

Technical Appendix: Health Start Evaluation for Teen Mothers (Ages 19 and Younger)

The following appendix presents population-level summary statistics (where available), results from propensity score matching models, and post-match comparisons for the treatment and comparison populations: teen mothers (aged<20), for the years 2006-2016. Following What Works Clearinghouse guidelines (WWC, 2020)¹ matching models were calibrated so that the standardized (effect size) differences between the intervention (Health Start) and comparison groups in the variables used for matching fell below 0.25. Where differences remained between 0.05-0.25, the intervention effect was adjusted via logistic regressions. The adjustment models included all variables used in the matching models plus the treatment (Health Start) indicator (these results are available upon request). Both the post-match unadjusted and regression-adjusted intervention effects are reported in Appendix Table 1 as odds ratios.

We did not attempt to impute missing outcome data and estimation models were limited to the populations for whom these measures were available. As a result, evaluation populations varied slightly between sets of outcomes. Accordingly, we include the matching results for each evaluation population.

¹ U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, What Works Clearinghouse.

Appendix Table 1: Unadjusted and Regression-Adjusted Health Start Effect Among Mothers<20 Years Old

	Unadjusted Odds Ratio	Adjusted Odds Ratio†
Any prenatal care	1.53* (1.02, 2.29)	1.58* (1.02, 2.45)
Kotelchuck Index: >= Adequate	1.27* (1.08, 1.49)	1.31** (1.11, 1.55)
Kotelchuck Index: < Adequate	0.88 (0.74, 1.04)	0.87 (0.73, 1.05)
Kotelchuck Index: Adequate+	1.03 (0.85, 1.25)	1.03 (0.85, 1.26)
Low birth weight	0.90 (0.67, 1.21)	0.87 (0.64, 1.18)
Very low birth weight	0.96 (0.47, 1.97)	0.85 (0.41, 1.79)
Extremely low birth weight	1.59 (0.44, 5.79)	1.56 (0.42, 5.83)
Preterm birth	0.68* (0.51, 0.91)	0.67** (0.50, 0.90)
All Shots On Time	1.13 (0.94, 1.36)	1.15 (0.95, 1.39)
All Shots By 5	1.28* (1.09, 1.50)	1.31** (1.11, 1.54)

† Regression (logit) adjusted, models include all variables used in matching model and post-matching weights.

*** p<.001; ** p<.01; * p<.05

Appendix Table 2: Missing Outcome Information

	AZ	Health Start
N	95,844	1,264
Insufficient/missing prenatal care information	0.48%	0.32%
Missing birthweight information	0.11%	0.00%
No match to ASIIS database	N/A	0.55%

Appendix Table 3: Summary Statistics & Propensity Score Matching Result for Birth Outcomes Population for Mothers<20

	AZ	Matching Model Results		Health	Matches	p-value difference	Standardized Difference
	Totals	OR	95% CI	Start			
N (Unweighted)	95,750			1,264	6,862		
Low birth weight	6.8%			7.0%	7.1%	0.968	0.002
Very low birth weight	1.0%			1.2%	0.7%	0.176	0.054
Extremely low birth weight	0.5%			0.5%	0.3%	0.493	0.027
Preterm birth	8.7%			6.6%	8.3%	0.121	0.062
White	23.9%	1.56**	(1.09, 2.24)	22.2%	23.5%	0.449	0.049
American Indian	9.7%	1.74***	(1.17, 2.59)	12.7%	11.3%	0.298	
Hispanic	59.7%	1.70***	(1.20, 2.40)	62.2%	62.5%	0.870	
Other race/ethnicity (reference)	6.6%			2.9%	2.7%	0.718	
Mother born outside US	20.3%	1.33***	(1.13, 1.57)	16.8%	16.0%	0.591	0.021
Less than high school (reference)	55.3%			57.6%	58.7%	0.589	0.029
High school degree/GED	36.4%	0.83***	(0.74, 0.95)	34.7%	33.5%	0.529	
Some college, no degree	7.6%	0.80*	(0.64, 1.01)	7.3%	7.4%	0.939	
Private/commercial insurance	11.6%	1.17	(0.78, 1.76)	6.0%	5.3%	0.439	0.039
AHCCCS	84.4%	2.08***	(1.49, 2.91)	90.6%	91.7%	0.327	
Other insurance (reference)	4.0%			3.4%	3.0%	0.572	
Married	12.0%	1.09	(0.66, 1.79)	11.7%	11.4%	0.804	0.010
Cohabiting	48.6%	0.99	(0.87, 1.13)	41.9%	41.5%	0.840	0.008
Married & cohabiting	11.2%	0.94	(0.55, 1.60)	10.3%	10.6%	0.795	0.010
First birth	80.6%	0.93	(0.80, 1.08)	80.8%	81.5%	0.647	0.018
Pre-existing health risk	3.1%	0.88	(0.64, 1.21)	3.8%	3.2%	0.450	0.030

Appendix Table 3: Summary Statistics & Propensity Score Matching Result for Birth Outcomes Population for Mothers<20
(continued)

	AZ	Matching Model Results		Health	Matches	p-value difference	Standardized Difference
	Totals	OR	95% CI	Start			
Maricopa (reference)	58.5%			22.2%	23.3%	0.507	0.109
Cochise, Santa Cruz	2.7%	25.24***	(20.94, 30.42)	24.5%	24.5%	1.000	
Gila	1.1%	9.16***	(6.52, 12.87)	3.8%	3.2%	0.450	
Mohave	2.7%	4.76***	(3.47, 6.55)	4.2%	4.4%	0.844	
Pima	13.4%	1.12	(0.86, 1.47)	5.5%	4.9%	0.530	
Coconino, Navajo	4.7%	7.22***	(5.68, 9.18)	13.0%	10.5%	0.056	
Yavapai	2.3%	5.30***	(3.88, 7.25)	4.4%	4.7%	0.702	
Yuma	4.5%	8.58***	(7.04, 10.47)	16.0%	18.4%	0.114	
Apache, Graham, Greenlee, Pinal, La Paz	8.3%	1.46**	(1.09, 1.97)	4.4%	4.5%	0.923	
County missing	1.8%	5.67***	(3.16, 10.19)	2.1%	1.6%	0.372	
Bottom income decile (reference)	4.7%			2.0%	1.7%	0.552	0.077
Income decile 2	10.2%	2.60***	(1.69, 3.99)	20.2%	20.3%	0.961	
Income decile 3	14.9%	2.72***	(1.75, 4.21)	13.1%	13.5%	0.770	
Income decile 4	9.3%	3.53***	(2.25, 5.54)	10.9%	12.0%	0.382	
Income decile 5	10.6%	2.76***	(1.77, 4.29)	14.2%	15.0%	0.536	
Income decile 6	12.5%	1.79**	(1.13, 2.86)	6.3%	5.9%	0.677	
Income decile 7	10.8%	3.39***	(2.18, 5.26)	14.2%	12.9%	0.324	
Income decile 8	9.8%	5.30***	(3.42, 8.21)	13.1%	12.8%	0.813	
Income decile 9	7.1%	2.90***	(1.71, 4.92)	2.9%	3.4%	0.496	
Top income decile	2.8%	1.80	(0.88, 3.68)	0.9%	0.9%	0.834	
Income decile (zip code) missing	7.2%	1.82*	(0.93, 3.58)	2.1%	1.7%	0.382	
2006-07 (reference)	25.9%			0.9%	0.9%	0.834	0.058
2008	12.1%	3.32***	(1.61, 6.86)	1.5%	1.3%	0.737	
2009	10.9%	9.36***	(4.97, 17.60)	4.0%	4.4%	0.552	
2010	9.4%	25.63***	(14.10, 46.59)	8.9%	8.8%	0.889	
2011	8.3%	57.76***	(32.19, 103.63)	17.2%	17.4%	0.916	
2012	8.0%	62.14***	(34.64, 111.47)	18.4%	17.5%	0.534	
2013	7.3%	55.43***	(30.74, 99.94)	14.1%	13.5%	0.687	
2014	6.7%	57.95***	(32.12, 104.53)	13.3%	14.7%	0.302	
2015	5.9%	60.08***	(33.25, 108.59)	12.4%	11.9%	0.670	
2016	5.5%	44.96***	(24.69, 81.86)	9.2%	9.6%	0.733	
Married x health risk	0.3%	0.83	(0.31, 2.23)	0.4%	0.2%	0.479	0.028
County, median income missing	1.4%	0.64	(0.24, 1.70)	1.0%	1.0%	1.000	0.000

*** p<.001; ** p<.01; * p<.05

Appendix Table 4: Summary Statistics & Propensity Score Matching Result for Prenatal Care Outcomes Population for Mothers<20

	AZ	Matching Model Results		Health	Matches	p-value difference	Standardized Difference
	Totals	OR	95% CI	Start			
N (Unweighted)	95,390			1,260	6,832		
Any prenatal care	96.8%			96.7%	95.1%	0.037	0.083
Kotelchuck Index: >= Adequate	59.9%			59.7%	53.8%	0.003	0.118
Kotelchuck Index: < Adequate	24.6%			27.8%	30.4%	0.144	0.058
Kotelchuck Index: Adequate+	21.6%			20.9%	20.4%	0.751	0.013
White	23.9%	1.43	(1.00, 2.06)	22.2%	22.7%	0.775	0.058
American Indian	9.7%	1.59*	(1.06, 2.38)	12.5%	12.2%	0.809	
Hispanic	59.8%	1.54*	(1.08, 2.19)	62.3%	63.0%	0.711	
Other race/ethnicity (reference)	6.6%			2.9%	2.1%	0.161	
Mother born in US (reference)	79.7%			83.3%	85.6%	0.111	0.073
Mother born in Mexico	18.3%	1.41***	(1.18, 1.67)	16.1%	14.1%	0.165	
Mother born outside US	2.0%	0.46	(0.14, 1.47)	0.6%	0.3%	0.247	
Hispanic & born outside US	0.8%	1.62	(0.37, 7.13)	0.4%	0.2%	0.479	0.028
Less than high school (reference)	55.3%			57.5%	57.8%	0.878	0.044
High school degree/GED	36.4%	0.84**	(0.74, 0.95)	34.8%	34.6%	0.933	
Some college, no degree	7.6%	0.81	(0.65, 1.02)	7.3%	7.0%	0.757	
Private/commercial insurance	11.7%	1.14	(0.76, 1.72)	6.0%	5.8%	0.800	0.017
AHCCCS	84.4%	2.01***	(1.44, 2.81)	90.6%	91.0%	0.679	
Other insurance (reference)	3.9%			3.4%	3.2%	0.738	
Married	12.0%	1.09	(0.66, 1.79)	11.7%	9.5%	0.070	0.072
Cohabiting	48.6%	0.99	(0.87, 1.13)	41.8%	40.6%	0.544	0.024
Married & cohabiting	11.2%	0.94	(0.55, 1.60)	10.3%	8.4%	0.101	0.065
First birth	80.6%	0.92	(0.79, 1.07)	80.8%	83.6%	0.068	0.073
Pre-existing health risk	3.1%	0.86	(0.64, 1.17)	3.8%	4.5%	0.370	0.036

Appendix Table 4: Summary Statistics & Propensity Score Matching Result for Prenatal Care Outcomes Population for Mothers<20 (continued)

	AZ Totals	Matching Model Results		Health Start	Matches	p-value difference	Standardized Difference
		OR	95% CI				
Maricopa (reference)	58.5%			22.2%	23.7%	0.394	0.090
Cochise, Santa Cruz	2.7%	25.37***	(21.04, 30.58)	24.6%	24.8%	0.926	
Gila	1.1%	9.12***	(6.49, 12.83)	3.8%	3.7%	0.834	
Mohave	2.7%	4.77***	(3.47, 6.56)	4.2%	4.1%	0.921	
Pima	13.4%	1.12	(0.86, 1.47)	5.5%	5.1%	0.656	
Coconino, Navajo	4.7%	7.05***	(5.54, 8.97)	12.8%	10.6%	0.094	
Yavapai	2.3%	5.25***	(3.84, 7.18)	4.4%	4.4%	1.000	
Yuma	4.5%	8.47***	(6.94, 10.33)	16.0%	17.9%	0.222	
Apache, Graham, Greenlee, Pinal, La Paz	8.3%	1.47*	(1.09, 1.98)	4.4%	4.2%	0.769	
County missing	1.8%	5.58***	(3.11, 10.03)	2.1%	1.7%	0.462	
Bottom income decile (reference)	4.7%			2.0%	1.7%	0.659	0.064
Income decile 2	10.1%	2.59***	(1.68, 3.98)	20.2%	21.3%	0.523	
Income decile 3	15.0%	2.70***	(1.74, 4.19)	13.2%	13.7%	0.683	
Income decile 4	9.3%	3.50***	(2.23, 5.49)	11.0%	11.3%	0.800	
Income decile 5	10.6%	2.73***	(1.75, 4.25)	14.2%	14.6%	0.777	
Income decile 6	12.5%	1.76*	(1.10, 2.81)	6.2%	5.6%	0.555	
Income decile 7	10.9%	3.31***	(2.13, 5.14)	14.0%	12.9%	0.415	
Income decile 8	9.8%	5.25***	(3.39, 8.14)	13.2%	13.0%	0.906	
Income decile 9	7.1%	2.87***	(1.69, 4.87)	2.9%	3.3%	0.646	
Top income decile	2.8%	1.79	(0.88, 3.67)	1.0%	0.8%	0.669	
Income decile (zip code) missing	7.2%	1.80	(0.91, 3.54)	2.1%	1.7%	0.471	
2006-07 (reference)	26.0%			1.0%	1.0%	0.841	0.050
2008	12.2%	3.32**	(1.61, 6.86)	1.5%	1.2%	0.490	
2009	11.0%	9.36***	(4.97, 17.60)	4.0%	4.0%	0.919	
2010	9.4%	25.80***	(14.19, 46.90)	9.0%	8.4%	0.621	
2011	8.3%	57.96***	(32.30, 104.00)	17.3%	17.4%	0.958	
2012	8.1%	62.04***	(34.58, 111.31)	18.4%	19.4%	0.509	
2013	7.3%	54.73***	(30.35, 98.72)	14.0%	14.0%	1.000	
2014	6.6%	59.15***	(32.79, 106.72)	13.3%	13.3%	0.953	
2015	5.8%	60.99***	(33.74, 110.24)	12.5%	11.7%	0.541	
2016	5.4%	45.68***	(25.08, 83.21)	9.1%	9.6%	0.682	
County, median income (zip code) missing	1.4%	0.64	(0.24, 1.70)	1.0%	1.0%	1.000	0.000

*** p<.001; ** p<.01; * p<.05

Appendix Table 5: Summary Statistics & Propensity Score Matching Result for Immunization Outcomes Population for Mothers<20†

	AZ	Matching Model Results		Health	Matches	p-value difference	Standardized Difference
	Totals	OR	95% CI	Start			
N (Unweighted)	95,844			1,264	6,704		
White	23.9%	1.44*	(1.00, 2.07)	22.2%	23.9%	0.322	0.091
American Indian	9.7%	1.60**	(1.07, 2.39)	12.7%	11.2%	0.270	
Hispanic	59.7%	1.54**	(1.08, 2.19)	62.2%	63.1%	0.651	
Other race/ethnicity (reference)	6.6%			2.9%	1.8%	0.067	
Mother born in US	79.7%			83.2%	84.7%	0.303	0.057
Mother born in Mexico	18.3%	1.41***	(1.19, 1.68)	16.1%	15.0%	0.411	
Mother born outside US	2.0%	0.45	(0.14, 1.45)	0.6%	0.3%	0.247	
Hispanic & born outside US	0.9%	1.61	(0.37, 7.10)	0.4%	0.2%	0.479	0.028
Less than high school (reference)	55.9%			57.9%	57.6%	0.872	0.007
High school degree/GED	36.4%	0.83***	(0.74, 0.95)	34.7%	34.8%	0.967	
Some college, no degree	7.6%	0.81*	(0.64, 1.02)	7.3%	7.4%	0.879	
Private/commercial insurance	11.7%	1.19	(0.79, 1.78)	6.0%	5.2%	0.388	0.035
AHCCCS	84.4%	2.09***	(1.50, 2.92)	90.6%	91.2%	0.580	
Other insurance (reference)	4.0%			3.4%	3.6%	0.828	
Married	12.0%	1.08	(0.66, 1.78)	11.7%	11.2%	0.662	0.017
Cohabiting	48.6%	1.00	(0.87, 1.13)	41.9%	43.5%	0.399	0.034
Married & cohabiting	11.2%	0.94	(0.55, 1.61)	10.3%	9.9%	0.741	0.013
First birth	80.6%	0.93	(0.80, 1.07)	80.8%	82.4%	0.281	0.043
Pre-existing health risk	3.1%	0.86	(0.64, 1.17)	3.8%	3.5%	0.671	0.017

†Immunization outcomes not available for full population

*** p<.001; ** p<.01; * p<.05

Appendix Table 5: Summary Statistics & Propensity Score Matching Result for Immunization Outcomes Population for Mothers<20 (continued)

	AZ Totals	Matching Model Results		Health Start	Matches	p-value difference	Standardized Difference
		OR	95% CI				
Maricopa (reference)	58.5%	0.18***	(0.10, 0.33)	22.2%	21.9%	0.848	0.094
Cochise, Santa Cruz	2.7%	4.58***	(2.53, 8.27)	24.5%	23.9%	0.710	
Gila	1.1%	1.66	(0.87, 3.17)	3.8%	3.3%	0.520	
Mohave	2.7%	0.86	(0.45, 1.64)	4.2%	4.3%	0.921	
Pima	13.4%	0.20***	(0.11, 0.38)	5.5%	6.3%	0.353	
Coconino, Navajo	4.7%	1.30	(0.71, 2.37)	13.0%	11.4%	0.224	
Yavapai	2.3%	0.95	(0.50, 1.81)	4.4%	5.3%	0.266	
Yuma	4.5%	1.54	(0.85, 2.80)	16.0%	17.8%	0.222	
Apache, Graham, Greenlee, Pinal, La Paz	8.3%	0.26***	(0.14, 0.50)	4.4%	4.0%	0.552	
County missing	1.8%	1.00	(1.00, 1.00)	2.1%	1.8%	0.665	
Bottom income decile (reference)	4.7%			2.0%	1.7%	0.552	0.082
Income decile 2	10.2%	2.59***	(1.68, 3.98)	20.2%	20.4%	0.882	
Income decile 3	14.9%	2.71***	(1.75, 4.20)	13.1%	13.4%	0.860	
Income decile 4	9.3%	3.53***	(2.25, 5.54)	10.9%	12.4%	0.239	
Income decile 5	10.6%	2.75***	(1.76, 4.28)	14.2%	14.6%	0.734	
Income decile 6	12.5%	1.79**	(1.12, 2.86)	6.3%	6.3%	1.000	
Income decile 7	10.9%	3.39***	(2.19, 5.27)	14.2%	13.1%	0.418	
Income decile 8	9.8%	5.28***	(3.41, 8.19)	13.1%	13.0%	0.906	
Income decile 9	7.1%	2.89***	(1.70, 4.90)	2.9%	2.9%	1.000	
Top income decile	2.8%	1.81	(0.88, 3.70)	0.9%	0.8%	0.669	
Income decile (zip code) missing	7.2%	1.82*	(0.92, 3.57)	2.1%	1.4%	0.176	
2006-07 (reference)	25.9%			0.9%	1.1%	0.694	0.034
2008	12.1%	3.33***	(1.61, 6.86)	1.5%	1.3%	0.737	
2009	10.9%	9.36***	(4.98, 17.61)	4.0%	3.8%	0.837	
2010	9.4%	25.81***	(14.20, 46.91)	8.9%	9.0%	0.945	
2011	8.3%	57.97***	(32.31, 104.01)	17.2%	17.1%	0.916	
2012	8.0%	62.37***	(34.77, 111.89)	18.4%	18.8%	0.838	
2013	7.3%	55.47***	(30.76, 100.03)	14.1%	14.6%	0.733	
2014	6.7%	58.05***	(32.18, 104.72)	13.3%	13.6%	0.816	
2015	5.9%	60.40***	(33.42, 109.16)	12.4%	12.0%	0.762	
2016	5.5%	45.26***	(24.85, 82.41)	9.2%	8.7%	0.676	
County, median income missing	1.4%	0.66	(0.25, 1.74)	1.0%	1.0%	1.000	0.000

*** p<.001; ** p<.01; * p<.05