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COMMENTARY

Consequences of Mandated Mathematics and Science Course Graduation Requirements

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In 1981, the National Commission on Excellence in Education (NCEE) examined the relationship between college admission requirements and student achievement in high school, reporting serious concerns with the preparation of high school graduates for college. Within a year twenty-six states had raised graduation requirements in response to the NCEE report. Mathematics and science were areas of particular concern and by 1989 forty-two states increased high school course graduation requirements (CGRs) in mathematics, science, or both.

These changes were intended to support improved achievement and to better prepare high school students for college. However, there were also concerns that higher CGRs could lead to increased high school dropout for students who were ill-prepared for more demanding coursework. To better understand both the intended and unintended effects of these policy changes, we examined the impact of state mandated mathematics and science CGRs on three outcomes:

- Failing to complete high school
- Beginning college but not necessarily completing a degree, conditioned on having graduated high school
- Obtaining any college degree, conditioned on having begun college

Data from the 1990 and 2000 Decennial Censuses and 2001-2011 waves of the American Community Survey were paired with state mathematics and science CGR data (n = 2,892,444). We included individuals who graduated within five years of a requirement's change in each state, which created a data set that allowed us to model the impact of the CGR changes over time. The whole population was examined first, after which a series of analyses conditioned on demographic characteristics like sex and race/ethnicity were performed to assess possible differences between groups. We also ran confirmatory analyses using the 1986–2000 waves of the Current Population Survey (CPS), which allowed us to also examine individual response to the CGR changes as they were occurring.

Individuals exposed to higher CGRs were more likely to drop out of high school in both our main and confirmatory analyses. We predicted that across the whole population the highest CGRs were associated with a 1.1 percentage point increase in the dropout rate, up from a dropout rate of 8.6% for those with no mandated CGR. Some groups were harder hit; for example the rate for some Black men increased by 1.9 points in response to the highest CGRs.

There was no overall impact for college enrollment, but CGR changes were associated with a decrease, rather than an increase, in the likelihood for Black women and Hispanic men and women to begin college after completing high school. However, higher

CGR was also associated with some benefit for these groups; some Black women and Hispanic men and women who were less likely to have moved between states as children were more likely to obtain a degree if they did graduate high school and then go on to start college when exposed to higher CGRs. The rate of completion increased by 6.4 points for Hispanic men and 5.32 points for Hispanic women, up from an average of 56.6% and 63.7%, respectively.

Raising mathematics and science CGRs did not seem to lead to broad short term benefit, and the increase in high school dropout is a serious negative unintended consequence. Despite being based on historical data, our findings highlight the importance of anticipating unintended consequences when making wide-ranging policy changes across diverse populations, and remain relevant today. In particular, implementing Common Core Standards and NRC Science Standards recommendations for more demanding content and more rigorous graduation requirements in science and mathematics will also likely require proactively incorporating appropriate academic and psycho-social supports for students who might be ill-prepared.

The full study can be found in Andrew D. Plunk, William F. Tate, Laura J. Bierut and Richard A. Grucza, "Intended and Unintended Effects of State-Mandated High School Science and Mathematics Course Graduation Requirements on Educational Attainment, Educational Researcher, June/July 2014 vol. 43 no. 5 230-241.

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