2806	0	2
2009	54333	0	0	1316	0	0	2081	0	0	0	2414	0	1513	3088	0	0	0	7887	0	3015	0	0	0	0	0	1515	2490	5311	5484	0	1914	0	0	0	0	1743	0
2010	35068	1599	5023	0	0	0	0	0	2800	0	0	0	0	0	0	4942	3370	0	5861	0	0	0	0	0	0	0	1773	0	0	0	0	1645	0	0	2323	0	2
2011	50944	0	0	1640	0	0	3239	0	0	0	5920	0	3183	0	0	0	0	0	0	7474	0	0	0	1543	0	2285	0	2926	6344	0	1585	0	0	0	0	5052	0
2012	16334	2954	0	0	0	0	0	0	2666	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3524	0	0	924	0	360	0	0	392	0	0
2013	40208	0	0	652	0	0	3446	0	0	0	3175	0	1133	0	0	3246	2872	1307	0	2608	0	0	0	0	0	879	1714	1371	3023	3193	0	3752	0	0	1603	1503	0
2014	22764	3689	0	0	0	0	0	0	1943	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2662	0	3897	0	0	1813	0	3327	0	0	2351	0	3
2015	61927	0	0	1124	0	0	1109	0	0	0	1483	0	16700	0	0	3476	0	0	0	8370	0	0	0	0	0	2189	11123	4295	1255	1638	0	2091	0	0	0	0	3
2016	19056	2985	0	0	0	0	0	0	5382	0	0	0	0	0	0	0	1123	0	0	0	0	0	0	0	0	0	4275	0	0	0	0	0	0	0	0	796	0
2017	1371	0	0	634	0	0	0	0	0	0	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	537	0	0
Total: 875245	Sum of Sum of SmokersTotal by LocationAbbr:	30790	22722	14043	5492	5225	24181	5536	25561	7428	28781	213	28005	19484	7144	31191	20906	12667	24217	37578	21239	8768	5336	21421	15244	18444	55577	49851	31377	16096	9274	24529	3941	7748	18345	24854	2



For example, in 2004 “ki6”, FemalSmoker were more than MaleSmoker

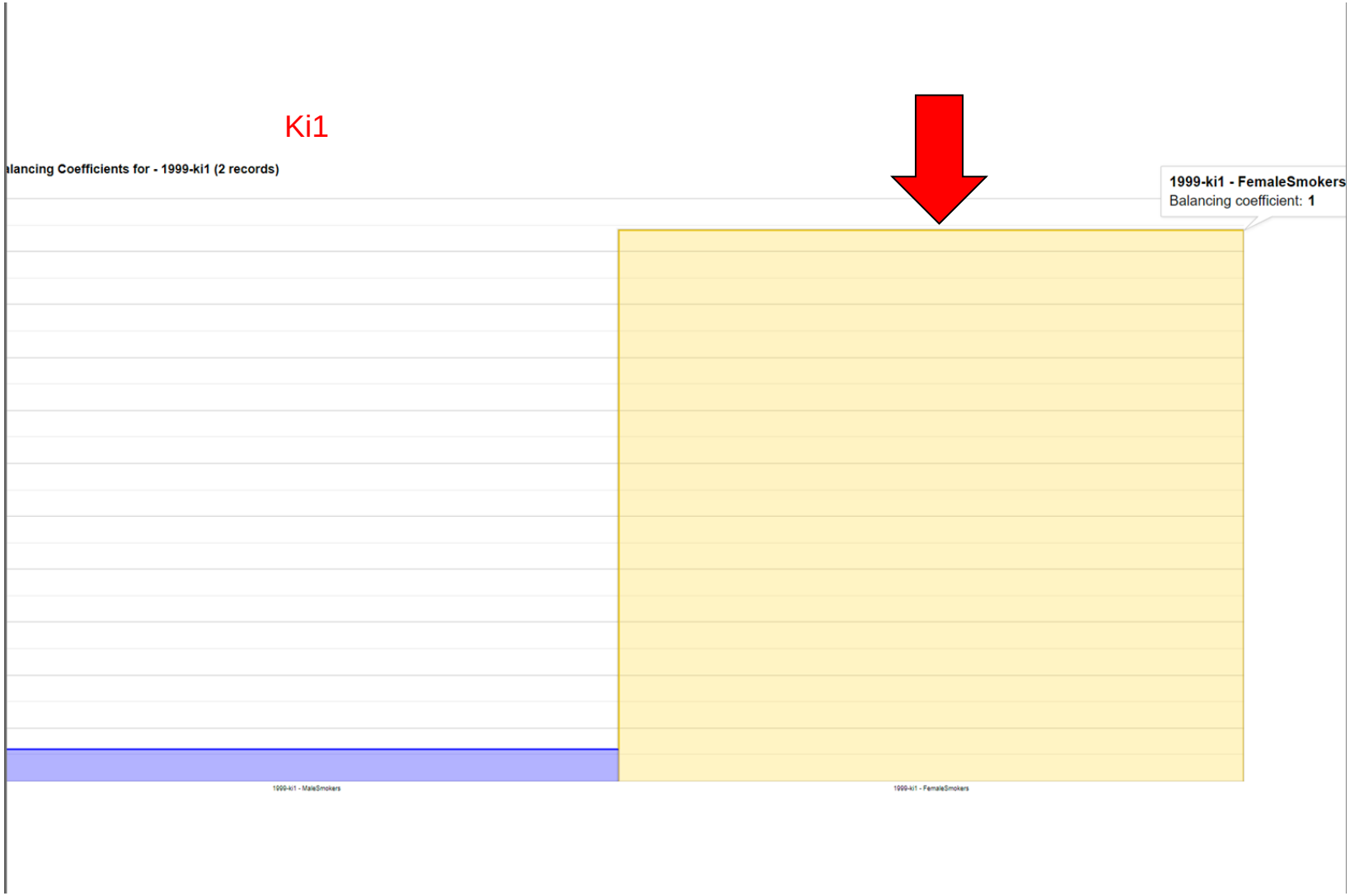
p2) Balancing coefficient: The result of the IPF procedure is a set of balancing coefficients for each cell in the starting matrix. These coefficients can be multiplied with the corresponding values in the starting matrix to get balanced Matrix that have the same row s as the starting matrix and the same column s as each target matrix.

The Iterative Proportional Fitting (IPF) procedure is applied to the starting matrix to adjust its values to match the row s of the starting matrix and the column s of each target matrix. The IPF procedure iteratively adjusts the rows and columns of the starting matrix until the sum of each row matches the corresponding row and the sum of each column matches the corresponding column.



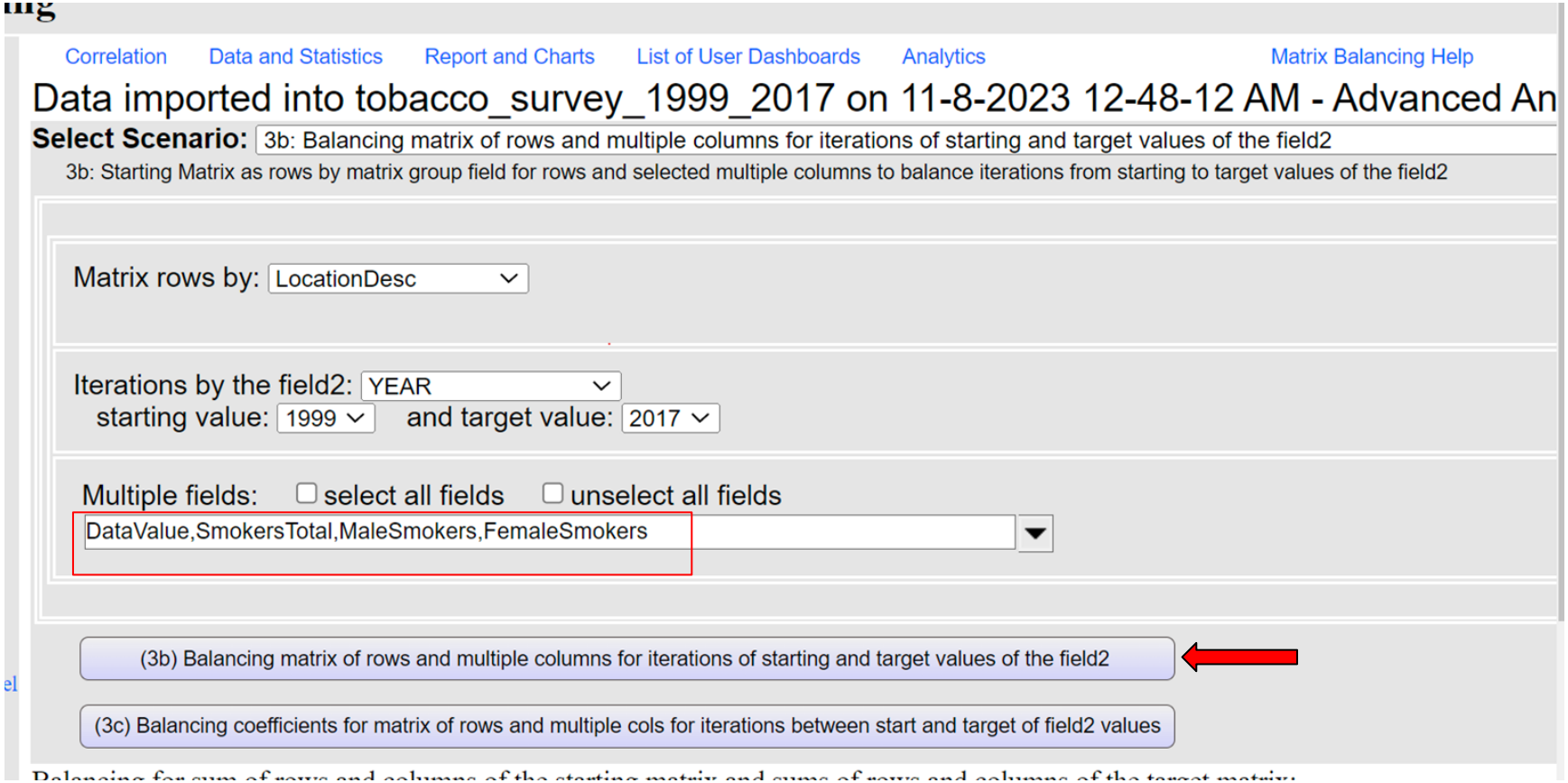
Balancing coefficients Chart Export to Excel

Steps	ki1	ki2	ki3	ki4	ki5	ki6	ki7	ki8	ki9	ki10	ki11	ki12	ki13	ki14	ki15	ki16	ki17	ki18	ki19	kj1	kj2	kj3	kj4	kj5	kj6	kj7	kj8	kj9	kj10	kj11
MaleSmokers	0.99983	1.00016	1.00077	1.0001	0.99912	0.99974	0.99972	1.00034	0.99992	1.00029	1.00004	1.00044	0.99993	1.00022	1.00022	1.00019	0.99986	0.99976	0.99784	0.99994	0.99978	1.00093	1.00133	0.99912	1.00049	0.99989	1.00056	0.9996	0.99986	0.99534
FemaleSmokers	1.00032	0.99969	0.99856	0.99981	1.00163	1.00049	1.00054	0.99935	1.00015	0.99943	0.99991	0.99917	1.00016	0.99955	0.99959	0.99963	1.00026	1.00043	1.00394	1.0001	1.0004	0.99826	0.9975	1.00163	0.99909	1.00021	0.99899	1.00077	1.00026	1.00844



As “Ki1” here shows the Balancing Coefficients for FemalSmoker in 1999

3b) Group Field Row Matrix Iterative Balancing: The starting matrix is organized by a matrix group field for rows and selects multiple columns. The matrix undergoes balancing across iterations that range from the starting to the target value ues of field2.



p1) The starting matrix for this iterative balancing process is organized by location, where the iterations span the years 1999 and 2017. Multiple columns are chosen, including (DataValue, MaleSmokers, FemaleSmokers, SmokersTotal) , to

form the basis of the matrix. Through iterative balancing, this matrix will evolve from its initial state in 1999 to its target values in 2017, ensuring that the data remains consistent and accurate across these crucial years.

Balanced, precision: 0.13413; steps: 3; maximum difference of cells in balancing and target matrix = 87.24; ma

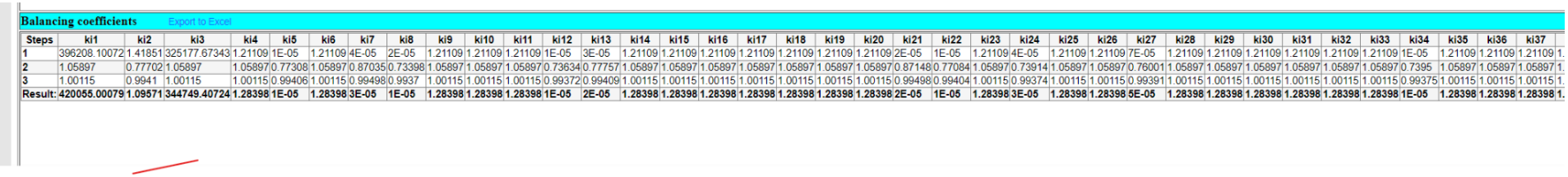
Starting Matrix for YEAR = 1999 Export to Excel

LocationDesc	Sum of row LocationDesc	DataValue	SmokersTotal	MaleSmokers	FemaleSmokers
Arizona	0	0	0	0	0
Georgia	394.7	24.7	185	120	65
Ohio	0	0			
Delaware	0	0			
South Dakota	876.5	50.5	413	269	144
Wisconsin	0	0	0	0	0
Oklahoma	116.7	20.7	48	31	17
Mississippi	212	0	106	69	37
Alabama	0	0	0	0	0
Indiana	0	0	0	0	0
Pennsylvania	0	0	0	0	0
North Carolina	397.5	1.5	198	129	69
New Jersey	143.3	9.3	67	44	23
Connecticut	0	0	0	0	0
West Virginia	0	0	0	0	0
South Carolina	0	0	0	0	0
Illinois	0	0	0	0	0
Louisiana	0	0	0	0	0
Hawaii	0	0	0	0	0
North Dakota	0	0	0	0	0
Nebraska	202.3	36.3	83	54	29
Missouri	406.1	22.1	192	125	67
Minnesota	0	0	0	0	0
Kansas	123.1	1.1	61	40	21
New Hampshire	0	0	0	0	0
Michigan	0	0	0	0	0
Arkansas	68.9	2.9	33	22	11
Kentucky	0	0	0	0	0
Iowa	0	0	0	0	0
Virginia	0	0	0	0	0
Utah	0	0	0	0	0
Rhode Island	0	0	0	0	0
Vermont	0	0	0	0	0
Tennessee	504.4	4.4	250	163	87
New Mexico	0	0	0	0	0
Virgin Islands	0	0	0	0	0
California	0	0	0	0	0
Idaho	0	0	0	0	0
Massachusetts	0	0	0	0	0
Maryland	0	0	0	0	0
Florida	0	0	0	0	0
New York	0	0	0	0	0
Guam	0	0	0	0	0
Maine	0	0	0	0	0
Texas	0	0	0	0	0
Wyoming	0	0	0	0	0
Colorado	0	0	0	0	0
District of Columbia	0	0	0	0	0

-60% compare to target. +86% compare to balanced

Here is some example of the Starting Matrix result. It shows the number of (DataValue, MaleSmokers, FemaleSmokers, SmokersTotal) in different states in the years 1999 and 2017.
Note: Some states show “0” is displayed because no survey was conducted during the specified years in our example.

*p2)*In the context of coefficient balancing, the process involves the iterative adjustment of a matrix organized by location, with a focus on years spanning 1999 and 2017. Within this matrix, multiple columns are selected,(DataValue, MaleSmokers, FemaleSmokers, SmokersTotal). Through the coefficient balancing procedure, the matrix evolves across iterations, moving from its initial state in 1999 towards its target values in 2017. This method ensures that the data remains balanced, reliable, and reflective of the changing trends over these years, particularly in the specified location.



Balancing coefficients Export to Excel

Steps	ki1	ki2	ki3	ki4	ki5	ki6	ki7	ki8	ki9	ki10	ki11	ki12	ki13	ki14	ki15	ki16	ki17	ki18	ki19	ki20	ki21	ki22	ki23	ki24	ki25	ki26	ki27	ki28	ki29	ki30	ki31	ki32	ki33	ki34	ki35	ki36	ki37
1	396208.10072	1.41851	325177.67343	1.21109	1E-05	1.21109	4E-05	2E-05	1.21109	1.21109	1.21109	1E-05	3E-05	1.21109	1.21109	1.21109	1.21109	1.21109	1.21109	1.21109	2E-05	1E-05	1.21109	4E-05	1.21109	1.21109	7E-05	1.21109	1.21109	1.21109	1.21109	1.21109	1.21109	1E-05	1.21109	1.21109	1.21109	1.
2	1.05897	0.77702	1.05897	1.05897	0.77308	1.05897	0.87035	0.73398	1.05897	1.05897	1.05897	0.73634	0.77757	1.05897	1.05897	1.05897	1.05897	1.05897	1.05897	1.05897	0.87148	0.77084	1.05897	0.73914	1.05897	1.05897	0.76001	1.05897	1.05897	1.05897	1.05897	1.05897	1.05897	0.7395	1.05897	1.05897	1.05897	1.
3	1.00115	0.9941	1.00115	1.00115	0.99406	1.00115	0.99498	0.9937	1.00115	1.00115	1.00115	0.99372	0.99409	1.00115	1.00115	1.00115	1.00115	1.00115	1.00115	1.00115	0.99498	0.99404	1.00115	0.99374	1.00115	1.00115	0.99391	1.00115	1.00115	1.00115	1.00115	1.00115	1.00115	0.99375	1.00115	1.00115	1.00115	1.
Result:	**420055.00079**	**1.09571**	**344749.40724**	**1.28398**	**1E-05**	**1.28398**	**3E-05**	**1E-05**	**1.28398**	**1.28398**	**1.28398**	**1E-05**	**2E-05**	**1.28398**	**1.28398**	**1.28398**	**1.28398**	**1.28398**	**1.28398**	**1.28398**	**2E-05**	**1E-05**	**1.28398**	**3E-05**	**1.28398**	**1.28398**	**5E-05**	**1.28398**	**1.28398**	**1.28398**	**1.28398**	**1.28398**	**1.28398**	**1E-05**	**1.28398**	**1.28398**	**1.28398**	**1.**

p3) The target Matrix in this iterative balancing scenario are organized by location, with iterations spanning from the years 1999 and 2017. Multiple columns are chosen, including (DataValue, MaleSmokers, FemaleSmokers, SmokersTotal) to create the target Matrix . These Matrix represent the desired states of the data over the specified time frame. Through the

iterative process, the data will transition from its initial state in the year 1999 to the target values in 2017, ensuring that the information remains accurate and reliable as it evolves over the years.

Target Matrix for YEAR='2017' Export to Excel

LocationDesc	Sum of row LocationDesc	DataValue	SmokersTotal	MaleSmokers	FemaleSmokers
Arizona	1308.6	40.6	634	412	222
Georgia	462.3	62.3	200	130	70
Ohio					
Delaware					
South Dakota	0	0	0	0	0
Wisconsin	0	0	0	0	0
Oklahoma	0	0	0	0	0
Mississippi	0	0	0	0	0
Alabama	0	0	0	0	0
Indiana	0	0	0	0	0
Pennsylvania	0	0	0	0	0
North Carolina	0	0	0	0	0
New Jersey	0	0	0	0	0
Connecticut	0	0	0	0	0
West Virginia	0	0	0	0	0
South Carolina	0	0	0	0	0
Illinois	0	0	0	0	0
Louisiana	0	0	0	0	0
Hawaii	0	0	0	0	0
North Dakota	0	0	0	0	0
Nebraska	0	0	0	0	0
Missouri	0	0	0	0	0
Minnesota	0	0	0	0	0
Kansas	0	0	0	0	0
New Hampshire	0	0	0	0	0
Michigan	0	0	0	0	0
Arkansas	0	0	0	0	0
Kentucky	0	0	0	0	0
Iowa	0	0	0	0	0
Virginia	0	0	0	0	0
Utah	0	0	0	0	0
Rhode Island	0	0	0	0	0
Vermont	0	0	0	0	0
Tennessee	0	0	0	0	0
New Mexico	0	0	0	0	0

+94% compare to balanced. +60% compare to start

*p4)*The balanced Matrix, derived through the iterative process, are organized by location and span the years 1999 to 2017. Multiple fields, including (DataValue, MaleSmokers, FemaleSmokers, SmokersTotal) are carefully selected to ensure that the Matrix are consistent and reliable throughout this time frame. This iterative balancing approach helps maintain data accuracy and quality as it transitions from the initial values in 1999 to the target values in 2017, offering a comprehensive and balanced perspective on the dataset.

Balancing Matrix

Export to Excel

LocationDesc	Sum of row LocationDesc	DataValue	SmokersTotal	MaleSmokers	FemaleSmokers
Arizona	1308.57	54.6	595.21	417.57	241.18
Georgia	462.36	3.52	287.24	130.71	40.89
Ohio	1073.98	44.82	488.51	342.71	197.94
Delawa					
South D					
Wisconsin	0	0	0	0	0
Oklahoma	0	0	0	0	0
Mississippi	0	0	0	0	0
Alabama	0	0	0	0	0
Indiana	0	0	0	0	0
Pennsylvania	0	0	0	0	0
North Carolina	0	0	0	0	0
New Jersey	0	0	0	0	0
Connecticut	0	0	0	0	0
West Virginia	0	0	0	0	0
South Carolina	0	0	0	0	0
Illinois	0	0	0	0	0
Louisiana	0	0	0	0	0
Hawaii	0	0	0	0	0
North Dakota	0	0	0	0	0
Nebraska	0	0	0	0	0
Missouri	0	0	0	0	0
Minnesota	0	0	0	0	0
Kansas	0	0	0	0	0
New Hampshire	0	0	0	0	0
Michigan	0	0	0	0	0
Arkansas	0	0	0	0	0
Kentucky	0	0	0	0	0
Iowa	0	0	0	0	0
Virginia	0	0	0	0	0
Utah	0	0	0	0	0
Rhode Island	0	0	0	0	0
Vermont	0	0	0	0	0
Tennessee	0	0	0	0	0
New Mexico	0	0	0	0	0

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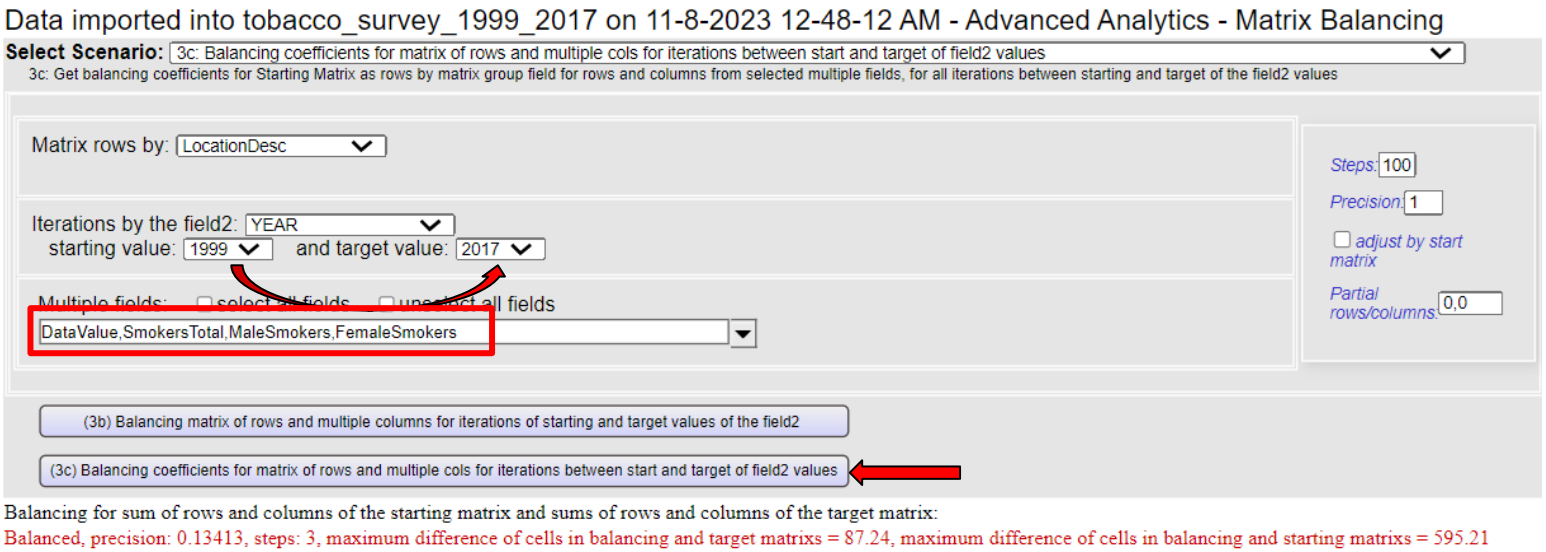
3c) The goal in this context is to calculate the coefficients necessary to balance a matrix that is grouped by a specific field for its rows. This matrix also selects columns from various fields. These coefficients need to be determined for all iterations between the initial values and the target values of Field2.

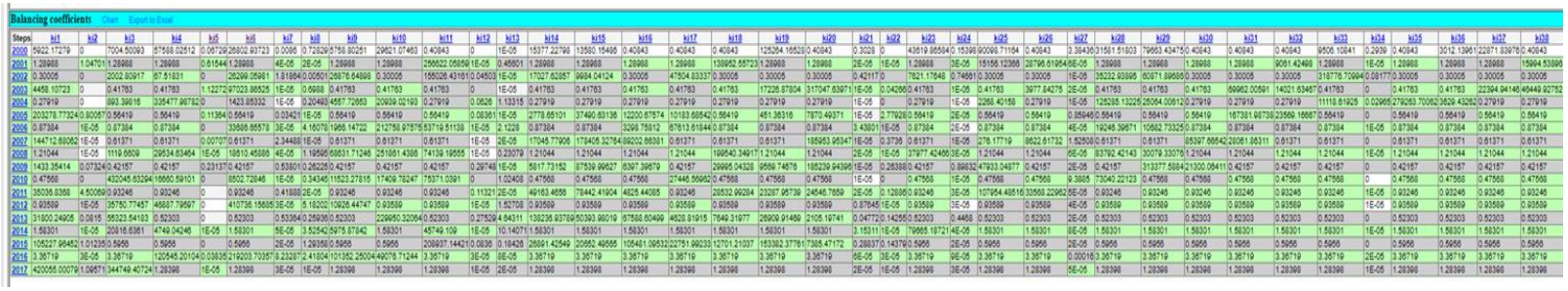


p1), The starting matrix is grouped by location and spans the years from **1999** to **2017**. Multiple fields, including (Total Smokers, DataValue, MaleSmokers, FemaleSmokers) are meticulously selected. The goal is to determine coefficients for all iterations between the initial values in **1999** and the target values of Field2 in **2017**. This approach ensures that the matrix remains well-balanced and reliable across a broad spectrum of data, guaranteeing accuracy and consistency throughout the specified time frame.

Starting Matrix of LocationDesc and DataValue,SmokersTotal,MaleSmokers,FemaleSmokers for YEAR = 1999

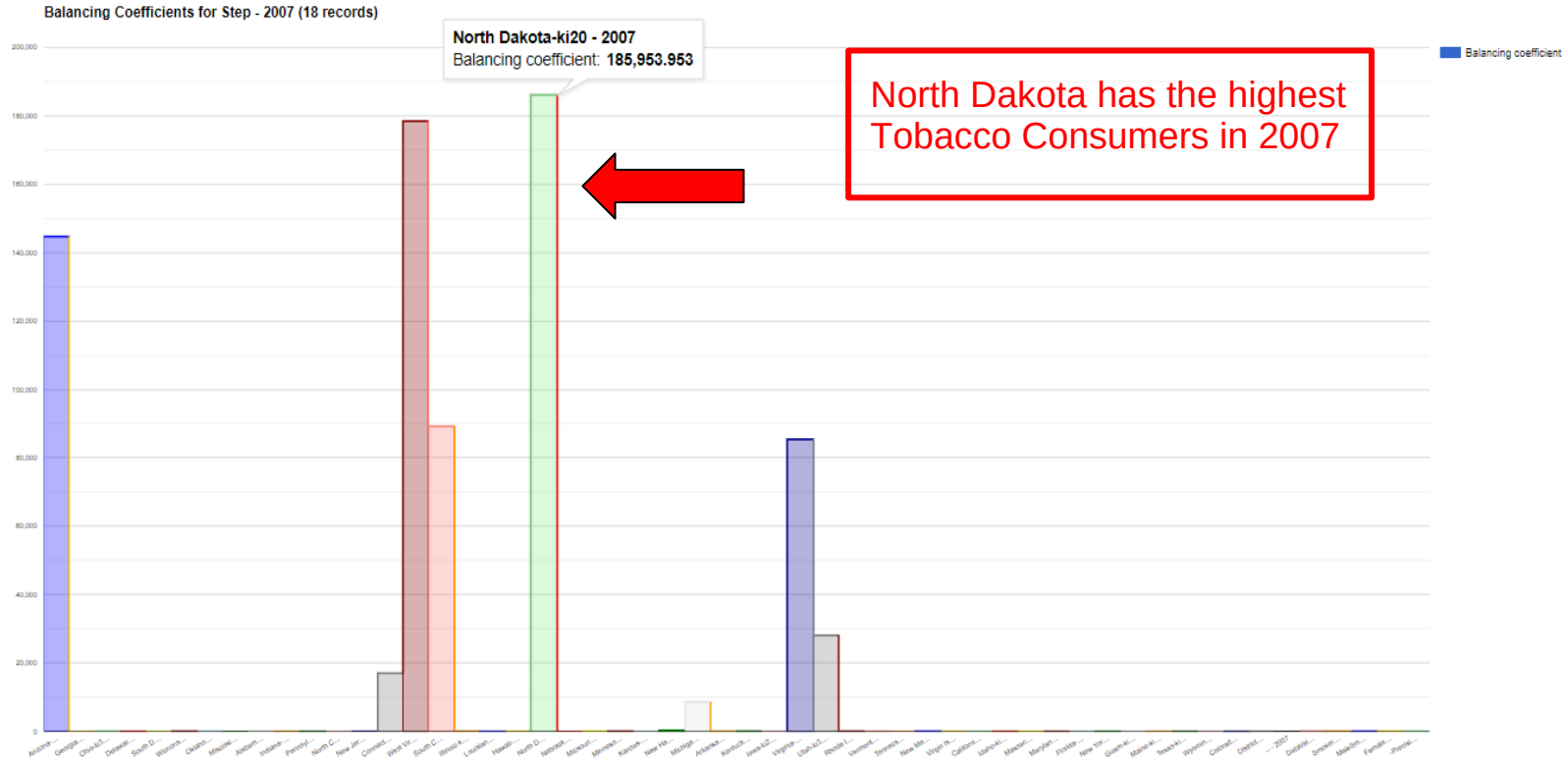
LocationDesc	Sum of row LocationDesc	DataValue	SmokersTotal	Male Smokers	Female Smokers
Arizona	0	0	0	0	0
Georgia	394.7	24.7	185	120	65
Ohio	0	0	0	0	0
Delaware	0	0	0	0	0
South Dakota	876.5	50.5	413	269	144
Wisconsin	0	0	0	0	0
Oklahoma	116.7	20.7	48	31	17
Mississippi	212	0	106	69	37
Alabama	0	0	0	0	0
Indiana	0	0	0	0	0
Pennsylvania	0	0	0	0	0
North Carolina	397.5	1.5	198	129	69
New Jersey	143.3	9.3	67	44	23
Connecticut	0	0	0	0	0
West Virginia	0	0	0	0	0
South Carolina	0	0	0	0	0
Illinois	0	0	0	0	0
Louisiana	0	0	0	0	0
Hawaii	0	0	0	0	0
North Dakota	0	0	0	0	0
Nebraska	202.3	36.3	83	54	29
Missouri	406.1	22.1	192	125	67
Minnesota	0	0	0	0	0
Kansas	123.1	1.1	61	40	21
New Hampshire	0	0	0	0	0
Michigan	0	0	0	0	0
Arkansas	68.9	2.9	33	22	11
Kentucky	0	0	0	0	0
Iowa	0	0	0	0	0
Virginia	0	0	0	0	0
Utah	0	0	0	0	0
Rhode Island	0	0	0	0	0
Vermont	0	0	0	0	0
Tennessee	504.4	4.4	250	163	87
New Mexico	0	0	0	0	0
Virgin Islands	0	0	0	0	0
California	0	0	0	0	0
Idaho	0	0	0	0	0
Massachusetts	0	0	0	0	0
Maryland	0	0	0	0	0
Florida	0	0	0	0	0
New York	0	0	0	0	0
Guam	0	0	0	0	0
Maine	0	0	0	0	0
Texas	0	0	0	0	0
Wyoming	0	0	0	0	0
Colorado	0	0	0	0	0
District of Columbia	0	0	0	0	0
Total: 3445.5	Sum by columns:	173.5	1636	1066	570

*p2)*The calculation of balancing coefficients for this specific context involves a matrix grouped by location, spanning the years from **1999** to **2017**. Various fields, such as (Total Smokers, DataValue, MaleSmokers, FemaleSmokers) are meticulously chosen. These coefficients are determined across all iterations, bridging the gap between the initial and target values of Field2. The aim is to achieve a harmonious balance in the dataset, ensuring that it accurately represents the evolving data landscape over this period while considering the multiple facets of the selected fields.

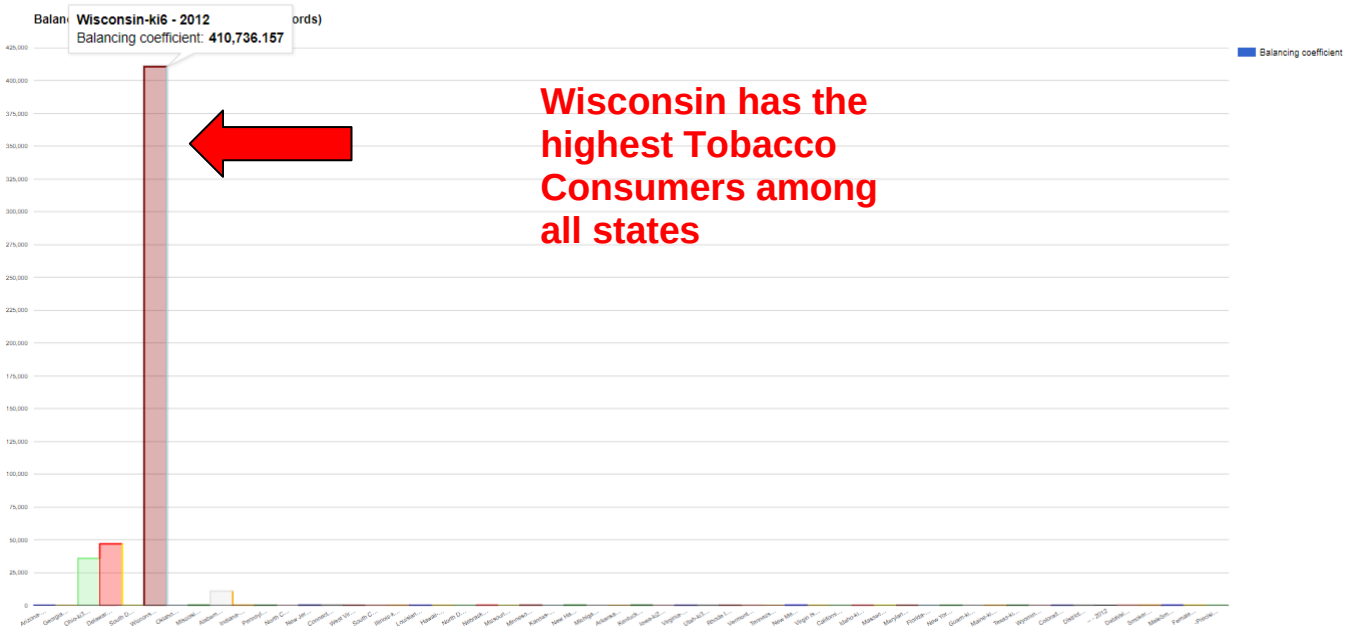


Balancing coefficients Chart Export to Excel

Steps	ki1	ki2	ki3	ki4	ki5	ki6	ki7	ki8	ki9	ki10	ki11	ki12	ki13	ki14	ki15	ki16	ki17	ki18	ki19	ki20	ki21	ki22	ki23	ki24	ki25	ki26	ki27	ki28	ki29	ki30	ki31	ki32	ki33	ki34	ki35	ki36	ki37	ki38
2000	5922.17279	0	7004.50093	57568.02512	0.06729	26802.93723	0.0086	0.72829	5758.80251	29621.07463	0.40843	0	1E-05	15377.22798	13580.15466	0.40843	0.40843	0.40843	125264.16528	0.40843	0.3028	0	43619.86584	0.15398	90096.71164	0.40843	3.38436	31581.51803	79663.43475	0.40843	0.40843	0.40843	9506.10841	0.2939	0.40843	3012.13961	22871.83976	0.40843
2001	1.28988	1.04701	1.28988	1.28988	0.61544	1.28988	4E-05	2E-05	1.28988	1.28988	256622.05859	1E-05	0.45801	1.28988	1.28988	1.28988	1.28988	138952.55723	1.28988	1.28988	2E-05	1E-05	1.28988	3E-05	15155.12366	28796.61954	6E-05	1.28988	1.28988	1.28988	1.28988	9061.42469	1.28988	1E-05	1.28988	1.28988	1.28988	15994.53896
2002	0.30005	0	2002.80917	57.51831	0	26299.05981	1.81884	0.00501	26876.64866	0.30005	155028.43161	0.04503	1E-05	17027.62857	9984.04124	0.30005	47504.83337	0.30005	0.30005	0.30005	0.42117	0	7821.17645	0.74661	0.30005	0.30005	1E-05	35232.93895	60871.89686	0.30005	0.30005	0.30005	318776.70994	0.08177	0.30005	0.30005	0.30005	0.30005
2003	4458.10723	0	0.41783	0.41783	1.12272	97023.86525	1E-05	0.6688	0.41783	0.41783	0.41783	0	1E-05	0.41783	0.41783	0.41783	0.41783	0.41783	17226.87804	317047.63971	1E-05	0.04266	0.41783	1E-05	0.41783	3977.84275	2E-05	0.41783	0.41783	0.41783	59962.00591	14021.63467	0.41783	0	0.41783	0.41783	22394.94146	46449.92782
2004	0.27919	0	993.39816	335477.98782	0	1423.85332	1E-05	0.20493	4567.72663	20939.02193	0.27919	0.0626	1.13315	0.27919	0.27919	0.27919	0.27919	0.27919	0.27919	0.27919	1E-05	0	0.27919	1E-05	2268.40158	0.27919	1E-05	125285.13225	25064.00612	0.27919	0.27919	0.27919	11118.61925	0.02965	279283.70062	3629.43262	0.27919	0.27919
2005	203278.77324	0.90057	0.56419	0.56419	0.11364	0.56419	0.03421	1E-05	0.56419	0.56419	0.56419	0.08361	1E-05	2778.65101	37490.83136	12200.67574	10193.68542	0.56419	461.36316	7870.49371	1E-05	2.77928	0.56419	2E-05	0.56419	0.56419	0.85946	0.56419	0.56419	0.56419	167381.98738	23569.16667	0.56419	0	0.56419	0.56419	0.56419	0.56419
2006	0.87384	1E-05	0.87384	0.87384	0	33606.86578	3E-05	4.16078	1966.14722	212756.97575	53719.51138	1E-05	2.1228	0.87384	0.87384	5299.75812	87613.61644	0.87384	0.87384	0.87384	3.43001	1E-05	0.87384	2E-05	0.87384	0.87384	4E-05	19246.39671	10662.73325	0.87384	0.87384	0.87384	0.87384	1E-05	0.87384	0.87384	0.87384	0.87384
2007	144712.66062	1E-05	0.61371	0.61371	0.00707	0.61371	2.34488	1E-05	0.61371	0.61371	0.61371	1E-05	2E-05	17045.77906	178405.32764	98002.66381	0.61371	0.61371	0.61371	185963.95347	1E-05	0.3736	0.61371	1E-05	278.17719	9622.61732	1.82606	0.61371	0.61371	85397.66642	26061.86311	0.61371	0.61371	0	0.61371	0.61371	0.61371	0.61371
2008	1.21044	1E-05	1119.6609	29534.83464	1E-05	16810.45586	4E-05	1.16505	59831.71245	251681.4386	74139.19555	1E-05	0.23079	1.21044	1.21044	1.21044	1.21044	199540.34917	1.21044	1.21044	2E-05	1E-05	37977.42466	3E-05	1.21044	1.21044	6E-05	83792.42143	30079.33076	1.21044	1.21044	1.21044	1.21044	1E-05	1.21044	1.21044	1.21044	1.21044
2009	1433.35414	0.07324	0.42157	0.42157	0.23137	0.42157	0.53801	0.26226	0.42157	0.42157	0.42157	0.29748	1E-05	5917.73152	87539.99627	6307.39579	0.42157	29995.04328	9559.74676	185239.94396	1E-05	0.26398	0.42157	0.99832	47933.04877	0.42157	2E-05	0.42157	313377.58942	21300.05411	0.42157	0.42157	0.42157	0	0.42157	0.42157	0.42157	0.42157
2010	0.47568	0	432045.83294	19560.59101	0	8502.72846	1E-05	0.34345	11523.27815	17409.78247	75371.0391	0	1.02408	0.47568	0.47568	0.47568	27446.56982	0.47568	0.47568	0.47568	1E-05	0	0.47568	1E-05	0.47568	0.47568	9.3865	73040.22123	0.47568	0.47568	0.47568	0.47568	0.47568	0	0.47568	0.47568	0.47568	0.47568
2011	35036.8368	4.50069	0.93246	0.93246	0	0.93246	0.41888	2E-05	0.93246	0.93246	0.93245	0.11321	2E-05	49163.4656	78442.41904	4825.44365	0.93245	28532.99284	23287.95739	24546.7659	2E-05	0.12886	0.93246	3E-05	107954.48516	33568.22962	5E-05	0.93246	0.93246	0.93246	0.93246	0.93246	1E-05	0.93246	0.93245	0.93246	0.93245
2012	0.93589	1E-05	35750.77457	46887.79597	0	410736.15685	3E-05	5.18202	10926.44747	0.93589	0.93589	1E-05	1.52708	0.93589	0.93589	0.93589	0.93589	0.93589	0.93589	0.93589	0.87645	1E-05	0.93589	3E-05	0.93589	0.93589	4E-05	0.93589	0.93589	0.93589	0.93589	0.93589	0.93589	1E-05	0.93589	0.93589	0.93589	0.93589
2013	31800.24905	0.0815	55323.54183	0.52303	0	0.52303	0.53364	0.25936	0.52303	229950.32064	0.52303	0.27529	4.84311	138236.93789	50393.98019	67588.60499	4828.81915	7649.31977	26909.91469	2105.19741	0.04772	0.14255	0.52303	0.4468	0.52303	0.52303	2E-05	0.52303	0.52303	0.52303	0.52303	0.52303	0.52303	0	0.52303	0.52303	0.52303	0.52303
2014	1.58301	1E-05	20816.6361	4749.04246	1E-05	1.58301	5E-05	3.52542	5975.87842	1.58301	45749.109	1E-05	10.14071	1.58301	1.58301	1.58301	1.58301	1.58301	1.58301	1.58301	3.15311	1E-05	79665.18721	4E-05	1.58301	1.58301	8E-05	1.58301	1.58301	1.58301	1.58301	1.58301	1.58301	1E-05	1.58301	1.58301	1.58301	1.58301
2015	105227.98452	1.01235	0.5956	0.5956	0	0.5956	2E-05	1.29358	0.5956	0.5956	208937.14421	0.0836	0.18426	26991.42549	20652.49565	105481.09532	22751.99233	12701.21037	153382.37761	7385.47172	0.28837	0.14379	0.5956	2E-05	0.5956	0.5956	2E-05	0.5956	0.5956	0.5956	0.5956	0.5956	0.5956	0	0.5956	0.5956	0.5956	0.5956
2016	3.36719	3E-05	3.36719	120545.20104	0.03935	219203.70357	8.23287	2.41804	101352.25004	49076.71244	3.36719	3E-05	8E-05	3.36719	3.36719	3.36719	3.36719	3.36719	3.36719	3.36719	6E-05	3E-05	3.36719	9E-05	3.36719	3.36719	0.00016	3.36719	3.36719	3.36719	3.36719	3.36719	3.36719	2E-05	3.36719	3.36719	3.36719	3.36719
2017	420056.00079	1.09571	344749.40724	1.28398	1E-05	1.28398	3E-05	1E-05	1.28398	1.28398	1.28398	1E-05	2E-05	1.28398	1.28398	1.28398	1.28398	1.28398	1.28398	1.28398	2E-05	1E-05	1.28398	3E-05	1.28398	1.28398	5E-05	1.28398	1.28398	1.28398	1.28398	1.28398	1.28398	1E-05	1.28398	1.28398	1.28398	1.28398



The graph above clearly illustrates that a significant majority of tobacco consumers in 2007 resided in North Dakota.



The graph above clearly illustrates that a significant majority of tobacco consumers in 2007 resided in Wisconsin .

Conclusion:

The provided data appears to be related to youth tobacco use and various related statistics over several years and locations. The data includes information on smoking status, quit attempts, and other measures for different states and years.

In conclusion, a comprehensive analysis of this data would require more context and specific research questions. However, based on the data, it's evident that there is variation in youth tobacco use across different states and years.

Some states have high percentages of youth using tobacco, while others have lower rates. Similarly, there are differences in quit attempts and other related measures.

Further analysis and interpretation of this data would be necessary to draw specific conclusions or insights regarding trends in youth tobacco use, and whether there have been changes over the years in different states. Additionally, one would need to consider various factors that might influence these trends, such as anti-smoking campaigns, policy changes, and socioeconomic factors.

Sources: We have obtained our data set from a public website called **Data.Gov** (Youth Tobacco Survey (YTS) Data - Catalog)

Here is the link for our video: video Matrix Balancing Saleh Alkredes, Faisal Alfawaz _11_20.mp4