# Predictive Analytics: Building and Utilizing an Academic Support Index 

Berkeley City College January, 282015

## Questions we had...

- How can we tell if our programs or interventions are actually making a difference for students?
- How can we figure out which students might struggle academically in advance so we can target them for support?
- How can we target our limited resources to the students most in need?
- How can we talk about the achievement gap without contributing to stereotype threat?
- Fundamentally, how can we become more effective with our outcomes and more efficient with our resources?


## What is "predictive analytics"?

- Analyzing data and measures of past performance to make predictions of future outcomes


## How we traditionally look at data...

|  |  | CAHSEE Math <br> Passing Rate <br> 2014 |
| :---: | :---: | :---: |
| All Students | 753 | $90 \%$ |
| White | 268 | $100 \%$ |
| Hispanic/Latino | 177 | $86 \%$ |
| African American | 152 | $75 \%$ |

## Disproportionality

- Students with Disabilities
-Relative Risk Ratio for African American Students in BUSD is 3.3:1
- Students with from low socio-economic homes
-55\% (African American), 54\% (Hispanic/Latino), and 8\% (White)
- Students who are in the process of learning English
- 61\% of ELs are from Spanish speaking homes


## What might our data

 look like if we could create "equivalent"groups?

## How we traditionally look at data...

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| :---: | :---: | :---: |
| All Students | 753 | $90 \%$ |
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| Hispanic/Latino | 177 | $86 \%$ |
| African American | 152 | $75 \%$ |

## How we can begin to look at data by creating "equivalent groups"...

|  |  | CAHSEE Math <br> Passing Rate <br> 2014 |
| :---: | :---: | :---: |
| All Students | 753 | $90 \%$ |
| White | 268 | $100 \%$ |
| Hispanic/Latino | 177 | $86 \%$ |
| African American | 152 | $75 \%$ |
| White | 253 | $100 \%$ |
| Without Disability/EL/SED* |  |  |

EL=English Learner
SED=Socio-economically disadvantaged

## Equivalent groups...

|  |  | CAHSEE Math <br> Passing Rate <br> 2014 |
| :---: | :---: | :---: |
| All Students | 753 | $90 \%$ |
| White | 268 | $100 \%$ |
| Hispanic/Latino | 177 | $86 \%$ |
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| White <br> Without Disability/EL/SED* | 253 | $100 \%$ |
| Hispanic/Latino <br> Without Disability/EL/SED* | 66 | $99 \%$ |

## Equivalent groups...

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| African American | 152 | $75 \%$ |
| White <br> Without Disability/EL/SED* | 253 | $100 \%$ |
| Hispanic/Latino <br> Without Disability/EL/SED* | 66 | $99 \%$ |
| African American <br> Without Disability/EL/SED* | 53 | $91 \%$ |
| Hfy |  |  |

## Why not continue creating equivalent groups this way?






# A Different way to create more similar groups... 

Adjust for differences but keep it simple

Struggling students:

Tailwinds

## Headwinds

Successful Students:

Tailwinds


## Protective and Risk Factors of Student Performance

Tailwinds (protective factors)

- High Parent Education Level
- Stable housing
- History of academic success
- High attendance rates

Headwinds (extra challenges)

- English Learner
- Disability
- Socio-economically Disadvantaged
- Low Parent Education Level
- Homeless
- History of academic struggles
- Poor attendance


## Demographic contributors to the Academic Support Index

| Demographic Characteristic: | Points |
| :--- | :---: |
| English Learner | $\mathbf{2}$ |
| Special Education | $\mathbf{2}$ |
| Socio-Economically Disadvantaged | $\mathbf{2}$ |
| Parents are not high school graduates | $\mathbf{2}$ |
| Parents are high school graduates | $\mathbf{1}$ |
| Experiencing Education as an African American Student | $\mathbf{1}$ |
| CST Math FBB | $\mathbf{2}$ |
| CST ELA FBB | $\mathbf{2}$ |
| CST Math BB | $\mathbf{1}$ |
| CST ELA BB | $\mathbf{1}$ |



## BHS Population by ASI



# Changing the Narrative 

## CAHSEE February 2014 Results*

| ASI | All BHS |  |  | African American |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | ELA <br> \% passed | Math <br> \% passed | $\mathbf{n}$ | ELA <br> \% passed | Math <br> \% passed | $\mathbf{n}$ |
| 0 | 100.00 | 99.71 | 347 | - | - | 0 |
| 1 | 95.06 | 96.30 | 83 | 92.59 | 96.30 | $\mathbf{2 8}$ |
| 2 | 92.22 | 94.51 | $\mathbf{9 2}$ | 94.12 | 82.35 | $\mathbf{1 7}$ |
| 3 | 86.44 | 90.00 | 62 | 72.73 | 78.26 | 24 |
| 4 | 80.95 | 86.89 | 66 | 86.36 | 86.36 | 22 |
| 5 | 56.00 | 54.72 | 57 | 55.17 | 54.84 | 33 |
| 6 | 44.12 | 63.64 | 34 | 52.94 | 70.59 | $\mathbf{1 7}$ |
| 7 | 20.00 | 47.37 | 21 | 20.00 | 55.56 | 10 |
| 8 | 22.22 | 44.44 | $\mathbf{9}$ | 16.67 | 50.00 | 6 |

*Includes only students who took the test in February.
Changing the narrative...

Looking at the Academic Support Index and its relationship to student outcomes...

I USED TO THINK CORRELATION IMPUED CAUSATION.

THEN I TOOK A STATISTICS CLASS. NOW I DON'T.


SOUNDS LIKE THE CLASS HELPED.


## ASI vs. Semester One 2013-14 GPA



## ASI vs. Cumulative GPA



## ASI vs. On-Track for UC Eligibility



# ASI vs. Meeting End of $3^{\text {rd }}$ Grade Reading Target 



## ASI Strongly Correlates to CAHSEE ELA Passing Rates Over Time

| Academic <br> Support Index | CAHSEE ELA <br> PASSING RATE <br> 2012 | CAHSEE ELA <br> PASSING RATE <br> 2013 | CAHSEE ELA <br> PASSING RATE <br> 2014 |
| :---: | :---: | :---: | :---: |
| 0 | $\mathbf{1 0 0 \%}$ | $\mathbf{1 0 0 \%}$ | $\mathbf{1 0 0 \%}$ |
| 1 | $\mathbf{9 5 \%}$ | $\mathbf{9 7 \%}$ | $\mathbf{9 7 \%}$ |
| 2 | $\mathbf{8 9 \%}$ | $\mathbf{9 6 \%}$ | $\mathbf{9 1 \%}$ |
| 3 | $85 \%$ | $88 \%$ | $87 \%$ |
| 4 | $79 \%$ | $89 \%$ | $70 \%$ |
| 5 | $50 \%$ | $60 \%$ | $61 \%$ |
| 6 | $40 \%$ | $58 \%$ | $55 \%$ |
| 7 | $16 \%$ | $39 \%$ | $43 \%$ |
| Correlation | $\mathbf{R}^{\mathbf{2}=\mathbf{0 . 9 0 2 2 4}}$ | $\mathbf{R}^{\mathbf{2}=\mathbf{0 . 8 7 0 5 1}}$ | $\mathbf{R}^{\mathbf{2}=\mathbf{0 . 9 6 8 5 9}}$ |

# At what point does a student become at-risk for academic underperformance? 

## Confidence Intervals for CAHSEE Math 2014


*Indicates range of 95\% confidence interval

## Confidence Intervals for Cumulative GPA vs. ASI



## Inflection Points...

Cumulative GPA < 2.5 by ASI


## How can we use the Academic

 Support Index?- Provides context when looking at student data
- Targeting students for intervention
- Program and Intervention Evaluation
- More precise data disaggregation


## Applications...

| Small Learning <br> Communities |  | Type |
| :---: | :---: | :---: |
| Academic Choice | AC | Traditional Model |
| Arts and Humanities |  |  |
| Academy |  |  | AHA* $_{\text {California Partnership }}^{\text {Academy }}$| Academy of Medicine and <br> Public Service | AMPS* | California Partnership <br> Academy |
| :---: | :---: | :---: |
| Berkeley International High <br> School | BIHS | International Baccalaureate <br> Communication Arts and <br> Sciences <br> CAS*California Partnership <br> Academy |
| Green Academy | GRN* | California Partnership <br> Academy |

Context for looking at classes, cohorts, and interventions

## Context when looking at Assessment Data...

(BHS 10th Grade ELA Common Assessments)

| Learning <br> Community | Average <br> ASI | Pre- <br> Assessment <br> Mastery \% | Post- <br> Assessment <br> Mastery \% | Change in <br> Percent <br> Mastery |
| :---: | :---: | :---: | :---: | :---: |
| AC (Traditional HS) |  |  | 41 |  |
| AHA (CPA) |  |  | 24 |  |
| AMPS (CPA) |  |  | 27 |  |
| BIHS (IB) |  |  | 57 |  |
| CAS (CPA) |  |  | 21 |  |
| GRN (CPA) |  |  | 29 |  |
| BHS Overall |  |  | 41 |  |

Context for looking at classes, cohorts, and interventions

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| :---: | :---: | :---: | :---: | :---: |
| AC (Traditional HS) |  | 26 | 41 | +15 |
| AHA (CPA) |  | 22 | 24 | +2 |
| AMPS (CPA) |  | $\mathbf{2}$ | $\mathbf{2 7}$ | +25 |
| BIHS (IB) |  | $\mathbf{3 4}$ | 57 | +23 |
| CAS (CPA) |  | 9 | 21 | +12 |
| GRN (CPA) |  | 25 | 29 | +16 |
| BHS Overall |  | 41 | +16 |  |

Context for looking at classes, cohorts, and interventions

## Context when looking at Assessment Data...

## (BHS 10 ${ }^{\text {th }}$ Grade ELA Common Assessments)

| Learning <br> Community | Average <br> ASI | Pre- <br> Assessment <br> Mastery \% | Post- <br> Assessment <br> Mastery \% | Change in <br> Percent <br> Mastery |
| :---: | :---: | :---: | :---: | :---: |
| AC (Traditional HS) | 1.78 | 26 | 41 | +15 |
| AHA (CPA) | 2.65 | 22 | 24 | +2 |
| AMPS (CPA) | $\mathbf{2 . 8 5}$ | $\mathbf{2}$ | $\mathbf{2 7}$ | +25 |
| BIHS (IB) | $\mathbf{1 . 1 5}$ | $\mathbf{3 4}$ | $\mathbf{5 7}$ | +23 |
| CAS (CPA) | 2.40 | 9 | 21 | +12 |
| GRN (CPA) | 2.66 | 13 | 29 | +16 |
| BHS Overall | 1.96 | 25 | 41 | +16 |

Context for looking at classes, cohorts, and interventions

## Understanding

 class compositions| Course | Average ASI |
| :---: | :---: |
| AC-AP-LangANDCmp(AP) | 0.89 |
| AHA-AP-LangCmp (AP) | 3.38 |
| CAS-AP-LangCmp (AP) | 3.35 |
| BHS Average | 1.33 |

## Composition of our interventions

| Intervention | Average Academic <br> Support Index |
| :---: | :---: |
| AC-ACADEV | 4.57 |
| AVID | 2.88 |
| Bridge | 3.84 |
| Rise | 4.40 |
| Y-Scholars | 3.10 |
| 3+ ASI and No Intervention | 4.80 |
| 3+ ASI and Yes Intervention | 4.54 |
| No Intervention | 1.19 |

## Identifying students for intervention...

## Intervention Menu



## Connecting incoming $9^{\text {th }}$ graders to appropriate resources



# Middle to <br> High School <br> Transition <br> Support 

- ASI Scores
- Scored all BUSD $8^{\text {th }}$ Graders on
Transition Rubric


## Rubric completed by teams lead by middle school counselors

|  | Level of Concern | No Informati on <br> (1) | Low (2) | Medium <br> (3) | High <br> (4) | Extreme (5) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Behavioral | No Information | - Age appropriate <br> - No concerns | Some concerns | Moderate concerns | - Drug and alcohol <br> - Fighting <br> - Gang membership <br> - History of discipline issues <br> - Has a Probation Officer |
| 2 | Mental Health | No information | - Age appropriate <br> - No concerns | Some concerns | Moderate concerns | - Should immediately connect with BHS Health Center |
| 3 | Family/Ho me life | No information | Strong home and family life <br> - No concerns | Some concerns | - Moderate concerns <br> - Minimal parent engagement | - Homeless/McKinney-Vento <br> - Incarcerated parent <br> - Group home/Foster <br> - Loss of a parent or sibling |
| 4 | Social/Peer | No information | - Strong social skills/peer group No concerns | Some concerns | Moderate concerns | - Makes poor choices <br> - Troubled peer group <br> - Few or no friends |
| 5 | Math Skills | No Information | - At or above grade level <br> - SBP 3 or 4 <br> - No concerns | - Some concerns <br> May need support | - Moderate concerns <br> - Should participate in support opportunities | - Significantly below grade level <br> - Has failed or repeated a math class |
| 6 | ELA Skills | No Information | ```- At or above grade level - SBP 3 or 4 - No concerns``` | Some concerns <br> May need support | - Moderate concerns <br> Should participate in support opportunities | - Significantly below grade level <br> - Has failed or repeated an English class |

## Middle to High School Transition Support

- Screened students by:
- Any Score of 4 or 5 on the rubric
- Total Score of 18 or higher from the rubric
- ASI of 4 or higher
- Results:
- ASI Scores
- Scored all BUSD $8^{\text {th }}$ Graders on Transition Rubric
- 23 Students showed up on all three screens
- 80 Students showed up on two screens
- 160 Students showed up on at least one screen
- 380 did not show up on any screen


## Middle to High School Transition Support

|  | Total number of students with DFs at first progress report | Total number of students with DFs identified through the Transition Screen | Percent Identified before school started via the <br> Transition <br> Screens |
| :---: | :---: | :---: | :---: |
| Any D or F | 130 | 75 | 58\% |

## Middle to High School Transition Support

\(\left.$$
\begin{array}{|c|c|c|c|}\hline & & \begin{array}{c}\text { Total } \\
\text { number of } \\
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Identified <br>
before <br>

school\end{array}\right\}\)| started <br> via the <br> Transition <br> Screens |
| :---: |

## Middle to High School Transition Support

| Ds or Fs | Total number of students with DFs at first progress report | Total number of students with DFs identified through the Transition Screen | Percent Identified before school started via the Transition Screens |
| :---: | :---: | :---: | :---: |
| Any D or F | 130 | 75 | 58\% |
| 2+ | 68 | 50 | 74\% |
| 3+ | 44 | 38 | 86\% |

## Middle to High School Transition Support

| Ds or Fs | Total number of students with DFs at first progress report | Total number of students with DFs identified through the Transition Screen | Percent <br> Identified before school started via the Transition Screens |
| :---: | :---: | :---: | :---: |
| Any D or F | 130 | 75 | 58\% |
| 2+ | 68 | 50 | 74\% |
| 3+ | 44 | 38 | 86\% |
| 4+ | 20 | 18 | 90\% |

Checking to see if the students identified by the screen were actually different from the nonscreened students

- Chi-squared Test
- For students getting any Ds or Fs:
- $p=0.00534$
- $<1 \%$ chance that students were chosen randomly
- For students getting 4 or more Ds or Fs:
- $p=0.013002$
- $1 \%$ chance that students were chosen randomly
- The results of the chi test tell us that our methodology for identifying students for support is reliable.


## CAHSEE Intervention

Screened students
by:

- Far Below Basic on writing
- ASI 3+

63 students
identified

- Removed EL
- Removed IEPs
- 43 remained


## CAHSEE

 Intervention
## Results:

|  | CAHSEE <br> ELA | CAHSEE <br> Math |
| :---: | :---: | :---: |
| Passing Rate for ASI 3+ <br> 2013 | $\mathbf{6 3 \%}$ | $\mathbf{6 4 \%}$ |

## CAHSEE Intervention

## Results:

|  | CAHSEE <br> ELA | CAHSEE <br> Math |
| :---: | :---: | :---: |
| Passing Rate for ASI 3+ <br> 2013 | $\mathbf{6 3 \%}$ | $\mathbf{6 4 \%}$ |
| Passing Rate for ASI 3+ <br> 2014 | $\mathbf{6 4 \%}$ | $\mathbf{7 1 \%}$ |

## CAHSEE Intervention

## Results:

|  | CAHSEE <br> ELA | CAHSEE <br> Math |
| :---: | :---: | :---: |
| Passing Rate for ASI 3+ <br> 2013 | $\mathbf{6 3 \%}$ | $\mathbf{6 4 \%}$ |
| Passing Rate for ASI 3+ <br> 2014 | $\mathbf{6 4 \%}$ | $\mathbf{7 1 \%}$ |
| Passing Rate for <br> Intervention Cohort 2014 | $\mathbf{7 4 \%}$ | $\mathbf{8 7 \%}$ |

## CAHSEE Intervention

## Results:

|  | CAHSEE <br> ELA | CAHSEE <br> Math |
| :---: | :---: | :---: |
| Passing Rate for ASI 3+ <br> 2013 | $\mathbf{6 3 \%}$ | $\mathbf{6 4 \%}$ |
| Passing Rate for ASI 3+ <br> 2014 | $\mathbf{6 4 \%}$ | $\mathbf{7 1 \%}$ |
| Passing Rate for <br> Intervention Cohort 2014 | $\mathbf{7 4 \%}$ | $\mathbf{8 7 \%}$ |
| All Students 2014 | $\mathbf{8 7 \%}$ | $\mathbf{9 0 \%}$ |

## Student Learning Center

 Intervention EvaluationProgram and

## Student Learning Center

 Intervention Evaluation

## Limitations...

- The ASI score is a screen, not the screen
- The ASI should be used in conjunction with other research based screens when identifying students for interventions
- Consider it a tool, not a solution
- Data integrity


## Next steps...

1. Protective factors?
2. ASI in other schools/districts?
3. School assignment system (Lottery)
4. Additional screens?
5. Replace CST?

## "Make it Stick"

What application of the ASI resonated most with you? Explain why.

What might we learn if we used the ASI levels to compare data across schools/districts instead of "similar schools"?

What would have to change in education in order to no longer need to assign one point for "experiencing education as an African American student"?

## Questions?

- Academic Support Index (ASI): contact Dave Stevens at davestevens@berkeley.net
- Or go to: academicsupportindex.blogspot.com to learn more


## Demographic contributors to the Academic Support Index

| Demographic Characteristic: | Points |
| :--- | :---: |
| English Learner | $\mathbf{2}$ |
| Special Education | $\mathbf{2}$ |
| Socio-Economically Disadvantaged | $\mathbf{2}$ |
| Parents are not high school graduates | $\mathbf{2}$ |
| Parents are high school graduates | $\mathbf{1}$ |
| Experiencing Education as an African American Student | $\mathbf{1}$ |
| CST Math FBB | $\mathbf{2}$ |
| CST ELA FBB | $\mathbf{2}$ |
| CST Math BB | $\mathbf{1}$ |
| CST ELA BB | $\mathbf{1}$ |

# Why do students who experience education as an African American get one point? 

- Cumulative impact of racial micro-aggressions
- Racialized outcomes in education
- Daily experience of racism in broader society


## Limitations of the Academic Support Index

## Areas for further research

- Protective factors
- ASI in other school districts
- Identify replacements for CST

What would we have to do in order to eliminate the one point for experiencing education as an African American student?

- Eliminate/reduce the cumulative impact of microaggressions
- Significantly improve the capacity of teachers to incorporate culturally relevant curriculum
- Increase the frequency of interaction between students and African American educators
- Eliminate the racialized outcomes in education
- Eliminate the racism that students experience before they walk through the door each morning
"Any exploration of the racial micro-aggressions concept must include examination of the cumulative nature of racial stereotypes and their effects. Steele and Aronson's (1995) work reveals that racial stereotypes are deeply woven into the fabric of U.S. society, yet their daily effects are often misunderstood. Specifically, Steele and Aronson examined how such stereotypes may interfere with Black students' abilities to-achieve high scores on standardized tests widely believed to measure aptitude or intelligence. Their research found that when African American college students were prompted to indicate their race before taking a Graduate Record Examination (GRE), their tests scores were significantly lower than when they were not prompted to note their race. Steele and Aronson described this phenomenon as "stereotype threat" or:
... a social-psychological predicament that can arise from widely known negative stereotypes about one's group ... the existence of such a stereotype means that anything one does or -any of one's features that conform to it make the stereotypes more plausible as a selfcharacterization in the eyes of others, and perhaps even in one's own eyes. We call this predicament stereotype threat and argue that it-is experienced, essentially, as a self-evaluative threat. (p. 797)"
- Chi Squared Tests show that the screens do identify


## Middle to

 High School Transition Support groups that are statistically different and the null hypothesis can be rejected.- Students who showed up on all three screens having any DFs at progress report
- Students who showed up on any one of the three screens having 4 or more DFs at progress report

|  | \# with any DFs | \# without any DFs | Marginal Row Totals |
| :---: | :---: | :---: | :---: |
| All three screens | 13 (6.89) [5.43] | 13 (19.11) [1.96] | 26 |
| All others | 130 (136.11) [0.27] | 384 (377.89) [0.1] | 514 |
| Marginal Column Totals | 143 | 397 | 540 (Grand Total) |

The Chi-square statistic is 7.7604 . The P value is 0.00534 . This result is significant at $\mathrm{p}<0.05$.

|  | \# with 4+ DFs | \# without 4+ DFs | Marginal Row Totals |
| :---: | :---: | :---: | :---: |
| Any of the three screens | 18 (11.26) [4.04] | 142 (148.74) [0.31] | 160 |
| All others | 20 (26.74) [1.7] | 360 (353.26) [0.13] | 380 |
| Marginal Column Totals | 38 | 502 | 540 (Grand Total) |

The Chi-square statistic is 6.1689. The $P$ value is 0.013002 . This result is significant at $p<0.05$.

- Recognizing outliers
- Grouping students within various measures
- Inflection points within measures
- ASI at which students underperform school averages


## Confidence Intervals for CAHSEE ELA 2014


*Indicates range of 95\% confidence interval

## Confidence Intervals for Semester Two

 GPA

Analysis of SLCs by grade level (Average ASI) 2013-14

| Grade | AC | AHA <br> (CPA) | AMPS <br> (CPA) | BIHS | CAS <br> (CPA) | GRN <br> (CPA) | B-tech | BHS <br> Average |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{9}$ | 1.51 | 2.07 | 2.93 | 1.44 | 2.43 | - | - | $\mathbf{1 . 8 0}$ |
| $\mathbf{1 0}$ | 1.69 | 2.29 | 3.73 | 1.13 | 2.56 | - | 6.20 | $\mathbf{1 . 9 3}$ |
| $\mathbf{1 1}$ | 2.00 | 2.40 | 3.37 | 1.32 | 2.05 | 3.53 | 4.19 | $\mathbf{2 . 1 2}$ |
| $\mathbf{1 2}$ | 1.99 | 3.46 | 4.31 | 1.55 | 3.28 | 3.83 | 3.81 | $\mathbf{2 . 5 1}$ |
| All | $\mathbf{1 . 7 7}$ | $\mathbf{2 . 5 2}$ | $\mathbf{3 . 5 7}$ | $\mathbf{1 . 3 6}$ | $\mathbf{2 . 5 8}$ | $\mathbf{3 . 7 1}$ | $\mathbf{4 . 0 6}$ | $\mathbf{2 . 0 9}$ |

