Proposal Details

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Project Description I

Title:

Stratification by Race and Gender: Tracking Change Across Four NCES Datasets

Statement of the research problem and national importance:

Our research will contribute to the understanding of stratification in access to postsecondary education (hereafter "institutional stratification"). We define institutional stratification as the extent to which enrollment in postsecondary education institutions (hereafter "institutions") of varying selectivity differs by socioeconomic status, gender, and ethnicity. We employ four NCES longitudinal surveys to analyze post-secondary enrollment in the high school senior classes of 1972, 1982, 1992, and 2004. In the proposed research we utilize the resulting dataset to test hypotheses about gender and ethnicity, with socioeconomic status and pre-collegiate academic preparation defined as important mediating variables. Whereas prior research often employs dichotomous measures of institutional destination, we create a seven-category outcome variable including no postsecondary education, technical and community colleges, and 4-year institutions of varying selectivity. Accounting for institutional selectivity thus provides a more nuanced understanding of national trends in college access.

Although widely accepted by policymakers (Bastedo, 2009; Bastedo & Gumport, 2003), institutional stratification has negative effects for students and states. First, poor students are increasingly concentrated in community colleges, which for states may have negative effects on baccalaureate attainment. One of the causes may be that as a nation, in recent years we have grown almost exclusively in the community college sector, yet community college students are 13% less likely to graduate with a bachelor's degree with the same personal characteristics and academic credentials (Long & Kurlaender, 2008) and 20% less likely if they are students of color (Lavin & Hyllegard, 1996). Moreover, in light of recent evidence that graduation from selective institutions improves labor market outcomes (Brewer, Eide, & Ehrenberg, 1999; Hoxby & Long, 1998; Monks, 2000), it is critical to understand national trends in access to such institutions across social background characteristics.

To that end, our analysis highlights the role of rising academic preparation required for access to selective universities (Contreras, 2005; Cook & Frank, 1993). Policymakers turn to high school standards and curricula as levers for improving postsecondary access (Allensworth, et al., 2009; Chazan, 1996), while research interventions seek similar outcomes by improving standardized test scores among students of color (Good, Aronson, & Inzlicht, 2003). High school curriculum, grades, and test scores remain among the strongest predictors of admission to highly selective colleges (Espenshade, Hale, and Chung, 2005; Alon & Tienda, 2007), but the strength of the relationship between academic preparation and institutional stratification over time remains unexamined.

Pre-collegiate academic preparation has risen for all students, including low-SES students, as has the competition for access to selective institutions (Bastedo & Jaquette, 2009). Later cohorts are more likely to "match" their academic preparation with that of their institutional destination. Students care more about going to the best college they can as the returns to selective education have

increased (Hoxby & Long, 1998), and institutions want students with the strongest academic indicators because their reputation and resources are increasingly determined by external rankings (Bastedo & Bowman, 2010; Bowman & Bastedo, 2009).

This research addresses current issues important to institutional, state, and national policy. First, enrolling underrepresented students of color remains crucial even in post-affirmative action state policy contexts (Atkinson, 2001; Taylor, 2000; Gurin, 2004). We exploit the national datasets to reveal complex patterns of stratification that can help target current policy and programmatic interventions (ACE, 2009). Holding academic preparation constant, we show the most competitive universities increasingly enroll Latino and Black students. However, White and Asian students remain overrepresented despite increasing academic preparation among minority students. The minority students who do attend selective institutions are increasingly male and affluent.

Second, the shrinking proportion of men enrolling in and graduating from higher education has recently become a policy concern (Chaplin & Klasik, 2006), one that may both reverse longstanding wage gaps favoring men and affect labor force participation (Bernhardt, Morris, & Handock, 1995). Unfortunately, basic research on gender trends is all but absent. We show that whereas women were less likely than men to attend any postsecondary education in 1972, they are now over-represented at all levels of selectivity except the most selective institutions. We study the extent to which academic preparation—including math and science course taking-- drives these trends.

Review the literature and establish a theoretical grounding for the research:

Despite narrowing of racial disparities in nearly all measures of academic preparation (Kao and Thompson, 2003; Jencks & Phillips, 1998; Hedges & Nowell, 1990), we show gains among Whites and Asians have been greater than those of underrepresented minorities, thus producing little change in system stratification. In any competition with a fixed number of opportunities, relative competitiveness matters far more than absolute competitiveness (Frank & Cook, 1995). We show that increases in academic preparation for historically-disadvantaged students have not been sufficient to catch up to the rising requirements for admission to selective institutions.

HE1a: The academic preparation of all ethnic groups has increased over time.

HE1b: However, over time the academic preparation of White and Asian students has increased at a faster rate than Black and Hispanic students.

H1c: Thus, over time, (i) White and Asian students are more likely to enroll in the most selective universities, and (ii) Black and Hispanic students are less likely to enroll in the most selective universities.

Paradoxically, we expect this trend to reverse when academic preparation is not held constant, largely due to the emergence during this period of affirmative action policies designed to compensate for disparities in academic preparation. Although affirmative action does not change opportunities for the majority of Black and Hispanic students, we show it has significant effects in the most selective universities. Research on minority enrollment in selective institutions is mixed.

All else equal, some find that minority youth are more likely to attend more prestigious institutions that Whites (Grodsky, 2007; Bowen & Bok, 1998), while others conclude underrepresented minorities have stronger odds of enrolling in community colleges and less selective colleges (Hearn, 1991; Karen, 2002; Karen & Dougherty, 2005). Longitudinal research will make an important contribution, because we show the odds of enrollment in selective institutions have been changing over the last thirty years. Thus, contradictory findings may be an artifact of cross-sectional data. The exception to this is Grodsky (2007), who finds increasing admissions advantages for Black and Latino students between 1972 and 1992. Admissions advantages occur later for Latino students because Blacks initiated social movements whose pressure fomented changes to admissions policies in selective colleges. According to Espenshade and Chung (2005) simulations, Asians bear the opportunity costs of affirmative action. By extension, these trends affect enrollment rates.

HE2: Holding academic preparation constant, predicted probabilities of enrollment in the most competitive institutions (a) increase over time for Black and Hispanic students relative to White students, and (b) decline over time for Asians relative to White students.

As a result of the trends introduced in hypotheses one and two, the status quo is mostly preserved. Measures such as SAT scores have taken on escalating importance in admissions to selective colleges (Bastedo and Jaquette, 2009; Alon and Tienda, 2007), and on average Black and Latino students do not perform as well on these tests as their later performance would suggest (Fleming & Garcia, 1998; Pearson, 1993). Given the positive relationship of SAT scores and socioeconomic status (Carnevale & Rose, 2004) and higher educational aspirations students of color report relative their White peers (Kao and Tienda, 1998; Carter, 1999), we propose:

HE3: Minority students in selective universities increasingly come from upper SES quartiles.

HE4: Students of color from the lowest SES quartile are more likely than White students from the lowest SES quartile to enroll in some form of some of post-secondary education than low-SES White students.

As is true across ethnicity and SES, academic preparation has been rising for both males and females. Females have outpaced males in their preparation, however, reversing a longstanding academic gender gap (Buchmann, 2009). Moreover,

women of all ethnic backgrounds are graduating from high school at higher rates than men (Ryu, 2009). Yet, there is significant evidence that selective colleges are engaging in de facto affirmative action for male students (Whitmire, 2009). As in our ethnicity-focused analyses, we examine whether women's pre-collegiate academic preparation and institutional destination is significantly higher than men's across different ethnic groups and levels of socioeconomic status. We propose:

HG1: Women increasingly have higher pre-collegiate academic preparation than men.

HG2: Thus, women are increasingly over-represented in more competitive institutions relative to men.

HG3: However, women are increasingly under-represented relative to their academic preparation in the most competitive institutions.

College enrollment disparities favoring women are strongest for under-represented minority groups (Ryu, 2009), despite persistent within-gender wage gaps favoring White women (Alon and Haberfeld, 2007). We hypothesize:

HG4: Black, Asian, and Hispanic females are more likely to enroll in selective colleges than their male counterparts.

HG5: The advantage that women have over men in odds of attending a selective college is stronger in low-SES households.

While earning comparable math scores in eighth and tenth grade, many high school females lose confidence in their math abilities and interest in the subject (Barnett and Rivers, 2004; Catsambis, 1994). Thus, to ensure some level of gender equity at selective colleges, admissions officers may more heavily weight achievement in math and science to select more boys, to compensate for declining relative academic achievement among males.

HG6: White males continue to have higher odds of attending the most competitive colleges relative to White women.

HG7: (a) The relationship between highest math course taken and highest science course taken and access to most competitive institutions is stronger for men then women, holding other factors constant (b) The relationship between highest high school GPA and access to most competitive institutions is stronger for women than men, holding other factors constant.

Describe the research method that will be used:

Data and Sample. Our sample consists of a nationally-representative sample of high school completers from the 1972, 1982, 1992, and 2004 high school senior classes, utilizing data from NLS72, HS&B80 (sophomore cohort), NELS88, and ELS2002. We only include students who complete high school within 1.5 years of their high school graduating class, because the most recent wave of the ELS survey begins interviewing students 1.5 years after the high school graduating class of (June) 2004.

Weights. In order to make claims about changes in stratification over time, we must select a weight variable that is consistent across all surveys. Appendix A, Table 1 shows the availability of weights by survey for the restricted data used in our study. We select a weight variable, which we have named "LONGWGT," which is non-zero for students who were survey respondents in 12th grade and who were survey respondents two years later, when students identify initial postsecondary attendance. Consistent with Bound, Hershbein, & Long (2009), we also create a single dataset, with results weighted to be nationally representative.

Dependent variable. We identify the first postsecondary institution attended. To remain consistent with ELS we define postsecondary attendance as attendance that begins within 1.5 years of the June of the student's high school graduating class. We create three different measures of first institution attended: (1) using only Postsecondary Education Transcript (PETS) data (available only for NLS72, HS&B, and NELS); (2) using only survey response data; and (3) using a combination of PETS and survey data. For reasons that are discussed in Bastedo and Jaquette (2009), the proposed research uses the measure created using only survey data.

Having identified the first institution attended, we merge selectivity data from Barron's Profiles of American Colleges (1971, 1981, 1991, 2003) to create a seven-category outcome variable: 1) does not attend postsecondary education; 2) 2-yr or a less than 2-yr institution; 3) non-competitive 4-yr institution; 4) competitive institution; 5) very-competitive institution; 6) highly-competitive institution; and 7) most-competitive institution. To maintain a consistent status order across the datasets, the dependent variable used in the proposed research applies the 2004 Barron's rankings to all years. We have also created variables that apply Barron's selectivity rankings from 1972 to the 1972 cohort, selectivity rankings from 1982 to the 1982 cohort, etc. See Bastedo and Jaquette (2009) for further details.

Covariates. Demographic, socioeconomic, and academic preparation covariates are included in the models. Demographic variables include gender, ethnicity, and number of siblings. Socioeconomic variables include weighted SES quartile/decile, parental education, family income (in 2008 dollars), and occupational prestige. Pre-collegiate academic preparation variables include SAT/ACT score (accounting for re-centering and with ACT scores converted to SAT scores), and senior year test score. We also created high school GPA, highest math course passed, and highest science course passed, but these variables utilize high school high school transcript data not available for NLS72. Finally, we created covariates for extracurricular activities, educational expectations, high school urbanicity, high school control (public, Catholic, other private), and high school state.

Methodology. Choice of methodology follows choice of dependent variable. The categories of the dependent variable are ordinally ranked, implying an ordinal logistic regression. However, “parallel regression assumption” (Long & Freese, 2003) is violated because the slope between a covariate and the dependent variable is not the same for all categories of the dependent variable. Instead, we employ a multinomial logistic regression model (MNLM), which creates M – 1 regression equations for the M outcome variable categories minus one for the base outcome J, non-selective 4-year institution. Therefore, for each covariate there are M – 1 coefficients. Each coefficient represents the effect of a one-unit increase on the probability of attending a particular institution type as opposed to attending a non-selective 4-year institution. Equation (1) shows the general equation used in our multinomial logistic regression model.

Hypothesis testing. Hypotheses will be tested using a combination of simple descriptive statistics and multinomial logistic regression. Here, we present our hypothesis testing strategies and descriptive statistics for a small selection of hypotheses. Once we begin conducting analyses in earnest, we will add the formal statistical tests, 95% confidence intervals, etc. Descriptive statistics for HE1c, that over time White and Asian students are more likely to enroll in the most selective universities than Black and Latino students, are shown in Appendix Table 2. However, HE2a, that holding academic preparation constant Black and Latino students are more likely to attend most competitive institutions than white students, can only be tested using multinomial logistic regression. Descriptive statistics for HE3, minority students in competitive universities increasingly come from upper SES quartiles, are shown in Appendix Table 3 (we present this table for Black students only). Finally, descriptive statistics for HG1, women increasingly have higher pre-collegiate academic preparation than men, and HG2,women are increasingly over-represented in more competitive institutions relative to men, are shown in Appendix Tables 4 through 5.

Hypothesis HG3, that women are increasingly under-represented relative to their academic preparation in the most competitive institutions, involves the use of “counterfactuals”; what would be the institutional destination of a women with a specific set of academic preparation covariates had she been a man. Several hypothesis-testing strategies exist. First, following Grodsky (2007) we can use propensity score matching (Morgan & Harding, 2006). Second, the “Oaxaca Decomposition” method (Oaxaca & Ransom, 1994), shown in Equation (2) through Equation (6), was devised as a strategy to measure gender discrimination in wages. At issue was whether wage differentials occur because men and women have different covariate values (e.g., men more likely to enter higher paying fields such as finance), implying no wage discrimination, or whether men and women have different coefficients on those covariates, implying wage discrimination.

Applying this method to the proposed research, the first three terms in Equation (6) represent the difference in predicted probabilities of institutional destination for men versus women due to differences in covariate values (e.g., level of highest math). The last four terms in Equation (6), representing the “discriminatory” source

of differences, show the extent to which men and women with the same covariate values have different probabilities of institutional destination. The Oaxaca decomposition was originally devised with a continuous variable, wages, as the outcome. However, due to econometric advances from DiNardo, Fortin, and Lemieux (1996), decomposition method can be applied to categorical dependent variables.

Project Description II

Will you use NCES target dataset? Yes

Please check all NCES datasets that apply
- Educational Longitudinal Study of 2002 (ELS: 2002)
- High School and Beyond (HS&B)
- National Education Longitudinal Study of 1988 (NELS:88)

Explain why each dataset best serves this research. Include a variable list for each dataset used.
We use data from four NCES longitudinal surveys, NLS72, HS&B80 (sophomore cohort), NELS88, and ELS2002 in order to understand change over time in access to postsecondary education. These surveys were designed to be consistent with one another so that analysts could combine them to understand trends over time (e.g., Ingels & Dalton, 2008).

Variables drawn from NLS, HS&B, NELS, & ELS:
- Demographic variables: gender; ethnicity; and number of siblings
- Socioeconomic variables: parental education; parental occupation (Duncan SEI score); family income (adjusted for inflation using 2008 CPI); weighted SES quartile and decile

- High school variables: state; region; urbanicity (urban, rural, suburban); and control (public, private catholic, private other)

- Pre-collegiate academic background: SAT/ACT test scores, senior-year test score; self-reported grades (not available for ELS); 0/1 indicator of “college track” curriculum

- High school transcript variables (not available for 1972 cohort): GPA, math course taking and highest math course passed; science course taking and highest science course passed

- Student educational expectations

- Extracurricular variables: student government; honors society; athletics; yearbook/newspaper; and vocational club.

Will you use NSF target dataset? No

Explain why each dataset best serves this research. Include a variable list for each dataset used.

Will you address the NPEC focus topic? Yes

If yes, please briefly describe:
Our research is highly relevant to the NPEC focus area on “socioeconomic factors affecting access” because our specific interest is in analyzing the changing relationships between socioeconomic status, gender, ethnicity, pre-collegiate academic preparation, and institutional destination.

Project Description III

Provide a timeline of key project activities:

June 2010 to December 2010: Finish variable construction; validate model assumptions; finalize appropriate analytical techniques; conduct initial descriptive analyses; begin analyses of race/ethnicity described in section 2c; begin constructing tables and figures; if time, conduct multinomial logistic regression for these variables.

November 2010: Present one paper at ASHE in Indianapolis based on descriptive results.

December 18, 2010: Mid-year progress report submitted to AIR.

January 2010 through July 2010: Finish analyses of race/ethnicity. Begin analyses of gender as described in section 2c. Complete variable construction; validate model assumptions; conduct multinomial logistic regression; perform Oaxaca/DiNardo decomposition. Construct tables and figures. Write AIR paper.

May 2011: Present MNLM results at AIR Annual Forum in Toronto, Canada.

June 30, 2011: Final progress report submitted to AIR.

Summer 2011: Given feedback at AIR Annual Forum, submit final co-authored papers to Research in Higher Education and Journal of Higher Education.

List deliverables such as research reports, books, and presentations that will be developed from this research initiative:

We intend to produce the following deliverables during the course of the grant:

1) A journal article examining the longitudinal shifts in access and institutional stratification by race/ethnicity for Research in Higher Education;

2) A journal article examining longitudinal shifts in access and institutional stratification by gender for the Journal of Higher Education;

3) A conference paper the MNLM results for the AIR Annual Forum 2011 in Toronto, Canada;

4) A conference paper on descriptive trends by race/ethnicity for the ASHE conference in Indianapolis in November 2010.

5) A policy brief of the results of this project for dissemination through the Institute for Higher Education Policy to major higher education policy groups in DC and state SHEEO officers, and on the internet;

6) Mid-term and final progress reports to AIR demonstrating the accomplishments of the grant, due December 2010 and June 2011.

Describe how you will disseminate the results of this research:

The results of this project will be disseminated primarily to researchers and policymakers in higher education. For researchers, this project will produce two major journal articles for submission to Research in Higher Education and Journal of Higher Education. In addition, we will present conference papers at each of the major research conferences (AIR, AERA, ASHE) in higher education. Early work on this project, focused on SES dynamics, has been presented at AERA, ASHE, the RESUP conference in Lausanne, Switzerland, and as a keynote talk at the University of Illinois.

For policymakers, a policy brief summarizing the empirical results and identifying potential policy interventions will be circulated on paper to major higher education policy groups in DC (e.g., One Dupont Circle, Federal agencies, Legislative committees), to state SHEEO officers around the country, and through the internet to the public. The Institute for Higher Education Policy, in Washington, DC, has already expressed interest in publishing policy or research briefs that emerge from this research project. I presented some initial data from the project to an IHEP-organized meeting in August 2008, and there was great enthusiasm among the U.S. and European policy analysts represented at the conference, as well as by IHEP President Michelle Cooper. They have agreed to assist us in disseminating

these results to the broadest possible policymaking audience through their existing relationships with policymakers and their high-profile series of policy briefs.

Provide a reference list of sources cited:

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IRB Statement

Statement of Institutional Review Board approval or exemption:

This project has IRB approval (UM Human Subjects Approval HUM00020594) through November 10, 2010. An application for Continuing Review will be submitted in October 2010.

Statement of Use of Restricted Datasets

We have access to the following restricted data CDs: For NLS, CD 94-487 (unrestricted); For HS&B sophomore cohort, CD 95-361 and 95-194 (PETS supplement); For NELS, CD 2003-348, CD 2003-402 (PETS), and CD 96-130 (BY-F3 CD used to retrieve high school transcript data); and for ELS, CD 2008-346. This is provided through NCES License Control Number 021218696.

Biographical Sketch

Michael Bastedo's Biography Sketch

Principal Investigator

Michael N. Bastedo is an associate professor in the Center for the Study of Higher and Postsecondary Education at the University of Michigan, where he is also a faculty affiliate at the Nonprofit and Public Management Center and at the European Union Center of Excellence. He has recently been a Ford Foundation Global Policy Fellow at the Institute for Higher Education Policy, a policy fellow at the Bellagio Center in Italy, and a visiting scholar at the Center de Sociologie des Organisations at the Institut d'Études Politiques (SciencesPo) in Paris.

Professor Bastedo has been a Fulbright Scholar at the Center for Higher Education Policy Studies (CHEPS) at the University of Twente in the Netherlands, and an Associate at the National Center for Public Policy and Higher Education in California. He was also the research director and a principal investigator of the Institutes on Public University Governance. Prior to his position at CSHPE, he was Assistant Professor of Education at the University of Illinois at Urbana-Champaign, and affiliated faculty in the Institute for Government and Public Affairs.

His scholarly interests are in the governance, politics, and organization of public higher education in the U.S. and abroad. His work has been published in the American Educational Research Journal, Research in Higher Education, The Review of Higher Education, Higher Education, Higher Education Quarterly, Journal of Student Financial Aid, Prospects, and American Higher Education in the 21st Century (2nd edition, Johns Hopkins University Press). He has been a member of the editorial board of the American Educational Research Journal and has reviewed for the Journal of Higher Education, Educational Evaluation and Policy Analysis, Educational Policy, and other major journals, as well as for major grant competitions such as FIPSE and GEAR UP. His research has been reported by journalists at the New York Times, U.S. News & World Report, and The Chronicle of Higher Education, among others.

Professor Bastedo has been supported through research grants and fellowships provided by The Mellon Foundation, The Ford Foundation, The Spencer Foundation, The Lumina Foundation, The Kauffman Foundation, The Carnegie Corporation of New York, The Association of Governing Boards of Colleges and Universities, The Council for the International Exchange of Scholars (CIES), The European Commission and The Organization for Economic Co-operation and Development (OECD), and The American Educational Research Association, The National Science Foundation, The National Center for Education Statistics.

Prior to entering the academic profession, Prof. Bastedo held policy positions with the Massachusetts Board of Higher Education, and research positions in the National Center for Postsecondary Improvement and the Stanford Institute for Higher Education Research. He holds the A.B. with honors from Oberlin College, an M.A. with distinction from Boston College, and the A.M. in Sociology and Ph.D. in Administration and Policy Analysis from Stanford University.

Research Assistants

The analysis dataset was constructed primarily by Ozan Jaquette, a Ph.D. candidate at the University of Michigan. He is primarily interested in the organization and finance of higher education, with expertise in statistical modeling and applied econometrics. Due to his work constructing the dataset, he will be a co-author on the grant work proposed here, but he will not be conducting the primary analytic work.

The analysis will be conducted with Julie Posselt, a Ph.D. candidate and Rackham Merit Fellow at the University of Michigan. She received the BS in history and political science summa cum laude and MA in educational policy studies, both from the University of Wisconsin-Madison. Before beginning the Ph.D., Posselt worked with the Wisconsin Center for Education Research and taught undergraduate courses in research methods with the McNair Scholars Program. At Michigan, she has been a research assistant as well as a teaching assistant for a graduate level course in hierarchical linear modeling. Her current research interests center on the sociology of education, including faculty judgment in graduate admissions, the construction of and stratification in educational choices and opportunities, and the role of education in a diverse democracy. Posselt uses quantitative and qualitative methods and her research has been published in a compendium of studies on undergraduate research, the Journal of Curriculum and Supervision, and Higher Education: Handbook of Theory and Research.

Budget Requirements

Michael Bastedo' Budget

SPONSOR
Salary Units 2010-2011

PERSONNEL	3% annual Salary	Incr. **$29,103**	
Faculty			
Michael Bastedo	**$4,070**		
Summer Ninths			
Michael Bastedo	**$18,089**		
GSRAs: $0 $0			
25% Grad Student Stipend Per term $4,323			
50% Grad Student Stipend Per term $8,646			
Temp Hourly			**$6,944**
summer $24.80 280 $6,944			
0 $0.00 0 $0 $0			
0 $0.00 0 $0 $0			
0 $0.00 0 $0 $0			
Fringe Benefits $7,203			**$7,203**
Faculty @30%, Staff @30% incl. Vacation Buy-out, Temporary Hourly @8%, GSRA Fringe Benefits			

Consumable Supplies & Materials $0
RESEARCH $0 $0
Duplicating/Copying $0 $0
SAS Statistical sofware $0 $0
STATA statistical software $0 $0
Travel/Working Meals (Travel Status **$ 2,694**
AIR Annual Forum 2011 Toronto $2,694
Total Direct Cost excl. tuition **$39,000**
Tuition Waiver $0
TOTAL DIRECT COST **$39,000**
Indirect Cost Base TDC $39,000
Subtotal $39,000
Indirect Cost 0% **$0**
Grand Total **$39,000**

Funding History

This grant is part of a large project examining institutional stratification over time. This project was begun using pilot funding from the Center for Enrollment Research, Policy, and Practice at the University of Southern California. Another small grant was provided by the University of Michigan's Rackham Graduate School. This funding allowed us to establish access to the data, construct the full analysis dataset, and to select and construct the variables needed for analysis. The first wave of analysis, focused on family-income dynamics, was funded by the AERA/NSF/NCES grant program in 2009.

Much of the work represented to date in our proposal to AIR in terms of our knowledge of all four datasets and the construction of the hypotheses for this research was funded through the USC & Michigan grants, and was designed to build a case for more substantial outside funding to complete the project.

This is our second grant application to AIR.