



# High School Start Times and Student Outcomes: Evidence from North Carolina

Presentation to the House Select Committee on Education Strategies and Practices  
October 18, 2016

Kevin C. Bastian and Sarah C. Fuller



THE UNIVERSITY  
*of* NORTH CAROLINA  
*at* CHAPEL HILL

Education Policy Initiative  
*at* Carolina



# Background

---

- As of 2011-12 average middle and high school start time in the US was 8:03am
- 42 states reported 75-100% of middle and high schools starting before 8:30am
- Only 18% of middle and high schools started at 8:30am or later
  
- American Academy of Pediatrics recommendation (2014)
- Zzz's to A's Resolution—US House of Representatives (2007)
  
- Barriers to changing school start times
  - Transportation schedules and costs
  - After-school activities (e.g. athletics, jobs)
  - Parental work schedules and child care



# Prior Research

---

- Sleep
  - Later start times associated with more hours of student sleep
- Absences
  - More absences in first period courses (overall)
  - Later start times associated with increased school attendance
- Course grades
  - Lower grades in first period courses (overall)
  - Later start times associated with higher grades in core courses
- Student test scores
  - Lower scores on exams linked to first period courses (overall)
  - Later start times associated with higher scores on standardized exams
  - Benefits may be largest for disadvantaged students
  - Insignificant results for the ACT
- Road safety
  - Later start times associated with reduced car crashes



# Our Work

---

- Approached by the NC General Assembly to investigate high school start times and student outcomes in NC
- Data on high school start times in NC from 2009-10 through 2014-15
- Start times data limitations
- Five student outcomes
  - End-of-Course exam scores
  - ACT scores
  - Absences
  - Suspensions
  - Course grades
- Run overall models and models to see if later start times benefit economically-disadvantaged students
- Control for many student, classroom, and school characteristics

# High School Start Times in NC

School Characteristics	Overall	7:30 and Before	7:31 to 8:00	8:01 to 8:30	After 8:30
School Start Time	7:59	7:21	7:56	8:19	8:51
School Size	1012.38	1338.54	821.86	939.96	1132.45
City	28.66	63.64	3.68	15.22	69.82
Suburban	8.89	3.72	12.93	5.29	13.51
Town	8.33	3.51	11.15	12.47	0.00
Rural	54.12	29.13	72.24	67.02	16.67
Percent Economically-Disadvantaged	47.71	40.91	52.50	47.36	46.03
Percent Minority	45.35	57.14	37.19	41.58	56.64
Performance Composite	61.24	63.23	59.98	60.27	63.52
Exceeds Growth	32.78	40.07	27.97	29.24	40.88
Meets Growth	31.22	25.89	31.28	38.63	27.01
Does Not Meet Growth	36.00	34.04	40.75	32.13	32.12
Short-Term Suspension Rate (Per 100)	28.94	29.63	28.24	26.44	35.25
Average Teacher Salary Supplements	3036.35	4379.70	2111.25	2553.44	4427.39
Unique School Count	410	104	165	99	49
School-by-Year Count	1981	489	797	473	222

# EOC Exam Scores

	Algebra I/Math I	Biology	English I/English II
<i>Overall Models</i>			
Start Time	0.008	<b>-0.038*</b>	-0.005
7:31 to 8:00	0.006	-0.025	0.001
8:01 to 8:30	0.001	-0.010	0.015
After 8:30	0.012	<b>-0.085**</b>	-0.019
<i>Impacts on Economically-Disadvantaged Students (EDS)</i>			
7:31 to 8:00	0.000	-0.036	0.007
8:01 to 8:30	-0.012	-0.017	0.016
After 8:30	-0.005	<b>-0.076*</b>	-0.015
7:31 to 8:00*EDS	0.009	0.025	-0.014
8:01 to 8:30*EDS	0.024	0.015	-0.003
After 8:30*EDS	0.028	-0.023	-0.009
Observations	427,999	466,400	502,606

Note: Results are in reference to schools that start at 7:30 or earlier

# ACT Scores

	ACT Composite	ACT English	ACT Reading	ACT Math	ACT Science
<i>Overall Models</i>					
<b>Start Time</b>	0.129	0.170	0.113	0.117	<b>0.133<sup>+</sup></b>
<b>7:31 to 8:00</b>	-0.050	-0.059	-0.139	0.052	-0.063
<b>8:01 to 8:30</b>	-0.105	-0.085	-0.132	-0.112	-0.091
<b>After 8:30</b>	0.247	0.301	0.218	0.241	<b>0.253<sup>+</sup></b>
<i>Impacts on Economically-Disadvantaged Students (EDS)</i>					
<b>7:31 to 8:00</b>	-0.251	-0.258	<b>-0.334<sup>+</sup></b>	-0.162	<b>-0.272<sup>+</sup></b>
<b>8:01 to 8:30</b>	<b>-0.263<sup>+</sup></b>	-0.249	-0.260	<b>-0.319<sup>*</sup></b>	<b>-0.236<sup>+</sup></b>
<b>After 8:30</b>	<b>0.355<sup>+</sup></b>	0.436 <sup>+</sup>	0.339	0.316	<b>0.339<sup>+</sup></b>
<b>7:31 to 8:00*EDS</b>	<b>0.484<sup>**</sup></b>	<b>0.474<sup>**</sup></b>	<b>0.470<sup>**</sup></b>	<b>0.520<sup>**</sup></b>	<b>0.506<sup>**</sup></b>
<b>8:01 to 8:30*EDS</b>	<b>0.383<sup>*</sup></b>	<b>0.390<sup>*</sup></b>	<b>0.311<sup>+</sup></b>	<b>0.504<sup>**</sup></b>	<b>0.354<sup>**</sup></b>
<b>After 8:30*EDS</b>	-0.297	-0.374	-0.331	-0.206	-0.241
<b>Observations</b>	324,813	325,846	325,341	325,670	325,063

Note: Results are in reference to schools that start at 7:30 or earlier

# Student Absences, Suspensions, and Grades

	Absences	Ever Suspended	Grades	1 <sup>st</sup> Period Grades
<i>Overall Models</i>				
Start Time	0.255	<b>0.928<sup>+</sup></b>	0.018	0.011
7:31 to 8:00	<b>-0.431<sup>+</sup></b>	<b>1.128<sup>+</sup></b>	<b>0.044<sup>*</sup></b>	0.036
8:01 to 8:30	-0.245	1.011	0.005	0.015
After 8:30	<b>0.648<sup>*</sup></b>	0.914	0.036	0.008
<i>Impacts on Economically-Disadvantaged Students (EDS)</i>				
7:31 to 8:00	0.024	<b>1.206<sup>**</sup></b>	-0.005	-0.000
8:01 to 8:30	0.353	1.084	-0.028	-0.006
After 8:30	<b>0.937<sup>**</sup></b>	<b>0.886<sup>+</sup></b>	-0.013	-0.014
7:31 to 8:00*EDS	<b>-1.022<sup>**</sup></b>	<b>0.896<sup>*</sup></b>	<b>0.109<sup>**</sup></b>	<b>0.078<sup>**</sup></b>
8:01 to 8:30*EDS	<b>-1.345<sup>**</sup></b>	<b>0.891<sup>*</sup></b>	<b>0.076<sup>**</sup></b>	<b>0.047<sup>*</sup></b>
After 8:30*EDS	<b>-0.661<sup>*</sup></b>	1.051	<b>0.111<sup>**</sup></b>	<b>0.048<sup>+</sup></b>
Observations	1,989,692	2,051,609	1,574,541	607,658

Note: Results are in reference to schools that start at 7:30 or earlier



# Summary

---

- Little evidence of later start times impacting EOC scores; suggestive results for economically-disadvantaged students in algebra I
- Some evidence that later start times—particularly after 8:30am and for economically-disadvantaged students—predict higher ACT scores
- Robust evidence that later start times predict absence, suspension, and course grades results for economically-disadvantaged students

# Unanswered Questions

---

- Replication of results when comparing within schools?
- What would this mean for other school levels (elementary, middle) in a district?
- Perceptions of stakeholders—what works, what doesn't, and how can the transition to later start times be better?