THE BATTLE OF NEIGHBORHOODS A REPORT

A comparison of two popular cities in the state of Ohio, USA

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INTRODUCTION

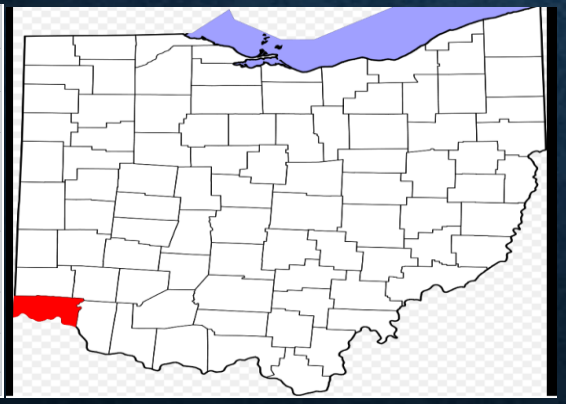
THE STATE OF OHIO & THE TWO COUNTIES

About Ohio

Ohio is a Midwestern state in the Great Lakes region of the United States. Of the fifty states, it is the 34th largest by area, the seventh most populous, and the tenth most densely populated. The state's capital and largest city is Columbus. Ohio is bordered by Pennsylvania to the east, Michigan to the northwest, Lake Erie to the north, Indiana to the west, Kentucky on the south, and West Virginia on the southeast.

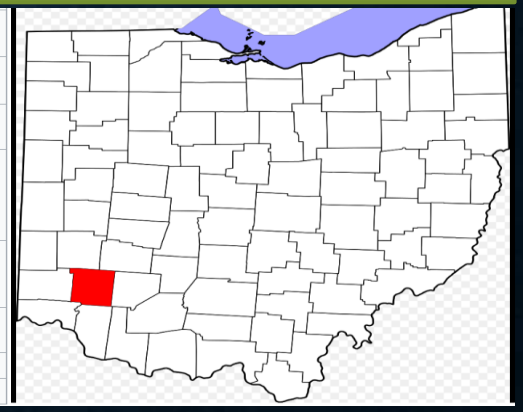
Hamilton County is a county in the southwest corner of the U.S. state of Ohio. As of the 2010 census, the population was 802,374. making it the third-most populous county in Ohio. The county seat and largest city is Cincinnati. The county is named for the first Secretary of the Treasury, Alexander Hamilton.
Hamilton County is part of the Cincinnati-Middletown, OH-KY-IN Metropolitan Statistical Area.

Country State	United States Ohio
Founded Named for	January 2, 1790[1] Alexander Hamilton
Seat Largest city	Cincinnati Cincinnati
Area • Total • Land • Water	 413 sq mi (1,070 km²) 406 sq mi (1,050 km²) 6.7 sq mi (17 km²) 1.6%%
Population • Estimate (2018) • Density	 816,684 1,987/sq mi (767/km²)
Time zone • Summer (DST)	UTC−5 (Eastern) UTC−4 (EDT)
Congressional districts	1st, 2nd
Website	www.hamilton-co.org



Warren County is a county in the U.S. state of Ohio. As of the 2010 census, the population was 212,693. Its county seat is Lebanon. The county was created on May 1, 1803 from Hamilton County; it is named for Dr. Joseph Warren, a hero of the Revolution who sent Paul Revere and the overlooked William Dawes on their famous rides and who died at the Battle of Bunker Hill.
Warren County is part of the Cincinnati, OH-KY-IN Metropolitan Statistical Area.

Country State	United States Ohio
Founded Named for	May 1, 1803[1] Dr. Joseph Warren
Seat Largest city	Lebanon Mason
Area • Total • Land • Water	 407 sq mi (1,050 km²) 401 sq mi (1,040 km²) 6.0 sq mi (16 km²) 1.5%%
Population • Estimate (2018) • Density	 232,173 571/sq mi (220/km²)
Time zone • Summer (DST)	UTC−5 (Eastern) UTC−4 (EDT)
Congressional district	1st
Website	www.co.warren.oh.us



Source: https://en.wikipedia.org

A TALE OF TWO CITIES – BLUE ASH & MASON

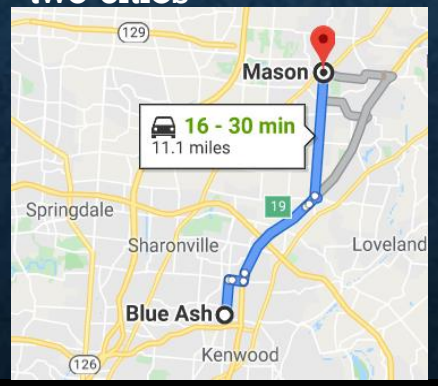
Blue Ash is a city in Hamilton County, Ohio, United States, and is an inner suburb of Cincinnati, which is located to the south. Blue Ash is located at 39°14′50″N 84°22′34″W.Blue Ash can be reached by Interstate 71 to the east, Interstate 275 to the north, and Ronald Reagan Cross County Highway to the south.

Mason is a city in southwestern Warren County, Ohio, United States, approximately 22 miles (35 km) from downtown Cincinnati. Mason is located at 39°21′29″N 84°18′43″W.Mason is served by one interstate, I-71

Map of Blue Ash

Map of Mason

Distance between the two cities



	CITY OF BLUE ASH	CITY OF MASON
Country	United States	United States
State	Ohio	Ohio
County	Hamilton	Warren
Government		
• Mayor	Tom Adamec	Victor Kidd
Area		
• Total	7.59 sq mi (19.66 km²)	18.67 sq mi (48.36 km2)
• Land	7.58 sq mi (19.63 km²)	18.63 sq mi (48.25 km2)
• Water	0.01 sq mi (0.03 km²)	0.04 sq mi (0.10 km2)
Elevation	846 ft (258 m)	810 ft (247 m)
Population (2010)	12,114	30,712
• Density	1,598.2/sq mi (617.1/km²)	1,648.5/sq mi (636.5/km2)
Time zone	UTC-5 (Eastern (EST))	UTC-5 (Eastern (EST))
• Summer (DST)	UTC-4 (EDT)	UTC-4 (EDT)
ZIP code	45242	45040
Area code(s)	513	513
Website	www.blueash.com	www.imaginemason.org

Source: https://en.wikipedia.org and https://www.google.com/maps

PROBLEM STATEMENT

THE BEST CHOICE TO MAKE

Background:
When a family moves from one location to another due to change of job or host of other reasons, they would be eager to find out more about the place they are moving to, including schools, rentals, property, commute, safety, restaurants etc.

Problem Statement:
Let's help families that are moving to suburbs of Cincinnati, Ohio to make a choice between the two of the top ten suburbs - the city of ***Blue Ash*** Vs the city of ***Mason***.

Summary:
Let's analyze, visualize and evaluate the cities based on the following key parameters:

- ❑ Education
- ❑ Healthcare
- ❑ Safety Profile
- ❑ Employment by Occupations
- ❑ Properties

Modeling:
Develop a explanatory model based on the survey data at the end of comparison of the above parameters

DATA ACQUISITION

DATA SOURCES

Property:
https://datausa.io/profile/geo/blue-ash-oh/#category_housing
https://datausa.io/api/data?measure=Property%20Value%20by%20Bucket,Property%20Value%20by%20Bucket%20Moe&geo=16000US3907300,01000US&drilldowns=Value%20Bucket
https://datausa.io/profile/geo/mason-oh%23about#category_housing
https://datausa.io/api/data?measure=Property%20Value%20by%20Bucket,Property%20Value%20by%20Bucket%20Moe&geo=16000US3948188,01000US&drilldowns=Value%20Bucket

Schools:
https://www.greatschools.org/search/search.page?distance=3&lat=39.2364358&locationLabel=Cincinnati%2C%20OH%2045242&locationType=zip&lon=-84.364719900000001&st=public_charter&st=public&st=charter&state=OH
https://www.greatschools.org/search/search.page?distance=3&lat=39.2798828&locationLabel=undefined%2C%20OH%2045241&locationType=zip&lon=-84.406761000000002&st=public_charter&st=public&st=charter&state=OH

Healthcare:
https://foursquare.com (through API call)

DATA SOURCES (CONTINUED)

Employment:
https://datausa.io/profile/geo/blue-ash-oh/#category_occupations
https://datausa.io/api/data?Geography=16000US3907300&measure=Workforce%20by%20Occupation%20and%20Gender,Workforce%20by%20Occupation%20and%20Gender%20Moe&drilldowns=Occupation&parents=true&debug=true
https://datausa.io/profile/geo/mason-oh%23about#category_occupations
https://datausa.io/api/data?Geography=16000US3948188&measure=Workforce%20by%20Occupation%20and%20Gender,Workforce%20by%20Occupation%20and%20Gender%20Moe&drilldowns=Occupation&parents=true&debug=true

Crime/Safety:
https://www.neighborhoodscout.com/oh/blue-ash/crime#targetText=The%20chance%20of%20becoming%20a,and%20towns%20of%20all%20sizes.
https://www.neighborhoodscout.com/oh/mason/crime

DATA EXPLORATION

DATA EXPLORATION

Crime Data

DESCRIPTION	VIOLENT	PROPERTY	TOTAL
Number of Crimes	16	279	295
Crime Rate (per 1,000 residents)	1.31	22.87	24.18
Crime Index (safer than %index of US cities)			25

Inference:

- ❑ The data is simple and straightforward. No cleaning was required

Schools Data

School	Grades	Type	Total students enrolled	Students per teacher	Rating	Latitude	Longitude
Madeira Elementary School	PK-4	Elementary	635	14:01	10	39.2027618	-84.3580265

Inference:

- ❑ Location coordinates were downloaded manually from google since data was not available
- ❑ Students per teacher is for information purpose only
- ❑ Rating column is used as a key parameter for comparison between two cities

DATA EXPLORATION (CONTINUED)

Property Data

ID Value Bucket	Value Bucket	ID Year	Year	Property Value by Bucket	Property Value by Bucket Moe	Geography	ID Geography	Slug Geography	share
25	$2,000,000 or More	2017	2017	0	18	Blue Ash, OH	16000US3907300	blue-ash-oh	0

Inference:
- ❑ Value Bucket and Property value by Bucket were considered key parameters
- ❑ Rest of the columns were informatory in nature

Employment Data

ID Group	Group	ID Subgroup	Subgroup	ID Occupation	Occupation	ID Year	Year	ID State	State	Workforce by Occupation and Gender	Workforce by Occupation and Gender Moe	Geography	ID Geography	Slug Geography
1	Service Occupations	4	Service Occupations	15	Building & Grounds Cleaning & Maintenance	2017	2017	04000US39	Ohio	66	53.75872	Blue Ash, OH	16000US3907300	blue-ash-oh

Inference:
- ❑ Group and Workforce columns were considered to plot bar graph
- ❑ Rest of the columns were informatory in nature

DATA EXPLORATION (CONTINUED)

Healthcare Data

	name	categories	lat	lng
0	Don Cook Fitness	Hospital	39.361643	-84.312966
1	Don Cook Fitness	Hospital	39.362066	-84.315493
2	West Chester Hospital	Hospital	39.358085	-84.367686
3	The Dermatology Group	Hospital	39.321697	-84.317388
4	7750 Discovery Dr. westchester oh	Hospital	39.361152	-84.365093
5	UC Health West Chester Surgical Center	Hospital	39.360981	-84.365643
6	The Christ Hospital Liberty Medical Center	Hospital	39.374153	-84.363180
7	West Chester Operating Room	Hospital	39.358172	-84.366370
8	W ChesterHospital Sleep Medicine Center	Hospital	39.361088	-84.366899
9	West Chester Recovery Room	Hospital	39.357826	-84.367973
10	West Chester Emergency Department	Hospital	39.357473	-84.368009

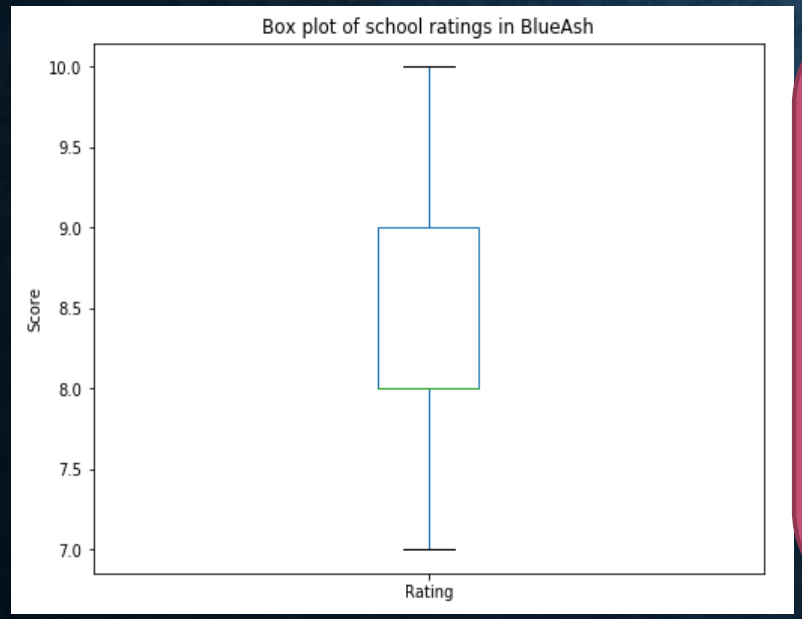
Inference:

- From Foursquare API, the Name, Category and location coordinates were extracted
- The list is used to calculate total number of health care facilities within 5km radius

VISUALIZATION & COMPARISON

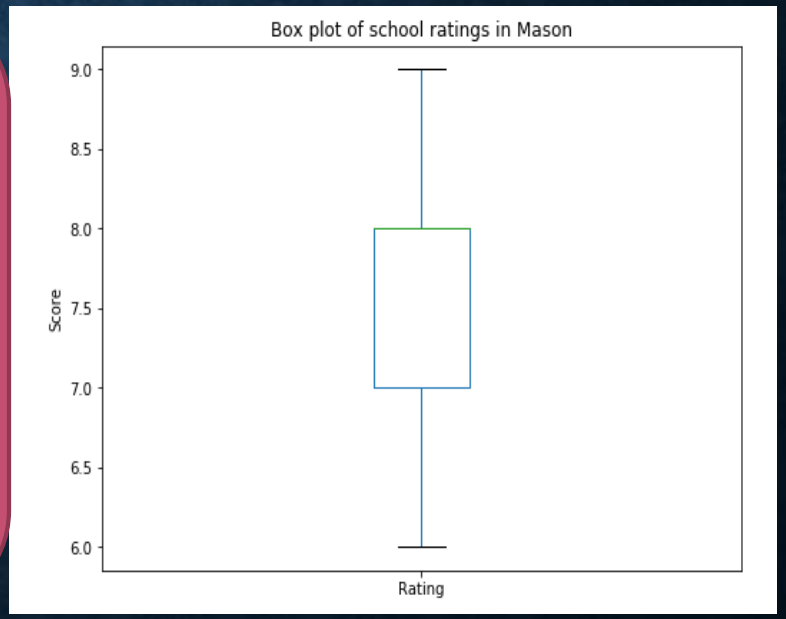
1. COMPARISON OF BLUEASH VS. MASON: EDUCATION

Education	
Source	https://www.greatschools.org
Data Summary & Analysis	The data from website has details on schools within 3 miles of the city and their ratings.
Approach	1. Use the data from above source websites to capture • School rating for elementary, middle and high schools.
Visualization	1. Box plot to view ratings scale 2. Use folium map to plot school locations on map



School Ratings - BLUEASH:
Minimum Rating = 7.0
Maximum Rating = 10.0
Average Rating = 8.33

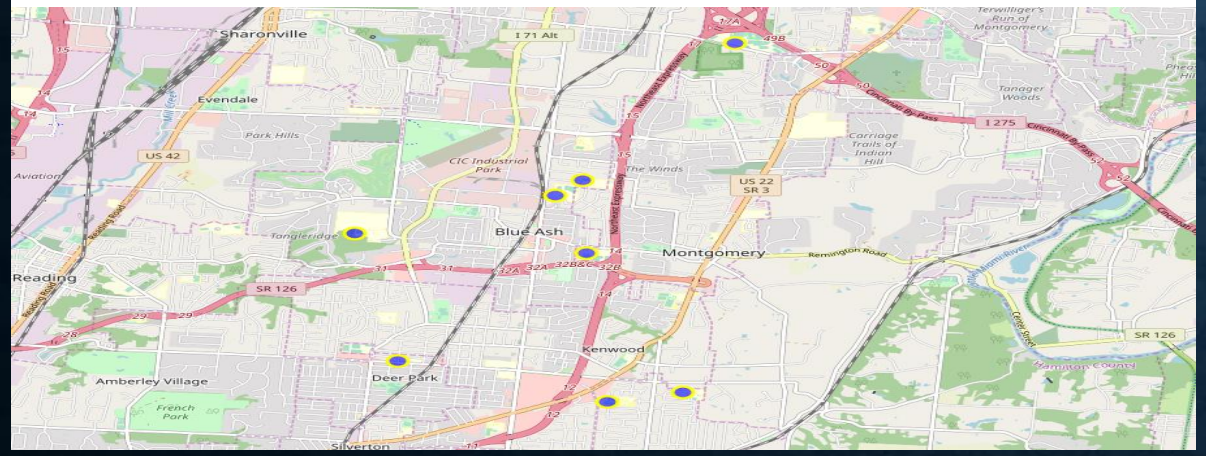
School Ratings - MASON:
Minimum Rating = 6.0
Maximum Rating = 9.0
Average Rating = 7.62



EDUCATION: PLOTTING SCHOOLS IN MAP

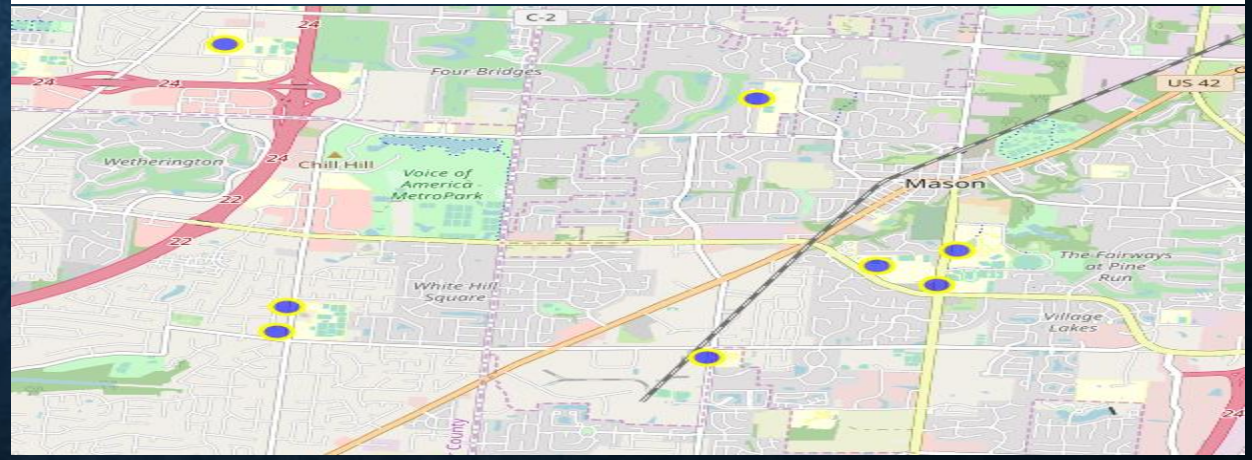
Schools in BlueAsh

	School	Grades	Type	Total students enrolled	Students per teacher	Rating	Latitude	Longitude
0	Madeira Elementary School	PK-4	Elementary	635	14:01:00	10	39.202762	-84.358026
1	Madeira High School	9-12	High	421	10:01:00	10	39.201060	-84.367885
2	Montgomery Elementary School	K-4	Elementary	448	16:01:00	9	39.863017	-83.842236
3	Edwin H Greene Intermediate Middle School	5-6	Middle	806	13:01:00	8	39.238638	-84.374803
4	Maple Dale Elementary School	PK-4	Elementary	595	19:01:00	8	39.241382	-84.371303
5	Sycamore High School	9-12	High	1646	16:01:00	8	39.266460	-84.351078
6	Sycamore Junior High School	7-8	Junior High	803	13:01:00	8	39.228124	-84.370769
7	Amity Elementary School	3-6	Elementary	417	16:01:00	7	39.208460	-84.395605
8	Blue Ash Elementary School	K-4	Elementary	519	18:01:00	7	39.231786	-84.401246



Schools in Mason

	School	Grades	Type	Total students enrolled	Students per teacher	Rating	Latitude	Longitude
0	Mason Intermediate Elementary School	4-6	Elementary	2486	19:01	9	39.348678	-84.315793
1	Lakota East High School	9-12	High	2579	27:01	8	39.379377	-84.371762
2	Mason Middle School	7-8	Middle	1798	17:01:00	8	39.345931	-84.310698
3	William Mason High School	9-12	High	3529	21:01:00	8	39.350750	-84.308951
4	Mason Early Childhood Center Elementary School	PK-2	Elementary	1822	22:01	8	39.371917	-84.326120
5	Hopewell Junior School	7-8	Junior High	574	21:01:00	7	39.342984	-84.366462
6	Western Row Elementary School	2-3	Elementary	970	18:01:00	7	39.335836	-84.330405
7	Hopewell Elementary School	2-6	Elementary	668	17:01:00	6	39.339494	-84.367277



2. COMPARISON OF BLUEASH VS. MASON: HEALTHCARE

Healthcare	
Source	Use Foursquare API to download list of all hospitals within 5 km radius
Data Summary & Analysis	Use Foursquare API to plot the location on map with venue category = 4bf58dd8d48988d196941735
Approach	1. Plot maps to tag healthcare location from dataframe 2. Calculate total number of healthcare units for BlueAsh and Mason
Visualization	1. Use folium map to plot healthcare locations on map

Healthcare in BlueAsh
Total units = 28

	name	categories	lat	lng
0	Define Skin Care & Esthetics	Hospital	39.228416	-84.375989
1	The Dermatology Group	Hospital	39.226588	-84.379330
2	Montgomery Profesnl Associates Inc	Hospital	39.245450	-84.385498
3	Bethesda North Hospital	Hospital	39.251531	-84.341376
4	The Jewish Hospital	Hospital	39.206034	-84.381569
5	Tri Health Imagjng	Hospital	39.206886	-84.370580
6	The Jewish Hospital - Mercy Health Wound Care ...	Hospital	39.205924	-84.381204
7	Mercy Health - The Heart Institute	Hospital	39.207762	-84.380280
8	Arden Courts of Kenwood	Hospital	39.207911	-84.385426
9	Trihealth Connect Training	Hospital	39.249779	-84.345570
10	Jewish Hospital Mercy Health Emergency Department	Hospital	39.206064	-84.380800
11	Bethesda North OR	Hospital	39.249435	-84.345105
12	Mercy Health Blood Cancer Center	Hospital	39.206011	-84.381111
13	Vero RN	Medical Center	39.206299	-84.365517
14	Bethesda North Emergency Room	Hospital	39.252285	-84.342779
15	Bethesda North Nucular/ Pulmonary	Hospital	39.251766	-84.341438
16	Bethesda North Hospital Labor & Delivery	Hospital	39.251768	-84.341138
17	Bethesda North maternity ward	Hospital	39.251826	-84.340917
18	Bethesda Surgery Center	Hospital	39.255539	-84.344499
19	Bethesda North Ambulatory Surgery Center	Hospital	39.251421	-84.339921
20	Bethesda North ICU	Hospital	39.252546	-84.340830
21	Tri Health Evendale Hospital	Hospital	39.251714	-84.420008
22	Minimally Invasive Spinal Institute	Hospital	39.255344	-84.422985
23	Med Mart	Hospital	39.262800	-84.415558
24	Dr Morrison Oral & Facial Assoc	Doctor's Office	39.251606	-84.340291
25	Sono Bello	Doctor's Office	39.201231	-84.370537
26	Bethesda North Clinical Decision Unit	Hospital Ward	39.252077	-84.342457
27	Bethesda North Creekside Orthopedic Unit	Hospital Ward	39.251857	-84.340928

Healthcare in Mason
Total Units = 11

	name	categories	lat	lng
0	Don Cook Fitness	Hospital	39.361643	-84.312966
1	Don Cook Fitness	Hospital	39.362066	-84.315493
2	West Chester Hospital	Hospital	39.358085	-84.367686
3	The Dermatology Group	Hospital	39.321697	-84.317388
4	7750 Discovery Dr. westchester oh	Hospital	39.361152	-84.365093
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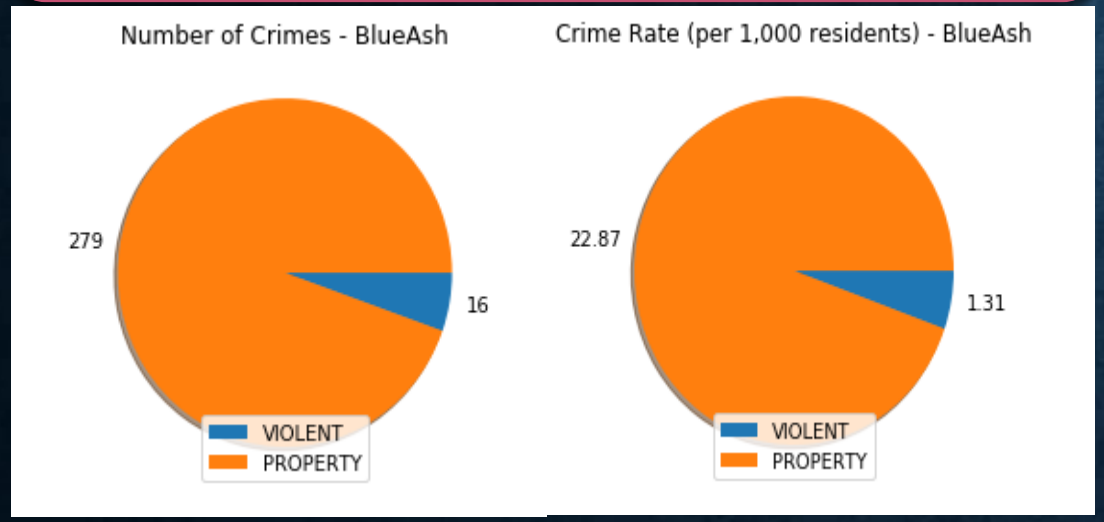
9	West Chester Recovery Room	Hospital	39.357826	-84.367973
10	West Chester Emergency Department	Hospital	39.357473	-84.368009

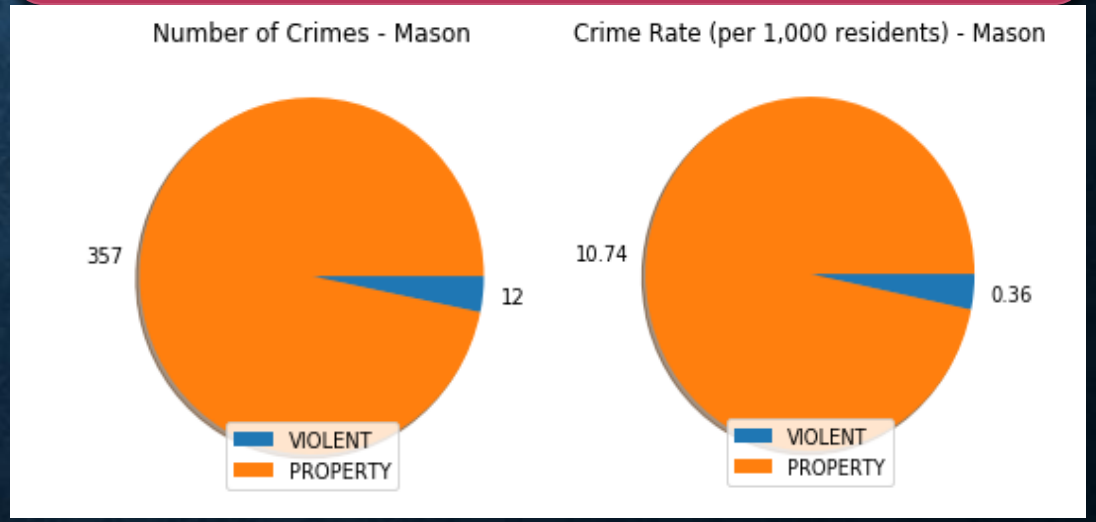
3. COMPARISON OF BLUEASH VS. MASON: SAFETY PROFILE

Crime & Safety	
Source	https://www.neighborhoodscout.com
Data Summary & Analysis	1. Use data to extract number of crimes and crime rate per 1,000 residents 2. Download crime index
Approach	1. Derive Crime Index, Crime Rates and Total number of crimes through a simple pandas extraction
Visualization	1. Use Pie Chart to capture VIOLENT Vs. PROPERTY crimes

Safety Profile in BlueAsh
Crime Index = 25
BlueAsh is 25 % safer than U.S. cities



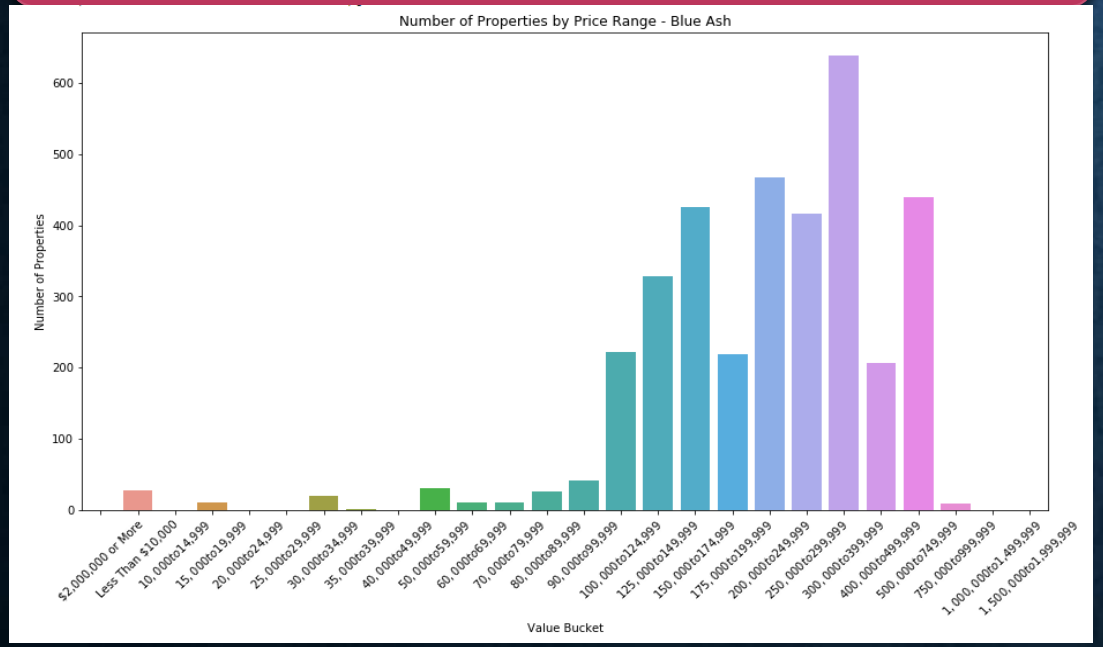
Safety Profile in Mason
Crime Index = 61
Mason is 61 % safer than U.S. cities



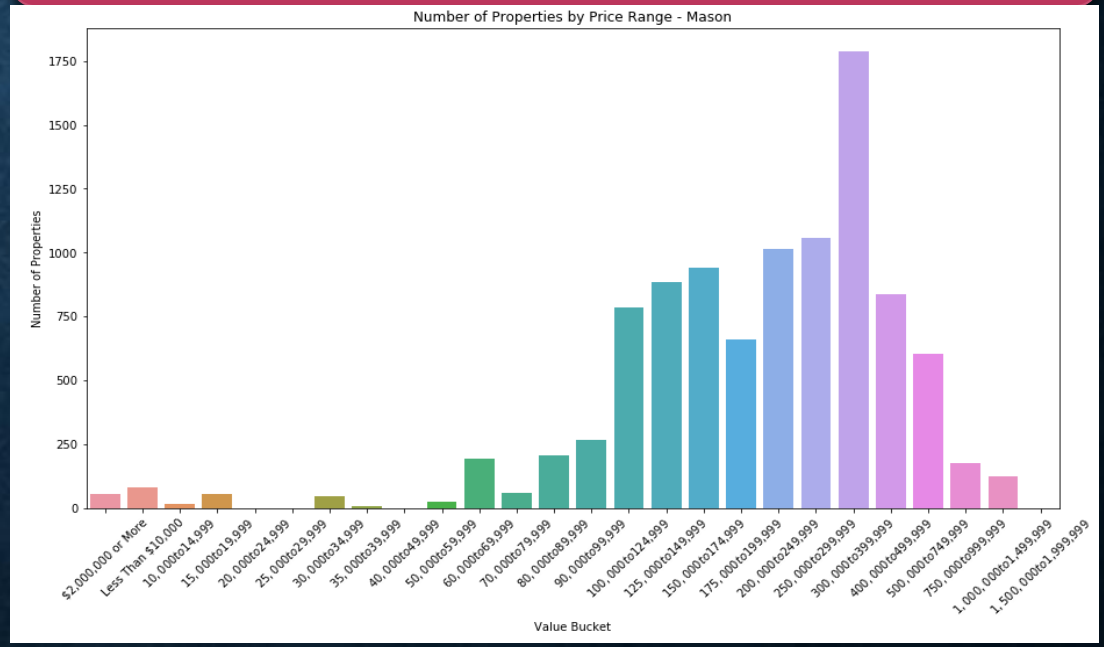
4. COMPARISON OF BLUEASH VS. MASON: PROPERTIES

Properties	
Source	https://datausa.io
Data Summary & Analysis	Data has value bucket and total number of properties per bucket. Use this data to create a chart and download the property median value from data source
Approach	1. Data from source #1 is straight forward and can be utilized to visualize property values
Visualization	1. Use seaborn barplot to plot property range and the total number of properties

Properties in BlueAsh
Median Value = $243,100

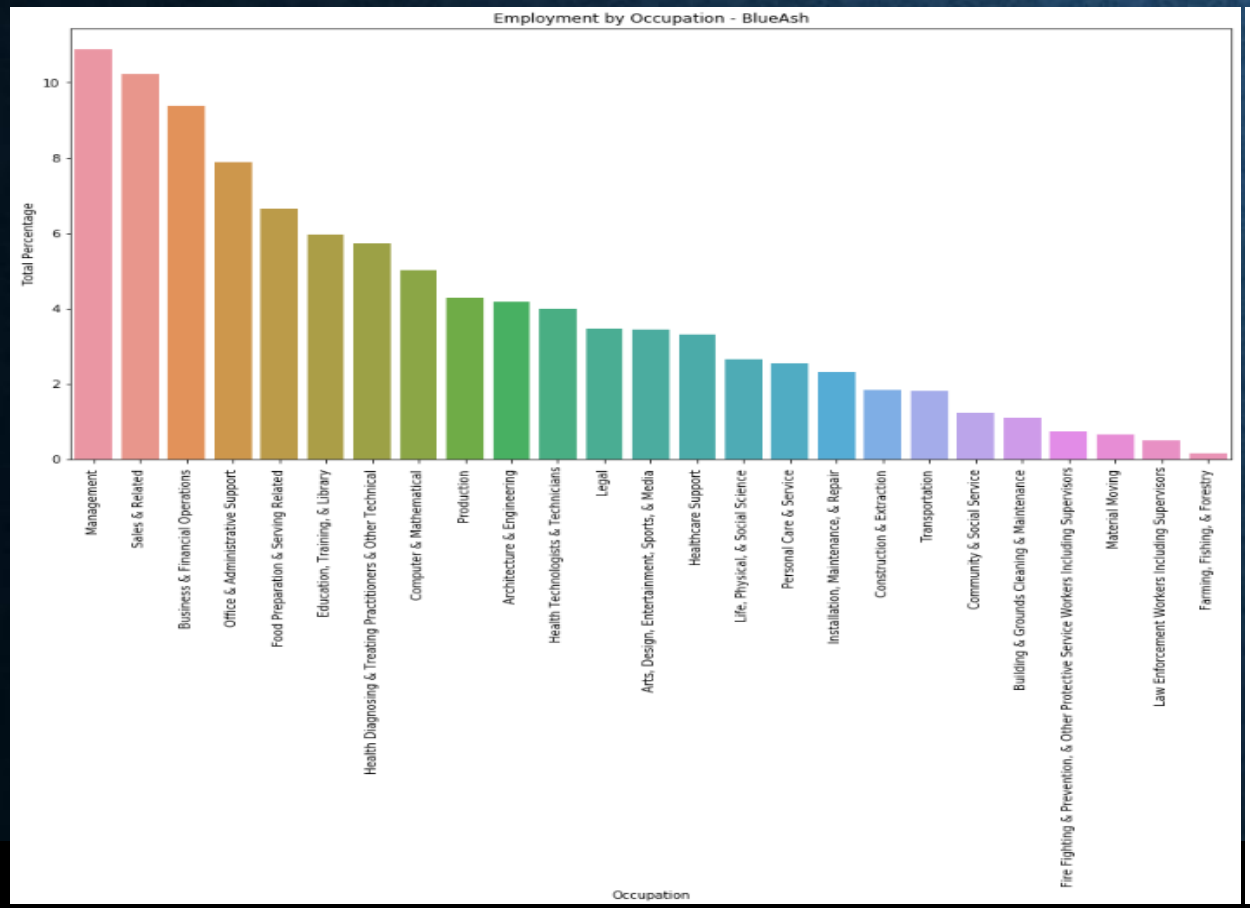


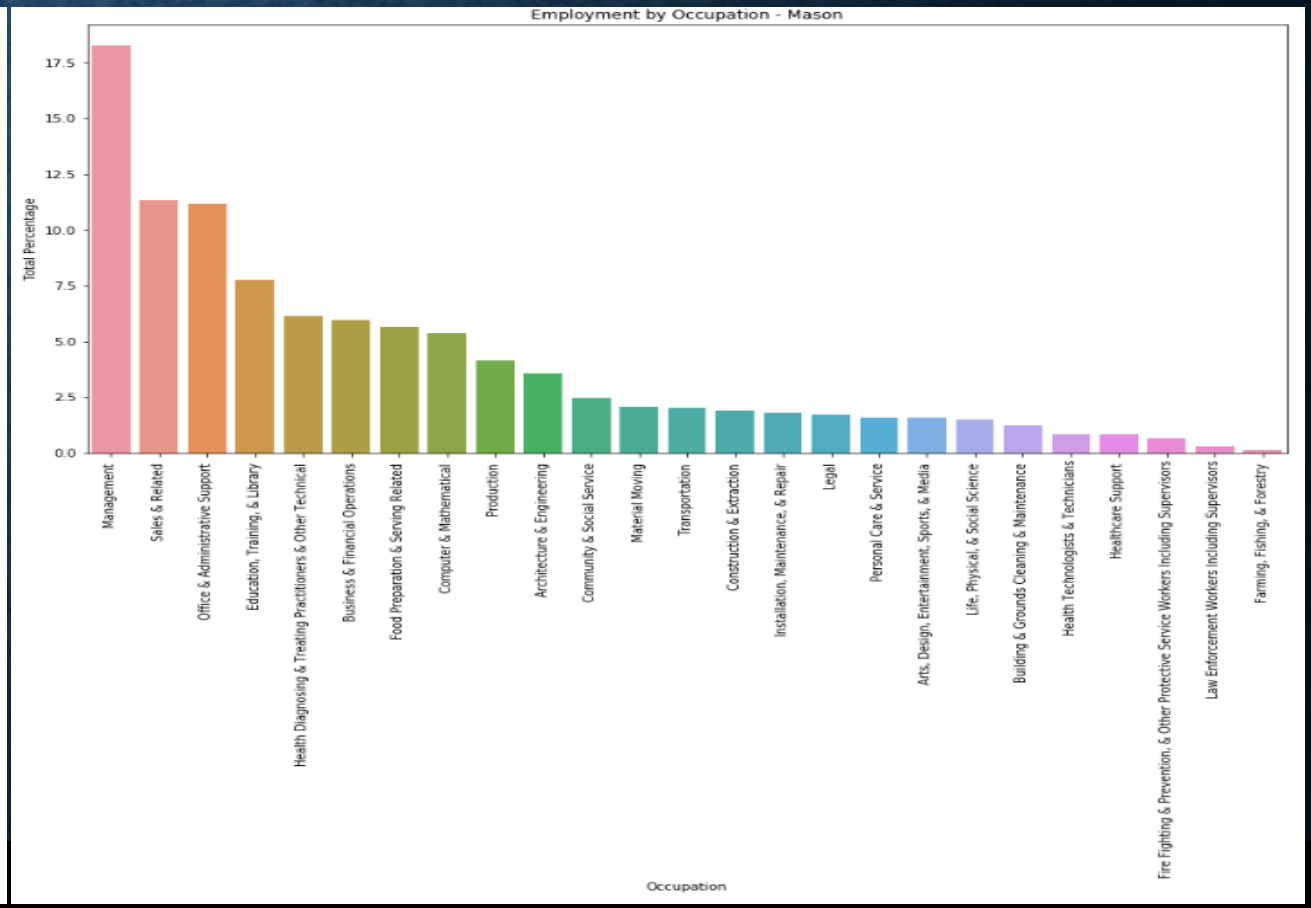
Properties in Mason
Median Value = $235,000



5. COMPARISON OF BLUEASH VS. MASON: EMPLOYMENT

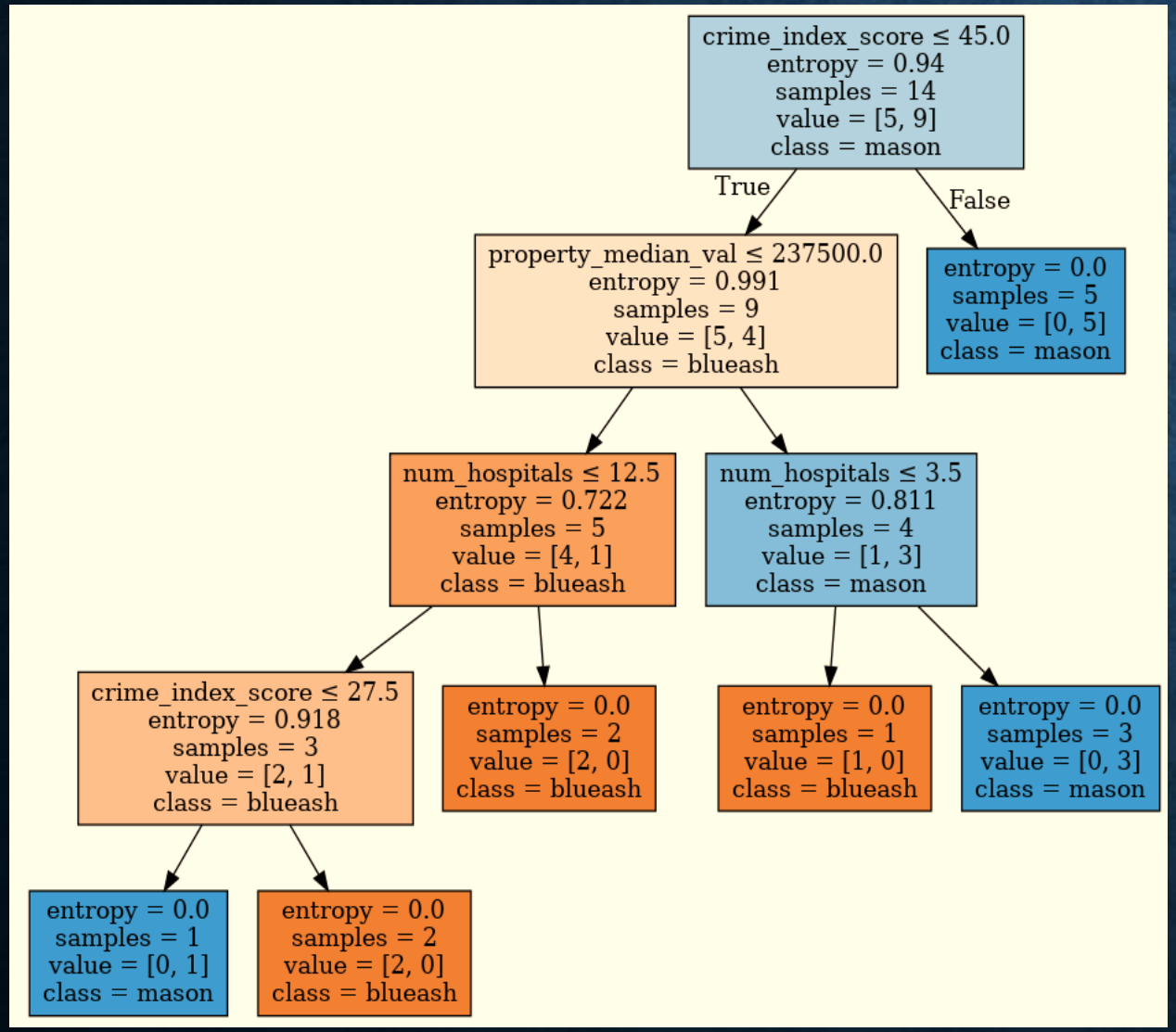
Employment	
Source	https://datausa.io
Data Summary & Analysis	Data contains occupation, workforce counts, geography and other minor details
Approach	1. Since the data available is structured and straightforward, there is no need to apply any techniques to extract or cleanse data 2. Extract Occupation, Total Workforce and then calculate percentage contribution towards total
Visualization	1. Use seaborn barplot to plot Occupation names and total percentage, order by descending





MODELING

DESCRIPTIVE MODELING – DECISION TREE



- Based on survey of a group of 24, data for crime index, number of hospitals, median property value and average school rating were used to choose a city of their preference.
- Decision Tree was used to capture what drove the decision of the individuals to pick a particular city
- Model Accuracy = 0.7

CONCLUSION

CONCLUSION

- Used different visualization methods to capture comparison between the two cities
- Accuracy of the descriptive 'Decision Tree' model can be tuned by changing 'test_size' and 'max_depth' parameters
- More comparison criteria could potentially be used, e.g. Commutation, Taxes, Restaurants etc., to expand the scope of comparison between the two cities

APPENDIX

DATA SAMPLE

- Data used in this project can be downloaded from:

https://github.com/kctaurus/Coursera_Capstone/blob/master/Data%20Sample.zip

https://github.com/kctaurus/Coursera_Capstone/blob/master/Survey_data_refined_2.xlsx

THANK YOU!