Comparison of Chronic and Acute Models of Risk on Mathematics Achievement and Growth

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Introduction

Disparities in mathematics achievement have been shown to be associated with differences in level of poverty.

Residential mobility is linked to lower achievement, increased problem behaviors, and increased grade retention.

Studies examining the effect of homelessness on achievement have been mixed but generally students have lower levels of achievement.

While there has been an increased federal focus on higher risk students with NCLB, there is still a dearth in longitudinal studies.

Finally, how should the risk of being homeless and highly mobile (HHM) be treated: acute (dynamic) or chronic (static)?

- Acute – The risk of an incident of being HHM disrupts growth in mathematics achievement only around the time of a HHM incident.
- Chronic – Risk associated with HHM represent high and stable, cumulative risks.

Research Problems

1) We examined whether HHM status indicates risk to achievement and growth in mathematics beyond that associated with poverty alone.
2) We examined whether risk among HHM students was episodic or chronic in nature.

Data & Methods

Data were collected on 26,474 students (grades 3 – 8) in a large, urban, Midwestern school district from 2005-2006 through 2009-2010.

Math achievement was measured using Northwest Evaluation Association Achievement Tests, a nationally normed adaptive test.

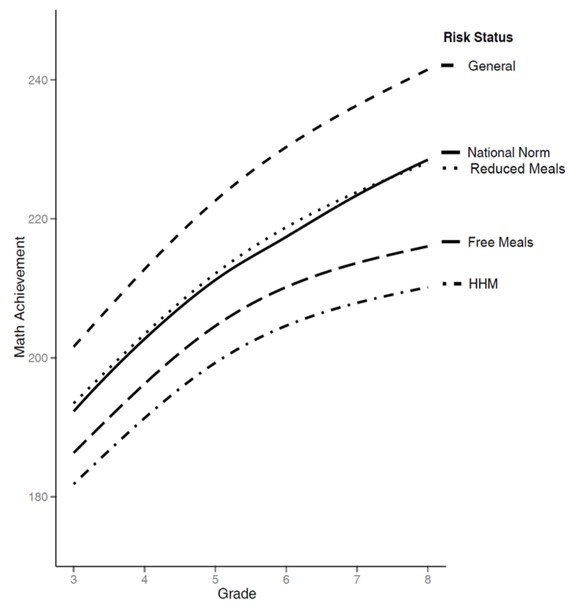
Risk was defined as: HHM – Student was HHM during the study; Free – Student was on free meals but not HHM; Reduced – Student was on reduced meals but not FREE or HHM; General – None of the above.

We controlled for ethnicity, gender, ELL and special education status, and attendance.

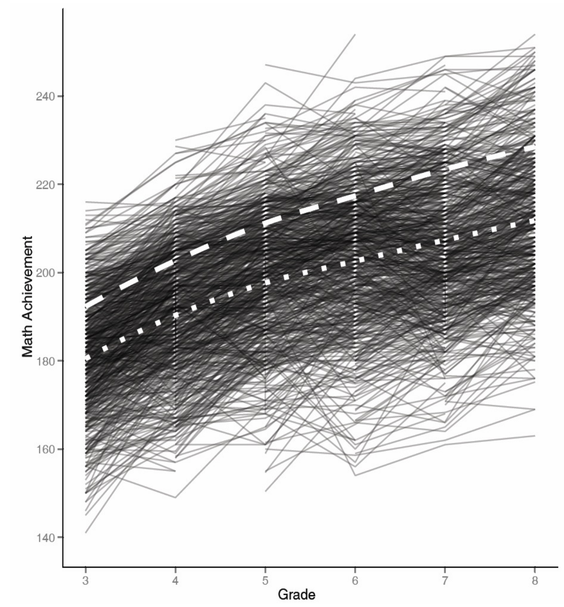
We fit longitudinal multilevel models and compared a series of models with AIC to find the best fitting model.

To examine if HHM was chronic or acute, HHM was treated as static flag (chronic) or dynamic flag (acute) in separate models.

Results



Smoother curves of mathematics achievement by static risk group. Note the non-linear trend suggestive of quadratic growth.



Individual math achievement trajectories of HHM students (black lines). The white dashed line represents the mean level of math achievement based on national norms. The white dotted line is one SD below the national norm mean.

Chronic Risk Model – Best Fitting

	Fixed Effects		
	Intercept	Interactions	
		Grade	Grade^2
Risk: HHM vs.			
General	9.60 (.39)	.54 (.27)	.09 (.05)
Reduced	5.70 (.56)	-.16 (.40)	.09 (.08)
Free	2.80 (.31)	-.06 (.22)	-.01 (.04)
Ethnicity: White vs.			
American Indian	-6.66 (.49)	-.03 (.34)	-.08 (.07)
African American	-8.61 (.29)	-.61 (.20)	-.07 (.04)
Asian	-3.06 (.42)	.24 (.29)	.01 (.06)
Hispanic	-5.13 (.38)	.45 (.26)	-.20 (.05)
Male	-1.31 (.19)	-.32 (.13)	.03 (.03)
ELL	-6.21 (.31)	-.99 (.22)	.15 (.04)
Special Education	-8.98 (.24)	-.92 (.17)	-.05 (.03)
Attendance	37.50 (2.48)	-2.79 (1.83)	1.32 (.34)
Unconditioned effects	159.06 (2.32)	13.53 (1.72)	-2.01 (.32)

Random Effects	
	Parameter Estimates
Var(Intercept)	111.82
Var(Random slope – linear)	8.55
Var(Random slope – quadratic)	.23

The best fitting dynamic model showed that during years in which students were identified as HHM, mean levels of math achievement were lower and slope accelerated at a slower rate.

Discussion

Students that were HHM had lower achievement than other low income students and the General group.

We found strong evidence of HHM as a chronic risk factor and some support for HHM as an acute risk as the intercept and trajectory changed as HHM flag was turned on.

By understanding whether HHM is a chronic or acute risk, stakeholders may further under the mechanism behind HHM and more appropriately develop effective interventions.

For more information & references see Cutuli et al. (under review) available by contacting cutu0001@umn.edu

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