WHY DO I HAVE TO REPEAT ALGEBRA IN COLLEGE?

THE EQUITY COST OF COLLEGE READINESS STANDARDS MISALIGNMENT

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The Mathematics of Opportunity
University of California Berkeley
November 5, 2018

This research was supported by a grant from the National Science Foundation Early-Concepts Grant for Exploratory Research (EAGER) initiative (#1544254). The opinions of the research do not necessarily represent the views of the granting agency.

Problem Statement

- Over 60% of low-income and minoritized students first enroll at a community college (Dalton, Ingels, & Fritch, 2016)
- About 70% of high school students are placed in developmental math as they transition to community college
- A recent meta-analyses of rigorous studies evaluating developmental math on a number of educational outcomes suggest that students are not benefitting from these courses (Valentine, Konstantopoulos, & Goldrick-Rab, 2017)

Use Linked Transcript Data to Explore the Equity Costs of Inter-Sector Misalignment in Math (ISMM)

- Nationwide, there seems to be agreement towards using high school transcript information to place students in developmental education
  - Formal data linkages between high school and community college districts are not common place (Dynarski & Berends, 2015)

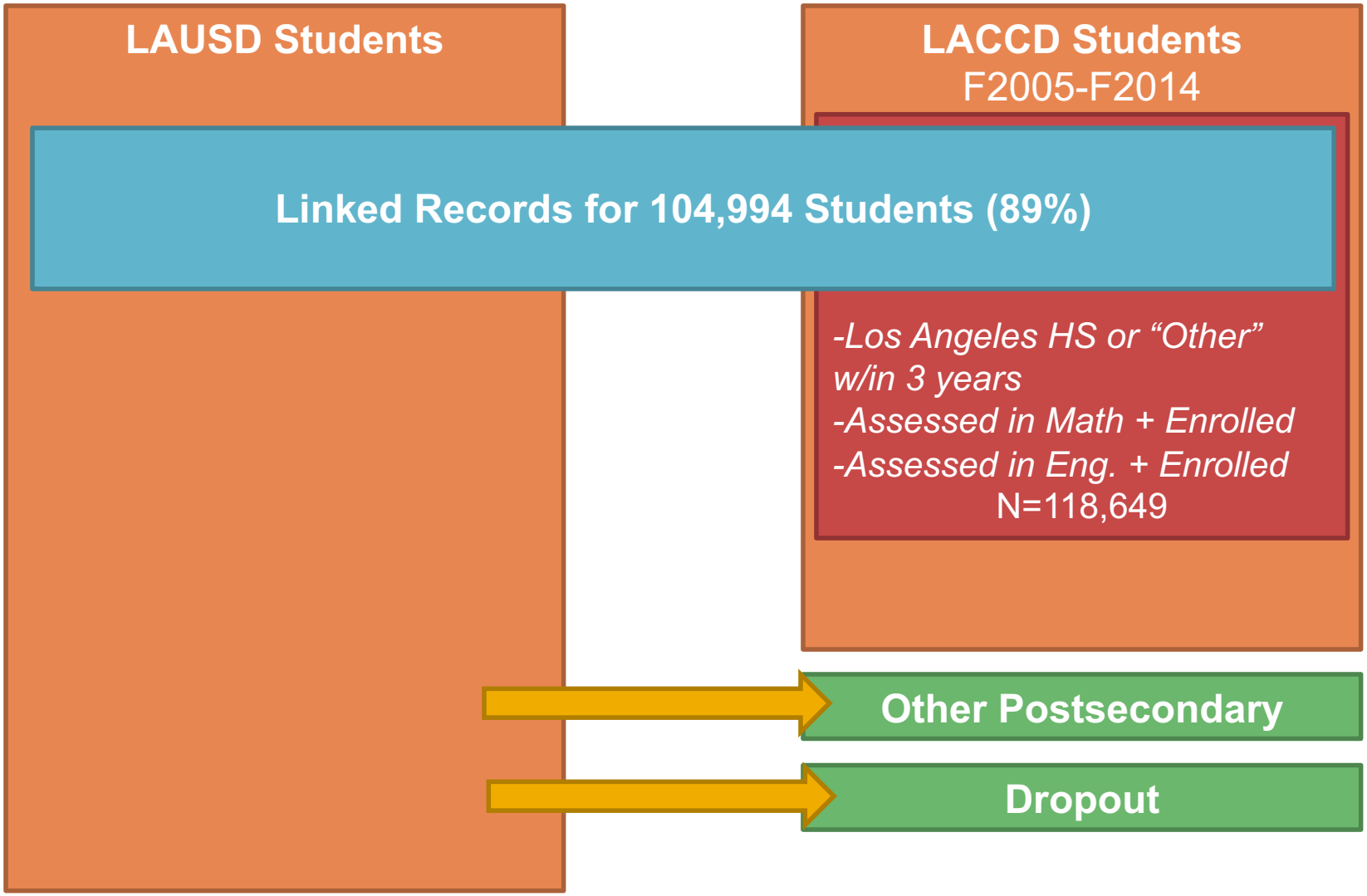
- In the context of a Research-Practitioner Partnership (RPP), we leverage access to a linked transcript dataset between two large urban high school and community college districts (LUSD, LUCCD) to explore the equity costs of inter-sector misalignment in math (ISMM)

Inter-sector Math Misalignment (ISMM)

1. ISMM: the proportion of students who, according to their high school transcripts and high school standards, were deemed “college ready” in math but were placed in developmental math when they transitioned to community college.

2. Explore whether the problem is more pronounced for racially minoritized students, as a way to measure the *equity costs of inter-sector math misalignment*.

Overview of Data



Focal Sample

Includes students who have a cumulative GPA and an 11th grade CST result, whose highest math was algebra 2 or higher, and who received a college math placement.

LAUSD Data

- Demographics
- CA High School Exit Exam (CAHSEE) scores (math, ELA)
- California Standards Test (CST) scores (math, ELA, science, social science)
- Early Assessment Program
- GPA
- Transcripts (All courses taken and grades)
- Special Education

LACCD Data

- Demographics
- Placement Test Scores in Math and English
- Credits Attempted/Completed by Term
- Transcripts/Enrollments (All courses taken and grades)
- Degree Outcomes through fall 2016

ISMM Affects All Students

Table. College math placement by college-readiness indicator (%)							Inter-Sector Math Misalignment	
	College Math Placement						% Placed in Dev. Math	ISMM: Minor (<25%) Moderate (25-50%) Substantial (50-75%) Severe (>75%)
	Basic Math	**Arith-metic**	**Pre-Algebra**	**Algebra 1**	**Algebra 2**	**Transfer-Level**		
Cumulative HS GPA								
2.7-3.7	*0*	9	17	24	33	17	*50*	*Substantial*
>3.7	*0*	3	9	11	32	46	*22*	*Minor*
Total	*0*	9	16	23	33	18	*49*	*Moderate*
Last HS Math Course								
Algebra 2	1	18	24	30	24	3	73	*Severe*
Trig/Pre-Calculus	0	8	17	23	35	17	*48*	*Moderate*
Statistics	0	8	14	20	36	22	*42*	*Moderate*
Calculus	0	2	8	10	31	48	*21*	*Minor*
Total	1	14	20	26	28	11	*60*	*Substantial*

Evidence of Equity Costs of ISMM

Table. College math placement by college-readiness indicators, disaggregated by race (%)							Inter-Sector Math Misalignment	
	College Math Placement						% Placed in Dev. Math	ISMM: Minor (<25%) Moderate (25-50%) Substantial (50-75%) Severe (>75%)
	Basic Math	Arith-metic	Pre-Algebra	Algebra 1	Algebra 2	Transfer-Level		
Highest HS Math (>B)								
Asian	0	4	8	14	34	40	26	Moderate
Black	2	28	24	23	19	4	77	Severe
Hispanic	0	14	23	26	28	9	64	Substantial
White	0	5	6	18	37	34	29	Moderate
11th Grade CST Math: Proficient or Advanced								
Asian		0	2	4	24	70	6	Minor
Black		4	11	7	40	38	22	Minor
Hispanic		2	9	9	40	40	19	Minor
White		0	2	5	29	64	7	Minor
Total		1	6	7	35	51	14	Minor

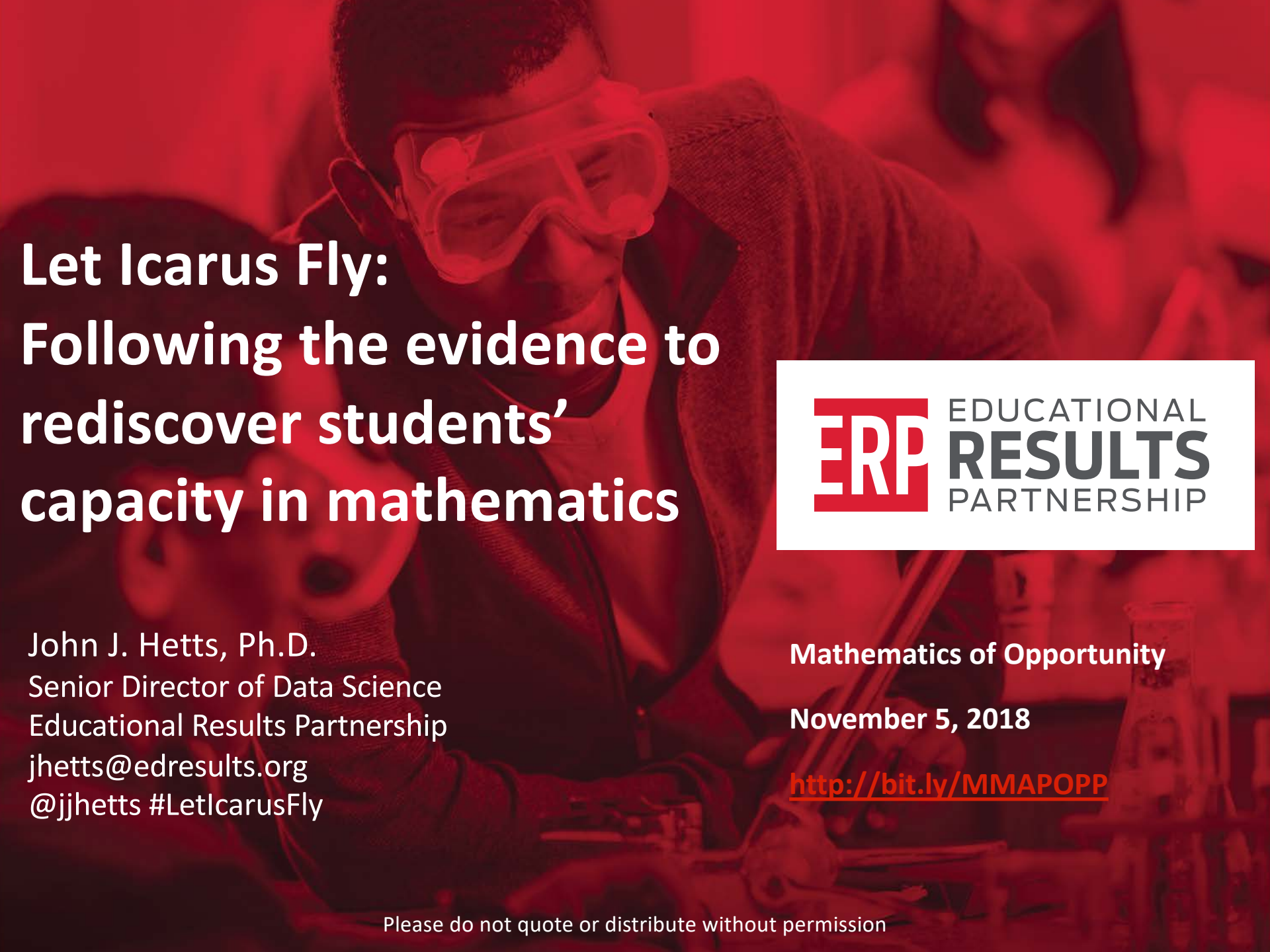
Discussion

- Initial results show many “college-ready” students were placed in lower-level math courses after A&P processes
  - → Inefficiencies in transition to college with substantial equity costs
  - → Need to find better measures for math placement
- We found evidence that the cost of inter-section misalignment and lack of college-ready standards at the time affected more African American and Latino students than their Asian American and White peers
- California recently passed AB 705 that requires colleges to place students in math and English level courses directly. This is a step in the right direction but the potential of real change lies on the college-level implementation

The Cost of Inter-Sector Misalignment for English Language Learners and STEM Aspiring Student

- Melguizo, T., Flores, S.M., Carrol, T., & Velasquez, D. (In progress). Identifying secondary school to community college curricular misalignment for English Learners: Race, ethnicity, language fluency. Rossier School of Education, University of Southern California.

- Park, E.S., Ngo, F., & Melguizo, T. (In progress). The role of misaligned math in helping or hindering STEM-aspiring students in community colleges. Rossier School of Education, University of Southern California.



Let Icarus Fly: Following the evidence to rediscover students' capacity in mathematics

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ERP EDUCATIONAL RESULTS PARTNERSHIP

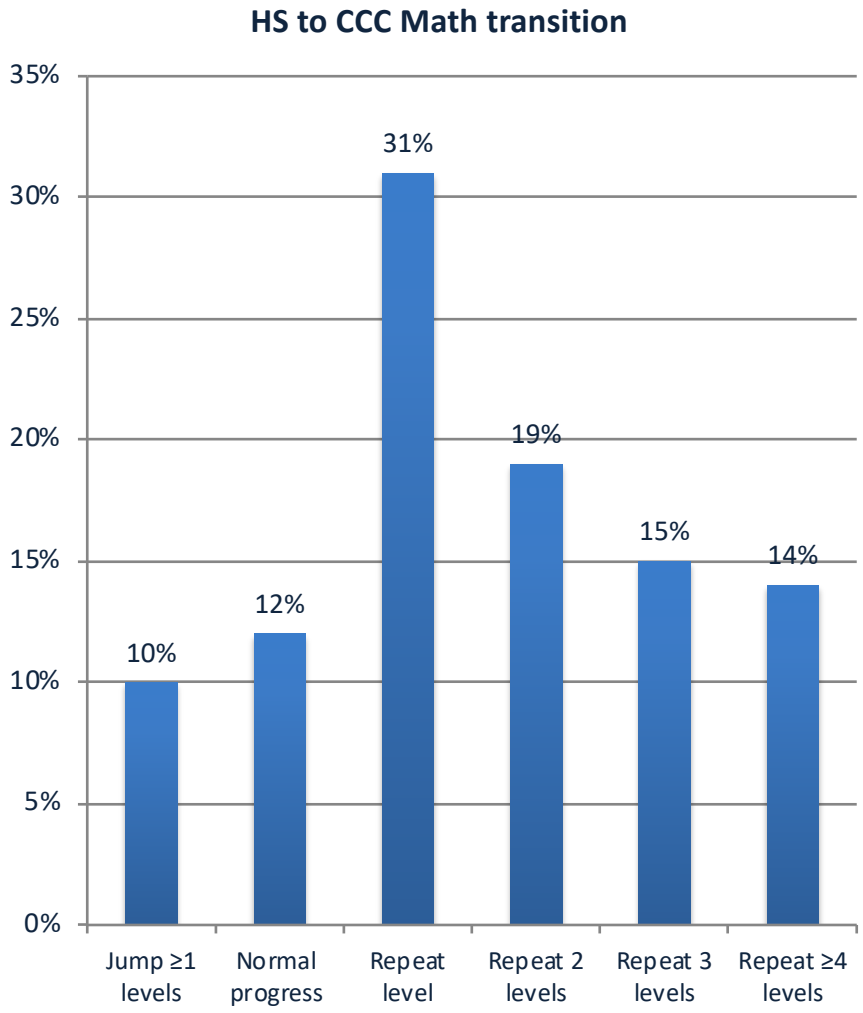
Mathematics of Opportunity

November 5, 2018

http://bit.ly/MMAPOPP

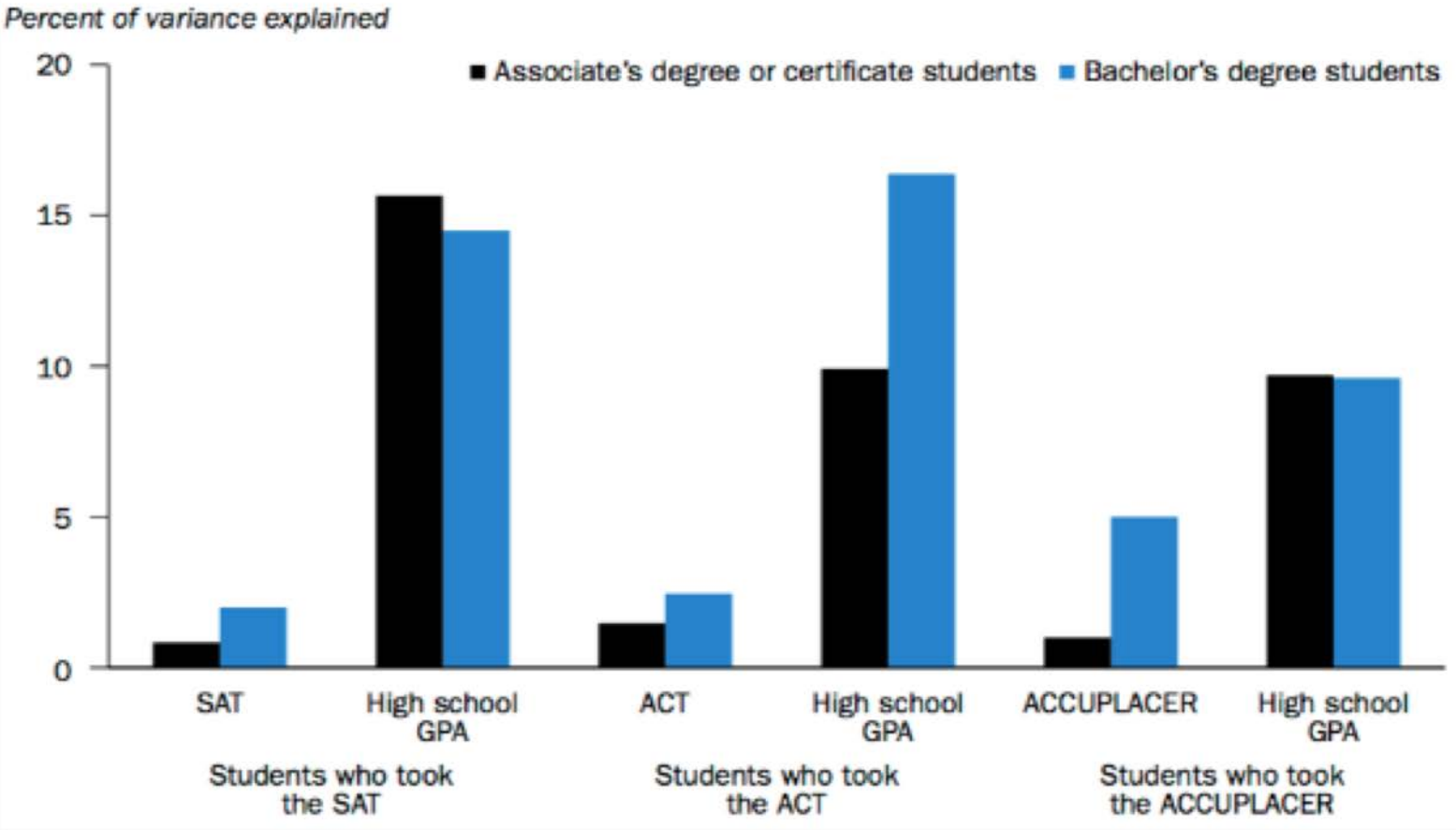
Transitions & intersegmental trust – K12 to CCC

- **Within systems**
  - **Highly reliable progression with C or better**
- **Between systems**
  - ~3/4 repeat ≥ 1 level, e.g.,
    - 76% of students who successfully complete Algebra 2
    - 68% of students w/B or better
    - 60% of students w/As
  - ~1/2 repeat ≥ 2 levels, e.g.,
    - 47% of students who successfully complete PreCalculus
    - 39% of students w/B or better
    - 33% of students w/As



Accuplacer, SAT, ACT - Alaska

Figure 7. Among University of Alaska students who enrolled directly in college math courses, high school grade point average explained more of the variation in college math grades than did exam scores, 2008/09–2011/12



From Hodara, M., & Cox, M. (2016), **Developmental education and college readiness at the University of Alaska**: http://bit.ly/HSGPAAK

Multiple Measures Assessment Project

- Ongoing, collaborative effort of CCCCO, Common Assessment Initiative (CAI), Cal-PASS Plus (Educational Results Partnership), RP Group and now >90 CCC pilot colleges
- Identify, analyze, & validate multiple measures data (including HS transcript data, non cognitive variable data, & self-report HS transcript data
- Predict course success using classification & regression tree models
  (robust to missing data, non-linear effects, and interactions)
  - Very conservative approach: identify students with success rate ≥70%
- Engage pilot colleges to conduct local replications, test models and pilot use in placement, and provide feedback

bit.ly/MMAP2018

MMAP Placement/Support Recommendations: Mathematics

Placement	Statistics	Precalculus
Entry-level transfer-level courses (Direct placement)	**HSGPA ≥ 3.0** **OR** **HSGPA ≥ 2.3 and ≥C in Precalculus**	**HSGPA ≥ 3.4** **OR** **HSGPA ≥ 2.6 and enrolled in Calculus**

bit.ly/RulesMMAP

bit.ly/Bahr2017

Differences Between Students Placed Traditionally and Students Placed by MMAP

Comparison Group	Comparison Metric	Difference
Students in transfer-level courses by previously methods in same term	**Success rates**	**MMAP success rates equal**

bit.ly/MMAPSummary2017

Adapting MMAP to AB 705

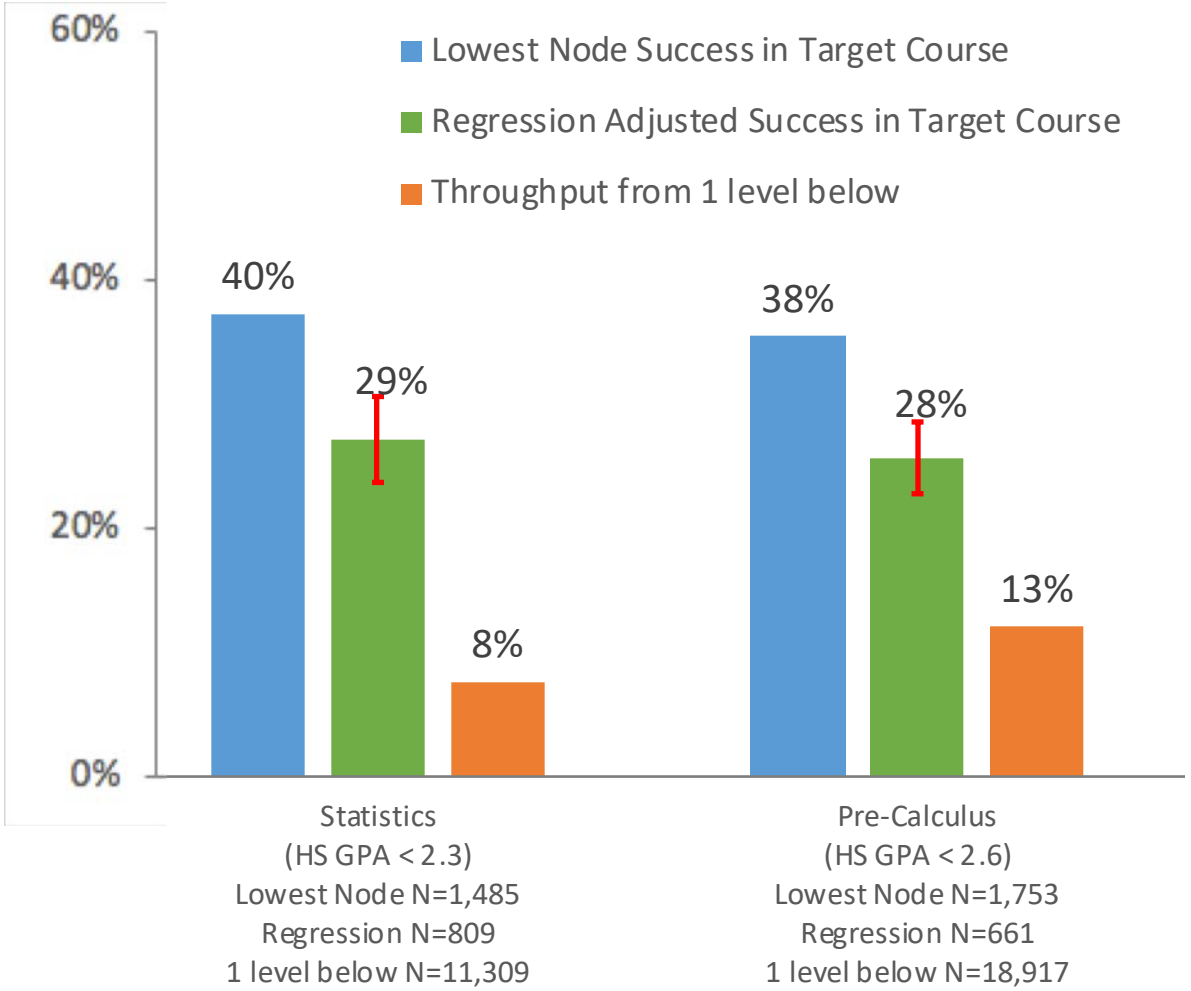
- MMAP decision trees identified students highly likely to succeed
  - ≥70% probability of success in transfer-level
- Now, only can be assigned to dev ed if:
  - *highly unlikely* to succeed at the transfer-level class AND
  - probability of successful completion of transfer-level course within one year (*throughput*) is maximized
- Have to examine students least likely to succeed based on HS performance (lowest GPA)

Likelihood of success: Mathematics

Placement	Statistics	Precalculus
Highly likely to succeed (Direct placement)	**HSGPA ≥ 3.0** **OR** **HSGPA ≥ 2.3 and ≥C in Precalculus**	**HSGPA ≥ 3.4** **OR** **HSGPA ≥ 2.6 and enrolled in Calculus**

bit.ly/MMAPMathTrees

Transfer-Level Course Completion in One Year from First Class in Discipline (error bars represent ±1 se)



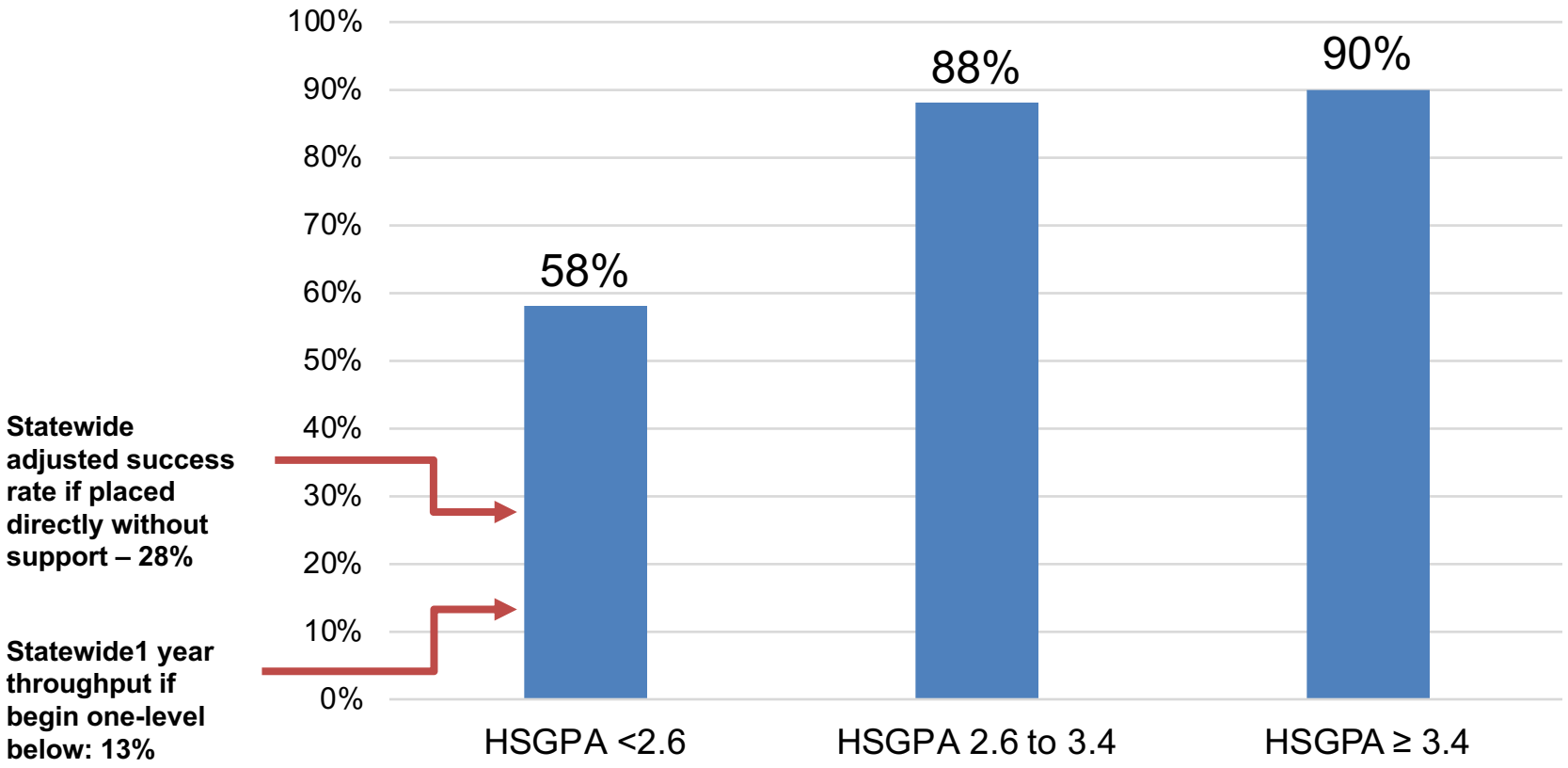
bit.ly/AB705Adjustments

Placement/Support Recommendations: Transfer-level Mathematics for Everyone

Support Recommendation	**Transfer-Level Statistics/Liberal Arts Mathematics**	**Entry-level BSTEM Mathematics (designed using Precalculus)**
Direct placement (no support recommended)	**HSGPA ≥ 3.0** **OR** **HSGPA ≥ 2.3 and ≥C in Precalculus**	**HSGPA ≥ 3.4** **OR** **HSGPA ≥ 2.6 and enrolled in Calculus**
Additional academic and concurrent support recommended	**HSGPA 2.3–3.0**	**HSGPA ≥2.6 or enrolled in Precalculus**
Additional academic and concurrent support strongly recommended	**HSGPA < 2.3**	**HSGPA ≤ 2.6 and no Precalculus**

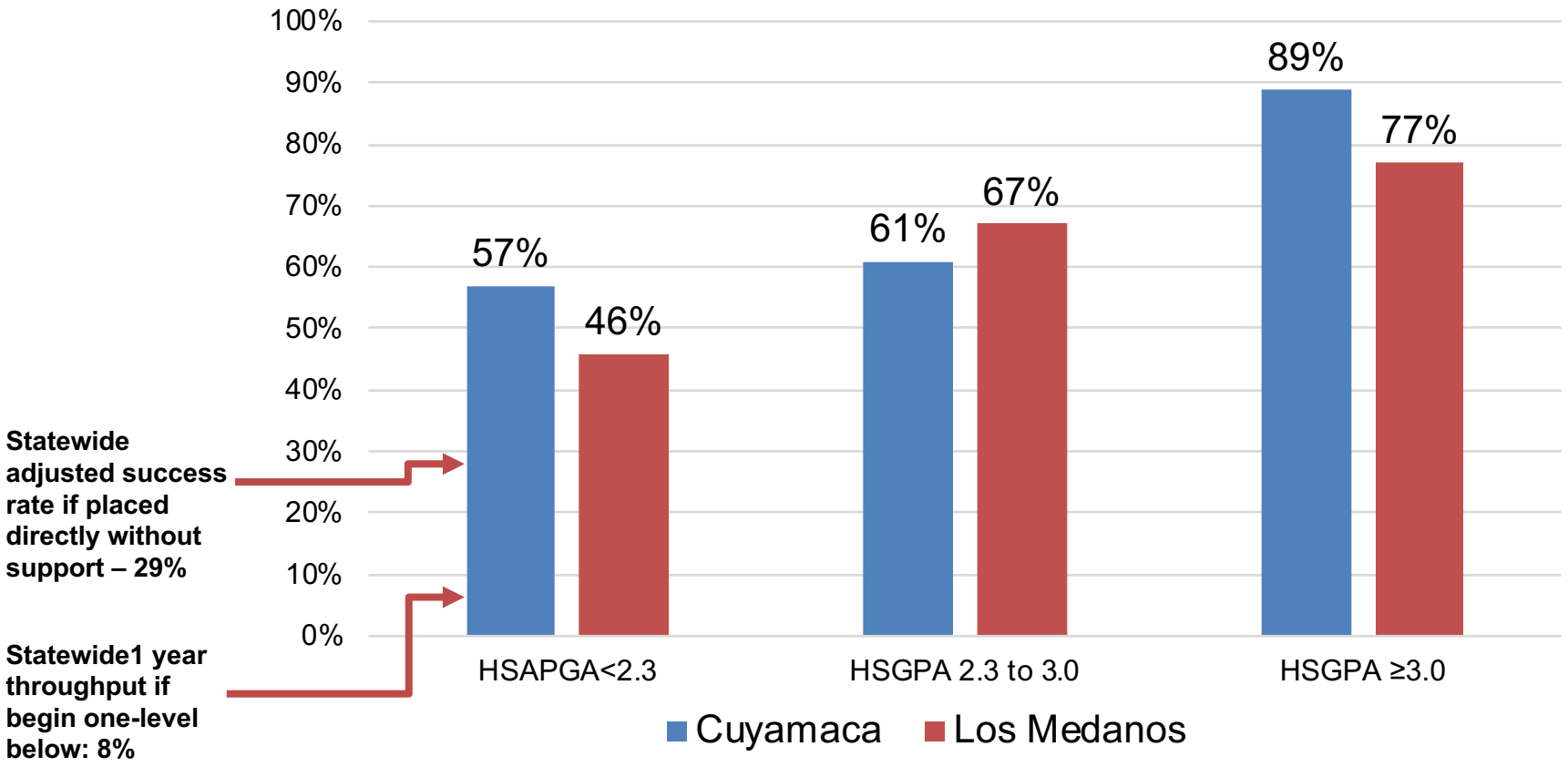
For more information, see the July, 2018 AB705 Implementation Memo at https://assessment.cccco.edu/resources/

Preliminary findings on corequisite success rate by GPA Band – BSTEM Corequisites (Cuyamaca College)



Students with high school transcript data available in CalPASS Plus with verified enrollments in either Business Calculus or Pre-Calculus AND a simultaneous corequisite course – n = 63

Preliminary findings on corequisite success rate by GPA Band – Statistics Corequisite (Cuyamaca & Los Medanos)



Students with high school transcript data available in CalPASS Plus with verified enrollments in either Statistics AND a simultaneous corequisite course – n = 498

SACRAMENTO STATE

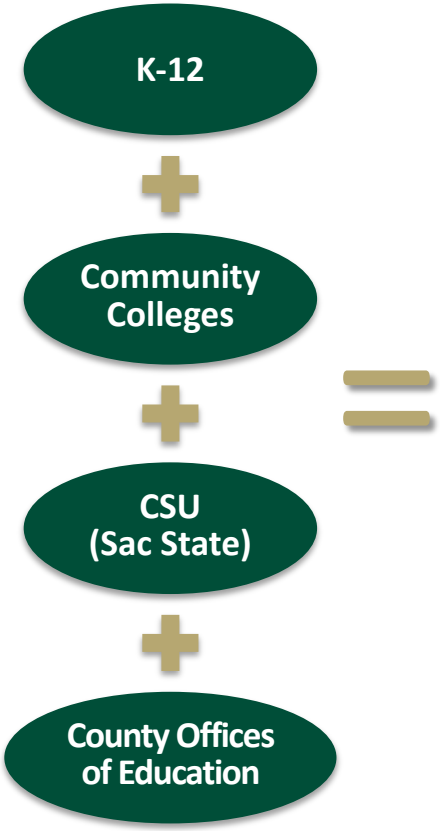
Center for College & Career Readiness

Increasing Math Readiness through Collaboration

Dr. Joy L. Salvetti

Redefine the Possible™

Collective Impact Model



Regional Partnership Infrastructure

In response to CAASPP scores in our region, together we developed more math options for more students, allowing more students to take a fourth year of math.

New Aligned Courses:

EAP Senior Year Mathematics (ESM)
C-Approved

EAP Quantitative Reasoning (EQR)
G-Approved

Mitigating System Change

Regional Partnership Infrastructure

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In partnership, we can navigate system-wide policy change together…

K-12:
SBAC & Common Core Alignment

Community Colleges:
Assembly Bill 705

CSU:
Executive Orders 1100 & 1110

Increased Student Participation

Academic Year	# Students Participating in ESM
2016 – 2017	800
2017 – 2018	1600
2018 – 2019	1800

Preliminary ESM Course Outcomes

Pass Rate for Non-ESM & ESM Courses
By 11th Grade CAASPP Scores

	Non-ESM*	ESM
CAASPP Levels 1 & 2	63%	**85%**
CAASPP Levels 3 & 4	85%	**93%**

***Non-ESM** refers to courses students would have taken their senior year that are comparable to ESM such as Statistics and Pre-Calculus. AP/Honors courses were not considered.

Pass Rate for Non-ESM & ESM Courses
By Ethnicity

	Non-ESM*	ESM
African American	65%	**79%**
Asian American	73%	**89%**
Latino American	59%	**84%**
Multiracial	72%	**89%**
White	80%	**92%**

Multiple Measures for Placement

Standardized Tests:
CAASPP/EAP, ACT, SAT, AP, IB, and CLEP

High School Grade Point Average (GPA)

High School and College Coursework*

Coursework must be completed with a C- or better

High School Math GPA

The CSU will use the highest achieved measure to determine placement in the appropriate GE English and math/QR course.

SACRAMENTO STATE

Center for College & Career Readiness

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