Is social mobility across the life-course associated with birth outcomes?

The Life-course Influences on Fetal Environment (LIFE) Study.

Theresa L. Osypuk[1], Jaime Slaughter-Acey[2], Rebecca Kehm[3], Dawn P. Misra[4].

[1] Associate Professor and Corresponding Author, University of Minnesota School of Public Health, Division of Epidemiology & Community Health, West Bank Office Building Suite 300, 1300 S. Second Street, Minneapolis, MN 55454 USA, tosypuk@umn.edu, (p)612-625-8279

[2] Assistant Professor, Drexel University, College of Nursing and Health Professions, Division of Graduate Nursing, Philadelphia, PA USA, jcs396@drexel.edu

[3] Doctoral Student, University of Minnesota School of Public Health, Division of Epidemiology & Community Health, Minneapolis, MN USA, kehmx003@umn.edu

[4] Professor, Wayne State University School of Medicine, Department of Family Medicine and Public Health Sciences, Detroit, MI, USA dmisra@med.wayne.edu

4/22/15

Population Association of America 2015

Extended Abstract

Please contact Dr. Osypuk (tosypuk@umn.edu) for a copy of the final manuscript.

Abstract

Background. Higher adult socioeconomic position (SEP) is associated with lower risk of poor birth outcomes. However, some demographic subgroups exhibit weaker health gradients, and few epidemiologic studies have incorporated life course SEP. We tested whether social mobility from childhood was associated with lower risk of adverse birth outcomes. **Methods**. Data derive from the LIFE retrospective cohort study among Black women, 2009–2011, in the Detroit MI metropolitan area. Using poisson regression with robust standard errors, we examined the association between social mobility and 2 birth outcomes: fetal growth (small for gestational age) and preterm birth (PTB). SEP was measured for childhood and adulthood by survey in adulthood, for two constructs, each measured ordinally: educational attainment and perceived income (financial sufficiency). Social mobility was calculated as the difference of adulthood minus childhood SEP. Adjusted poisson regression models controlled for age, parity, and childhood SEP. **Results**. As hypothesized, covariate-adjusted one-standard deviation of improved educational social mobility from childhood to adulthood was protective for fetal growth in adjusted models (RR= 0.78 (95% CI: 0.66,0.94)). Financial social mobility was also marginally protective for SGA. For example, for a 1-SD increase in social mobility from early childhood to adulthood, RR for SGA= 0.85 (95% CI: 0.71, 1.01). We found no associations between social mobility and PTB. **Conclusions**. Improved social mobility from childhood is associated with improved birth outcomes among Black women, primarily operating through fetal growth.

INTRODUCTION

Adverse birth outcomes, such as being born too early, and/or too small, have important consequences for children and families both in the near term, and throughout life, to affect health and developmental trajectories as well as social outcomes (Behrman & Butler, 2007). Lower socioeconomic position has been consistently linked to worse health outcomes, including birth outcomes, across different places, populations, and times (Blumenshine et al., 2010). Although this research evidence is consistent among White women, it is less consistent for Black and Hispanic women. This is important, given that Black women and some Hispanic subgroups of women experience much greater risk of adverse birth outcomes than native-born White women. Moreover, existing research has not accounted for why this disparity occurs. Blacks and Hispanics experience higher risk of deprivation, and longer periods of time in deprivation, both at a given point in time as well as over time, compared with Whites (Cellini et al., 2008). Therefore it is feasible that the trajectory of social class plays a role to explain disparities in birth outcomes that disfavor minorities, as exposures arising throughout a woman's life experience likely impact birth outcomes (Misra et al., 2003).

Although there is a rather large body of evidence linking socioeconomic position to birth outcomes, limited evidence has tested whether social mobility from childhood to adulthood is associated with risk of adverse birth outcomes. The evidence that does exist tends to focus on birthweight. However, LBW conflates two mechanisms of why being born too light is harmful: restricted growth, and early delivery. While intrauterine growth and preterm delivery have some overlapping determinants (Lang et al., 1996), it is important to distinguish between the two since their determinants and their sequelea may differ.

We build on the small literature by examining how increased social mobility via gains in educational attainment or financial security from childhood is associated with risk of adverse birth outcomes for Black women, among whom the evidence is mixed. In this manuscript, we test first, whether upward social mobility (SEP from childhood to adulthood) is associated with lower risk of adverse birth outcomes. Second, we probe whether the measure of social mobility matters, by comparing results across several different SEP specifications.

METHODS

The LIFE-course influences of Fetal Environments (LIFE) study is a retrospective cohort study of self-reported Black/African American women ages 18-45 who had just given birth to a singleton baby in a Detroit, MI suburban hospital (Providence Hospital, Southfield MI). Women were recruited from the hospital's labor and delivery and postpartum unit logs, with enrollment occurring between June 2009 and December 2011. Women were excluded from the study if they: did not speak English; had mental retardation, serious cognitive deficits, or significant mental illness, on the basis of history or any prior records; or were currently incarcerated. All eligible women were approached for enrollment during their postpartum hospitalization, and written informed consent was obtained for all enrollees (71% participation rate, N = 1410). Women participated in structured interviews with trained interviewers in their hospital room during the immediate postpartum hospitalization. A $50 gift card to a local store was provided as an incentive for completing the interview. Additional information on participants and their newborns was obtained via medical record abstraction by trained study staff. The study was approved by the institutional review boards at Wayne State University and Providence Hospital.

Birth Outcome Measures

Preterm Birth (PTB) was defined as < 37 completed week's gestation (compared to 37 weeks or greater, reference). Estimates of gestational age (GA) were abstracted from the medical record.

Fetal Growth was operationalized as Small for Gestational Age (SGA), defined as birthweight < 10th percentile (compared to above that threshold), which was determined by comparing an infant's birthweight for a given week of gestational age to the most recent sex-specific US National Fetal Growth Curve by Talge (Talge et al., 2014).

Socioeconomic Position (SEP) Exposure Measures

Educational Attainment. A woman's own education (her adulthood SEP) was operationalized as the highest degree earned and number of grades completed in school. Additionally, for childhood SEP, women reported the educational attainment for her biological mother (85%) or the woman who raised her. Responses were categorized into a four-level ordinal education variable: (1) < 12 years of school, no GED; (2) 12 years of school or GED; (3) "some college" or 13-15 years of school; (4) 16+ years of school.

Perceived Income/Financial sufficiency. Interviewers asked women to describe their family's current financial situation (operationalizing adulthood SEP), as well as their financial situation during two periods from the daughter's childhood (retrospectively, childhood SEP): from birth to age 10, and from age 10 to 18. Five likert responses included (1) very poor, not enough to get by; (2) barely enough to get by; (3) enough to get by but no extras; (4) more than enough to get by; and (5) well-to-do. Higher values indicated better financial situation.

Social Mobility Measures

Educational Mobility. Educational mobility scales were created to assess women's educational attainment in adulthood compared to (subtracted from) her mother's educational attainment based on the ordinal education variables described above. Education scales ranged from -3 to +3, with negative values indicating that the woman had less education than her mother (downward social mobility since childhood), and positive values indicating higher education for the woman compared to her mother (upward social mobility since childhood). Zero indicates stable education across generations.

Perceived Income/Financial Mobility. Financial mobility measures were constructed to capture change in reported income sufficiency from each of the two childhood periods to current day (adulthood) based on the individual ordinal SEP variables described above. The financial mobility measures were created by subtracting childhood SEP from adulthood SEP and represented the following periods: (1) early childhood (birth to age 10) to current/adult, and (2) late childhood (age 10- 18) to current/adult. Scales ranged from -4 to +4, with negative scale values representing downward mobility, positive values representing upward mobility, and a value of zero representing stable SEP from childhood to adulthood. For example, a woman who reported her financial situation from birth to age 10 as "(1) very poor" and current situation as "(5) well to do" would have a birth to current financial mobility score of +4, which represents the upper positive end of the social mobility spectrum. See Figure 1 for a visual depiction of how the social mobility measures were derived from a cross-tabulation of adult compared to child SEP. For interpretability, all social mobility coefficients were rescaled so that a 1-point difference corresponded to a standard deviation change in the measure.

<<FIGURE 1>>

Covariates

Potential confounders adjusted in the models included the women's childhood SEP, and her age and parity at the time of the index pregnancy. Childhood SEP was operationalized by childhood financial sufficiency or maternal educational attainment (described above), and aligned with the social mobility indicator in the model (for example, models for educational mobility included the mother's education as the measure of child SEP in the model). Age was obtained from the medical record and modeled linearly (although sensitivity models operationalizing age as categorical were comparable); parity was measured as first live birth or higher.

Analytic Methods

The socioeconomic and social mobility variables were evaluated in bivariate preliminary analysis with crosstabs and correlations. Because we have common outcomes, we used multiple Poisson regression with robust standard errors to estimate risk ratios with 95% confidence intervals, between social mobility and birth outcomes (Zou, 2004). Model 1 was bivariate, and Model 2 adjusted for childhood SEP, age, and parity.

We had relatively few missing data for any variable; maternal education had 5% missing (n=76) and there was less than 2% missing data for all other covariates. We chose to deal with missing data for most variables by modeling an indicator variable for missing values, and conducted a complete-case sensitivity analysis which produced comparable results. For ordinal variables, the small proportion of missing values were imputed to the median (which was also the mode) of the sample, which was zero for the social mobility scales. Two women were excluded from analysis due to missing birth outcome data; final analytic sample size was 1408.

Results

Sample Characteristics

Women in the LIFE sample ranged in age from 18 to 45 years, with a mean age of 27.3 years. On average, women reported their current and childhood financial situation as falling between (3) (having enough to get by but no extras), and (4) (had more than enough to get by), as represented by means for the ordinal scales of 3.42-3.65, and by concentration (69-82%) of the sample in these two categories on the categorical variable. Women and their mothers had obtained education between (2) (12 years of school or GED) and (3) (some college), as represented by a mean of 2.67-

2.84 and with the majority (62-68%) reporting 12-15 years of education. Fifteen percent of infants in the sample were small for gestational age, and 16% were preterm.

Social Mobility Univariates and Bivariates.

All social mobility variables were distributed approximately normally. Therefore, most frequently, women's financial situation and education remained stable from childhood to adulthood. The two financial mobility measures were strongly correlated (rho, ρ= 0.67). However, the financial mobility measures were only weakly (yet significantly) associated with the educational mobility measure (ρ range: 0.08 to 0.13).

Multiple Regression Models of Educational Mobility with Birth Outcomes

After adjusting for age, parity, and childhood SEP in poisson regression models, women who experienced educational social mobility from childhood to adulthood gave birth to infants with better fetal growth. For example, a one-SD improvement in educational mobility from mother to daughter was associated with a 21% lower risk of SGA in her infant (RR=0.79, 95% CI: 0.66-0.94). However, educational mobility from childhood did not exhibit any associations with PTB.

Multiple Regression Models of Financial Mobility with Birth Outcomes

In adjusted poisson models, financial social mobility from childhood to adulthood was associated with marginally beneficial effects on fetal growth, for each of the financial mobility measures. For example, a 1-SD improvement in financial mobility from early childhood to adulthood was associated with a 15% lower risk of SGA (RR=0.85, 95%CI: 0.71, 1.01). Measuring financial mobility from middle childhood achieved comparable protective associations with SGA. Although improved financial mobility was also associated with lower risk of PTB, no associations were different than unity.

DISCUSSION

In this analysis, we found that upward social mobility, from childhood to adulthood, particularly based on education, was associated with better fetal growth. Our results are broadly consistent with prior studies that tested outcomes based on birthweight and vital records, and those testing upward mobility among only lower childhood SEP samples. Although no prior studies have tested associations of social mobility with SGA, our results suggest that intrauterine growth may be the most sensitive of these birth outcomes to life course social mobility.

Results for our second study objective found that the specific measure of social mobility (education versus perceived income) achieved roughly comparable patterns, although associations for SGA with educational mobility were stronger. While these social mobility measures were only weakly correlated, they may be tapping a similar underlying constructs or processes.

We found that financial sufficiency was slightly more strongly related to SGA when anchored from early childhood, although results were comparable for middle childhood. If results had vastly differed for early versus middle childhood, that could signal etiologic relevance of SEP in early life, but not later in childhood, for adverse birth outcomes.

In sum, this study found that improving one's socioeconomic position from childhood to adulthood may improve the next generation's health. As supported by the cumulative pathway life course model, social mobility may improve birth outcomes by decreasing the accumulation of risk to adverse exposures over the lifecourse. Achieving changes in health across the entire distribution of socioeconomic position is challenging, especially in an environment where the current generation may be less socially mobile than prior generations. However there are a suite of policies targeting low income populations, to help achieve financial self-sufficiency and provide a financial safety net for basic needs. Some of these policies have also achieved benefits for health outcomes(Osypuk et al., 2014), including birth outcomes, e.g. the Earned Income Tax Credit (Strully et al., 2010). Since socioeconomic position is such a fundamental cause of health outcomes, it is necessary to complement medical care and health behavior change efforts to also change social position explicitly, in order to achieve improvements for population health and health disparities.

REFERENCES

Behrman, R.E., & Butler, A.S. (Eds.) (2007). *Preterm Birth: Causes, Consequences, and Prevention*. Washington, DC: National Academies Press.

Blumenshine, P., Egerter, S., Barclay, C.J., Cubbin, C., & Braveman, P.A. (2010). Socioeconomic disparities in adverse birth outcomes: a systematic review. *Am J Prev Med,* 39, 263-272.

Cellini, S.R., McKernan, S.-M., & Ratcliffe, C. (2008). The Dynamics of Poverty in the United States: A Review of Data, Methods, and Findings. *Journal of Policy Analysis and Management,* 27, 577-605.

Lang, J., Lieberman, E., & Cohen, A. (1996). A comparison of risk factors for preterm labor and term small-for-gestational-age birth. *Epidemiology,* 7, 369-376.

Misra, D.P., Guyer, B., & Allston, A. (2003). Integrated perinatal health framework: A multiple determinants model with a life span approach. *American Journal of Preventive Medicine,* 25, 65-75.

Osypuk, T.L., Joshi, P., Geronimo, K., & Acevedo-Garcia., D. (2014). Do Social and Economic Policies Influence Health? A Review. *Current Epidemiology Reports,* 1, 149-164.

Strully, K.W., Rehkopf, D.H., & Xuan, Z. (2010). Effects of Prenatal Poverty on Infant Health: State Earned Income Tax Credits and Birth Weight. *American Sociological Review,* 75, 534-562.

Talge, N.M., Mudd, L.M., Sikorskii, A., & Basso, O. (2014). United States Birth Weight Reference Corrected For Implausible Gestational Age Estimates. *Pediatrics,* 133, 844-853.

Zou, G. (2004). A Modified Poisson Regression Approach to Prospective Studies with Binary Data. *Am J Epidemiol,* 159, 702-706.

Figure 1. Operationalization of Social Mobility Measures

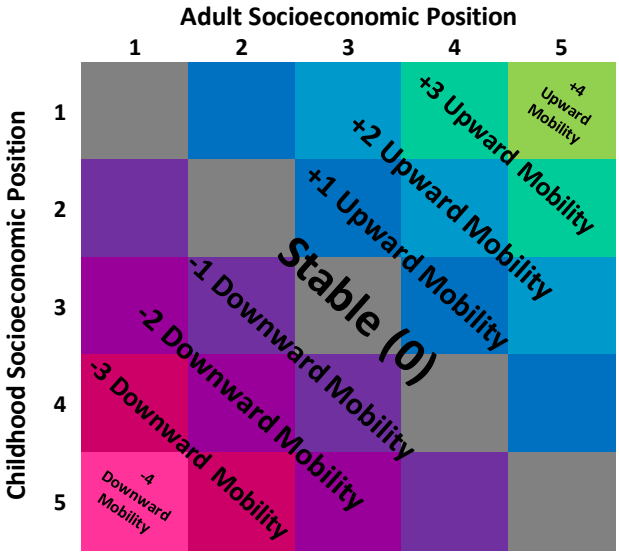

Figure 1 notes: Although Financial mobility scale ranges from -4 to _4, the educational mobiltiy scale ranges from -3 to +3.