

# CS506 Deliverable 1

## ***BCNC Group3 Members:***

Dawei Wang  
Jiaye Liu  
Sarinna Sung  
Yuyan Li  
Zhifan Xue

## ***1 Data Collection***

- Our group used four different datasets and focused on three aspects.
  - Total\_Population\_Changed\_MA  
Visualize total population change in MA over the last decade.  
<https://www2.census.gov/programs-surveys/popest/tables/2010-2019/counties/totals>
  - Region\_Population\_Change\_MA:  
Visualize regional total / Asian population change over the last decade.
  - Immigrantation\_Data\_MA:  
Visualize Asian immigrants' population change over the last two decades in MA.  
Source Link:  
<https://www.migrationpolicy.org/data/state-profiles/state/demographics/MA>
  - Age\_and\_Sex\_MA:  
Visualize age and gender features of Asian community in the past 10 years.

### ***1.1 Data Preprocessing***

- *Total\_Population\_Changed\_MA:*

The dataset is census data directly downloaded from the Census website. The table is cleaned, then there is only MA population and 14 MA counties population from 2019 to 2020.

- *Region\_Population\_Change\_MA:*

The dataset mainly compares the difference in population in 2010 and 2020. We downscale the geographical area to 14 counties in MA. By comparing the differences, we can see that even though the total population and Asian population are growing, there's some slight differences in some counties.

- *Immigrantation\_Data\_MA:*

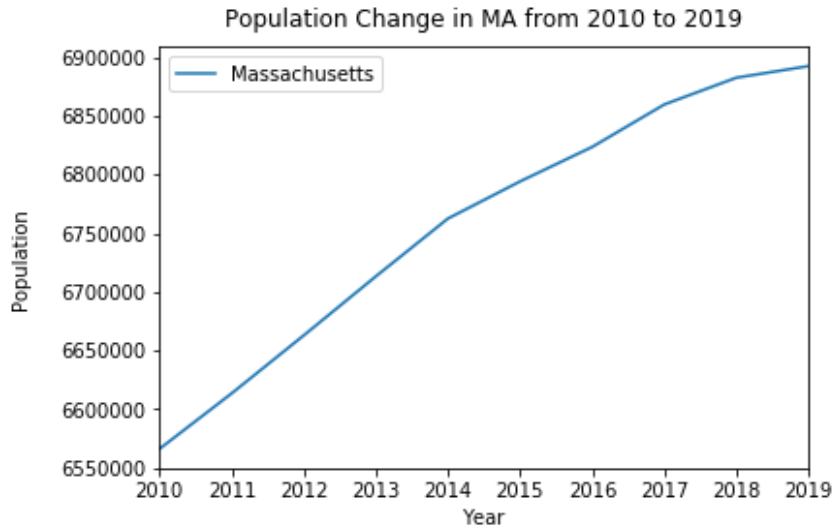
The dataset contains Massachusetts Immigrants data from 1990 to 2019. It separated the population by their race and region. In the subset of Asian, it divided Asian into several small groups: Eastern Asian, South Central Asian, Southeastern Asian, Western Asian and other Asian. It also contains data for “Foregin Born” (People residing in the United States at the time of the population survey who were not U.S. citizens at birth) and "U.S. born"(People residing in the United States who were U.S. citizens in one of three categories). It is evident that there is a large number of caucasian males for US Born compared to the minority population in Massachusetts during 2019. You can see in the pie chart that there are 76% of caucasian US Born compared to the 23.3% of the combined minorities. Asian Americans consist of 2.4% of the population which shows evident lack of representation in the area. There is a pronounced difference in the amount of Foreign Born (22%) citizens in Massachusetts compared to US Born(2.4%).

- *Age\_and\_Sex\_MA:*

The dataset we use is directly downloaded from the census website. The table B01001D is about the Asian community alone, and it concludes the range of age for both male and female Asians alone in the United States. The census website allows me to narrow the geographical range down to the Boston area. Thus we choose counties related to the Boston area and made plots about the changing trends of population for each age group and sex group in different regions in the last 10 years.

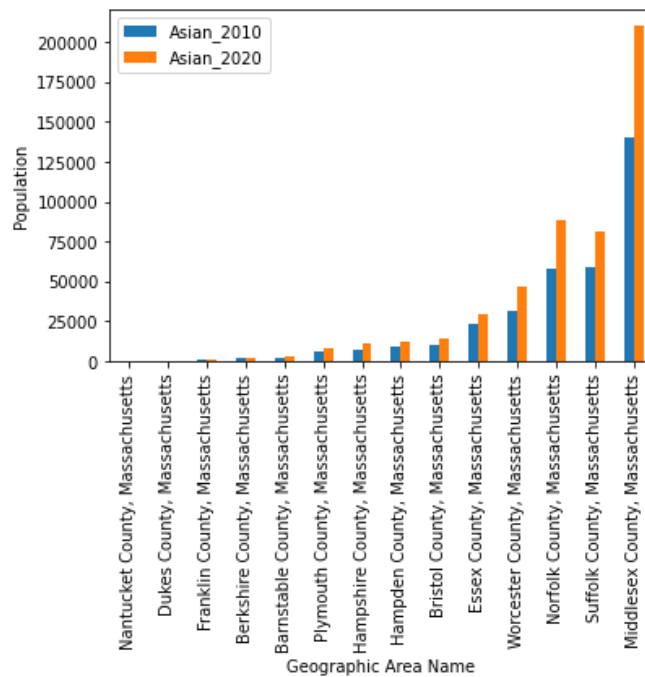
## ***2 Preliminary Analysis***

We start with looking at the overall population change in MA in ten years. Based on Figure 1, the overall MA population is almost linearly increasing from 2010 to 2019, from about 6.55m to 6.9m. From 2014, the increased speed slightly drops with the slope becoming smoother a little bit. I also take a look at each county, what is the trend of percentage change from 2010 to 2019? Interestingly, there are several counties' populations continually decreasing, ie: Barnstable, Berkshire, Franklin. While some continually increased to a large extent. This shows some geographically discrepancies are embodied in population change. The reason for the discrepancies may be explained in later research.



**Figure 1: Total Population Change in MA from 2010 to 2019**

Then we shift our focus on the Asian population change and compare it with the overall population. Following the study of the total Asian population change, based on Figure 2, the Asian population overall increased in almost every county, and especially rapidly increased in Worcester county, Norfolk county, Suffolk county, and Middlesex county.

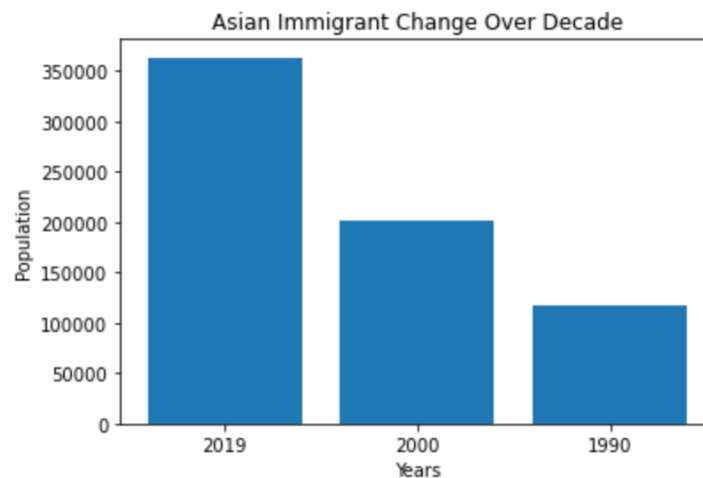


**Figure 2: Asian Population Different between 2010 and 2020**

Based on total Asian population change, we then try to perceive more specific aspects of Asian population, ie: Is there any trend we can find based on different age groups? Is there any sudden shift or general pattern we can infer based on different age groups? With that in mind, we found that there is a changing trend for each age group in the last 10 years that can be used to infer the mobility and general

development of one region. One general trend we found in almost every region was that the population of age group 55-64 (years old) for both the male and female was steadily increasing in the last 10 years, which could be evidence of an aging population or a trend of aging immigration. Another pattern we found was that in Suffolk county, there is a skyrocketed increase in male population from 2017 to 2019 for Asians. Some of the abnormal changes are valuable for us to investigate. However, further research and data information from other dimensions like education or employment are needed in order to give a reliable and general analysis.

Further on, we start to notice Asian immigrants might be a reason for the total Asian population growth over the past two decades. Is there any trend of Asian immigrant population growth between the years?

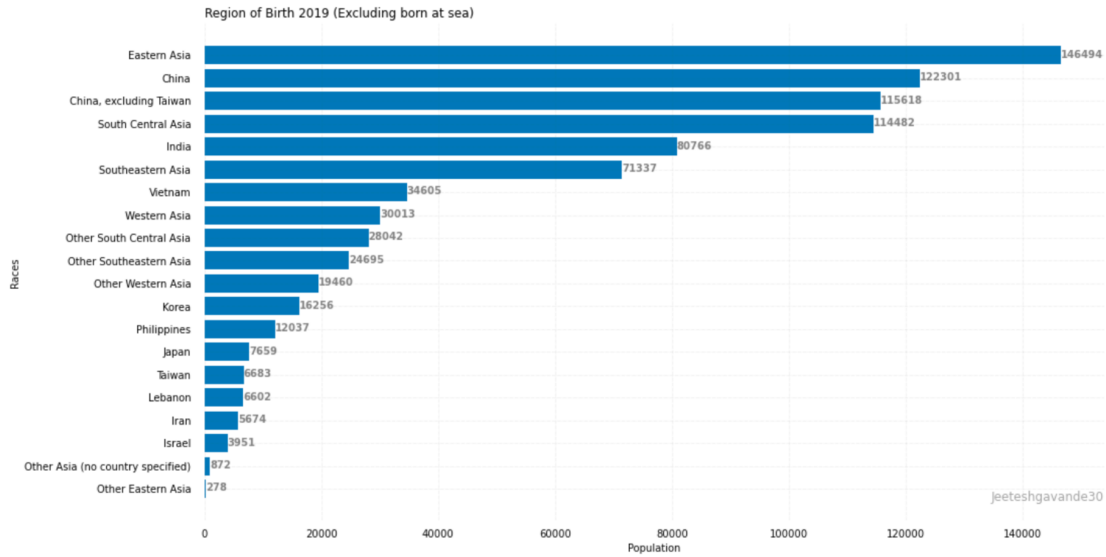


***Figure 3: Region of Birth with Population in 2019***

Over the past two decades, Asian population has grown tremendously. In 1990, there were only 116,608 Asian immigrants in Massachusetts, but in the year of 2019, there were 363,189 Asians in Massachusetts. The total amount of Asian population has tripled over last 40 years. According to the Figure 3, the amount of Asian population has doubled from 1990 to 2020, and those are the years that Asian population has the most growth rate.

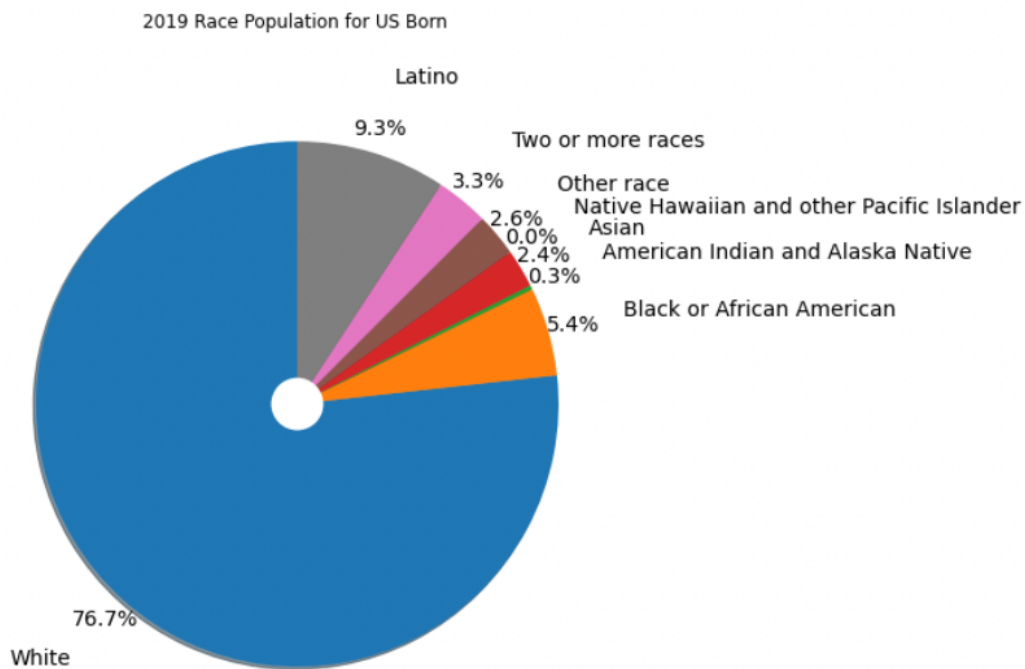
After analyzing Asian immigrant change over the past 40 years, now we wonder where they are from?

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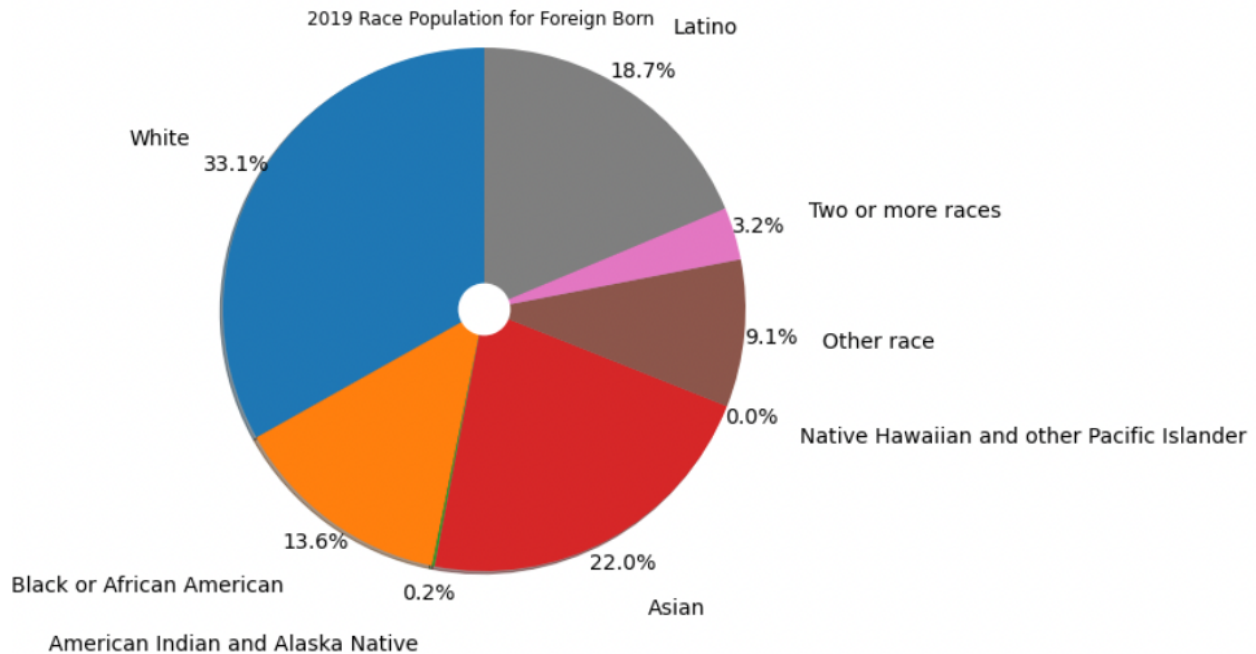
**Figure 4: Asian Immigrant Change Over Decade**

According to Figure 4, we can see most Asian immigrants were coming from Eastern Asian and South Central Asia. However, China, India and Vietnam have the most immigrants to the Massachusetts. And we will further analyze the race population in Massachusetts.



**Figure 5: 2019 Race Population for US Born**

In Figure 5 you can see that the US Born Asian population is very miniscule compared to most of the other races. You can see a dramatic difference between the caucasian population US Born population from the minority population. It is evident the asian population is 2.4% of the population of US Born. You can see the magnitude of the Caucasian American population compared to the Asian American population in this graph significantly.



**Figure 6: Race Population for Foreign Born 2019**

In Figure 6, the Foreign Born Asian (22.0%) population is the largest percentage compared to the other minorities and close to the percentage of caucasians (33.1%) which shows that there is an increase of immigrants migrating to Massachusetts during 2019.

### **3 One Key Question**

- How has the total Asian population changed in the MA area in the past 10 years? What are possible reasons for the trend? Are there any further trends about different sub-Asian groups being revealed?

#### **Answer:**

In the above analysis, we dug into total and Asian population change in MA, and we found an overall increase trend in both total population and Asian population from 2010 to 2020, which follows the common trend. In several specific counties (Norfolk, Suffolk, and Middlesex county), the increase is relatively larger and faster than others. Not much surprise with their population change, we then try to find the reasons for the increasing population. We think a large portion of the increased population is due

to immigration. The possible reason for this trend may be because of the growth of the economy during 2019 producing job opportunities for Asian immigrants. We predict that there will be an increase of Asian immigrants in the future because in the pie chart we can see that there is a noticeable difference in the incoming population of Asian immigrants compared to all of the minorities. In the future, if the economy becomes better in the US we will most likely see a noticeable increase in Asian immigrant population than before.

#### ***4 Updated Potential Risks and Limitations***

- When narrowing the geographical range down to specific areas and counties, there are missing values in different counties. However, it is hard to decide whether the missing value is valuable or not because the missing values can be due to missing data on surveys, or there are indeed no people for this age group in the county.
- The dataset only contains data from 2 times, which is not suitable for analyzing population change trends. Even though we use another dataset to analyze the trend, the two dataset might not be comparable.
- While using different datasets based on different survey methods, there might be discrepancies among our datasets, ie: different populations for the same object. This is unfortunately unavoidable, even though we all use census data, since population statistics is based on estimation. Therefore, there is potential risk of having differences in our plots and data, but the overall trends should be similar, since the errors are overall tolerable.
- Some of the years are missing because we only have the year 1990, 2000, 2019. The year 2020 is missing so we cannot see the clear trends of the Asian immigrants population groups and Asian American population groups.