INTERGENERATIONAL POVERTY INTERVENTIONS IN AFTERSCHOOL GRANT PROGRAM EVALUATION

Longitudinal Analyses of Student Outcomes:

Year One 2014-15

Year Two 2015-16

Year Three 2016-17

THE UNIVERSITY OF UTAH
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Introduction

In 2014, the Utah State Legislature passed Senate Bill 43, *Intergenerational Poverty Interventions (IGPI) in Public Schools* (sponsored by Senator Reid and Representative Gibson). Senate Bill 43 appropriated annual funding for educational programming outside of the regular school day. Through a competitive process, the Utah State Board of Education (USBE) awarded IGPI grants to six Local Education Agencies (LEAs) for three academic years (2014-15 through 2016-17). In the 2015-16 academic year, the DWS OCC provided additional IGP funding to two additional LEAs. The two additional LEAs began offering programming in 2016-17. Together, the eight grantees operated 29 afterschool programs in the 2016-17 academic year. These grantees were required to provide academic support and developmental enrichment for students affected by intergenerational poverty. Programs were also expected to provide support for families.

As a result of IGPI, the Department of Workforce Services Office of Child Care (DWS OCC) qualified for a fiscal match through the federal Child Care Development Fund (CCDF). This match allowed DWS OCC to allocate additional funding to afterschool programs. These matching funds facilitated a collaborative partnership between DWS OCC and the USBE and provided additional support for IGPI grantees.[1]

The USBE and DWS OCC contracted the Utah Education Policy Center (UEPC) to conduct an evaluation of the IGP[2] grant programs. The purpose of the evaluation was to understand program implementation and academic outcomes. The UEPC produced three annual evaluation reports for the IGP grant program. This fourth IGP evaluation report presents findings from a set of comprehensive longitudinal analyses. These analyses examine the relationships between participation in IGP afterschool programs and academic outcomes. More specifically, these analyses answer the following evaluation questions:

> What was the effect of IGP program participation on students' standardized test scores?
>
> What were the cumulative effects of IGP program participation on students' standardized test scores?

Methods

Data Sources

Data for these analyses were obtained after establishing data share agreements with grantees and the USBE.[3] Data sources include three years of IGP afterschool program participation data and four years of student education data (baseline year plus three program years). Program participation data included numbers of days students attended the programs and days of possible attendance.

The analyses used student demographic characteristics and Student Assessment of Growth and Excellence (SAGE) scores. Student demographics included gender, race, grade level, low-income, mobility, chronic absenteeism, and English language learner status. SAGE tests are standardized, annual assessments that are administered statewide. They include summative assessments in English language arts, mathematics, and science for the following grades and subjects: English language arts grades 3-11; mathematics grades 3-8 and high school Math I-III; science grades 4-8 and high school biology, earth science, chemistry, and physics.[4]

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[1] Additional information about the IGP grant programs is available in year 3 annual evaluation report: uepc.utah.edu
[2] Funders combined three IGP-related afterschool grants. In this report we use IGP to refer to all three grants.
[3] The views expressed are those of the authors and are not the USBE's nor are they endorsed by the USBE.
[4] https://schools.utah.gov/

Program Participation Sample

Table 1 shows the total number of students who participated in IGP afterschool programs each year and the number who continued in the following years. These data indicate that while most students participated for one year, there were also many students who attended for two or three years.

Table 1. Student Participation by Grant Year

Annual Student Cohorts	Students Served 2014-15	Students Served 2015-16	Students Served 2016-17	Total Unique Students Served (All 3 Years)
Cohort of students who started in 2014-15	**3,895**	1,838	684[5]	--
Cohort of students who started in 2015-16	--	**2,511**	784	--
Cohort of students who started in 2016-17	--	--	**3,004**	--
Unmatched students*	49	3	13	**65**
Total	3,944	4,352	4,485	**9,475**

Source: Program Participation Records

*Unmatched students were students with incomplete data who could not be matched across years or with other data sources.

Table 2 provides a summary of the number of students each grantee reported serving each year and the total number of unique students served at least once across all three years. The annual totals include the number of student participants that each grantee reported for each academic year. The unique students served across all three years includes only students who could be matched across all three years and who had sufficient data for the analyses. Carbon and San Juan School Districts did not submit data in the first two years because they began serving students in 2016-17. Gateway Preparatory Academy and Provo School District did not provide data in 2016-17.

Table 2. Number of Students Served in each IGP Grant Year

Grantee	Students Served 2014-15	Students Served 2015-16	Students Served 2016-17	Unique Students Served (All 3 Years)
American Preparatory Academy	1,623	1,614	1,027	2,479
Carbon School District	--	--	409	409
Gateway Preparatory Academy	134	53	--	144
Grand County School District	247	52	363	526
Granite School District	1,147	1,190	884	2,648
Ogden School District	578	1,275	1,329	2,355
Provo School District	215	168	--	383
San Juan School District	--	--	473	466
Total Number of Students Served	**3,944**	**4,352**	**4,485**	**9,410**

Source: Program Participation Records

[5] 469 students attended all three years and 215 students attended only in 2014-15 and 2016-17.

Sample for the Longitudinal Analyses

The sample used for the analyses included all students who participated in an IGP afterschool program for at least one year, plus a baseline year, and that had available education data. This resulted in 8,632 (91%) from the total 9,475 participants. Of these, 6,601 participants had SAGE ELA scores, 6,568 participants had SAGE mathematics scores, and 5,894 participants had SAGE science scores. Roughly equal numbers of female (4,313) and male (4,319) students were represented in the sample. Table 3 shows the distribution of matched students by race. Detailed information about matching procedures are in the appendix.

Table 3. Race of Students in the Matched Data

Race	Number of students	Percent of students
African American	294	3%
American Indian/Alaskan Native	446	5%
Asian	341	4%
Hispanic/Latino	4,090	47%
White	3,049	35%
Other race	412	5%
Total	**8,632**	**100%**

Sources: Program Participation Records and USBE Student Records

Analyses

In order to examine the effects of multiple years of participation in IGP afterschool programs on student academic achievement, we used fixed effects regression models. Fixed effects models mitigate self-selection bias by comparing students to themselves over time rather than to their peers. We used the fixed effects models to look for causal relationships between IGP program participation and student academic performance. In other words, we compared the average test scores of students during years of IGP Program participation with the test scores of those same students during years of non-participation, while holding other factors constant. Detailed information about the analyses, including additional results tables are provided in the appendix.

We used three fixed effects models to test the effect of program participation on each outcome variable (English language arts, mathematics, and science SAGE scores). All three models included chronic absenteeism,[6] low-income status, mobility,[7] and English language learner status as covariates. The appendix provides a detailed description of the analyses. The three models varied in how they operationalized IGP participation:

Model 1 operationalized IGP participation as a dichotomous variable (whether the student participated or not in a given school year).

Model 2 operationalized participation as the total number of days a student participated in an IGP program in a given school year.

Model 3 operationalized participation as the number of years a student participated in an IGP program prior to and including a given school year.

[6] A student was considered chronically absent if he/she was absent for 10% or more of the days he/she was in membership. A student was only included in calculations of chronic absence if he/she was enrolled for at least 60 calendar days in a given school year.

[7] Mobility refers to students who have attended more than one school in a given school year.

Results

Table 4 presents the results from each fixed effects model on each of the three academic achievement variables. All of the models were statistically significant for all of the three outcomes, indicating that participation in the program had a positive effect on student SAGE scores. Interpretations of the coefficients of each model are provided. The appendix provides additional information about the full models and coefficients for all variables included in the analysis.

Table 4. Outcomes and Interpretations for each Fixed Effects Model

Outcome	Predictor	Coefficient	Significant	Interpretation
English Language Arts	Model 1 Participate Y/N	5.72	yes	IGP program participation was associated with a 5.7 point increase on SAGE ELA.
	Model 2 Days Attended	0.03	yes	Every 10 days of IGP program participation was associated with a 0.3 point increase on SAGE ELA.
	Model 3 Attended 1 year	8.03	yes	Students who attended IGP programs for one year scored 8 points higher on SAGE ELA compared to years they did not participate.
	Model 3 Attended 2 years	20.23	yes	Students who attended IGP programs for two years scored 20.2 points higher on SAGE ELA.
	Model 3 Attended 3 years	30.52	yes	Students who attended IGP programs three years scored 30.5 points higher on SAGE ELA.
Math	Model 1 Participate Y/N	3.20	yes	IGP program participation was associated with a 3.2 point increase on SAGE math.
	Model 2 Days Attended	0.03	yes	Every 10 days of IGP program participation was associated with a 0.3 point increase on SAGE math.
	Model 3 Attended 1 year	7.39	yes	Students who attended IGP programs for 1 year scored 7.4 points higher on SAGE math compared to years when they did not participate.
	Model 3 Attended 2 years	19.96	yes	Students who attended IGP programs for 2 years scored 20 points higher on SAGE math.
	Model 3 Attended 3 years	23.95	yes	Students who attended IGP programs for 3 years scored 24 points higher on the SAGE math exam.
Science	Model 1 Participate Y/N	2.26	yes	IGP program participation was associated with a 2.3 point increase on SAGE science.
	Model 2 Days Attended	.02	yes	Every 10 days of IGP program participation was associated with a 0.2 point increase on SAGE science.
	Model 3 Attended 1 year	3.85	yes	Students who attended IGP programs for 1 year scored 3.9 points higher on SAGE science compared to years when they did not participate.
	Model 3 Attended 2 years	7.64	yes	Students who attended IGP programs for 2 years scored 7.6 points higher on SAGE science.
	Model 3 Attended 3 years	15.14	yes	Students who attended IGP programs for 3 years scored 15.1 points higher on SAGE science.

Sources: Program Participation Records and USBE Student Records

Note: Chronic absence, mobility, ELL, and low-income status are included as covariates in each model. Grade level and school year are included as fixed effects.

Conclusion

This longitudinal study applied fixed effects models that established causal relationships between student participation in the IGP programs and SAGE test score gains in English language arts, math, and science between 2014-15 and 2016-17. As presented in Table 4, the longitudinal analyses found that participating in IGP programs had significant, positive impacts on student SAGE scores.

As participation increased, SAGE scores also increased. For example, for every ten days students participated in an IGP afterschool program, their SAGE scores in ELA increased by *.3*. Additionally, there was a significant, positive cumulative effect on SAGE scores in all three subject areas, such that as years of attendance increased, SAGE scores increased. On average, students' academic gains for attending three years at least tripled the gains in SAGE scores seen for one year of attendance.

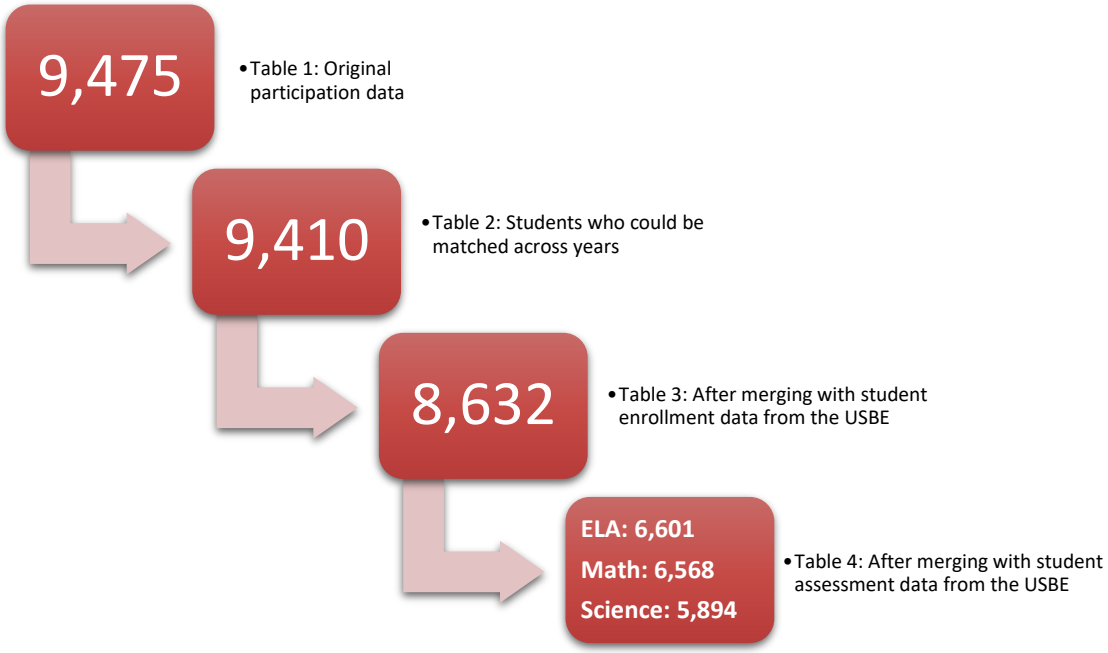
Appendix: Detailed Methods and Results

Matching Procedures

Several steps were involved in preparing the final dataset for the longitudinal analysis. First, to identify all of the students who participated in the program for at least one year, we merged all participation data. This resulted in 9,475 students who participated in IGP programs at least once, however, not all of those students could be matched across years, bringing the participation sample to 9,410. We credited students who attended two or more programs in a single school year to the program each student attended for the greatest number of days. Among all participants, 6,573 students attended for one year, 2,368 students attended two years (any two years among the three years), and 469 students attended all three years.

To create a baseline for analysis, we matched education records from 2013-2014, the year prior to the start of the grant cycle, with participation data from IGP afterschool programs. Overall, we matched 8,632 IGP participants with enrollment data. The descriptive analysis of student demographics based on enrollment data was based on the matched sample of 8,632 students. From these students, there were 6,601 students with English language arts scores, 6,568 students with math scores, and 5,894 students with science scores.

Figure 1. Matching Criteria and Sample Size



Sources: Program Participation Records and USBE Student Records

Analyses

In order to examine the effects of participation in IGP afterschool programs on student academic achievement over time, we used fixed effects regression models. Fixed effects models mitigate self-selection bias by comparing students to themselves and thus can be used to establish causal relationships between IGP participation and student academic performance. In other words, we compared the average test scores of students during years of IGP program participation with the test scores of those same students during years of non-participation, while holding other factors constant.

The model can be written as:

$$Score_{ijt} = \beta_0 + \beta_1 Characteristics_{ijt} + \beta_2 Participation_{ijt} + \delta_i + \mathrm{I}_t\theta + \gamma_j + \varepsilon_{ijt}$$

We performed three sets of fixed effects models that examined the effects of student participation on English language arts, math, and science SAGE scores, respectively. The dependent variables $Score_{ijt}$ represents student SAGE scores in English language arts, math, and science in grade *j* and school year *t*, respectively. The independent variables $Characteristics_{ijt}$ is a vector of characteristics of student *i* in grade *j* and school year *t* that might change over time, including whether student *i* was chronically absent, low-income, mobile, and/or an English language learner (ELL). δ_i is the student fixed effect which controls for all time-invariant student characteristics, (e.g., gender, race, innate ability, and parental involvement). γ_j is a grade fixed effect to control for the systematic test score differences between grades. Finally, we added a set of dummy variables for each year (I_t), which captured any systematic influence that was different each year but common to all students.

In Model 1, $Participation_{ijt}$ is a dichotomous variable indicating whether or not student *i* in grade *j* participated in the IGP program school year *t*. In Model 2, $Participation_{ijt}$ is the total number of days that student *i* in grade *j* participated in the IGP programs in school year *t*. In Model 3, $Participation_{ijt}$ indicates the total number of years student *i* in grade *j* has participated in the programs prior to and including the school year *t*. For example, if a student only participated in the programs in 2015 and 2017, the value of the $Participation$ variable from 2014 to 2017 would be 0, 1, 1, and 2, respectively.

Results

Table 5 provides average SAGE scores for IGP participants and students statewide for all three tested subjects, across all four years. Generally, IGP participants in our sample had lower SAGE scores compared with the state averages, suggesting that IGP programs had enrolled lower-performing students.

Table 5. Average Student SAGE Scores for Students in IGP Programs Compared with State Averages

Tested Subject	Year	Statewide		IGP Participants	
		N	Average SAGE Score	N	Average SAGE Score
English Language Arts	2014	409,327	414	3,859	344
English Language Arts	2015	425,901	420	2,518	382
English Language Arts	2016	434,549	419	3,088	390
English Language Arts	2017	411,775	410	2,770	367
Mathematics	2014	385,909	420	3,789	357
Mathematics	2015	410,933	437	2,430	396
Mathematics	2016	424,203	437	3,010	399
Mathematics	2017	409,052	425	2,736	361
Science	2014	345,866	834	3,299	815
Science	2015	360,121	836	2,313	818
Science	2016	369,339	836	2,756	820
Science	2017	365,786	835	2,226	823

Sources: Program Participation Records and USBE Student Records

Note: 2014 IGP data represents the baseline year 2013-14 student SAGE scale scores for all students who participated in IGP programs in any school year between 2013-14 and 2016-17. All subsequent years include the students who participated in IGP in that school year. The statewide averages include IGP participants.

This section presents a summary of the results from fixed effects models. Table 6 shows the effects of student participation on SAGE English language arts scores. Table 7 shows the effects of student participation on SAGE math scores. Table 8 shows the effects of student participation on SAGE science Scores.

Table 6. Effects of Student Participation on SAGE ELA Scores

	Model 1 Participation	**Model 2 Days Attended**	**Model 3 Number of years**
Participation	5.72* (0.69)		
Number of days attended		0.03* (0.01)	
Attended 1 year			8.03* (1.08)
Attended 2 years			20.23* (1.70)
Attended 3 years			30.52* (3.30)
Chronic absence	-3.15* (1.32)	-3.35* (1.32)	-3.36* (1.32)
Low income	0.85 (1.48)	1.25 (1.48)	1.86 (1.47)
Mobile	-0.44 (1.08)	-0.50 (1.08)	0.07 (1.07)
ELL	-1.95 (1.64)	-2.31 (1.64)	-0.86 (1.64)
R^2	0.500	0.497	0.503
Observations	19,534	19,534	19,534

Notes:
1. Fixed effects are included in the models.
2. Standard errors in parentheses.
3. *Indicates statistical significance (p = <.05).

Table 7. Effects of Student Participation on SAGE math Scores

	Model 1 Participation	Model 2 Days Attended	Model 3 Number of years
Participation	3.20* (0.59)		
Number of days attended		0.03* (0.01)	
Attend 1 year			7.39* (0.93)
Attend 2 year			19.96* (1.47)
Attend 3 year			23.95* (2.82)
Chronic absent	-4.62* (1.16)	-4.71* (1.16)	-4.75* (1.15)
Low income	-0.19 (1.29)	0.02 (1.30)	0.52 (1.29)
Mobile	0.23 (0.93)	0.19 (0.93)	0.70 (0.92)
ELL	-3.11* (1.42)	-3.30* (1.43)	-1.87 (1.42)
R^2	0.553	0.552	0.559
Observations	19,093	19,093	19,093

Notes:
1. Fixed effects are included in the models.
2. Standard errors in parentheses.
3. *Indicates statistical significance (p = <.05).

Table 8. Effects of Student Participation on SAGE Science Scores

	Model 1 Participation	Model 2 Days Attended	Model 3 Number of years
Participation	2.26* (0.35)		
Number of days attended		0.02* (0.01)	
Attend 1 year			3.85* (0.55)
Attend 2 year			7.64* (0.86)
Attend 3 year			15.14* (1.77)
Chronic absent	-0.92 (0.66)	-0.99 (0.66)	-1.04 (0.66)
Low income	1.80* (0.73)	1.94* (0.73)	2.11* (0.73)
Mobile	-0.07 (0.54)	-0.14 (0.54)	0.05 (0.54)
ELL	0.34 (0.90)	0.19 (0.90)	0.73 (0.90)
R^2	0.094	0.091	0.099
Observations	16,717	16,717	16,717

Notes:
1. Fixed effects are included in the models.
2. Standard errors in parentheses.
3. *Indicates statistical significance (p = <.05).