



Bharatiya Vidya Bhavan's
SARDAR PATEL INSTITUTE OF TECHNOLOGY

Advanced Data Visualization

Experiment no. 10

Submitted To

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1. Dataset

Can view the dataset here: <https://drive.google.com/drive/folders/1KO2kY-Xy0HbeQGAIHx583m7glfw5RTOF?usp=sharing>

2. Description

This dataset contains information about financial aid in the form of Washington College Grants. It has 318 entries with seven columns that capture various data points about college grants and post-aid tuition costs. The dataset spans academic years from 1965 to 2021.

3. Metadata

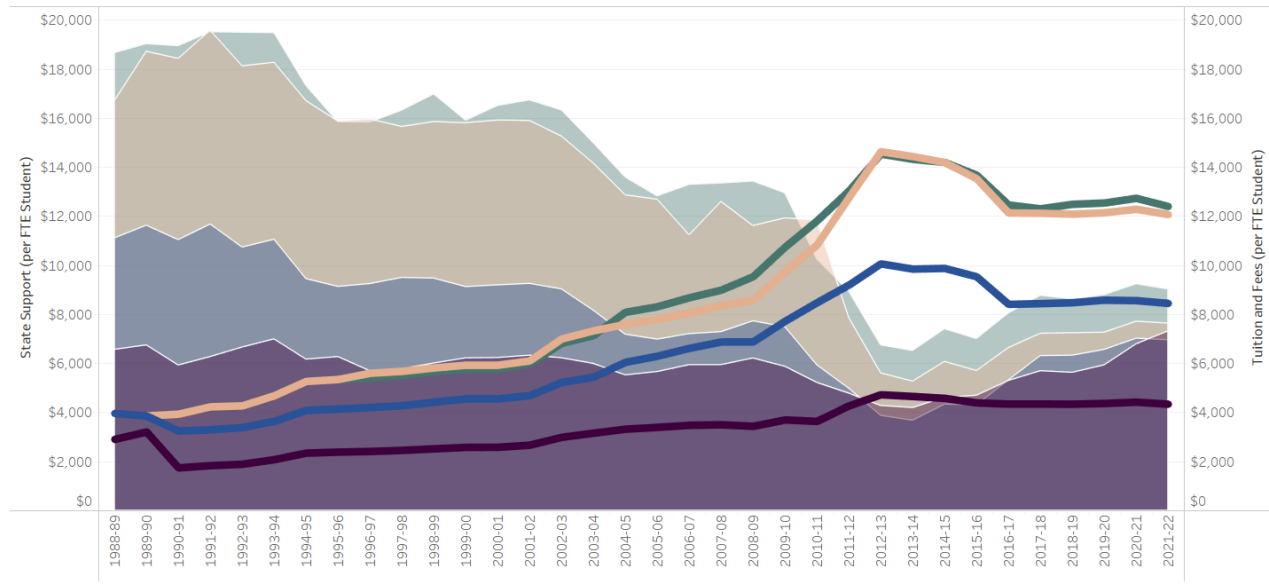
- **Year of Academic Year Start:** The start year of the academic period, ranging from 1965 to 2021. (Data type: integer)
- **Percent of Median Family Income:** Describes the family income eligibility for aid as a percentage of the median family income (MFI). (Data type: string)
- **Institution:** The educational institution receiving or managing the grants. (Data type: string)
- **Append income text:** Additional income-related text, sparsely populated (only 29 entries have values). (Data type: string)
- **Income (family of four):** Family income thresholds for a family of four, with missing values in 28 entries. (Data type: string)
- **Post-Aid Tuition/Fees (inflation-adjusted \$):** Tuition and fees after financial aid, adjusted for inflation. (Data type: string)
- **Post-aid tuition/fees as a percent of median family income:** Post-aid tuition as a percentage of median family income, with 290 populated entries. (Data type: string)



4. Visualizations and Observations

1.

State vs. student share of higher education funding: All schools



This visualization compares the state and student shares of funding for higher education across all schools over a span of several years, from 1988-89 to 2021-22. Here's a detailed analysis:

1. State Support Trend (Left Axis):

- **The shaded areas represent state funding per full-time equivalent (FTE) student.**
- **Between the late 1980s and the early 2000s, state support was relatively high, reaching a peak around 2001-2002, where it exceeded \$16,000 per FTE student.**
- **However, there was a notable decline in state support starting around 2002, with a steep drop during the Great Recession (2008-2010). It reached a lower point around 2012 before stabilizing.**
- **After 2012, state support slowly recovered but did not reach the previous peak levels, indicating a sustained reduction in state funding per student.**

2. Tuition and Fees Trend (Right Axis):

- **Tuition and fees, as indicated by the line graphs, generally increased over the years.**
- **Before the early 2000s, tuition fees were relatively low. However, as state support decreased, tuition fees began to rise sharply to offset the lost state funding.**



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- There's a peak around 2011-12, corresponding to the low point in state support, where tuition fees spiked to over \$12,000 per FTE student.
- In recent years, although state support increased slightly, tuition fees remained high, indicating a shift where students now bear a larger share of education costs compared to previous decades.

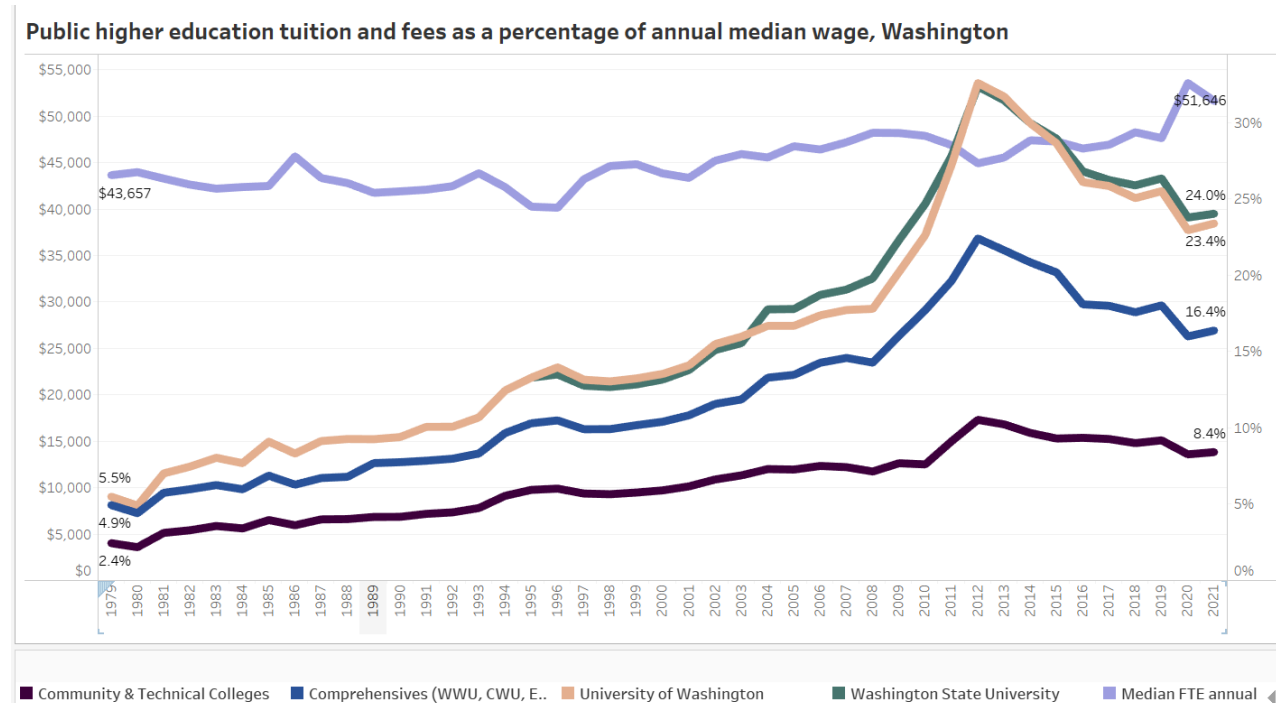
3. Shift in Funding Burden:

- The graph shows an inverse relationship between state funding and student tuition, especially during economic downturns, where decreased state support typically led to increased tuition.
- This shift indicates that the burden of funding higher education has increasingly shifted from the state to students over time, particularly since the early 2000s.

4. Insights on Long-term Trends:

- The long-term trend suggests that public funding for higher education has become less stable and more dependent on economic conditions. During recessions or budget cuts, state support tends to decrease sharply, placing a higher financial burden on students through increased tuition.

2.





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This visualization displays the trend in public higher education tuition and fees as a percentage of the annual median wage in Washington state from 1978 to 2021. It compares tuition costs for different types of institutions (Community & Technical Colleges, Comprehensive Universities, University of Washington, Washington State University) against the median full-time earnings (FTE) for the state. Here's an analysis:

1. Median FTE Annual Earnings (Top Line):

- The light purple line represents the median annual wage for a full-time worker, which has gradually increased over time, starting at about \$43,657 in the late 1970s and reaching \$51,646 in 2021.
- Although the median wage has increased, the rate of increase is slower compared to the growth in tuition fees, resulting in tuition taking up a larger percentage of earnings over time.

2. Tuition and Fees as a Percentage of Median Wage:

- The lines for each institution type represent the percentage of the median wage that is required to pay tuition and fees.
- University of Washington and Washington State University show significant increases over time, peaking around 2011-12. By this peak, tuition fees were taking up approximately 30% of the median wage.
- Comprehensive Universities (WWU, CWU, etc.) follow a similar pattern, with tuition costs reaching a high percentage of the median wage in the same period.
- Community & Technical Colleges have the lowest tuition-to-wage ratio throughout the timeline, reaching around 8.4% by 2021. This line is relatively stable, indicating that community college tuition is generally more affordable relative to wages.

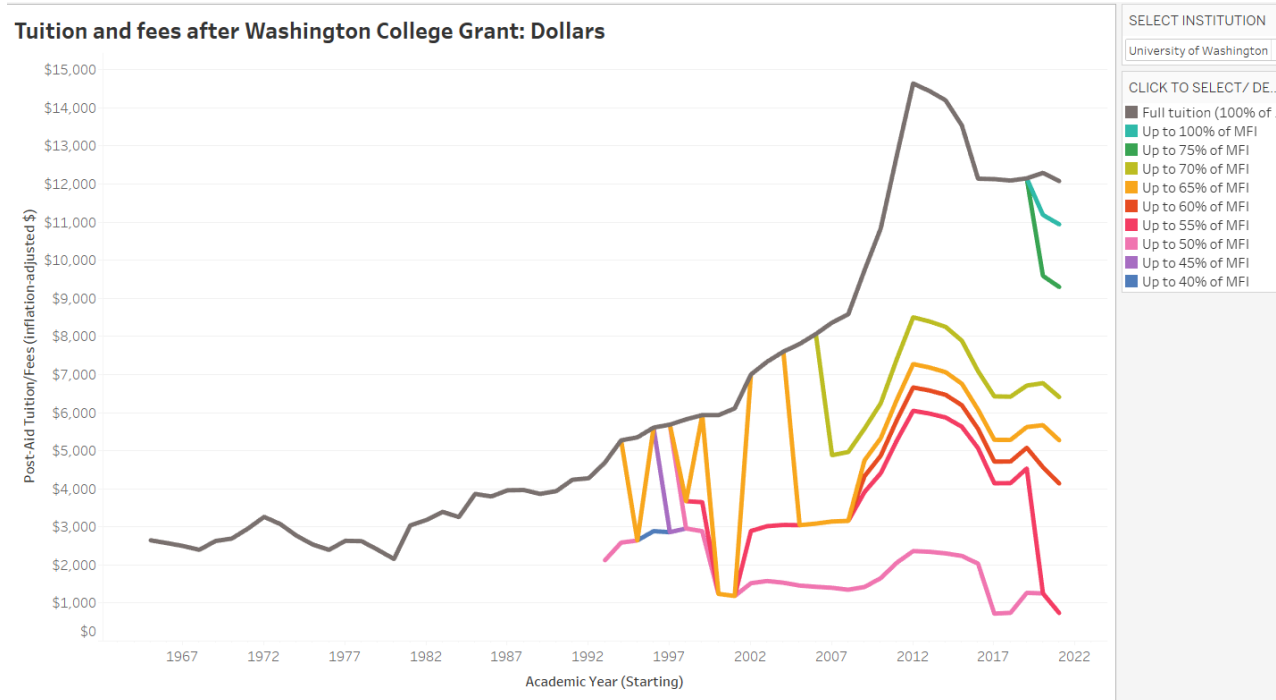
3. Tuition Cost Peaks and Trends:

- There's a marked increase in tuition as a percentage of wages from around the early 2000s to 2012 across all institution types. This aligns with the period when state funding decreased significantly, causing tuition to rise as a response.
- After the peak in 2011-12, the percentage of median wages required for tuition began to decrease slightly or stabilize, but it remains much higher than earlier decades.

4. Long-term Financial Burden on Students:

- The overall trend indicates that students are bearing an increasing financial burden over time, as tuition represents a higher percentage of annual earnings than in the past.
- This shift reflects both rising education costs and the relatively slower growth in wages, which poses a growing challenge for affordability in higher education.

3.



This graph shows the tuition and fees at the University of Washington after applying the Washington College Grant, tracked over multiple decades (1967-2022) and broken down by different income levels relative to the Median Family Income (MFI).

Key observations:

1. Long-term Trends:

- From 1967 to early 1990s, tuition (shown by the gray line representing full tuition) remained relatively stable and low
- A significant increase began in the mid-1990s
- The steepest rise occurred between 2007 and 2012
- Recent years (2017-2022) show some stabilization and slight decline

2. Income-Based Aid Structure:

- The graph shows multiple lines representing different MFI levels (from 40% to 100% of MFI)
- Lower-income students (represented by lower MFI percentages) consistently pay less
- The aid structure creates a stepped system where:
 - Students at 40-45% MFI pay the least
 - Each higher income bracket pays progressively more



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- **Full tuition (100% MFI) pays the highest amount**

3. Notable Features:

- **Peak tuition appears to be around 2012-2013 at approximately \$14,000-15,000**
- **Recent years show a general downward trend across all income levels**
- **The gap between different income levels has widened over time**
- **There are some sharp fluctuations, particularly in the 1997-2002 period**

4. Affordability Impact:

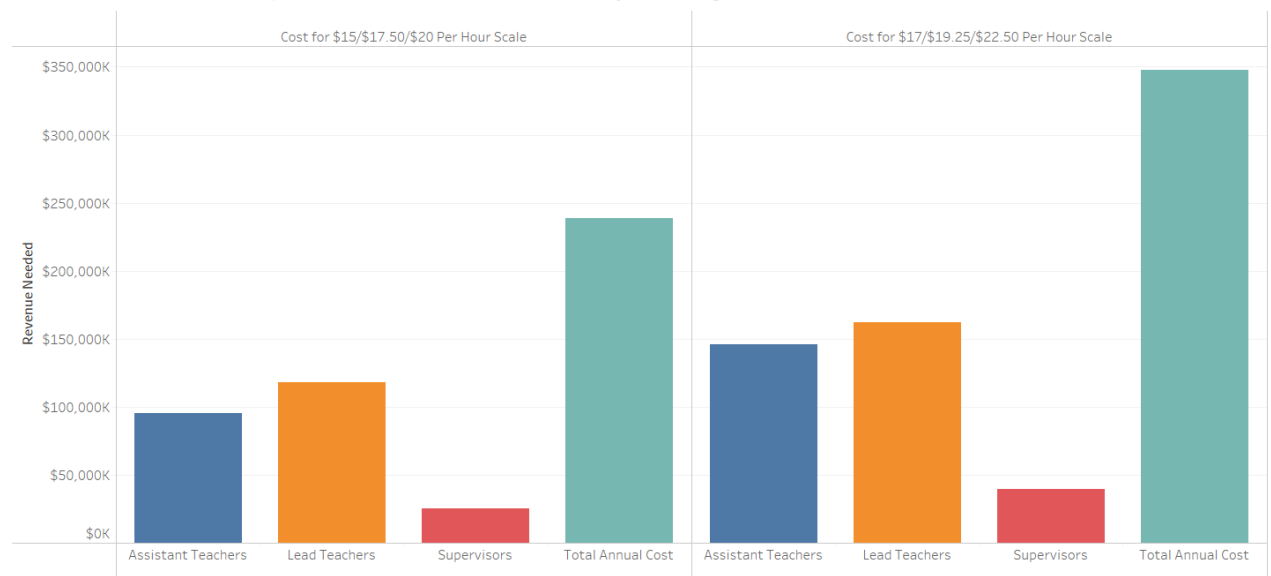
- **The Washington College Grant appears to be effectively reducing costs for lower-income students**
- **Even during periods of rising tuition, lower-income students' costs remained relatively controlled**
- **By 2022, there's a clear stratification of costs based on family income**

5. Current State (2022):

- **Full tuition is approximately \$12,000**
- **Students from families at lower MFI levels pay significantly less**
- **The lowest income brackets appear to pay under \$1,000**

4.

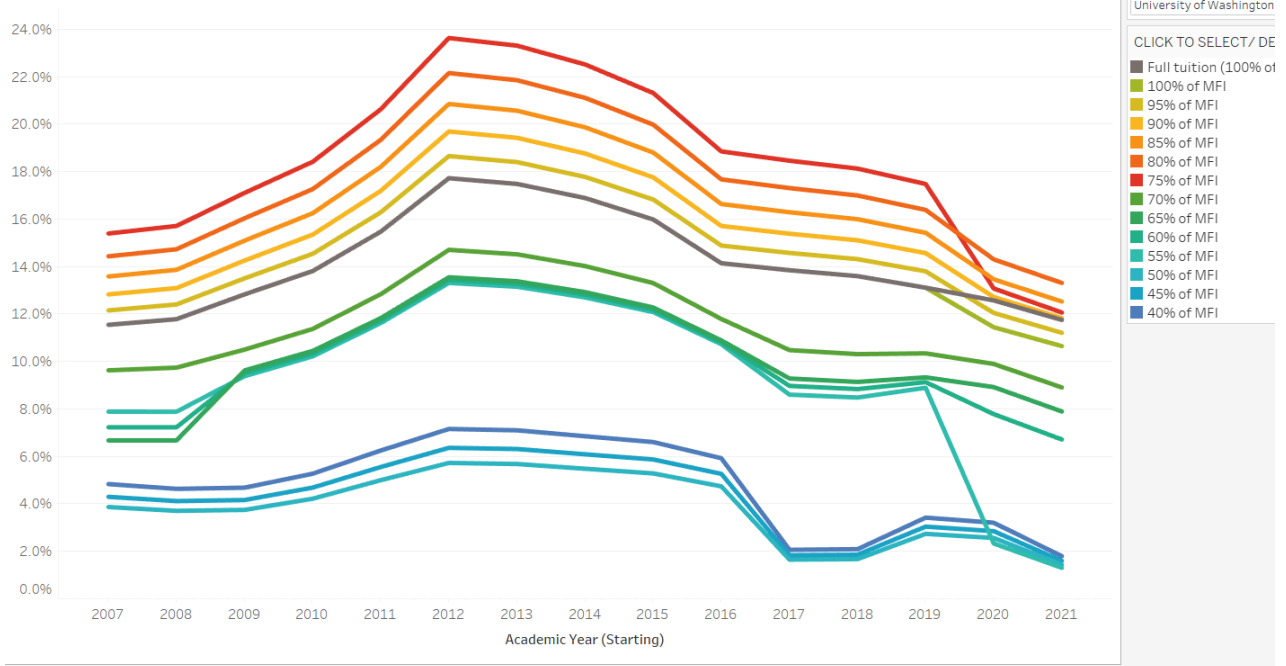
Revenue Needed for Compensation Enhancements for Early Learning



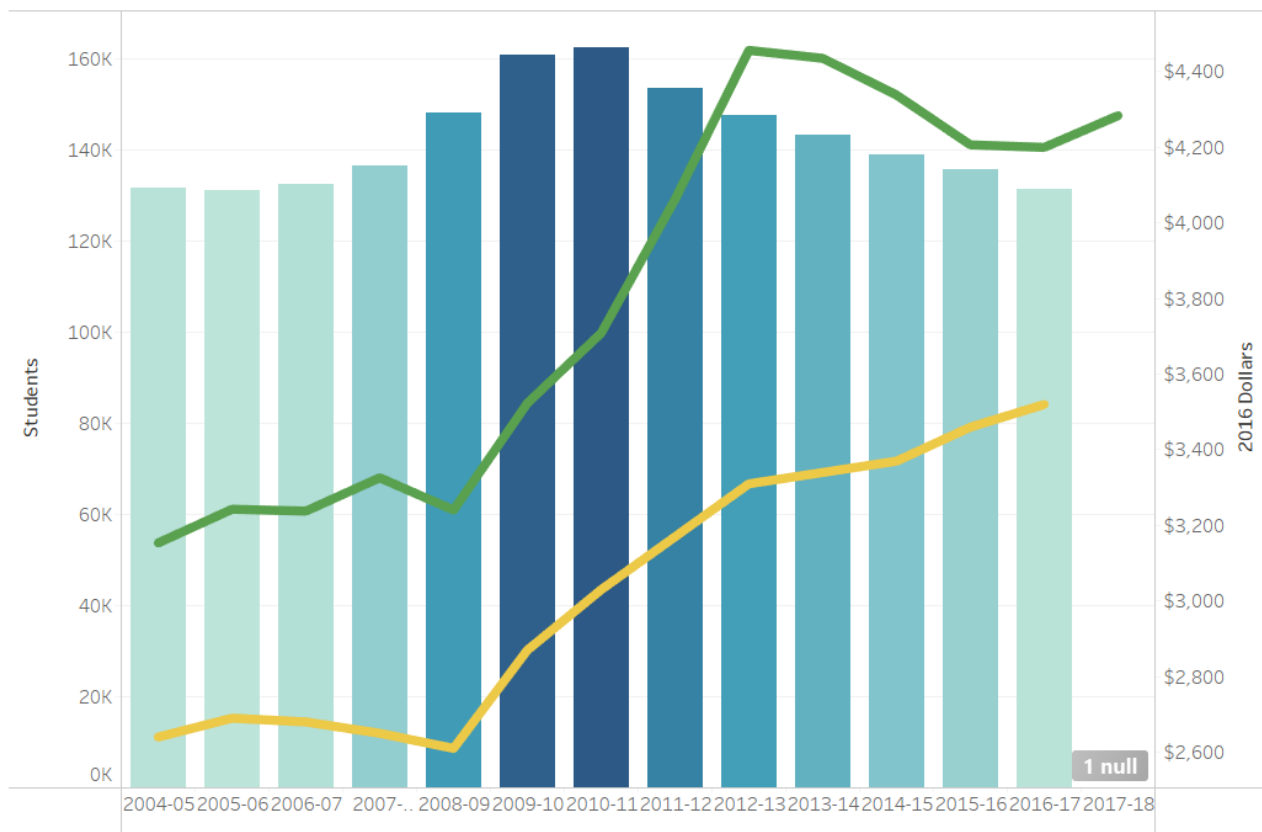


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Tuition and fees after Washington College Grant: Percent of family income



Enrollment and Average Tuition and Fees at Washington State 2-Year Colleges





ashington state:

- 1. Early Learning Compensation Analysis (Image 1):**
 - Shows two compensation scales for early education staff
 - **First scale (\$15/17.50/\$20):**
 - Assistant Teachers: ~\$95,000 annual cost
 - Lead Teachers: ~\$120,000 annual cost
 - Supervisors: ~\$25,000 annual cost
 - Total: ~\$240,000 annually
 - **Second scale (\$17/19.25/\$22.50):**
 - Higher costs across all positions
 - Total annual cost increases to ~\$350,000
 - Clear hierarchical cost structure between positions
- 2. Washington State 2-Year Colleges Enrollment & Tuition (Image 2):**
 - **Timeline: 2004-2018**
 - **Two key metrics tracked:**
 - Enrollment (bars): Peak around 2010-11 at ~160,000 students
 - Tuition/Fees (lines): Steady increase over time
 - **Notable trends:**
 - Enrollment declined after 2011
 - Tuition increased more sharply between 2009-2013
 - Recent years show stabilization in both metrics
 - By 2017-18, enrollment around 130,000 students
- 3. UW Tuition as Percentage of Family Income (Image 3):**
 - **Timeline: 2007-2021**
 - Shows different MFI (Median Family Income) levels
 - **Key observations:**
 - Peak burden around 2012-2013 (up to 24% for some income levels)
 - Consistent decline in burden after 2015
 - Greater spread between income levels during peak years
 - Significant reduction in burden by 2021
 - Lower-income families (40-55% MFI) see much lower percentages

Combined Insights:

- 1. Cost Pressures:**



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- **Education costs across all levels (early learning to college) show significant financial implications**
- **Investment needed for fair compensation at early learning level**
- **Higher education costs peaked around 2012-2013**
- 2. Accessibility:**
 - **Washington College Grant appears effective at reducing burden on lower-income families**
 - **2-year colleges saw enrollment impacts during periods of higher tuition**
 - **Recent trends show improved affordability across sectors**
- 3. System Evolution:**
 - **Clear effort to balance compensation needs with accessibility**
 - **Progressive approach to tuition based on family income**
 - **Recent years show stabilization or improvement in cost metrics**

5.Source Code

<https://drive.google.com/drive/folders/1KO2kY-Xy0HbeQGAIHx583m7glfw5RTOF?usp=sharing>