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This PDF document and the supporting four page Child Outcomes Bulletin 2010 were constructed through a creative collaboration of Child Care Results, the California Head Start Association, and the 15 participating Head Start programs listed on page four. This analysis of child assessment data on 6,600 children was conducted by Child Care Results in the fall of 2009. The 4 page bulletin can be found www.caheadstart.org/ChildOutcomes2010. An electronic version of this methodology can be found on-line at: www.childcareresults.com/ChildOutcomes2010.

The analysis was conducted by Child Care Results alone. Any errors are solely the responsibility of Child Care Results.

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The California Head Start Association is the unified voice providing leadership and advocacy for the Head Start community. The California Head Start Association is an important strategic partner representing Head Start interests in California and the nation.

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Supporting Methodology

Supplement to the Child Outcomes Bulletin 2010

The following methodology explains what we could not fit in the 4 page bulletin and includes complete regressions results. It also clarifies applications of and potential issues with the analysis.

- 1. Sample and Data Descriptions**
- 2. Study Design**
- 3. Policy Context**
- 4. Results**
- 5. Conclusion**

1. Sample and Data Descriptions

Data were collected on 14,444 children participating in 15 different Head Start programs from across the state of California. Children enrolled in Head Start are typically from families at or below 100% of the Federal Poverty Level. In some circumstances, a limited number of children from families above the poverty level can be enrolled.

The children were assessed using the Desired Results Developmental Profile-Revised (DRDP-R). Among California Head Start programs, the DRDP-R is typically administered three times during the year: once within sixty days of enrollment, again after three months, and the third time after another three months. Generally, these assessments happen in the fall, winter, and spring respectively. Frequently, however, children enroll at different times during the year resulting in a slightly different timing for the assessments. For convenience, we will refer to the first assessment as the fall assessment and the third assessment as the spring assessment.

About the DRDP-R

The Desired Results Developmental Profile– Revised (DRDP-R) was developed by the California Department of Education. The DRDP-R assessment for Preschoolers includes ten indicators. The indicators include fundamental areas of development (e.g. Math, Literacy, Social and Interpersonal Skills) and have been aligned to the Head Start outcome framework domains.

Table 1: Desired Results Indicators

Self Awareness & Self Concept	Children show self-awareness and a positive self-concept
Social Interpersonal Skills	Children demonstrate effective social and interpersonal skills
Self Regulation	Children demonstrate effective self-regulation in their behavior
Language	Children show growing abilities in communication and language
Learning	Children show interest, motivation, and persistence in their approaches to learning
Cognitive Competence	Children show cognitive competence and problem-solving skills through play and daily activities
Math	Children demonstrate competence in real-life mathematical concepts
Literacy	Children demonstrate emerging literacy skills
Motor Skills	Children demonstrate an increased proficiency in motor skills
Safety and Health	Children show an emerging awareness and practice of safe and healthy behavior

There are thirty-nine measures grouped into these ten indicators. Within each measure, children are assessed at one of four developmental levels or as “Not yet at first level”.

Developmental Levels (listed from least developed to most developed):

- 0 – Not Yet at First Level
- 1 – Exploring
- 2 – Developing
- 3 – Building
- 4 – Integrating

In validating the tool, researchers combined the indicators into six developmental domains (or indicator groupings). Since the validity of the tool was demonstrated using scores combined at the level of the domains, the analysis was conducted at that level and the Child Outcomes Bulletin reports on these six developmental domains.

Developmental Domains (or Indicator Groupings)

1. Self Concept – Social Interpersonal Skills
2. Self Regulation – Safety and Health
3. Language – Literacy
4. Learning – Cognitive Competence
5. Math
6. Motor Skills

The analysis does not include the English language learners measures, added in the Head Start version of the DRDP-R. These measures specifically address the development of language skills for non-English speaking children but were not included in CDE studies validating the tool.

Research on the DRDP-R demonstrates that most children reach the third developmental level by the end of preschool. While this is not a research based indicator of school readiness, it is a useful informal benchmark. The analysis in this bulletin uses that level of development as a benchmark to evaluate the program effect of Head Start programs on Child Development. Throughout the bulletin, you will see the language referring to the “top two developmental levels”. This indicates that children are at or above the third developmental level (out of four) within each developmental domain.

About the Data

Data were collected from the fall of 2008 and spring of 2009 assessment periods. We did not collect data on the winter of 2009 assessments. Only children who were assessed in both the fall of 2008 and the spring of 2009 were included in the analysis.

The 15 agencies were geographically spread across the state of California and were selected based on their use of the DRDP-R and their willingness to contribute data to the project. Given the varying size of Head Start programs, four of the 15 accounted for 58% of the starting sample, with one program contributing 24% of the sample. Given the non-random nature of the agency selection, these results cannot be generalized to California Head Starts as a whole.

Table 2: Participating Agencies

Agency	County	# of Children	% of Total
Community Action Commission of Santa Barbara	Santa Barbara County	761	5%
Community Action Partnership of Kern	Kern County	1,575	11%
Community Action Partnership of San Luis Obispo	San Luis Obispo County	295	2%
Center for Community and Family Services	Los Angeles County	988	7%
Child Care Resource Center	Los Angeles County	590	4%
Child Development Resources of Ventura County	Ventura County	821	6%
Kidango	Santa Clara and Alameda Counties	183	1%
MAAC Project	San Diego County	803	6%
Merced County Office of Education	Merced County	870	6%
Neighborhood House Association	San Diego County	3,421	24%
Orange County Head Start	Orange County	1,889	13%
Placer Community Action Council	Placer County	297	2%
Santa Cruz Community Counseling Center	Santa Cruz County	257	2%
Sierra Cascade Family Opportunities	Lassen, Modoc, Plumas, & Sierra Counties	159	1%
Tulare County Office of Education	Tulare County	1,535	11%
	TOTAL	14,530	

Data were collected on all preschool children served by the Head Start programs. However, the analysis focuses on typically developing children in center based programs between the ages of 45 and 59 months. Excluding children who do not fit into these categories or for whom key information was missing, a total of 6,619 were included in the analysis.

- Head Start guidelines mandate that at least 10% of the children served have a special need. Given the significant impact that a special need can have on a child’s development, limited data on the nature or severity of the special need, and the fact that not all special needs children are assessed using the DRDP-R, we chose to focus the analysis on typically developing children. This eliminated 1,034 children from the analysis (this number is less than 10% because many special needs children are assessed using the DRDP Access assessment tool rather than the DRDP-R).
- To maximize flexibility in serving diverse families and communities, Head Start operates through different structures. Most commonly, children are served in center-based programs, but children are also cared for through licensed-family homes or in home-based programs. To simplify the analysis we focused only on children served through center-based programs. This criterion eliminated 977 children from the analysis.
- Although data were collected on all preschool age children (3 and 4 years-old), the analysis only focused on children between the ages of 45 and 59 months at the time of the fall assessment. We focused the analysis on this age group because they had a reasonable probability of having attended preschool the prior year. 3,335 children fell outside this age range.
- For a variety of reasons, demographic information was missing on a number of children. If the demographic information was incomplete for a child, their data were dropped from the data set. This eliminated an additional 2,565 children – most of whom we did not have information on whether the children had a special need.

The tables below describe the final sample of 6,619 children by gender, ethnicity/language, age, and whether the children were enrolled in Head Start during the previous year.

Table 3: By Gender and Prior Enrollment
Number and Percentage of Children in Final Sample

	Prior Enrollment in Head Start					
	No		Yes		Total	
Gender	#	% of row	#	% of row	#	% of column
Male	1,630	50%	1,605	50%	3,235	49%
Female	1,629	48%	1,755	52%	3,384	51%
Total	3,259	49%	3,360	51%	6,619	100%

Table 4: By Ethnicity-Language and Prior Enrollment
Number and Percentage of Children in Final Sample

Ethnicity-Language	Prior Enrollment in Head Start					
	No		Yes		Total	
	#	% of row	#	% of row	#	% of column
White-English	247	56%	195	44%	442	7%
African American-English	148	46%	173	54%	321	5%
Latino-English	549	54%	461	46%	1,010	15%
Latino-Spanish	1,796	49%	1,902	51%	3,698	56%
Other Ethnicity-Other Language	114	45%	137	55%	251	4%
Other Ethnicity-English	135	49%	142	51%	277	4%
Asian/Pacific Islander-East Asian Languages	112	41%	161	59%	273	4%
Other Ethnicity-Spanish	158	46%	189	54%	347	5%
Total	3,259	49%	3,360	51%	6,619	100%

Table 5: By Age and Prior Enrollment
Number and Percentage of Children in Final Sample

Age	Prior Enrollment in Head Start					
	No		Yes		Total	
	#	% of row	#	% of row	#	% of column
45 to 47 months	866	71%	346	29%	1,212	18%
48 to 50 months	745	50%	756	50%	1,501	23%
51 to 53 months	666	46%	793	54%	1,459	22%
54 to 56 months	620	43%	836	57%	1,456	22%
57 to 59 months	362	37%	629	63%	991	15%

2. Study Design

Of the 6,619 children used in the primary analysis (all of whom were enrolled in the 2008-2009 school year), 3,360 (50.8%) were also enrolled in the Head Start program during the previous school year (2007-2008). The fall 2008 assessment results (that represent the children's development level at the beginning of the school year) were compared between those children new to the Head Start program this year and those who were enrolled in the program last year. In essence, this methodology captures the program effect of three year-old preschool. We compare children entering 4 year-old preschool with and without 3 year-old preschool. Children who enrolled in Head Start during the previous year act as our experimental group and children new to the program this year serve as our comparison group.

Regression analysis controls for the variations in the characteristics of the two groups and allows us to determine the statistical significance of the difference between the two groups. To make the final analysis as easy to understand as possible, we express the results in terms of the probability that a child would be in the top two developmental levels with and without the previous year of enrollment. This approach required the use of logit regressions.

To understand the design in a simplistic way, imagine two groups of children. All of the children are 4 ½ years-old, have the same demographic characteristics, and are recently enrolled in a Head Start program in the fall of 2008. The only observable difference between the two groups is that one group was enrolled in the Head Start program in the previous year – i.e. the fall of 2008 is the beginning of their second year of Head Start participation. The second group is completely new to the Head Start program. Comparing the DRDP-R assessment scores of these two groups of children shortly after they start in the fall of 2008 provides a reasonable estimate of the program effect of participating in Head Start during the previous year.

There are four potential issues with the analysis:

- Potential selection bias
- Potential inter-rater reliability issues
- Uncertainty of prior enrollment data
- Concerns over data use and accountability

Potential selection bias

The analysis presented below, unambiguously finds that children with prior participation in Head Start have higher levels of development. However, other factors besides prior enrollment in Head Start may influence the difference in development levels between the two groups in the fall of 2008. For example, children who enroll earlier in Head Start may have more involved parents or more enriched home environments, which could lead to higher development. We test for this effect by following both groups of children from the fall of 2008 to the spring of 2009 and find that both have the same rate of growth during the year. While this would lead us to believe that the difference we see in the groups is the result of the Head Start program, a limitation of the analysis is that we cannot be sure. A more structured research design (which is not possible using operational data) would be required to eliminate the possibility of selection bias.

Table 6: Comparing the Growth of Children With and Without Prior Head Start Enrollment
Reported in the DRDP-R Scale Score

Domain	Score	No Prior Enrollment ¹	Prior Enrollment ²	All Children	p-value, two tailed ³
Self Awareness – Social Interpersonal Skills	Mean of Fall '08 Scores	199.2	209.4	204.4	
	Mean of Spring '09 Scores	231.7	238.8	235.3	
	Growth	32.4	29.4	30.9	<0.0000
Self Regulation- Safety and Health	Mean of Fall '08 Scores	200.6	211.3	206.0	
	Mean of Spring '09 Scores	234.0	240.8	237.4	
	Growth	33.4	29.4	31.4	<0.0000
Language- Literacy	Mean of Fall '08 Scores	201.4	210.9	206.2	
	Mean of Spring '09 Scores	231.7	239.0	235.4	
	Growth	30.3	28.1	29.2	<0.0000
Learning- Cognitive	Mean of Fall '08 Scores	200.6	209.8	205.3	
	Mean of Spring '09 Scores	230.0	236.1	233.1	
	Growth	29.3	26.4	27.8	<0.0000
Math	Mean of Fall '08 Scores	199.5	209.6	204.6	
	Mean of Spring '09 Scores	230.4	237.5	234.0	
	Growth	30.8	28.0	29.3	<0.0000
Motor Skills	Mean of Fall '08 Scores	202.3	214.5	208.5	
	Mean of Spring '09 Scores	241.3	247.5	244.4	
	Growth	39.0	33.0	35.9	<0.0000

Note 1: Children not enrolled in Head Start during the 2007-2008 school year.

Note 2: Children enrolled in Head Start during the 2007-2008 school year.

Note 3: Results of a t-test on growth of children with "No Prior Enrollment" compared to children with "Prior Enrollment" in Head Start. The hypothesized mean difference is 0.

Potential inter-rater reliability issues

The DRDP-R assessment results are based on individual teacher observations and assessments. Naturally, this raises the question of whether the assessments of two different teachers can be compared to one another. Research on the DRDP-R tool shows that it has high inter-rater reliability, between 0.87 and 0.90 (<http://www.wested.org/desiredresults/training/questions.htm> 11/1/2009). Still, it may be argued that inter-rater reliability would be lower in less controlled field settings where there may be variability in training, experience, or effort.

Even if it were possible to demonstrate that there are issues with inter-rater reliability in our sample, we do not believe that would undermine the clear pattern of children with prior enrollment having higher levels of enrollment. It may, however, make the precise magnitude of the differences less reliable.

Uncertainty of prior enrollment data

The classification of children into those with and without prior Head Start enrollment is based whether the child was enrolled in the same Head Start program in the 2007-2008 school year. We know this with a high degree of certainty. Unfortunately, it is possible that a child not enrolled in Head Start in 2007-2008 was enrolled another child development program or possibly even another Head Start program. The impact on the analysis is that we may be underestimating the program effect of these Head Start programs. If a significant number children categorized as not having prior enrollment participated in other child development programs than our estimates of Head Start's program effect are too low.

This issue does not cause us any concern from the perspective of using this analysis to inform public policy. Our ultimate conclusion is that this analysis provides evidence that Head Starts provide quality child development supports and as such should be supported. If we are underestimating the benefits of Head Start, that would in no way undermine this conclusion (in fact it would reinforce the conclusion).

Concerns over data use and accountability

In the wake of the national No Child Left Behind legislation, many in the early childhood education (ECE) community fear that assessment data (or DRDP-R data specifically) will evolve to be used as a tool for accountability. Or more bluntly from the perspective of many in the ECE field – there is a fear that DRDP-R data will someday be used to punish programs and teachers. Some may feel that this analysis is a step in that direction.

We recognize that there is some risk that this type of analysis (using DRDP-R data to evaluate program effect) may be misused within an accountability framework. However, there is also tremendous value in giving programs and policy makers a direct measure of program effect. Ultimately, we do not believe that it makes sense to ignore the value that can be gleaned from DRDP-R data because of fears

that the data may be misused.

We believe strongly that the DRDP-R tool is not appropriate for use as an accountability tool. As an observation based tool, the DRDP-R is subjective by nature. Using incentives or pressure on programs or teachers to meet certain benchmarks could undermine the integrity of the results and jeopardize the usefulness of assessment data. The DRDP-R tool and DRDP-R data can be very useful for guiding program activities and understanding program results. But to protect that value, DRDP-R outcomes should not be used for accountability. (This does not apply to making programs accountable for adequate implementation of the DRDP-R process).

Finally, we should note that this methodology requires very large sample sizes making it impossible to perform on a class level.

3. Policy Context

Head Start is perhaps the most researched and evaluated federal program in existence. As a result, there is ample academic literature on the benefits of Head Start programs. The National Head Start Association has a good overview of the academic findings on the benefits of Head Start. It can be found on-line at http://www.nhsa.org/files/static_page_files/399E0881-1D09-3519-AD56452FC44941C3/BenefitsofHSandEHS.pdf . More broadly, the RAND Corporation recently did a review of the academic literature on the impact of quality preschool programs:

“[A] review of the rigorous evaluations of high-quality preschool programs demonstrates that well-designed programs that serve children one or two years before kindergarten entry can

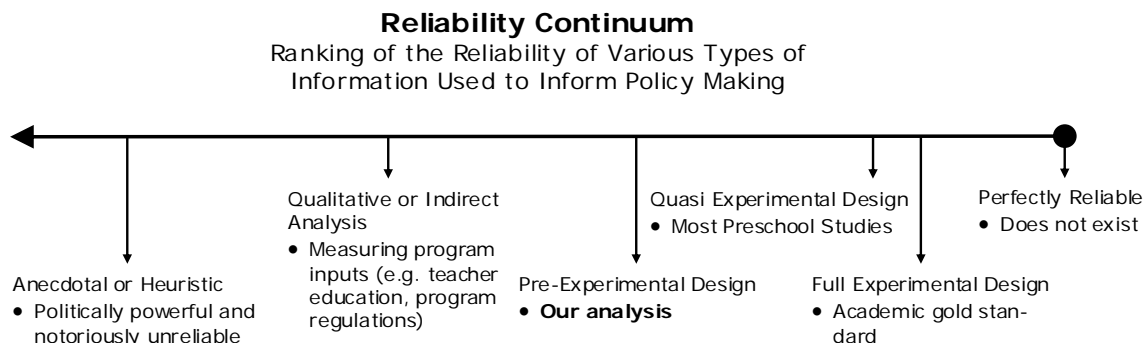
- improve measures of school readiness,
- raise performance on academic achievement tests in the early elementary grades,
- generate sustained effects on academic achievement into the middle-school years ...
- [reduce] special-education use and grade repetition and
- [increase] rates of high-school graduation”

Karoly, Lynn A., *Preschool Adequacy and Efficiency in California: Issues, Policy Options, and Recommendations*, Santa Monica, Calif.: RAND Corporation, 2009

The California Head Start Child Outcomes Bulletin was not designed as an academic study nor was it designed to contribute to the academic literature. What is missing at the policy and program level are adequate operational metrics of program effect. Quality programs are the key to achieving the benefits identified in the academic literature. But how can we be assured of quality in a program stretching the breadth of the largest state in the Union?

Full academic studies cannot reasonably be performed on continuing operations of significant scale. As a result, policy makers rely on less reliable information as a matter of course. Sound operational analysis must fill the gap between academic

capabilities to evaluate and the need run a program on a day to day basis. The limitations of this analysis (as addressed in the Analytical Design section) do reduce the reliability of the results, but less reliable does not translate into unreliable. The diagram below presents a reliability continuum with which to put this analysis in a proper perspective.



We believe that the most powerful argument in favor of Head Start comes from a combination of academic research, operational analysis, and qualitative information. It is important that the Child Outcomes Bulletin not be presented as the equivalent of academic research, but also that the value of operational analysis not be discounted.

Despite the inevitable imperfections of operational analysis, these results do support the conclusion that California Head Starts participating in the bulletin are having a positive impact on child development. That positive impact is evidence that these are quality programs and the academic literature shows clear benefits to children and society resulting from quality child development programs. Therefore, policy makers should endeavor to support Head Start.

4. Results

Below are detailed logit regression results for each domain. We also show the calculations for how the results were interpreted. The odds of a child being in the top two developmental levels are calculated for three scenarios:

1. The Typical Odds for a child in the sample,
2. The No Prior Enrollment Odds for a child who was not enrolled in Head Start in the previous year.
3. The Prior Enrollment Odds for a child who was enrolled in Head Start in the previous year.

The difference between the three calculations is in the treatment of the prior enrollment variable. For the Typical Odds calculation, the percentage of sample is set to 51%. But for the No Prior Enrollment Odds and the Prior Enrollment Odds scenario calculations it is set to 0 and 1 respectively. These changes are bolded.

The first step in the calculation is multiplying the estimates from the regression results (see the first row) by the Percentage of the sample. We show this as

equation A. The calculations where this equation are used are in the orange box in the "Interpreting the Lang-Lit Logit Regression" table below.

Equation A: $[Estimate] \times [Percentage\ of\ Sample]$

Equation B is then used to calculate the Odds in the three scenarios. "e" is the base of the natural logarithm equal to 2.71828182845904. The use of this equation is highlighted using the purple circles in the "Interpreting the Lang-Lit Logit Regression" table below.

Equation B: $e^{[sum\ of\ ([Estimate] \times [Percentage\ of\ Sample])]}$

Roncek, Dennis W. "Using Logit Coefficients to Obtain the Effects of Independent Variables on Changes in Probabilities" Social Forces; Dec 1991; 70, 2.

Finally, the odds are converted to probabilities using equation C. The use of equation C is bracketed in green below.

Equation C: $Probability = [Odds] / ([Odds] + 1)$

The probabilities and percentage point difference in the black box are the numbers presented in the Child Outcomes Bulletin.

Lang-Lit Logit Regression Results

	Const. B0	Female	Latino-Spanish	Latino-English	African American-English	Other Ethnicity-Spanish	Asian/Pacific Islander-East Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old	Individual Agency Results
n=6436															
Estimate	-3.375	0.277	-0.827	-0.254	0.061	-0.467	-0.403	-0.293	-0.809	1.103	0.281	0.868	1.259	1.515	
Standard Error	0.239	0.087	0.172	0.189	0.232	0.249	0.250	0.244	0.307	0.100	0.195	0.183	0.177	0.183	An indicator was included in the analysis to account for the Head Start program each child participated in.
t(6410)	-14.107	3.195	-4.808	-1.338	0.265	-1.873	-1.615	-1.202	-2.639	11.011	1.443	4.754	7.107	8.289	For purposes of confidentiality, these individual results are not provided.
p-level	0.000	0.001	0.000	0.181	0.791	0.061	0.106	0.229	0.008	0.000	0.149	0.000	0.000	0.000	
-95%CL	-3.844	0.107	-1.165	-0.625	-0.393	-0.956	-0.893	-0.771	-1.410	0.907	-0.101	0.510	0.912	1.157	
+95%CL	-2.906	0.448	-0.490	0.118	0.515	0.022	0.086	0.185	-0.208	1.300	0.663	1.226	1.606	1.874	
Wald's Chi-square	199.014	10.205	23.119	1.790	0.070	3.507	2.607	1.445	6.962	121.252	2.081	22.604	50.506	68.709	
p-level	0.000	0.001	0.000	0.181	0.791	0.061	0.106	0.229	0.008	0.000	0.149	0.000	0.000	0.000	
Odds ratio (unit ch)	0.034	1.320	0.437	0.776	1.063	0.627	0.668	0.746	0.445	3.014	1.324	2.382	3.522	4.551	
-95%CL	0.021	1.113	0.312	0.535	0.675	0.384	0.409	0.462	0.244	2.476	0.904	1.665	2.489	3.180	
+95%CL	0.055	1.565	0.613	1.125	1.674	1.022	1.090	1.203	0.812	3.668	1.940	3.406	4.985	6.513	
Odds ratio (range)		1.320	0.437	0.776	1.063	0.627	0.668	0.746	0.445	3.014	1.324	2.382	3.522	4.551	
-95%CL		1.113	0.312	0.535	0.675	0.384	0.409	0.462	0.244	2.476	0.904	1.665	2.489	3.180	
+95%CL		1.565	0.613	1.125	1.674	1.022	1.090	1.203	0.812	3.668	1.940	3.406	4.985	6.513	

Interpreting the Lang-Lit Logit Regression

	Constant	Female	Latino-Spanish	Latino-English	African American-English	Other Ethnicity-Spanish	Asian/Pacific Islander-East Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old	Individual Agency Result
Percentage of Sample	100%	51%	56%	15%	5%	5%	4%	4%	4%	51%	23%	22%	22%	15%	

Typical Odds -- Odds of a typical child being in the top 2 developmental levels:

	Constant	Female	Latino-Spanish	Latino-English	African American-English	Other Ethnicity-Spanish	Asian/Pacific Islander-East Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old	Individual Agency Result
Percentage of Sample X Estimate =	-3.375	0.142	-0.461	-0.039	0.003	-0.024	-0.017	-0.012	-0.031	0.558	0.064	0.191	0.278	0.225	-0.091
No Prior Enrollment Odds -- Odds of a child with no prior enrollment being in the top 2 developmental levels:	-3.375	0.142	-0.461	-0.039	0.003	-0.024	-0.017	-0.012	-0.031	0.000	0.064	0.191	0.278	0.225	-0.091
Prior Enrollment Odds -- Odds of a child with prior enrollment being in the top 2 developmental levels:	-3.375	0.142	-0.461	-0.039	0.003	-0.024	-0.017	-0.012	-0.031	1.103	0.064	0.191	0.278	0.225	-0.091

	Odds	Predicted Probability	Actual Probability
Typical	0.075	7%	10%
No Prior Enrollment	0.043	4%	5%
Prior Enrollment	0.129	11%	15%
Percentage Point Increase Ratios	3.014	2.783	3.120

Calculated using Equation B

Calculated using Equation C

Calculated using Equation A

Self-Soc Logit Regression Results

n=6500	Self-Soc Logit Regression Results															Individual Agency Results
	Const. B0	Female	Latino-Spanish	Latino-English	African American-English	Other Ethnicity-Spanish	Asian/Pacific Islander-East Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old		
Estimate	-2.668	0.273	-0.478	-0.061	0.167	-0.266	-0.673	-0.208	-0.776	1.037	0.173	0.736	0.892	1.239		
Standard Error	0.193	0.072	0.149	0.161	0.203	0.212	0.233	0.214	0.278	0.090	0.144	0.136	0.134	0.138		
t(6410)	-13.809	3.793	-3.213	-0.381	0.821	-1.251	-2.882	-0.972	-2.794	12.984	1.201	5.418	6.646	8.888		
p-level	0.000	0.000	0.001	0.703	0.412	0.211	0.004	0.331	0.005	0.000	0.230	0.000	0.000	0.000		
+95%CL	-3.047	0.132	-0.770	-0.377	-0.231	-0.682	-1.131	-0.627	-1.320	0.881	-0.110	0.470	0.629	0.966		
+95%CL	-2.289	0.415	-0.186	0.254	0.565	0.151	-0.215	0.211	-0.231	1.194	0.456	1.003	1.156	1.512		
Wald's Chi-square	190.683	14.389	10.322	0.145	0.674	1.566	8.308	0.945	7.805	168.593	1.441	29.351	44.167	79.005		
p-level	0.000	0.000	0.001	0.703	0.412	0.211	0.004	0.331	0.005	0.000	0.230	0.000	0.000	0.000		
Odds ratio (unit ch)	0.069	1.314	0.620	0.941	1.182	0.767	0.510	0.812	0.460	2.822	1.189	2.088	2.441	3.451		
+95%CL	0.048	1.141	0.463	0.686	0.793	0.505	0.323	0.534	0.267	2.413	0.896	1.600	1.876	2.626		
+95%CL	0.101	1.514	0.830	1.289	1.759	1.163	0.806	1.235	0.793	3.300	1.578	2.725	3.176	4.535		
Odds ratio (range)		1.314	0.620	0.941	1.182	0.767	0.510	0.812	0.460	2.822	1.189	2.088	2.441	3.451		
+95%CL		1.141	0.463	0.686	0.793	0.505	0.323	0.534	0.267	2.413	0.896	1.600	1.876	2.626		
+95%CL		1.514	0.830	1.289	1.759	1.163	0.806	1.235	0.793	3.300	1.578	2.725	3.176	4.535		

Interpreting the Self-Soc Logit Regression

Percentage of Sample	Constant	Female	Latino-Spanish	Latino-English	African American-English	Other Ethnicity-Spanish	Asian/Pacific Islander-East Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old	Individual Agency Result
100%	51%	56%	15%	5%	5%	4%	4%	4%	4%	51%	23%	22%	22%	15%	

Typical Odds -- Odds of a typical child being in the top 2 developmental levels:

0.141	-2.668	0.140	-0.267	-0.009	0.008	-0.014	-0.028	-0.009	-0.030	0.527	0.039	0.162	0.197	0.184	-0.189
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No Prior Enrollment Odds -- Odds of a child with no prior enrollment being in the top 2 developmental levels:

0.084	-2.668	0.140	-0.267	-0.009	0.008	-0.014	-0.028	-0.009	-0.030	0.000	0.039	0.162	0.197	0.184	-0.189
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Prior Enrollment Odds -- Odds of a child with prior enrollment being in the top 2 developmental levels:

0.236	-2.668	0.140	-0.267	-0.009	0.008	-0.014	-0.028	-0.009	-0.030	1.037	0.039	0.162	0.197	0.184	-0.189
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	Odds	Predicted Probability	Actual Probability
Typical	0.141	12%	16%
No Prior Enrollment	0.084	8%	9%
Prior Enrollment	0.236	19%	23%
Percentage Point Increase Ratios	2.822	2.474	2.673

Reg-Sh Logit Regression Results

n=6497	Reg-Sh Logit Regression Results															Individual Agency Results
	Const. B0	Female	Latino-Spanish	Latino-English	African American-English	Other Ethnicity-Spanish	Asian/Pacific Islander-East Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old		
Estimate	-3.660	0.425	-0.310	0.000	0.045	-0.168	-0.371	-0.255	-0.571	0.871	0.344	0.744	0.870	1.133		
Standard Error	0.394	0.065	0.085	0.000	0.164	0.164	0.171	0.174	0.215	0.070	0.122	0.118	0.117	0.124		
t(6410)	-9.291	6.523	-3.645	-0.051	0.274	-1.029	-2.172	-1.471	-2.660	12.513	2.808	6.286	7.402	9.177		
p-level	0.000	0.000	0.000	0.959	0.784	0.304	0.030	0.141	0.008	0.000	0.005	0.000	0.000	0.000		
+95%CL	-4.432	0.297	-0.476	0.000	-0.277	-0.489	-0.706	-0.595	-0.992	0.734	0.104	0.512	0.639	0.891		
+95%CL	-2.888	0.552	-0.143	0.000	0.367	0.152	-0.036	0.085	-0.150	1.007	0.584	0.976	1.100	1.376		
Wald's Chi-square	86.322	42.553	13.284	0.003	0.075	1.059	4.717	2.163	7.075	156.577	7.885	39.520	54.793	84.214		
p-level	0.000	0.000	0.000	0.959	0.784	0.304	0.030	0.141	0.008	0.000	0.005	0.000	0.000	0.000		
Odds ratio (unit ch)	0.026	1.529	0.734	1.000	1.046	0.845	0.690	0.775	0.565	2.388	1.410	2.104	2.386	3.106		
+95%CL	0.012	1.346	0.621	1.000	0.758	0.613	0.494	0.551	0.371	2.084	1.109	1.668	1.895	2.438		
+95%CL	0.056	1.738	0.867	1.000	1.444	1.164	0.965	1.089	0.861	2.737	1.793	2.653	3.004	3.957		
Odds ratio (range)		1.529	0.734	1.000	1.046	0.845	0.690	0.775	0.565	2.388	1.410	2.104	2.386	3.106		
+95%CL		1.346	0.621	1.000	0.758	0.613	0.494	0.551	0.371	2.084	1.109	1.668	1.895	2.438		
+95%CL		1.738	0.867	1.000	1.444	1.164	0.965	1.089	0.861	2.737	1.793	2.653	3.004	3.957		

Interpreting the Reg-Sh Logit Regression

Percentage of Sample	Constant	Female	Latino-Spanish	Latino-English	African American-English	Other Ethnicity-Spanish	Asian/Pacific Islander-East Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old	Individual Agency Result
100%	51%	56%	15%	5%	5%	4%	4%	4%	4%	51%	23%	22%	22%	15%	

Typical Odds -- Odds of a typical child being in the top 2 developmental levels:

0.216	-3.660	0.218	-0.173	0.000	0.002	-0.009	-0.015	-0.011	-0.022	0.441	0.078	0.164	0.192	0.169	1.092
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No Prior Enrollment Odds -- Odds of a child with no prior enrollment being in the top 2 developmental levels:

0.139	-3.660	0.218	-0.173	0.000	0.002	-0.009	-0.015	-0.011	-0.022	0.000	0.078	0.164	0.192	0.169	1.092
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Prior Enrollment Odds -- Odds of a child with prior enrollment being in the top 2 developmental levels:

0.331	-3.660	0.218	-0.173	0.000	0.002	-0.009	-0.015	-0.011	-0.022	0.871	0.078	0.164	0.192	0.169	1.092
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	Odds	Predicted Probability	Actual Probability
Typical	0.216	18%	21%
No Prior Enrollment	0.139	12%	13%
Prior Enrollment	0.331	25%	29%
Percentage Point Increase Ratios	2.388	2.043	2.241

Lrn-Cog Logit Regression Results

	Const. B0	Female	Latino-Spanish	Latino-English	African American-English	Other Ethnicity-Spanish	Asian/Pacific Islander-East Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old	Individual Agency Results
n=6506															
Estimate	-2.651	0.241	-0.703	-0.201	-0.230	-0.609	-0.829	-0.257	-0.960	1.003	0.278	0.899	1.090	1.299	
Standard Error	0.191	0.071	0.146	0.160	0.207	0.209	0.227	0.206	0.269	0.078	0.144	0.136	0.134	0.141	An indicator was included in the analysis to account for the Head Start program each child participated in. For purposes of confidentiality, these individual results are not provided.
t(6410)	-13.911	3.406	-4.818	-1.256	-1.115	-2.909	-3.652	-1.250	-3.567	12.910	1.921	6.592	8.112	9.243	
p-level	0.000	0.001	0.000	0.209	0.265	0.004	0.000	0.211	0.000	0.000	0.055	0.000	0.000	0.000	
-95%CL	-3.024	0.102	-0.988	-0.516	-0.635	-1.019	-1.274	-0.661	-1.487	0.851	-0.006	0.631	0.827	1.024	
+95%CL	-2.277	0.379	-0.417	0.113	0.175	-0.198	-0.384	0.146	-0.432	1.156	0.561	1.166	1.353	1.575	
Wald's Chi-square	193.521	11.603	23.213	1.578	1.243	8.460	13.337	1.562	12.725	166.678	3.691	43.455	65.813	85.435	
p-level	0.000	0.001	0.000	0.209	0.265	0.004	0.000	0.211	0.000	0.000	0.055	0.000	0.000	0.000	
Odds ratio (unit ch)	0.071	1.272	0.495	0.818	0.794	0.544	0.436	0.773	0.383	2.728	1.320	2.456	2.974	3.667	
-95%CL	0.049	1.108	0.372	0.597	0.530	0.361	0.280	0.517	0.226	2.342	0.994	1.880	2.285	2.784	
+95%CL	0.103	1.461	0.659	1.119	1.191	0.820	0.681	1.157	0.649	3.177	1.752	3.209	3.870	4.830	
Odds ratio (range)															
-95%CL															
+95%CL															

Interpreting the Lrn-Cog Logit Regression

	Constant	Female	Latino-Spanish	Latino-English	African American-English	Other Ethnicity-Spanish	Asian/Pacific Islander-East Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old	Individual Agency Results
Percentage of Sample	100%	51%	56%	15%	5%	5%	4%	4%	4%	51%	23%	22%	22%	15%	

Typical Odds -- Odds of a typical child being in the top 2 developmental levels:

0.151	-2.651	0.123	-0.392	-0.031	-0.011	-0.032	-0.034	-0.011	-0.037	0.509	0.063	0.197	0.241	0.193	-0.021
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No Prior Enrollment

Odds -- Odds of a child with no prior enrollment being in the top 2 developmental levels:

0.091	-2.651	0.123	-0.392	-0.031	-0.011	-0.032	-0.034	-0.011	-0.037	0.000	0.063	0.197	0.241	0.193	-0.021
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Prior Enrollment

Odds -- Odds of a child with prior enrollment being in the top 2 developmental levels:

0.247	-2.651	0.123	-0.392	-0.031	-0.011	-0.032	-0.034	-0.011	-0.037	1.003	0.063	0.197	0.241	0.193	-0.021
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	Odds	Predicted Probability	Actual Probability
Typical	0.151	13%	17%
No Prior Enrollment	0.091	8%	10%
Prior Enrollment	0.247	20%	24%
Percentage Point Increase Ratios	2.728	2.386	2.502

Math Logit Regression Results

	Const. B0	Female	Latino-Spanish	Latino-English	African American-English	Other Ethnicity-Spanish	Asian/Pacific Islander-East Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old	Individual Agency Results
n=6414															
Estimate	-3.065	0.197	-0.937	-0.369	-0.131	-0.869	-0.594	-0.384	-0.847	1.027	0.455	1.207	1.207	1.454	
Standard Error	0.230	0.085	0.167	0.184	0.229	0.256	0.250	0.239	0.290	0.097	0.184	0.178	0.172	0.178	An indicator was included in the analysis to account for the Head Start program each child participated in. For purposes of confidentiality, these individual results are not provided.
t(6410)	-13.317	2.328	-5.600	-2.003	-0.574	-3.390	-2.377	-1.606	-2.917	10.641	2.465	4.436	7.010	8.178	
p-level	0.000	0.020	0.000	0.045	0.566	0.001	0.017	0.108	0.004	0.000	0.014	0.000	0.000	0.000	
-95%CL	-3.517	0.031	-1.265	-0.731	-0.581	-1.372	-1.085	-0.852	-1.416	0.838	0.093	0.441	0.870	1.106	
+95%CL	-2.614	0.363	-0.609	-0.008	0.318	-0.367	-0.104	0.085	-0.278	1.217	0.816	1.141	1.545	1.803	
Wald's Chi-square	177.337	5.419	31.360	4.010	0.329	11.491	5.652	2.579	8.507	113.224	6.075	19.676	49.138	66.880	
p-level	0.000	0.020	0.000	0.045	0.566	0.001	0.017	0.108	0.004	0.000	0.014	0.000	0.000	0.000	
Odds ratio (unit ch)	0.047	1.218	0.392	0.691	0.877	0.419	0.552	0.681	0.429	2.794	1.575	2.206	3.344	4.282	
-95%CL	0.030	1.032	0.282	0.482	0.560	0.254	0.338	0.426	0.243	2.312	1.097	1.555	2.386	3.022	
+95%CL	0.073	1.438	0.544	0.992	1.374	0.693	0.901	1.088	0.758	3.376	2.262	3.129	4.687	6.068	
Odds ratio (range)															
-95%CL															
+95%CL															

Interpreting the Math Logit Regression

	Constant	Female	Latino-Spanish	Latino-English	African American-English	Other Ethnicity-Spanish	Asian/Pacific Islander-East Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old	Individual Agency Results
Percentage of Sample	100%	51%	56%	15%	5%	5%	4%	4%	4%	51%	23%	22%	22%	15%	

Typical Odds -- Odds of a typical child being in the top 2 developmental levels:

0.083	-3.065	0.101	-0.524	-0.057	-0.006	-0.045	-0.025	-0.016	-0.033	0.522	0.103	0.174	0.268	0.216	-0.106
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No Prior Enrollment

Odds -- Odds of a child with no prior enrollment being in the top 2 developmental levels:

0.049	-3.065	0.101	-0.524	-0.057	-0.006	-0.045	-0.025	-0.016	-0.033	0.000	0.103	0.174	0.268	0.216	-0.106
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Prior Enrollment

Odds -- Odds of a child with prior enrollment being in the top 2 developmental levels:

0.137	-3.065	0.101	-0.524	-0.057	-0.006	-0.045	-0.025	-0.016	-0.033	1.027	0.103	0.174	0.268	0.216	-0.106
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	Odds	Predicted Probability	Actual Probability
Typical	0.083	8%	11%
No Prior Enrollment	0.049	5%	6%
Prior Enrollment	0.137	12%	16%
Percentage Point Increase Ratios	2.794	2.577	2.818

Mot Logit Regression Results

n=6538	Asian/Pacific															Individual Agency Results
	Const. B0	Female	Latino-Spanish	Latino-English	African-American-English	Other Ethnicity-Spanish	Other Ethnicity-Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old		
Estimate	-0.895	0.044	-0.562	-0.218	-0.054	-0.219	-0.157	-0.273	-0.709	0.792	0.316	0.597	0.735	1.121		
Standard Error t(6410)	0.138	0.054	0.117	0.130	0.165	0.163	0.173	0.168	0.187	0.056	0.088	0.088	0.088	0.098	An indicator was included in the analysis to account for the Head Start program each child participated in. For purposes of confidentiality, these individual results are not provided.	
p-level	-6.504	0.817	-4.800	-1.674	-0.326	-1.340	-0.907	-1.624	-3.803	14.185	3.590	6.779	8.347	11.490		
-95%CL	0.000	0.414	0.000	0.094	0.744	0.180	0.364	0.104	0.000	0.000	0.000	0.000	0.000	0.000		
+95%CL	-1.165	-0.062	-0.791	-0.473	-0.377	-0.538	-0.496	-0.603	-1.075	0.683	0.144	0.424	0.562	0.930		
Wald's Chi-square	42.302	0.667	23.036	2.801	0.106	1.797	0.824	2.638	14.461	201.219	12.891	45.961	69.681	132.018		
p-level	0.000	0.414	0.000	0.094	0.744	0.180	0.364	0.104	0.000	0.000	0.000	0.000	0.000	0.000		
Odds ratio (unit ch)	0.408	1.045	0.570	0.804	0.948	0.804	0.855	0.761	0.492	2.208	1.372	1.816	2.086	3.068		
-95%CL	0.312	0.940	0.453	0.623	0.686	0.584	0.609	0.547	0.341	1.979	1.155	1.528	1.755	2.534		
+95%CL	0.535	1.162	0.717	1.038	1.309	1.106	1.200	1.058	0.709	2.463	1.631	2.158	2.478	3.715		
Odds ratio (range)		1.045	0.570	0.804	0.948	0.804	0.855	0.761	0.492	2.208	1.372	1.816	2.086	3.068		
-95%CL		0.940	0.453	0.623	0.686	0.584	0.609	0.547	0.341	1.979	1.155	1.528	1.755	2.534		
+95%CL		1.162	0.717	1.038	1.309	1.106	1.200	1.058	0.709	2.463	1.631	2.158	2.478	3.715		

Interpreting the Mot Logit Regression

Percentage of Sample	Asian/Pacific															Individual Agency Result
	Constant	Female	Latino-Spanish	Latino-English	African-American-English	Other Ethnicity-Spanish	Other Ethnicity-Asian Languages	Other Ethnicity-English	Other Ethnicity-Other Language	Prior Enrollment	48 to 50 Months Old	51 to 53 Months Old	54 to 56 Months Old	57 to 59 Months Old		
100%	51%	56%	15%	5%	5%	4%	4%	4%	51%	23%	22%	22%	15%			

Typical Odds -- Odds of a typical child being in the top 2 developmental levels:

Percentage of Sample X Estimate =	0.724	-0.895	0.023	-0.314	-0.033	-0.003	-0.011	-0.007	-0.011	-0.027	0.402	0.072	0.132	0.162	0.168	0.022
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No Prior Enrollment Odds -- Odds of a child with no prior enrollment being in the top 2 developmental levels:

0.484	-0.895	0.023	-0.314	-0.033	-0.003	-0.011	-0.007	-0.011	-0.027	0.000	0.072	0.132	0.162	0.168	0.022
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Prior Enrollment Odds -- Odds of a child with prior enrollment being in the top 2 developmental levels:

1.069	-0.895	0.023	-0.314	-0.033	-0.003	-0.011	-0.007	-0.011	-0.027	0.792	0.072	0.132	0.162	0.168	0.022
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	Odds	Predicted Probability	Actual Probability
Typical	0.724	42%	43%
No Prior Enrollment	0.484	33%	32%
Prior Enrollment	1.069	52%	54%
Percentage Point Increase Ratios	2.208	1.584	1.666

Effect Size Calculations and Comparisons

To understand the relative impact of these results and to compare them to the results found in other preschool program, the "effect size" was calculated. The effect size is the change attributed to the program divided by the standard deviation of the comparison group. In the example of the Language and Literacy domain, the change attributed to the program is the 7 percentage point (0.0734) increase in children in the top two developmental levels. The standard deviation for the comparison group was 0.2165. The effect size for Language and Literacy is 0.339. The table below shows the effect sizes for all of the DRDP-R domains:

DRDP-R Domain	Effect Size
Lang Lit	0.339
Self Soc	0.405
Reg Sh	0.377
Lrn Cog	0.391
Math	0.323
Mot	0.406

Overall the effect size ranges between 0.323 to 0.406. These results are comparable to those found for other preschool programs. Below are the effect sizes

from studies of other preschool programs:

Project	Effect Size Range	Length of Preschool
Head Start National Study	0.147 to 0.319	one year of preschool
Tulsa Head Start Program	0.334 to 0.514	one year of preschool
Tulsa Public School Pre-K Program	0.355 to 0.985	one year of preschool
Abecedarian Project	1.08 average	three years of preschool
Perry Preschool Study	0.77 to 1.16	two years of preschool

Gormley, Jr., William T.; Phillips, Deborah; Gayer, Ted "Preschool Programs Can Boost School Readiness" Georgetown University.
<http://www.crocus.georgetown.edu/reports/scilong.pdf> 12/01/09.

5. Conclusion

The California Head Start Child Outcomes Bulletin provides imperfect but reasonable estimates of the program effect of Head Start programs on child development. Significant improvements in child development were found to correspond with participation in Head Start programs. The findings, based on operational analysis, are not as robust as most academic studies, but are superior to most of the information available to program administrators and policy makers on an on-going basis. The observed program impact is evidence that the Head Starts included in the analysis are providing quality early education comparable to other quality programs. The benefits of quality early education experiences are well documented. That body of evidence combined with this analysis provides ample reason to support California Head Starts.