Comparison of Dynamic and Static Models of Risk on Academic Achievement and Growth

Children who experience homelessness and high rates of residential mobility (HHM) are at risk for falling behind in the classroom. These students are at increased risk for health problems, poor self-control, malnutrition, developmental delays, anxiety, and depression (Miller & Lin, 1988; Rafferty & Shin, 1991). Many have academic and behavioral problems associated with chronic poverty, single-parent families, unemployed and uneducated parents, exposure to familial violence, and heightened mobility (Rafftery & Shin, 1991; McChesney, 1993). By 3rd grade, risk-related disparities in math and reading are already present (Obradovic et al., 2009). Prior longitudinal studies investigating risk have treated it as a static phenomenon, i.e. not allowing risk to change yearly. This assumption may inadequately model academic variation. The purpose of this study is to examine the relationship between risk, treated as a static and dynamic phenomenon, and achievement.

This study includes data on 16,561 students from a large, urban school district. Math and reading achievement were measured annually for 4 years in grades 3 - 8. Students were placed into one of three risk groups: HHM, receiving free or reduced-price meals, and neither HHM nor receiving free or reduced-price meals. In addition, gender, ethnicity, English language learner status (ELL), special education status (SPED), and average attendance rates were included as control variables. Four multilevel models were developed: Static math, static reading, dynamic math, and dynamic reading. The static models treated risk and all control variables as static. The dynamic models treated risk, ELL, SPED, and attendance as dynamic and the remaining control variables as static. These variables were treated as dynamic as they may change across time. All models were initially fit with intercept and grade interactions for all the variables. Variables were

then removed from the model using backward elimination and the Bayesian information criterion (Raftery, 1995) until the most parsimonious, best-fitting model was selected.

Results show strong effects of risk in all models with HHM students having lower initial achievement than other students. Results also show an interaction effect between risk and grade in math, showing that as students progress through the grades, higher risk students fall further behind (Figure 1). SPED and ELL were important predictors of growth in math and reading, respectively. The results also found poor fit of the dynamic models relative to the static models, and relatively large variation and resilience in the HHM students was observed (Figure 2).

This study has several implications for researchers and educators. First, we found initial disparities in math achievement that widen over time. Second, HHM may be a marker of a high cumulative risk of a chronic nature that can lead to lasting achievement problems. Therefore, even though a student may no longer be classified as HHM, they are still at a higher academic risk because of underlying systemic adversities (e.g. poverty, family problems, mobility). Future work examining the timing of risk events, with a focus on HHM students, may better explain achievement and bolster the fit of the dynamic models.