Gauging Environmental Influences on Student Success and Graduate Contributions to Enhance the State Economy : A Geospatial Analysis

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Online Report

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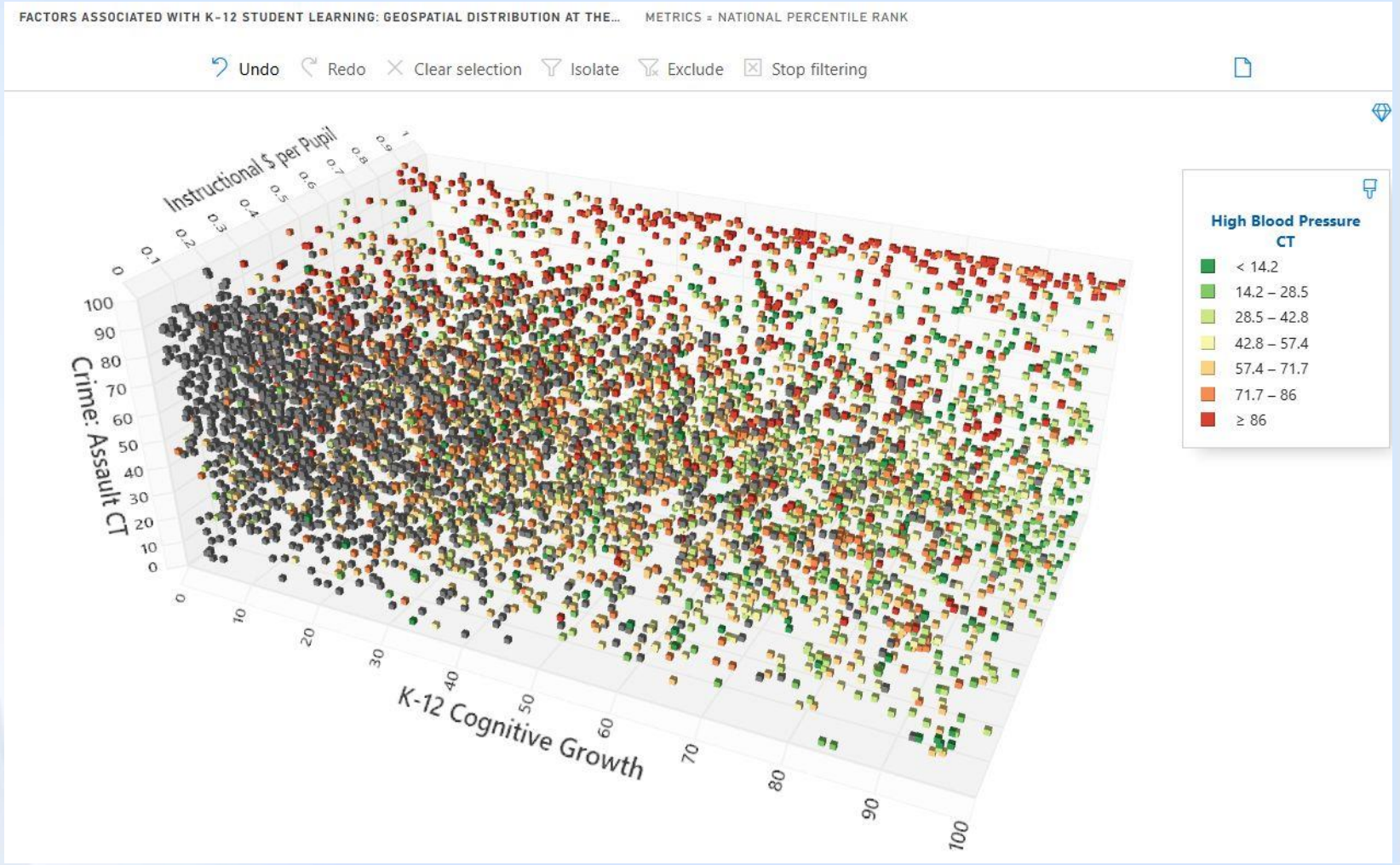
Student Background & Data Privacy

- *Accreditation Mandate: E.g., 2023 WASC Standard CFR 4.2:* Institutions collect, analyze, and act on disaggregated student outcomes data, including retention and graduation rates.
- Account for socio-demographic and economic student background.
- *Option 1*: Share student-level identifiers with third parties to collect background data. Can student opt out to ensure data privacy?
- *Option 2*: Collect public geospatial data as proxy measures to obviate the risk of breaching student data privacy.

Visualizing the Human Condition Through Data

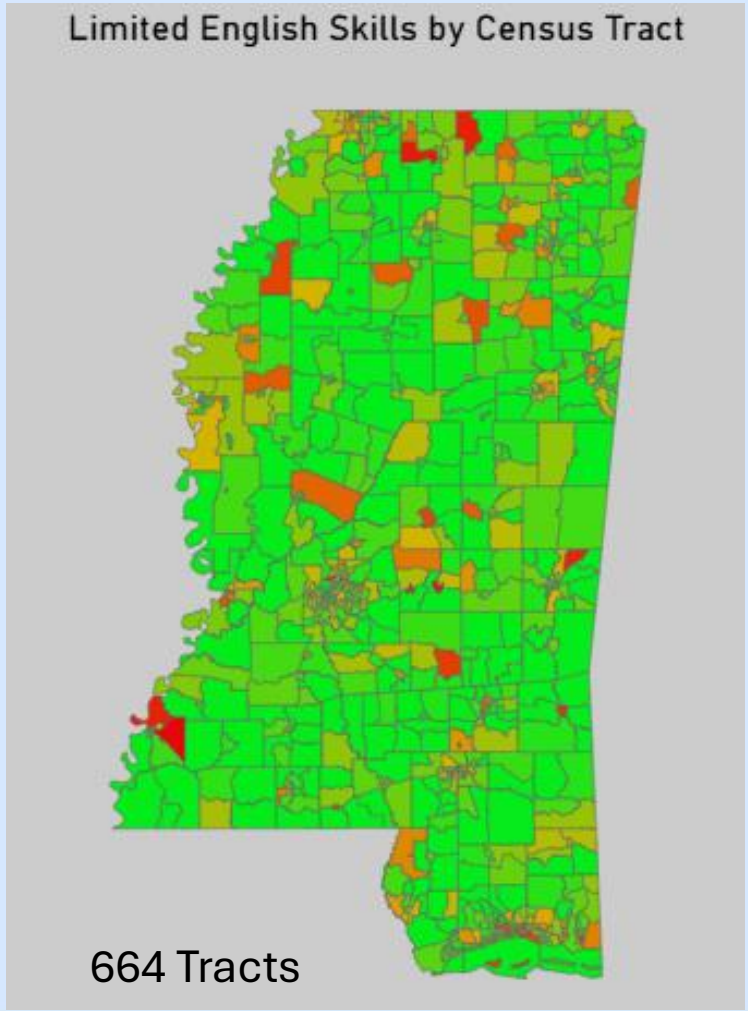
High-crime areas exhibit high levels of physical stress, even for areas with the highest level of per pupil funding (see red-dotted band at top edge of scatter plot below). Conversely, high levels of cognitive growth (>90th percentile) are predominantly in low-stress, low-crime areas (green-dot density near floor of plot) with no relationship to level of per pupil funding (dot density from bottom-right to top-right corner). Findings are based on 20,110 K-12 schools, enrolling 11.3 million students in 12,322 census tracts, and corroborate James Coleman's seminal 1966 finding in "Equality of Educational Opportunity" that educational outcomes are largely shaped by familial and social factors.



Geospatial Data to Measure Influence of Student Background

- *Why geospatial data?* Income-location correlation = 0.7*
- Customized interactive dashboards
- Geospatial data at the national, state, county, city/town, and census tract levels for enrolled students
- Student background correlation with K12 education, college attainment, socio-economics, socio-demographics, healthcare condition, housing, crime, and civic engagement
- Geographically mapped and tabulated data
- Identification of significant background factors associated with student academic outcomes at select geospatial levels
- -23 Composite Indices (~200 metrics)

Education (4) Economics (4) Healthcare (3) Social capital
Civic engagement Personal challenge
Crime (6) Social vulnerability (3 CDC Indices)



*Cohen, S.A., Nash, C.C., Byrne, E.N. et al. Income and rural–urban status moderate the association between income inequality and life expectancy in US census tracts. J Health Popul Nutr 42, 24 (2023).

Background Influence on Retention: Neighborhood Education

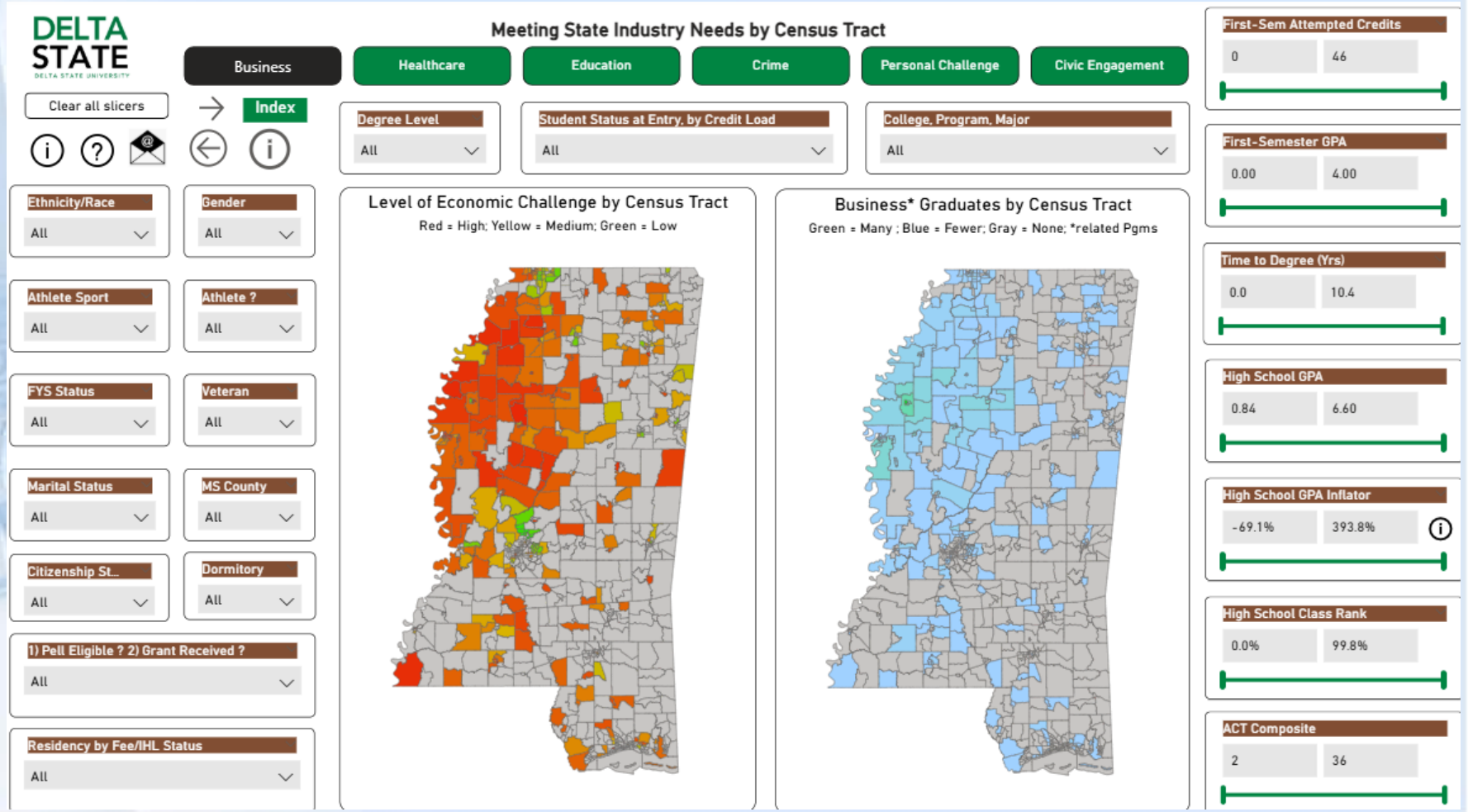
- *Percentage rate influence:*
- Education attainment = 9
- Education challenge = 14
- K-12 academic quality = 1-33
- K12 risk = 22
- Results control for residency status
- Significant diff in academic preparation
- Caveat: K-12 data based on smaller sample

Background Influence on Graduation: Neighborhood Crime

- *Percentage rate influence:*
- Personal crime = 8 to 17
- Property crime = 10 (F only)
- Youth-to-adult crime risk 4 yp 15 (M only)
- Crime risk + rate of single parent/teen births ~ 10 (F only)
- Results control for gender
- Significant diff in academic preparation

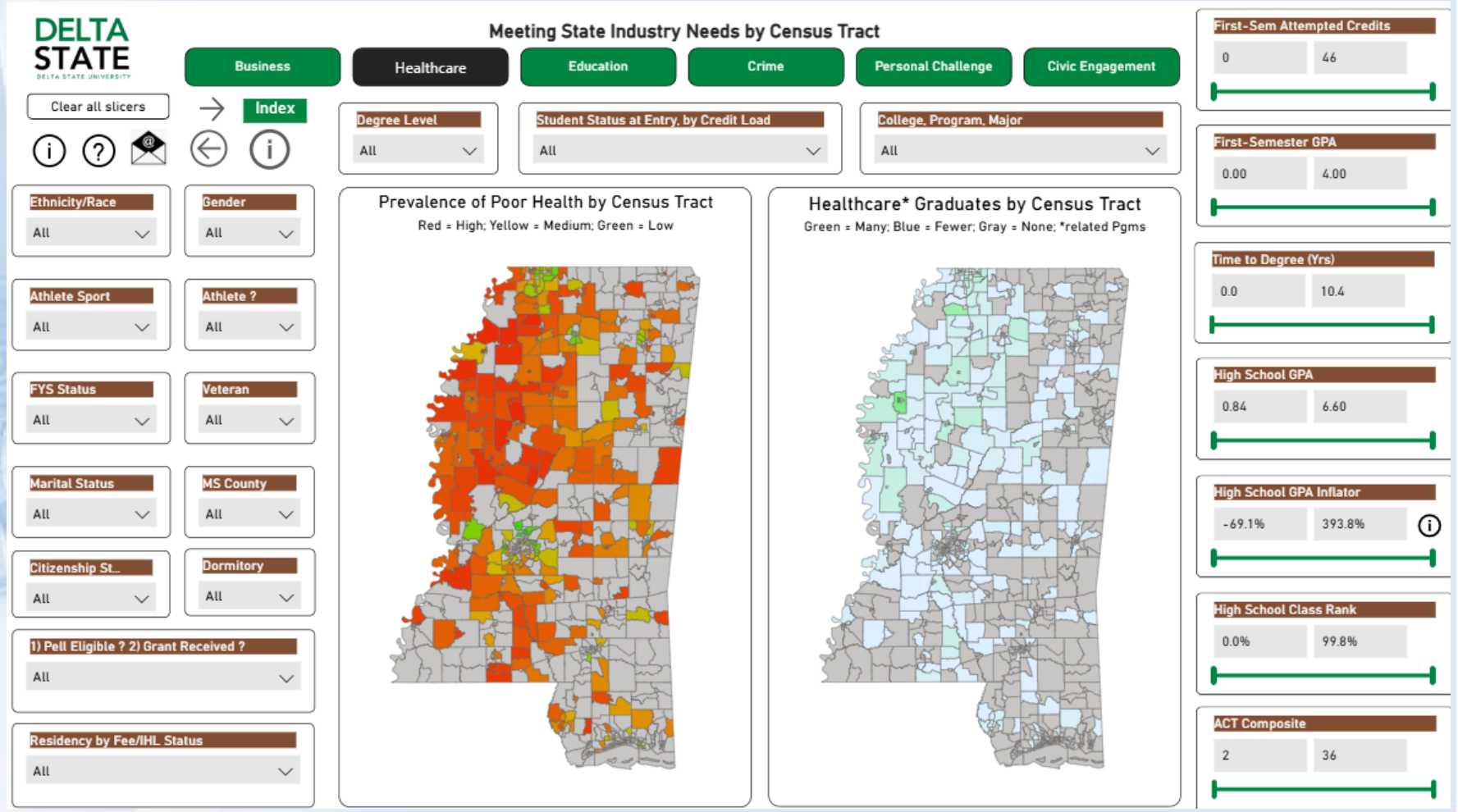
Meeting State Industry Needs: Business Development

Matching high-need areas with graduates holding Business and business-development degrees. Left map shows high-need areas (red), right map shows location of graduates based on last physical address. Purpose: Steer graduates to high-need areas and gauge contribution of graduates to local economy via online data portal.



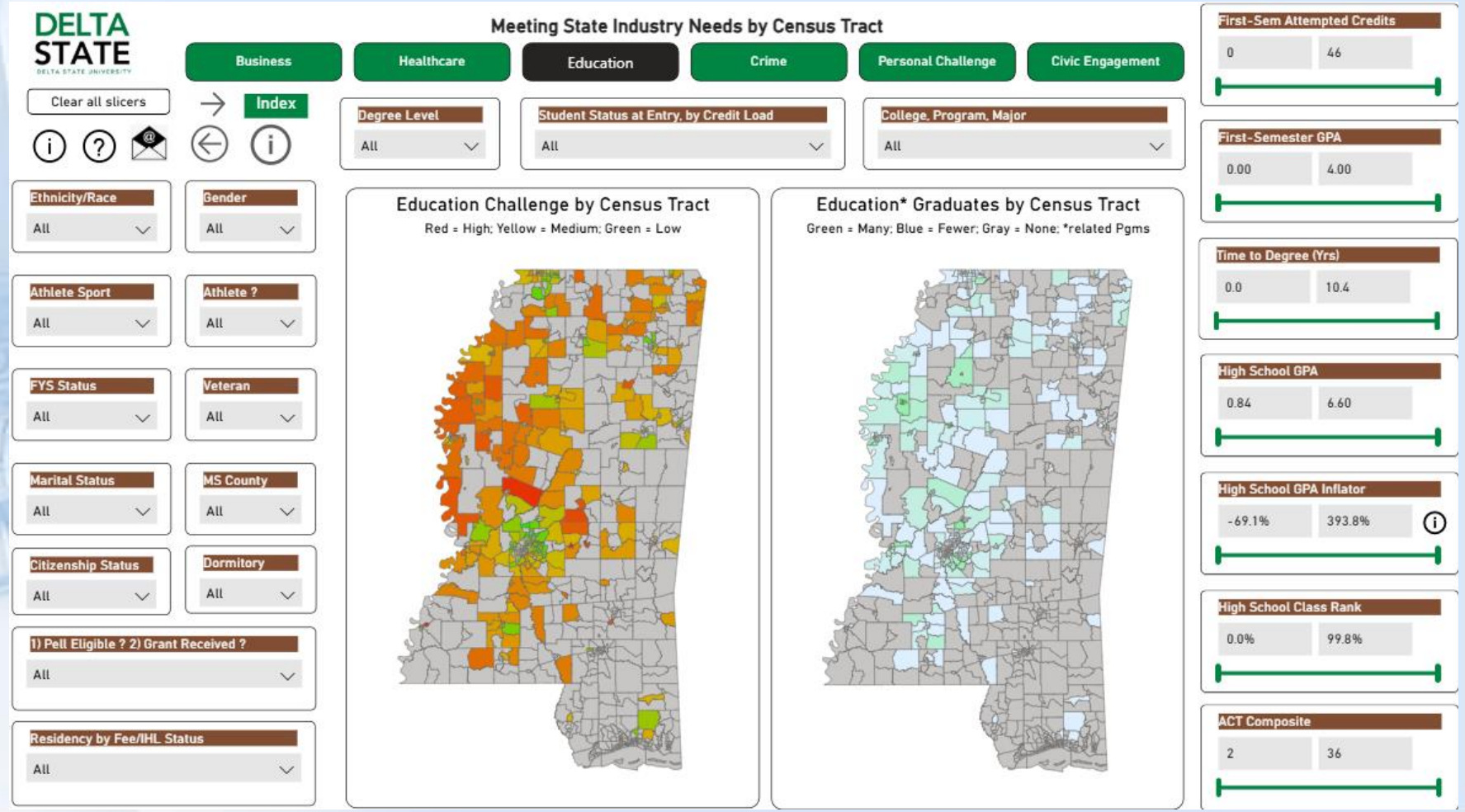
Meeting State Industry Needs: Healthcare Development

Matching high-need areas with graduates holding Healthcare and healthcare-related degrees. Left map shows high-need areas (red), right map shows location of graduates based on last physical address. Purpose: Steer graduates to high-need areas and gauge contribution of graduates to local economy via online data portal.



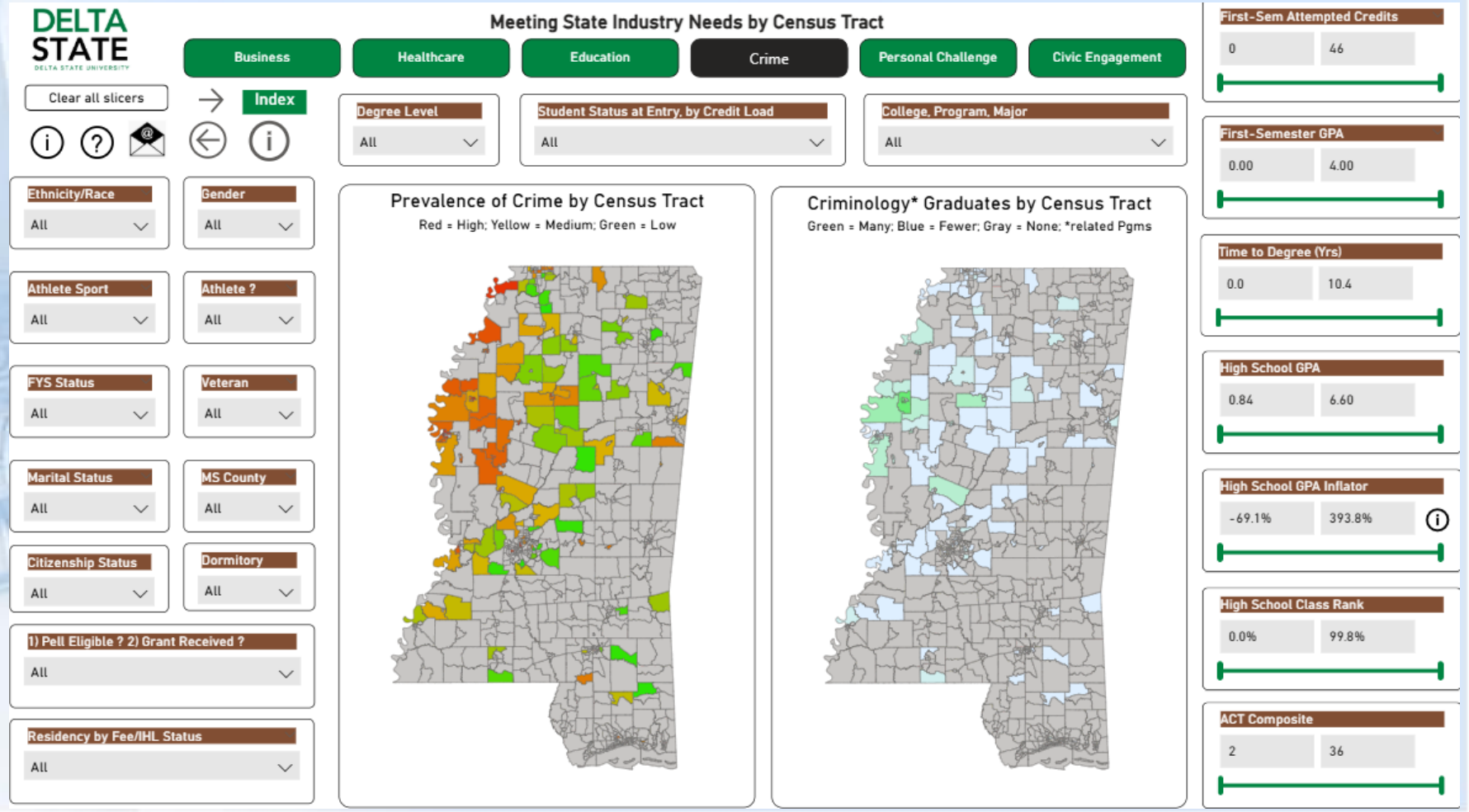
Meeting State Industry Needs: Education Development

Matching high-need areas with graduates holding Education and teaching-related degrees. Left map shows high-need areas (red), right map shows location of graduates based on last physical address. Purpose: Steer graduates to high-need areas and gauge contribution of graduates to local economy via online data portal.



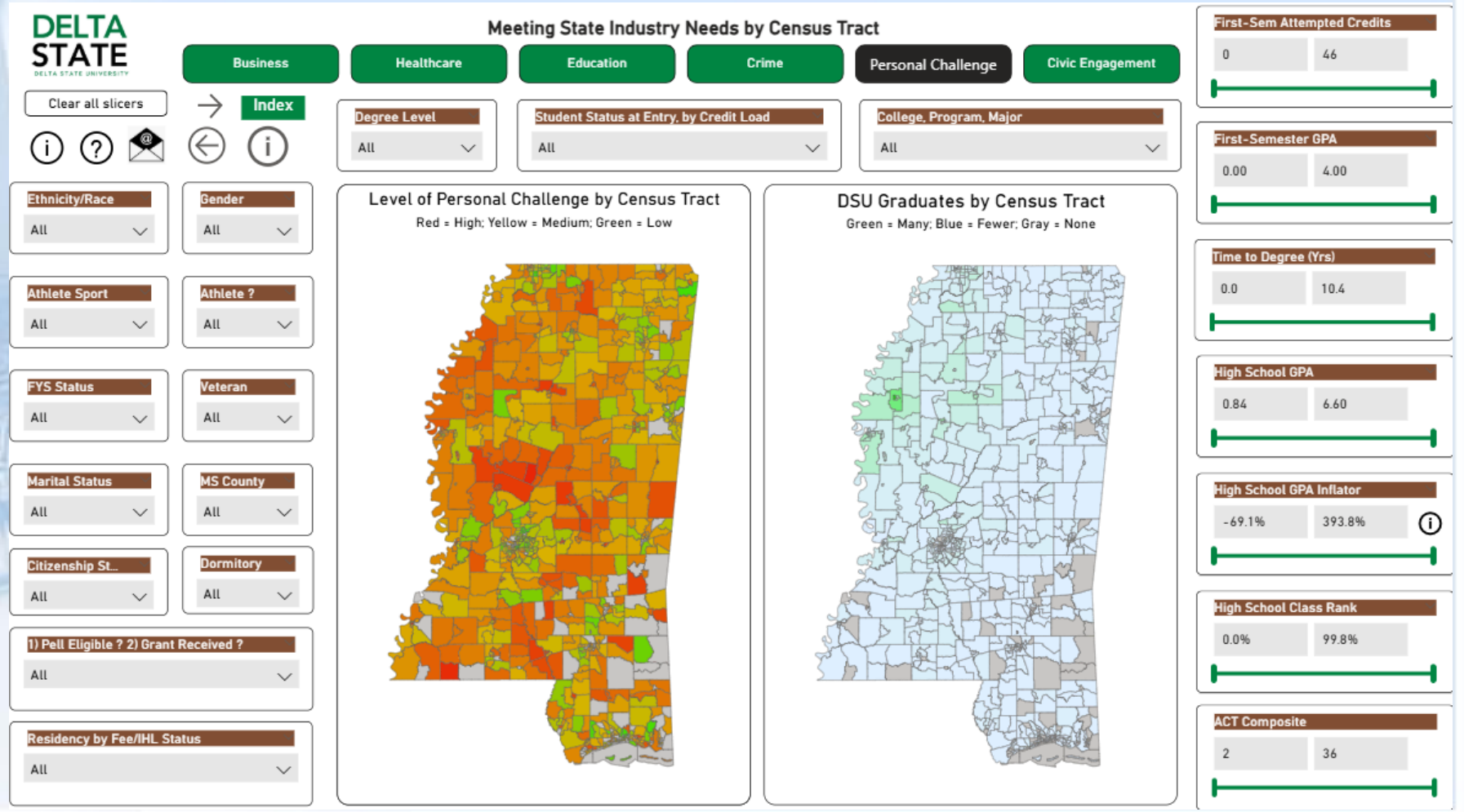
Meeting State Industry Needs: Crime Management & Prevention

Matching high-need areas with graduates holding Criminology and related degrees. Left map shows high-need areas (red), right map shows location of graduates based on last physical address. Purpose: Steer graduates to high-need areas and gauge contribution of graduates to local economy via online data portal.



Meeting State Industry Needs: Human Resource Development

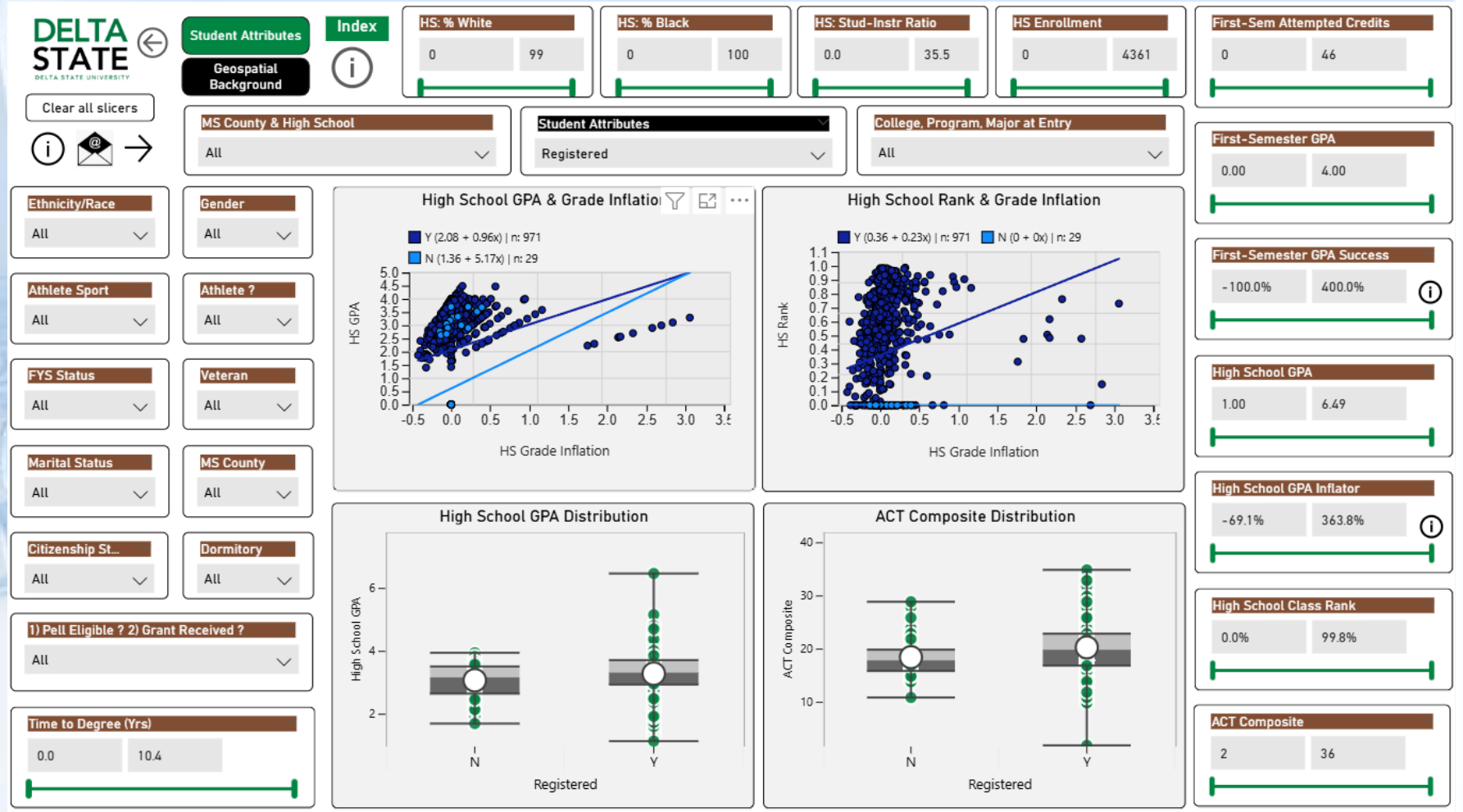
Matching high-need areas* with college graduates to enhance education and development of lifetime skills. Left map shows high-need areas (red), right map shows location of graduates based on last physical address. Purpose: Steer graduates to high-need areas and gauge contribution of graduates to local economy via online data portal.



*Prevalence of crowded households, single-parent homes, child disabilities, Veteran unemployment, high debt-to-income households, teenage pregnancies, income inequality, long job commuting (>1hr), and air pollution.

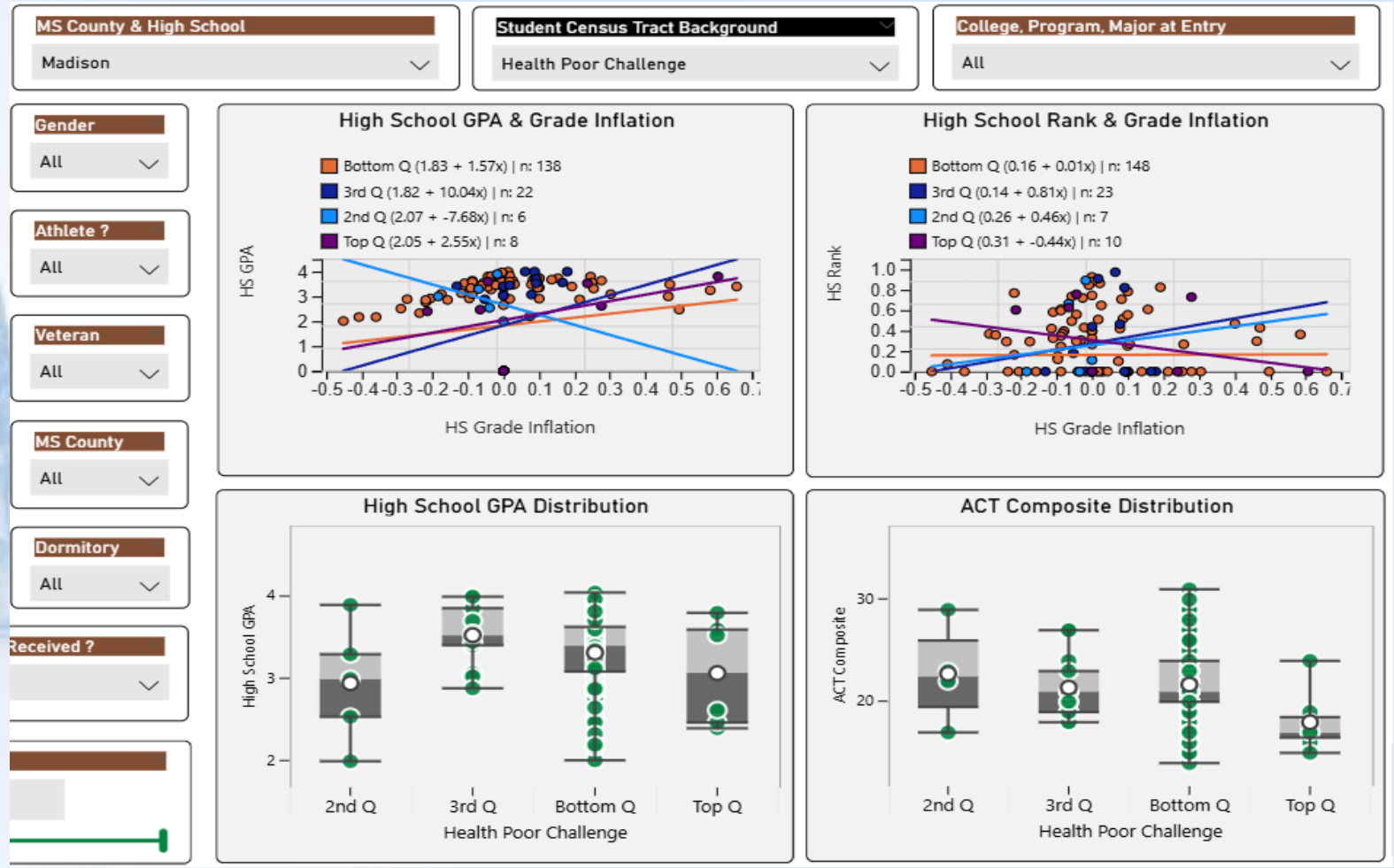
Getting Students Ready for College: Gauging Preparation

The high school GPA is positively correlated with grade inflation based on the GPA-standardized test score distribution. Juxtaposition of GPA with test scores by student attributes identifies correlation with potentially significant covariates. Example: Enrolled applicants are slightly better prepared with a larger variation than non-enrollees.



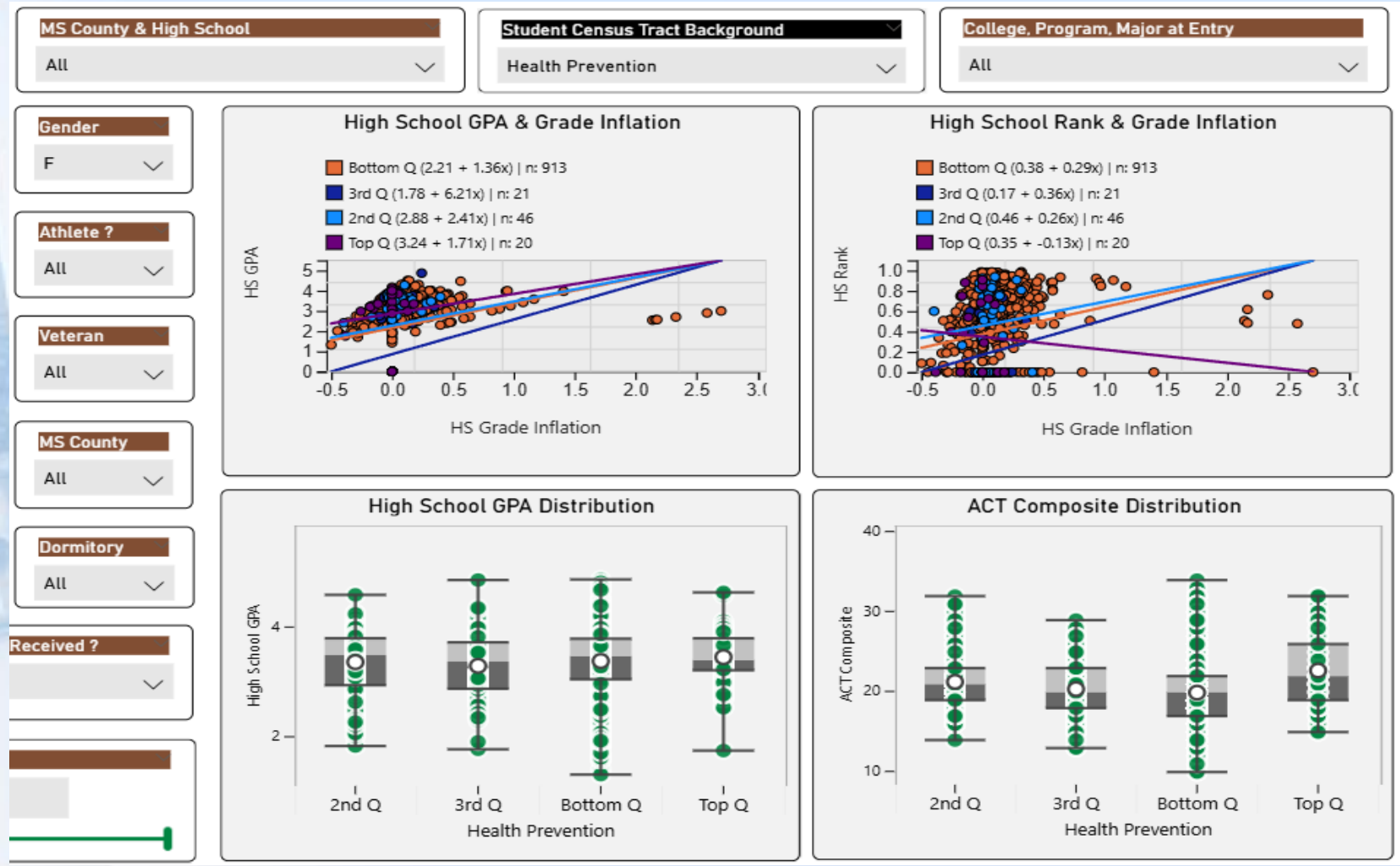
Getting Students Ready for College: Gauging Neighborhood Influences

High level of poor health in a student's geospatial neighborhood may negatively impact academic preparation. *Example: Madison County*. DSU applicants residing in areas with high levels of poor health have significantly lower academic preparation, which may also correlate with higher levels of HS grade inflation.



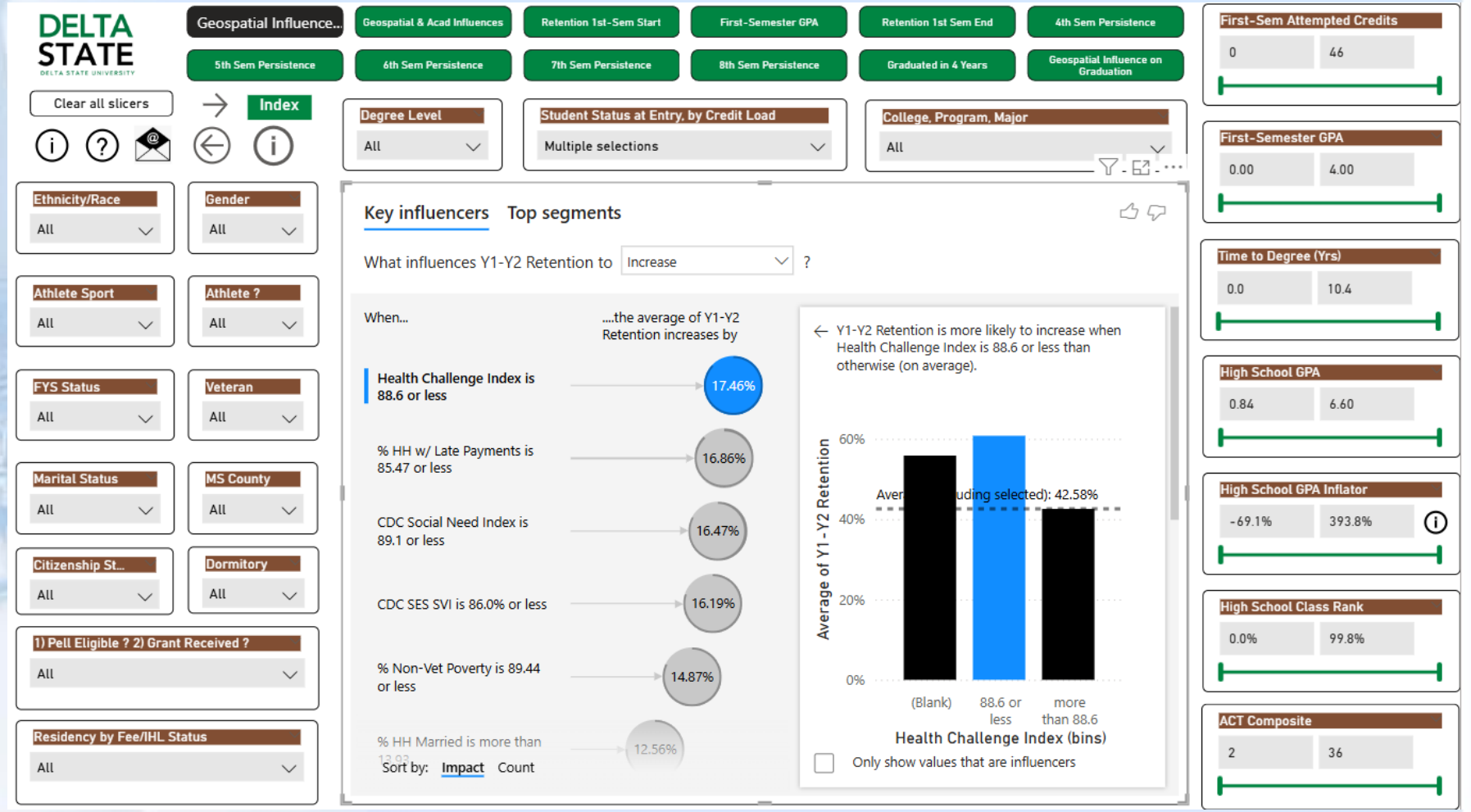
Getting Students Ready for College: Gauging Neighborhood Influences

Conversely, high level of preventive healthcare in a student's geospatial neighborhood is positively associated with academic preparation. *Example: Female students* have significantly higher test scores and higher HS GPAs compared to females residing in areas with lower preventive healthcare. Also, Top Q females' HS rank is not associated with grade inflation.



Predicting Student Retention: Gauging Neighborhood Influences

Significant neighborhood conditions associated with student retention. *Example: New Full-Time Freshmen*. Poor health lowers retention by 17%; household financial duress, high social need and low SES each reduces retention by 16%; high non-Veteran poverty increases it by15%; and low % of married households reduces retention by 12%.

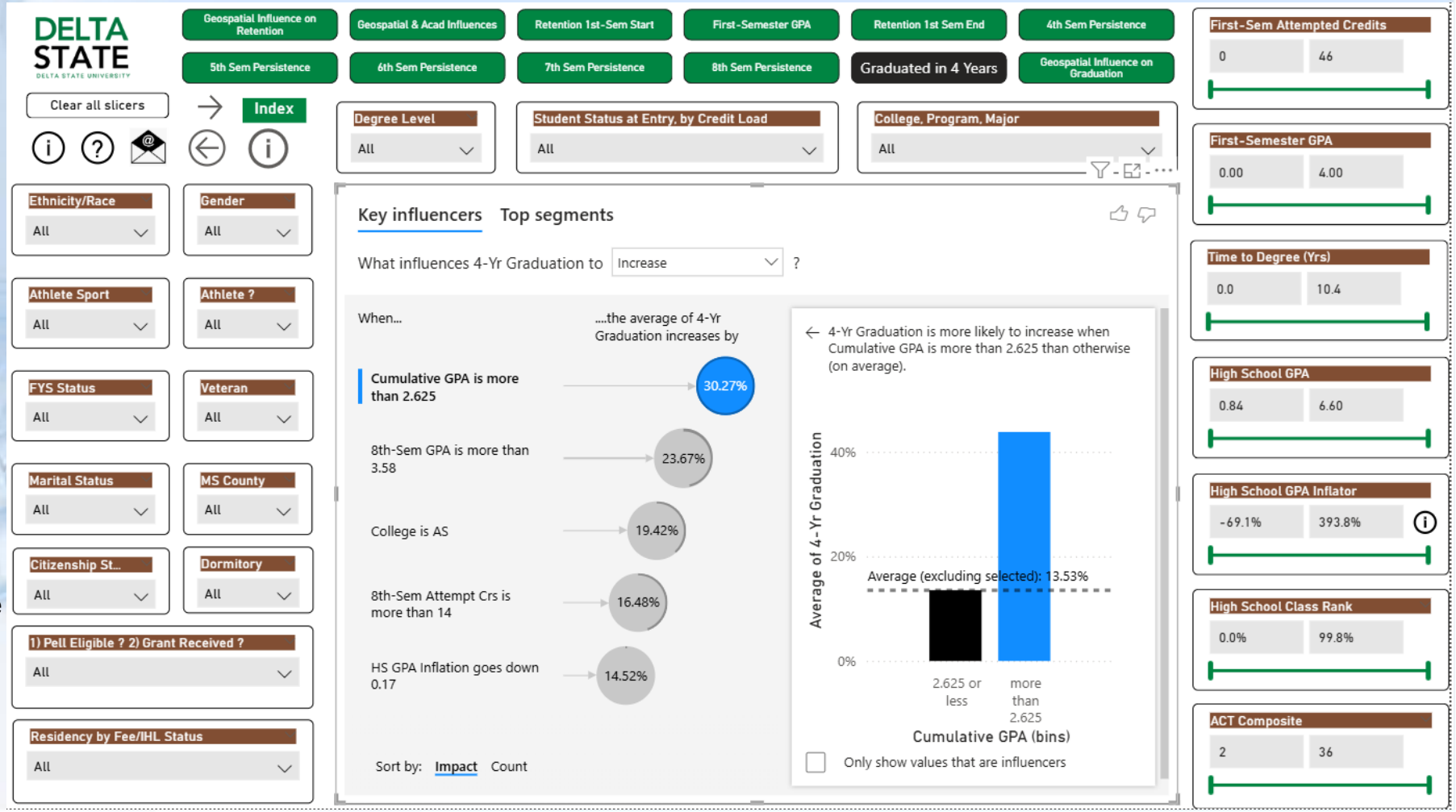


Predicting Student Graduation: Significant Measurable Factors

Significant factors after four years of continual enrollment:

1) Cumulative GPA > 2.63
2) 8th semester GPA >3.58
3) College of AS major
4) 8th semester attempted credits > 14
5) High school grade inflation < average

Key Takeaway: Academic experience outweighs student attributes and neighborhood influences



***** Benefits of Geospatial Data *****

- It can substitute for missing institutional data, enhance student data privacy
- Offers national, regional benchmarks at the “neighborhood” level
- Triangulation of KPIs via multiple internal and external data
- Enhanced data accuracy and validity of peer comparisons
- Illuminates and validates limitations of self-report survey data
- Post-graduate professional outcome data are indispensable to gauge degree ROI
- Complements alumni data to gauge industry (discipline) geospatial impact
- Institutional value-added measures rely on external sources for data normalization to enhance ROI documentation
  - •Corrects for misleading “equity” metrics (e.g., UC Berkeley)

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