Exploring the Latino-White Achievement Gap Across Disability Classifications Over Time

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Center on Teaching & Learning

NCAASE National Center on Assessment and Accountability for Special Education
Advancing research on growth measures, models, and policies for improved practice

UNIVERSITY OF OREGON

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Abstract

Latino students tend to score lower on standardized tests, on average, than their peers who are White. This poster uses statewide testing data from one Pacific Northwest state to explore achievement trajectories across Grades 3-8 for Latino and non-Latino students with documented disabilities. Results indicate Latino students without a disability have an initial achievement much lower than their White peers, but progress at a marginally faster rate. Within specific disability classifications, the achievement gap was generally less pronounced than for students without a disability, but persisted across Grades 3-8.

Method

Measure. Statewide accountability test from one Pacific Northwest state
- Computer adaptive
- Vertical scale

Sample. Six years of data collected across the 2007-08 to 2012-13 school years.
- One cohort, matched longitudinally
- **Data Restrictions:**
  - Only records counting for AYP
  - Disability groups with at least 20 Latino and 20 non-Latino students
  - Typical grade-level progressions only
  - Complete demographics only
- **"Wandering" demographics:**
  - In some cases, student demographics changed across years
    - Majority rule used
    - Random assignment in case of ties
  - ~13% changed disability classifications
    - 3% ties
  - ~ 8% changed race/ethnicity
    - 2% ties

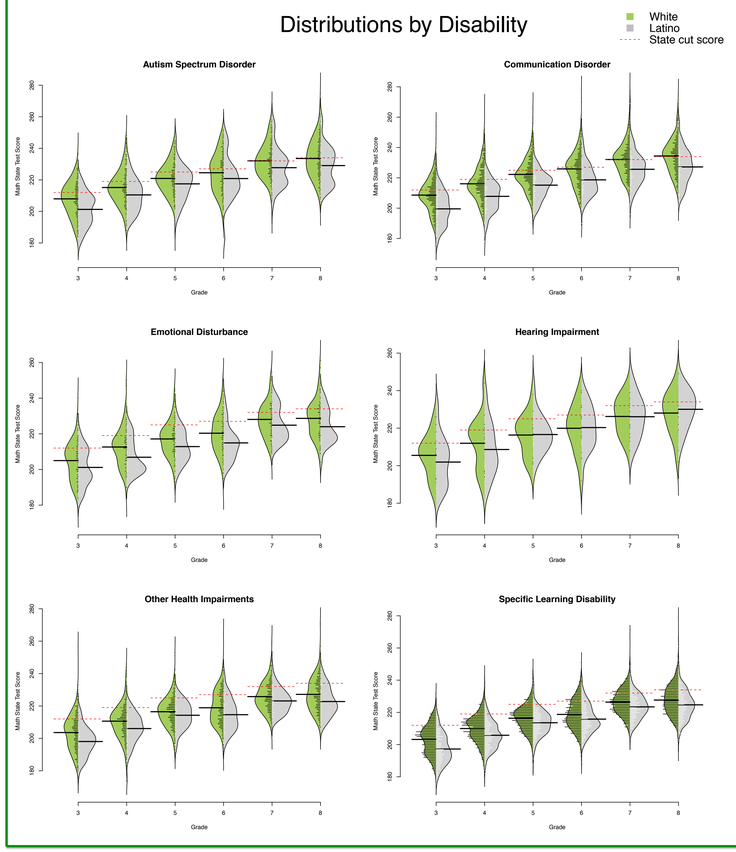
Analytic Sample Demographics

Disability	Non-Latino		Latino	
	n	%	*n*	%
Autism spectrum disorder	456	1.15	51	0.51
Communication disorder	1,010	2.55	252	2.54
Emotional disturbance	317	0.80	44	0.44
Hearing impairment	38	0.10	25	0.25
Other health impairments	807	2.04	109	1.10
Specific learning disability	2,420	6.12	802	8.08
No disability	34,511	87.24	8,642	87.07

Note. Percentages represent the percentage of non-Latinos/Latinos classified to the specific disability.

Results

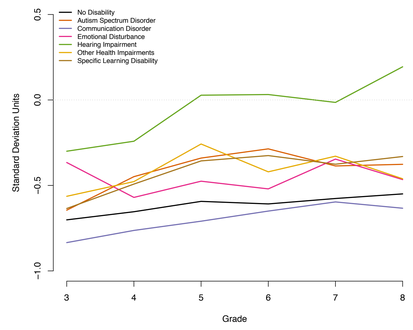
Distributions by Disability



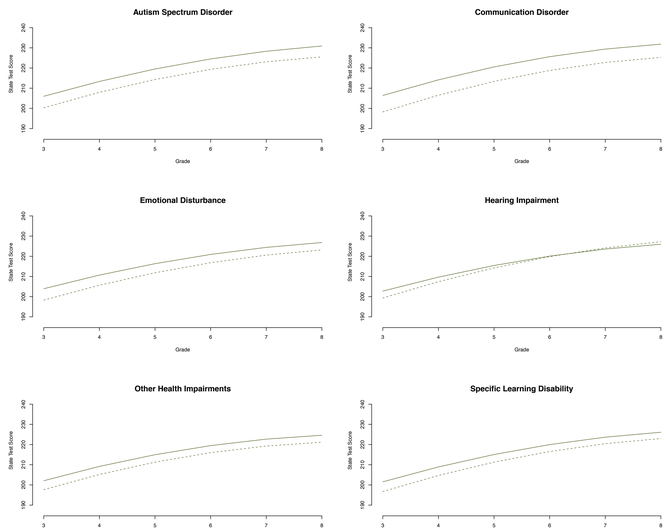
Coefficients for Latino Students

	μ	μ_{lb}	μ_{ub}
α	212.20	211.93	212.48
β_{Linear}	8.20	8.08	8.32
β_{Quad}	-0.63	-0.65	-0.61
β_{Latino}	-5.74	-5.97	-5.51
$\beta_{Latino}Linear$	0.25	0.14	0.37
$\beta_{Latino}Quad$	-0.04	-0.06	-0.02
$\beta_{Latino}ASD$	-0.27	-2.92	2.38
$\beta_{Latino}CD$	-2.35	-3.60	-1.10
$\beta_{Latino}ED$	0.08	-3.11	3.27
$\beta_{Latino}HI$	1.84	-2.93	6.61
$\beta_{Latino}OHI$	0.74	-1.12	2.61
$\beta_{Latino}SLD$	0.45	-0.30	1.21
$\beta_{Latino}ASD_{Linear}$	0.58	-0.82	1.98
$\beta_{Latino}CD_{Linear}$	0.26	-0.38	0.90
$\beta_{Latino}ED_{Linear}$	0.46	-1.35	2.27
$\beta_{Latino}HI_{Linear}$	1.63	-0.85	4.11
$\beta_{Latino}OHI_{Linear}$	1.04	0.08	2.01
$\beta_{Latino}SLD_{Linear}$	1.09	0.71	1.47
$\beta_{Latino}ASD_{quad}$	-0.11	-0.37	0.15
$\beta_{Latino}CD_{quad}$	0.01	-0.11	0.13
$\beta_{Latino}ED_{quad}$	-0.02	-0.35	0.31
$\beta_{Latino}HI_{quad}$	-0.14	-0.60	0.31
$\beta_{Latino}OHI_{quad}$	-0.18	-0.36	0.00
$\beta_{Latino}SLD_{quad}$	-0.16	-0.23	-0.09

Latino/White Math Achievement Gap
Effect Size By Disability



Growth by Disability



Model Comparison

	df	*AIC*	*LogLikelihood*	*Deviance*	χ^2	χ^2_{df}	*p*
Unconditional	10.00	1565480.12	-782730.06	1565460.12			
Model 2	12.00	1562720.03	-781348.02	1562696.03	2764.09	2.00	0.00
Model 3	18.00	1555494.22	-777729.11	1555458.22	7237.81	6.00	0.00
Model 4	20.00	1555453.13	-777706.57	1555413.13	45.09	2.00	0.00
Model 5	32.00	1555366.65	-777651.33	1555302.65	110.48	12.00	0.00
Model 6	38.00	1555337.64	-777630.82	1555261.64	41.01	6.00	0.00
Fully Conditional	50.00	1555308.66	-777604.33	1555208.66	52.97	12.00	0.00

Analyses. Multilevel growth models, fit with the *lme4* package (Bates, Mächler, Bolker, & Walker, 2015), within the R statistical framework (R Core Team, 2014).

Fully Conditional Model

$$RIT_i = \mu_\alpha + \mathbf{X}_i\beta + \mathbf{Z}_i r_{j[i]} + \mathbf{Z}_i u_{k[i]} + \epsilon_i$$

X = Fixed effects design matrix
- Year (Grade – 3) and Year^2 (Grade – 3)^2
- Disability status
- Latino, non-White and non-Latino
- All interactions

Z = Random effects design matrix
- Intercept and (Grade – 3)

r_j = by-student variation

u_k = by-school variation

$$r_j \sim MVN\begin{bmatrix}0\\0\end{bmatrix}, \begin{bmatrix}\sigma^2_{\alpha_{stu}} & \rho\sigma_\alpha\sigma_\beta\\ \rho\sigma_\alpha\sigma_\beta & \sigma^2_{\beta_{stu}}\end{bmatrix}$$

$$u_k \sim MVN\begin{bmatrix}0\\0\end{bmatrix}, \begin{bmatrix}\sigma^2_{\alpha_{sch}} & \rho\sigma_\alpha\sigma_\beta\\ \rho\sigma_\alpha\sigma_\beta & \sigma^2_{\beta_{sch}}\end{bmatrix}$$

Model building
- Evaluate functional form
- Add student-level predictors of initial achievement
- Add student-level predictors of growth
- Add interactions
- Evaluate models using Akaike's information criteria

Effect sizes

Standardized achievement gap between Latino and White students calculated at each time point by disability classification (including students without a disability)

$$ES = \frac{\bar{X}_{focal} - \bar{X}_{reference}}{\sqrt{\frac{\sigma^2_{focal} + \sigma^2_{reference}}{2}}}$$

Model Descriptions

	Description
Unconditional	Curvilinear growth model, no covariates
Model 2	Latino and non-White/non-White predicting intercept
Model 3	Model 2 + Disability predicting intercept
Model 4	Model 3 + Latino predicting slope
Model 5	Model 4 + Disability predicting slope
Model 6	Model 5 + Latino/disability interaction predicting intercept
Fully conditional	Model 6 + Latino/disability interaction predicting slope

Discussion

Overall Findings
- Distributions appear relatively similar for some disability groups, despite mean differences
- Achievement gaps generally lower within disability classifications than for students without a documented disability

Limitations & Future Directions
- Single cohort of students
- Common growth curvature
- All covariates treated as fixed

References

- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-e ects models using lme4. *Journal of Statistical Software, 67* (1), 1–48. doi:10.18637/jss.v067.i01
- R Core Team. (2015). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/.