# MAPPING OF SCHOOL DISTRICTS DROP OUT RATE IN MASSACHUSETTS

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## Introduction

A public school district consists of one or more public schools operated under the supervision of an elected or appointed school committee and a superintendent. The majority of school districts serve a single city or town, and are considered a department of the municipal government. Two or more municipalities can also join together to form a regional school district, which is considered a separate and independent unit of local government. A regional school district can offer all grades (preK-12), just certain grades (for example, just elementary grades or just high school), or just certain types of instruction (for example, vocational and technical programs). Number of School Districts in this state are 399, Number of Schools 1,827, Enrollment 914,959, and Grades Served PK-12 (dese, 2024). The annual high school dropout statistics represents a snapshot of those students who dropped out of school in any given year. This study will present the school district dropout rate in Massachusetts.

## Aim and Objectives

The main aim of this study is to project the school dropout rate as per zone/districts. The study will be carried out with the following objectives:

1. To Know the statistics and pattern of school districts dropout rate

2. To present and analysis the school dropout rate of Massachusetts.

## Methodology

### a. Data Collection and Data Processing for Chart preparation

This study is secondary data base. There by, data is collected from the US government online data base, Massachusetts Department of Elementary and Secondary Education (dese), MassGIS (Bureau of Geographic Information), and mass.gov website. At first, I downloaded the dropout rate of students (excel sheet) in different school districts of Massachusetts area from dese which reflects the grade, gender and race wise drop out scenario. After that I processed the downloaded excel sheet and categorized all districts into four categories such as Elementary Public-School Districts, Charter School Districts, Vocational and Technical School Districts and Others Districts. Later on, I sum up the values of dropout rate as per the school districts types and make separate excel sheet for grade, gender and race wise dropout rate. In the Jupiter notebook, I connected this New excel Sheets and used matplotlib and plotly libraries and python codes for making graph.

### b. Data Collection and Data Processing for Mapping

Data has been downloaded as an excel file from dese which represents the yearly school district dropout rate of Massachusetts among them the dropout rate of 2021-2022 which is taken for visualization. Firstly, I modified the excel sheet and the same district has shown multiple times that they are merged in single district name and calculating the mean value of it and count the school under the districts and save this file as .csv in the system folder. The school districts polygon

is taken from MassGIS. In this step, these two files (.csv and polygon) are added in ArcGIS pro and a shape file is created by using join and relates and add joins tool the and join feature district Name. After that the unnecessary columns are deleted from the school district shape file. This shape file is export to the system folder as final shape file where the project is located. Then I create a symbology layer which is also export to system as symbology layer. After that I created template layout out with all necessary map elements and export the template layout as name of layout in the system folder. Before entering the code section, I have done all these preprocessing. After that sequence of GIS operations, I have used Python and the ArcPy library to apply symbology to a shapefile, create a layout for visual presentation, and export it to a PDF.

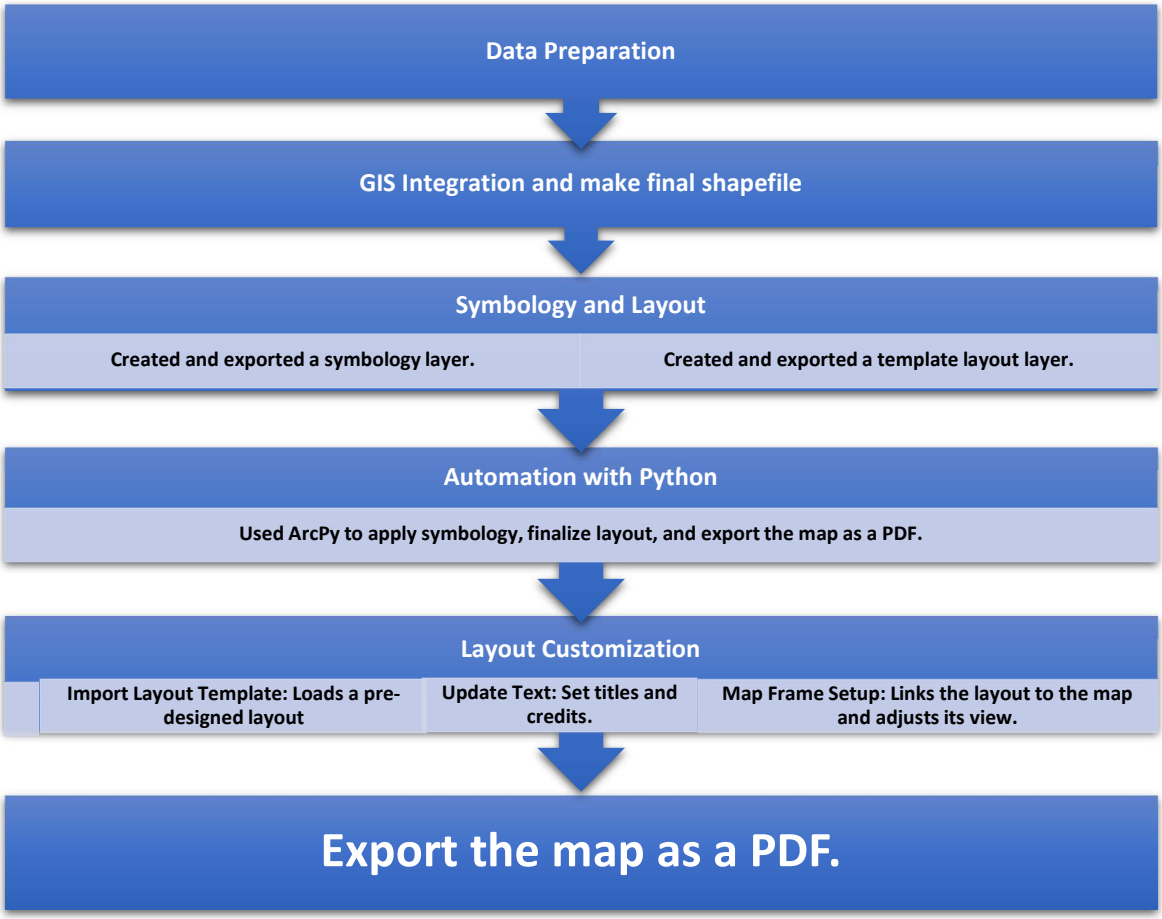



Figure 1: Workflow in ArcGIS pro

## Results and Discussion

School dropout rates are the reflection of the effectiveness of the state's education system. It plays a vital role in finding out the gap between these systems. The Massachusetts area is well known for its good education system but there are also a few challenges which came out through the analysis of state dropout rates. Socio-economic and gender inequalities, resources differences of varying districts level might be the responsible factors for these issues. Analysis the patterns of dropout rates of different types of school districts like Charter, vocational & technical, public schools and other school districts show varying level of dropout rate.

## A. School Districts Dropout Rate Based on Gender

This bar chart (Figure 2) illustrates dropout rates across different school district categories in Massachusetts, based on gender (male and female).

- The SUM category represents the total or combined dropout rates. Males are showing a dropout rate of approximately 11% and females around 8%. Overall, Males have higher dropout rates than females in this category (Figure 2).
- In Charter School Districts, males also exhibit higher dropout rates compared to females, though the gap appears narrower than the overall total (SUM).
- Other district, Vocational and Technical School Districts and Elementary Public-School Districts reflect similar trends, of higher male dropout rates (Figure 2).

In general, Male dropout rates pose a systemic challenge across all school district categories.

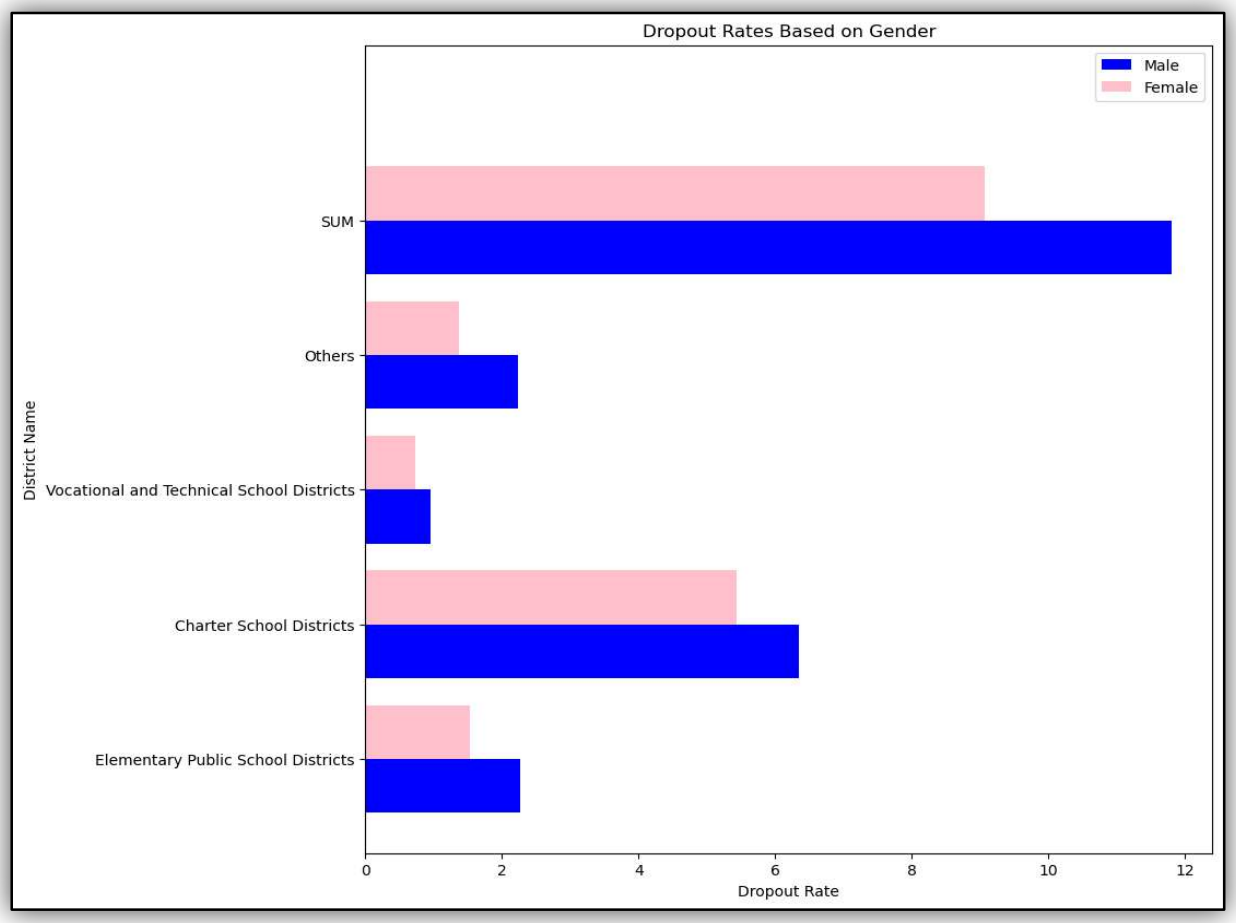



Figure 2: Dropout Rate based on gender

## B. Grades Based Dropout Rate

This bar chart (figure 3) displays dropout rates in Massachusetts across different school district types, based on grade levels 9 to 12. The overall data (SUM) indicates that Grade 10 experiences the highest dropout rate at approximately 50%, other grades like Grade 9, Grade 11 & 12 having dropout rates of about 8%, and 12% respectively (Figure 3). In Charter School Districts, the Grade 10 dropout rate is also high, which is around 42% (Figure 3), while other grades maintain much lower rates. In Vocational and Technical School Districts, dropout rates are relatively low across all grades and Grade 12 shows a slight peak than other grades (Figure 3). Similarly, Elementary Public-School Districts exhibit the lowest dropout rates, which are below 5% across all grades. In the Others district category, dropout rates are also low, and no significant variations are found across all grades (Figure 3).

In general, Grade 10 faces a critical dropout risk, particularly in charter schools and overall school district performance reports. This may occur due to academic pressures, or socio-economic challenges or family conditions.

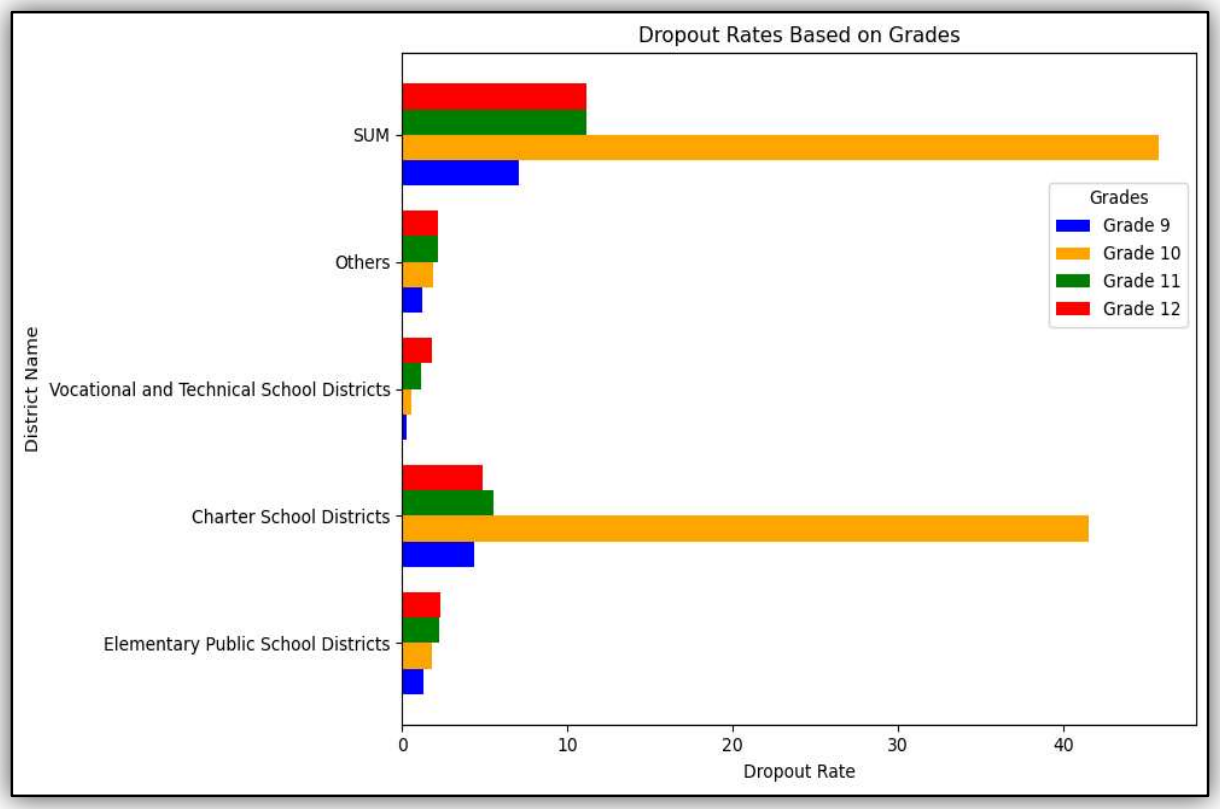



Figure 3: School District Dropout Rate Based on Grades

## C. School Districts Dropout Rates Based on Races

The following bar chart (Figure 4) illustrates dropout rates across different racial groups in Massachusetts school districts.

Overall (SUM): The highest dropout rate is observed among students identified as Native American (approximately 17%), followed by Multi-Race, Non-Hispanic students (around 14%). Hispanic students have a notable dropout rate of about 13.5%, Native Hawaiian 13% and black dropout rate 12.5%, while White students show a rate close to 10%. The lowest rates are observed among Asian students, approximately 4% (Figure 4).

Charter School Districts: Native Hawaiian students have the highest dropout rate, exceeding 12%. Native American, black and Multi-Race, Non-Hispanic students follow closely, with rates near 10%, and White & Hispanic dropout rate is approximately 5%, while Asian students have the lowest dropout rate, around 3% (Figure 4).

Vocational and Technical School Districts: Dropout rates are more balanced, with Native American, Multi-Race, Non-Hispanic, Hispanic, and black students showing rates near 3%. Asian students maintain low dropout rate, around 1% and Native Hawaiian has no dropout scenario (Figure 4).

Elementary Public-School Districts: Dropout rates are minimal across all racial groups, typically below 5%, Native American and Hispanic student's dropout rate is slightly higher than rest of the districts categories (Figure 4).

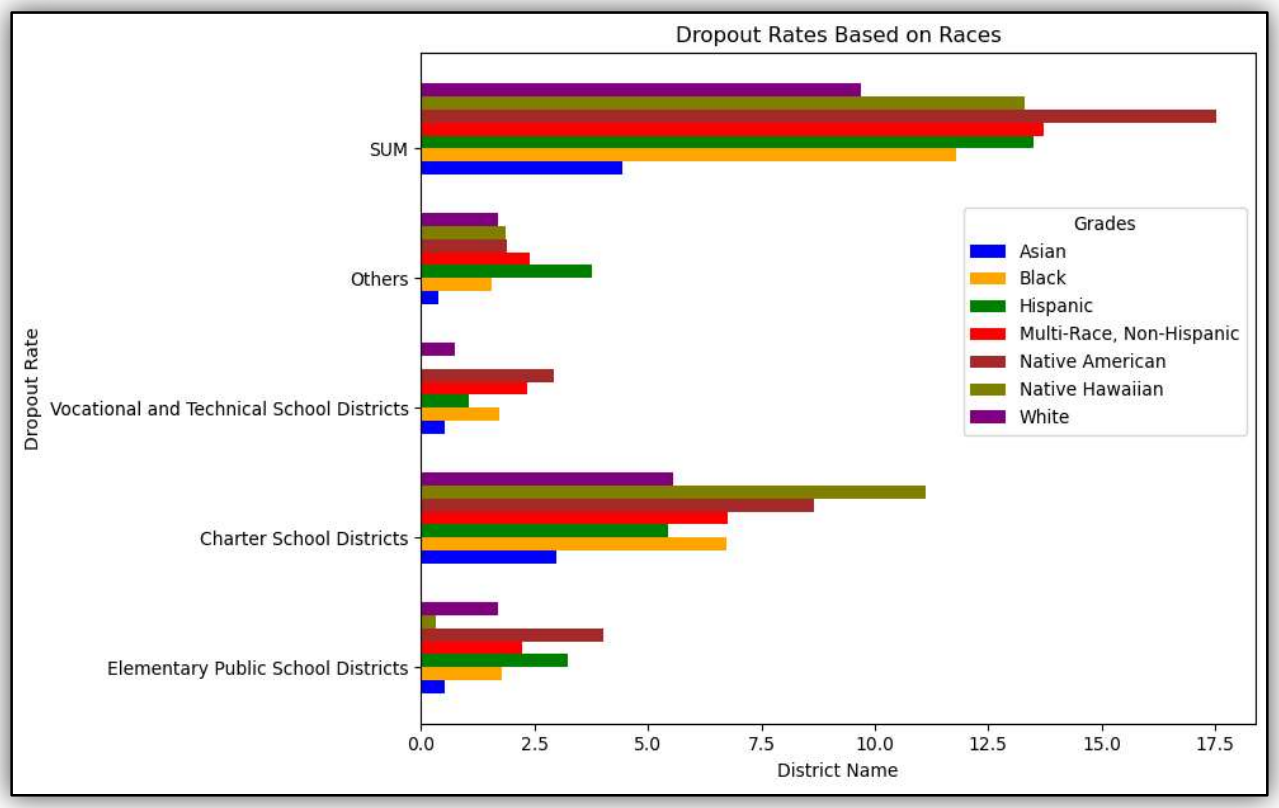



Figure 4: Dropout Rates based on Races

Others Category: Hispanic students having the highest dropout rate (around 4%) and Asian students showing the lowest dropout rate (approximately 1%) (Figure 4).

Native American, Native Hawaiian, and Hispanic students consistently show higher dropout rates in different district types, while Asian students exhibit the lowest rates across all district types.

**D. Overall School Districts Dropout Rate in Massachusetts**

Eastern Massachusetts (near Boston and its surroundings): The dropout rates are predominantly low. Light yellow (0.00 – 1.30%) and orange (1.31 – 3.70%), indicating low to moderate dropout rates (Figure 5). Likely due to better access to educational resources, funding, and student support services.

Western Massachusetts: There are clusters of green (3.71 – 8.02%) and some dark purple (8.03 – 14.84%) zones (e.g., Worcester County, Springfield, Berkshire County), suggesting higher dropout rates compared to the eastern part of the state (Figure 5).

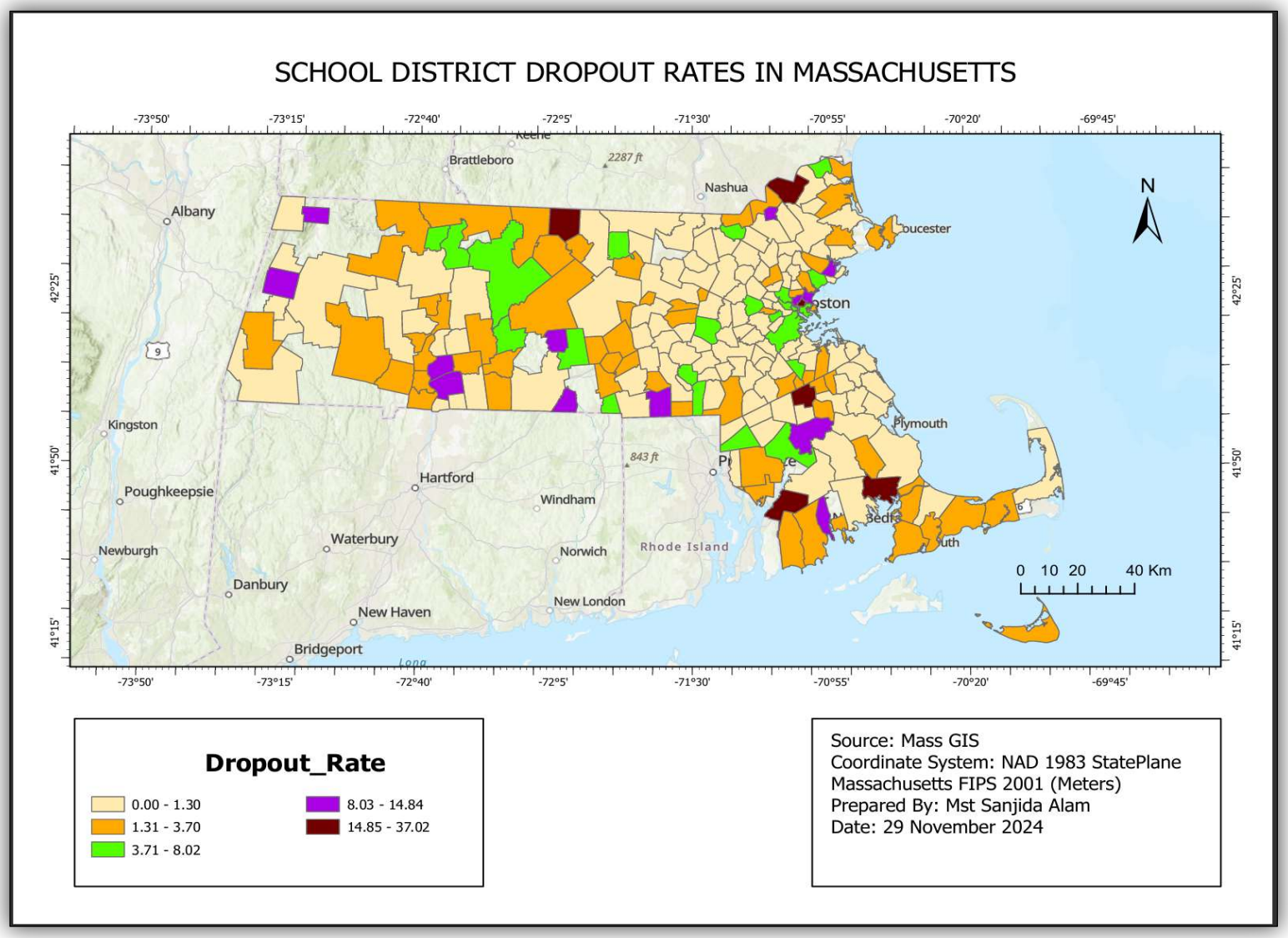



Figure 5: Map of School District Dropout Rate in Massachusetts

Central Massachusetts: A mix of light yellow, orange, green and purple areas indicate varying dropout rates (Figure 5), likely reflecting differences in socioeconomic conditions.

Notable High Dropout Areas: Districts (Northwestern and southwestern Areas) in dark brown (14.85 – 37.02%) seem to appear sparsely but represent significant challenges and high school districts dropout rate in those regions (Figure 5). These may be rural or economically disadvantaged areas.

## Recommendation

- Gender-Specific Support: Develop programs that address the unique challenges faced by male students, such as mentoring, counseling, and engagement initiatives tailored to their needs.
- Grade 10 Interventions: Focuses on the students of grade 10 by implementing warning systems, academic support, and career-focused programs to improve retention rates during this critical year.
- Culturally Responsive Programs: Addresses racial disparities relevant curriculum for Native American, Native Hawaiian and Hispanic students for ensuring their retention rate.
- District-Level Strategies:
  Charter Schools: Strengthen retention strategies, such as increased academic and emotional support during transitional years.
  Vocational schools can expand skill-based opportunities to engage students.
- Family and Community Engagement: It can play an essential role in reducing specific problems in this community and reducing the dropout rate of this group.
- Early identification and increasing support in Rural Areas: The identification of week zones or rural areas and allocating resources and good teachers can minimize the dropping rates.
- Introducing Students Support: Motivational session, counselling, extra class, after school capacity building program can reduce the drop scenario.

## Conclusion

The dropout rates of Massachusetts school districts are not that much of a concern compared with the other states of the country. This state is reputed for its renowned educational institute like Harvard, MIT. But there is still some scope of improvement. Gender, grades and race-based dropout rate indicating some initiatives are required to minimize this problem. On the other hand, the dropout rate is high in some counties and rural areas which can be solved through proper educational management and initiatives based on their needs. Besides allocating resources and employing good teachers and staff in the vulnerable area can improve this situation.

## References


1. Massachusetts Department of Elementary and Secondary Education (dese). (2024). https://www.doe.mass.edu/
2. Commonwealth of Massachusetts. (2024). Massachusetts state government. http://www.mass.gov/
3. MassGIS, Bureau of Geographic Information. (2024). https://www.mass.gov/orgs/massgis-bureau-of-geographic-information