PolicyLab

The Alliance for the Determinants of Health: Evaluation of Healthcare Utilization and Cost of Care

Executive Summary

The Alliance for the Determinants of Health is a community collaboration formed to impact the affordability of healthcare, improve participants' well-being, and be a model for change by addressing social determinants of health (SDOH). Four Alliance intervention programs were implemented from 2019-2021. The evaluation team at PolicyLab at Children's Hospital of Philadelphia examined the impacts of the Alliance's core programs on key healthcare service utilization and cost outcomes.

Findings

Key finding: Across all programs, patients engaged in Alliance programming maintained engagement in healthcare services during the COVID-19 pandemic—a period in which there were well documented reductions in preventive and maintenance healthcare behavior.

- **Castell House Calls Program** patients, compared to matched non-enrolled patients, demonstrated sustained utilization of healthcare services during the pandemic period, resulting in higher:
  - Outpatient visits,
  - Emergency department (ED) visits, and
  - Payment for healthcare services.
- **Community Health Worker (CHW) Program** patients, compared to matched non-enrolled patients, demonstrated sustained utilization of healthcare services during the pandemic period, resulting in higher:
  - Outpatient visits, and
  - Payment for healthcare services.
- **Pediatric patients screened for SDOH** compared to matched non-screened pediatric patients, demonstrated sustained utilization of healthcare services during the pandemic period, resulting in higher:
  - Well-child visits,
  - Outpatient visits,
  - Payment for healthcare services, and
  - Payment for pharmaceuticals.

Considerations

- The **pandemic** coincided with the Alliance's demonstration period, resulting in overall secular **declines in healthcare utilization** for most SelectHealth Community Care members.
- Our analysis examined outcomes in the 12 months following patients' initial enrollment with Alliance programs. It is plausible that the effects of Alliance programs on hospitalizations or ED visits were **lagged** and, therefore, **unobserved** within the 12-month follow-up period.

- This evaluation included patients enrolled through 2020. The **Alliance programs have evolved** and have enrolled substantially more patients in the interim. Nearly two-thirds of individuals who were enrolled in Alliance programs had insufficient follow-up data to be evaluated in this analysis. Moreover, subsequent evaluation would reflect programmatic outcomes following the early implementation/demonstration period.

Conclusions

Despite a small sample size, a model that had not yet matured, and disruptions from the pandemic, our analysis identified the Alliance's early successes in **sustaining frequency of outpatient visits** (House Calls Program, CHW Program, and pediatric SDOH screening program) and **well visits** (CHW program and pediatric SDOH screening program). There were **no observed reductions in inpatient care** and total costs of care were higher overall for those enrolled in Alliance programs (mostly due to sustained utilization compared to those who were not enrolled).

Implications and Next Steps

Continued evaluation of the Alliance's programs would provide an opportunity to capture a larger cohort of enrolled patients and sufficient time to observe outcomes. Examining periods beyond the pandemic may yield different results than were demonstrated during a period when social structures and health status at the individual, family, and community levels were unduly influenced by the public health emergency and pandemic-related policies, yielding—among other results—overall limited healthcare access. Ongoing evaluation should also measure patient-level benefits that may not be reflected in healthcare service utilization, such as self-efficacy and patient activation.

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1. Introduction

The Alliance for the Determinants of Health is a three-year demonstration project that began in January 2019 with the goal of addressing the social needs of SelectHealth Community Care patients to improve their well-being, while also making healthcare more affordable. The demonstration project took place in Utah's Washington and Weber Counties with the goals of scaling up successful components of social care intervention to other communities and sharing best practices locally and nationally.

The Alliance consisted for four pillar programs:

- **Castell House Calls Program** – The House Calls team includes providers, care managers, and social workers who care for patients in their homes. House Calls works with patients who have complex medical needs and, often, who are homebound with social needs. House Calls connects patients to primary care and provides ongoing updates to primary care practices.

- **Community Health Worker (CHW) Program** – Through this program, a CHW team in each county works collaboratively with Alliance organizations (e.g., clinics, community organizations) and other community agencies and organizations. The CHWs connect with patients on a weekly basis in-person or by phone for a period of up to 6 months to understand needs and navigate to supportive resources. CHWs use motivational interviewing, home visits, and self-management goal setting to empower patients to address barriers to overall wellness. CHW teams participate in regular care coordination meetings with SelectHealth Care Management, Castell House Calls, federally qualified health centers (FQHCs), and local mental health authorities (LMHAs) to align services for shared patients.

- **Social Determinants of Health (SDOH) Screening** – SelectHealth patients and families answer screening questions about their social needs using the Safe Environment for Every Kids (SEEK) Questionnaire for pediatrics (ages 0-5), and the Social Check screening tool for school-aged children to adults. They may answer the screening before an appointment (by text message or on paper), during an appointment, during an emergency department (ED) visit, or by phone. When social needs are identified through screening, patients and families are connected to community services through a variety of approaches including sending referrals to community-based organizations on *Unite Us*, a closed loop digital referral platform, and connecting patients and families to the CHW Program.

- **SelectHealth Care Management** – SelectHealth provides patients with care management by phone. SelectHealth Care Managers access member claims to identify care management services received by patients from other practices or organizations, view where patients are seeking care within and outside of Intermountain Healthcare, and connect patients to appropriate medical care and services. SelectHealth Care Management participates in regular care coordination meetings with CHW teams, Castell House Calls, FQHCs, and LMHAs, often providing important insight into opportunities to engage patients.

2. Individual-Level Outcomes for Patients Enrolled in the Alliance Programs

2.1 Overview

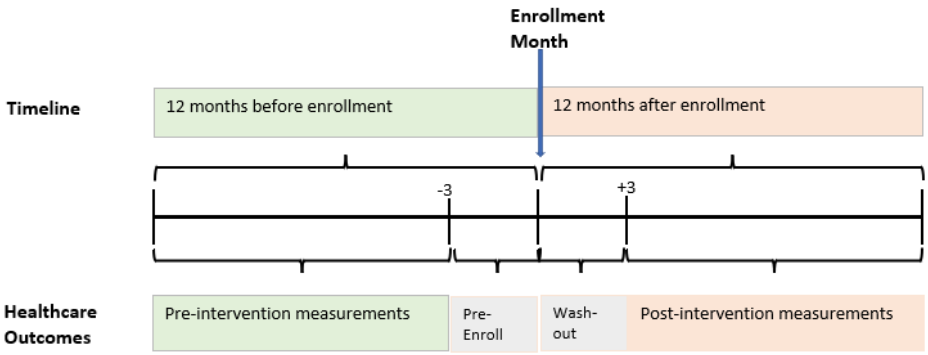
This analysis assessed the impact of the Alliance's programs on healthcare service utilization and cost of care for enrollees.

This study employed a quasi-experimental approach to characterizing real-world effectiveness of a program following implementation. We used a statistical technique that mimics the conditions of a randomized control trial. The approach, **propensity score matching (PSM)**, is a matching technique for observational data that examines the characteristics of individuals who received the intervention and uses available baseline data to generate a comparison cohort that is as similar as possible to the characteristics of the intervention cohort at the time when they were enrolled.[1]

2.2 Methods

Study Sample and Data Sources:

The intervention cohort included SelectHealth Community Care members who 1) enrolled in one or more of the Alliance intervention programs during 2019-2021 in Weber and Washington Counties; 2) were under 65 years of age; and 3) had 10 months or more SelectHealth Community Care coverage during the study observation period (the year prior to the date of program enrollment and the year after the enrollment date). The eligibility criterion of sufficient insurance coverage was established to ensure adequate capture of medical conditions and healthcare utilization. The observational time periods for each patient in the intervention cohort are presented in the figure below:



Adult and child SelectHealth Community Care members were eligible to be included in the non-enrolled analysis cohort if they 1) lived in Weber, Washington, Cache, or Davis Counties in Utah; 2) were 18-65 years of age (to be matched with House Calls, CHW and Care Management intervention cohorts) or were 0-18 years of age (to be matched with pediatric SDOH screening intervention cohort); 3) did not participate in any of the Alliance interventions during 2019-2021; 4) had sufficient insurance coverage during the study observation period; and 5) had similar baseline characteristics with the intervention cohort and matched with the intervention cohort on propensity scores.

[1] Ross ME, et al. Propensity Score Methods for Analyzing Observational Data Like Randomized Experiments: Challenges and Solutions for Rare Outcomes and Exposures. Am J Epidemiol. 2015 Jun 15;181(12):989-95.

The data used in this study consisted of four components: 1) SelectHealth Community Care enrollment file: the monthly insurance coverage of each member; 2) sociodemographic characteristics of SelectHealth Community Care members; 3) SelectHealth Community Care inpatient, outpatient, procedures, and prescriptions claims data; and 4) Alliance intervention enrollment records: date of enrollment and level of engagement with Alliance programs. The four data components were linked by person ID. (Claims information related to substance abuse were excluded from the data set due to the federal rule 42 CFR.) In addition, we accessed data on community characteristics, such as the racial composition of communities (percent Hispanic, percent Black) from American Community Survey data. We linked these area-level data with individual-level data using the census tract of the residence addresses of SelectHealth Community Care members.

Propensity Score Modeling and Matching:

Propensity score modeling is a matching technique for observational data that mimics a randomized control trial by creating cohorts of intervention and control group members who have a similar distribution of baseline covariates. The propensity scores indicated the expected probability of Alliance enrollment, conditional on observed baseline characteristics. To generate the propensity scores, we built multivariable logistic regression models with enrollment in each of the Alliance programs as the outcome and the following covariates as the predictors:

- Sociodemographic factors: age, race/ethnicity, gender, marital status (for adults only), family primary language spoken
- Clinical conditions during pre-intervention period: number of chronic conditions were calculated using Charlson Comorbidity Index for adults and an algorithm developed and validated by Children's Hospital of Philadelphia for children
- Healthcare utilization and cost during pre-intervention period: number of ED visits, number of outpatient visits, and number of impatient admissions and bed-days
- Community-level socioeconomic factors: composite scores (generated by principal component analysis) that summarize area-level socioeconomic characteristics of the census tract where each member lives, such as population density and proportion of residents living in poverty

We fitted the propensity score model for each intervention program separately using data of the intervention cohort and potential non-enrolled members in Weber and Washington Counties. The expected probabilities (i.e., the propensity score) were estimated from the model for all eligible individuals in the four counties.

After the propensity scores were generated for all enrolled and potential non-enrolled members, we used 1:1 optimal matching to find matched non-enrolled members who are most comparable on baseline covariates with the enrolled members. In 1:1 optimal matching, we created a non-enrolled cohort whose propensity scores were closest to that of the enrolled cohort. We specified a caliper of 0.1 to place a restriction on the maximum acceptable difference between the propensity score of the matched non-enrolled member and the enrolled member. We evaluated this matching approach by calculating the standardized mean difference (SMD) on all covariates between the matched cohorts. The balance was determined to be reached if the SMD was less than 0.1. After checking the balance, we decided to further perform exact matching on healthcare utilization measures (i.e., inpatient admissions, ED visits, outpatient visits).

Outcome Models: To estimate the impact of the Alliance interventions on healthcare utilization and cost, we compared the outcomes of the intervention cohort versus the matched non-enrolled analysis cohort. We fitted multivariate linear models for continuous outcomes and

multivariate negative binomial regression models for count outcomes. Outliers in healthcare utilization and cost (observations above 99.5% of the whole-sample distribution) were removed from the analysis. As a doubly robust approach, we also adjusted for baseline characteristics in the outcome models to account for residual confounding.

2.3 Results for the House Calls Program

- Enrolled Cohort: We included 122 out of 372 enrolled adults (18-65 years of age) in the analysis. We excluded 239 of them from the analysis due to insufficient coverage duration (many were later enrollees for whom outcome data was not available). The House Calls Program enrolled most patients in the ED setting, and 65% of them had ED visits in close proximity (within 2 months) of enrollment. (See **Figure A1** in the Appendix for details.)
- Matched Non-enrolled Cohort: The matched non-enrolled patients were comparable on observed characteristics to the enrolled cohort, indicating we achieved a suitable matching process. Balanced characteristics at baseline between the two groups included demographic characteristics, baseline comorbidity, and healthcare utilization during the enrollment period. (See **Table 1a.**)
- Outpatient (OP) Visits: Enrolled patients had comparatively higher change rates of OP visits between the post- and pre-intervention periods (difference of +8.1 visits per 100 enrolled vs. -7.9 visits per 100 non-enrolled). The marginal difference in OP visit rates between enrolled and matched non-enrolled patients was notably higher at +28.2 visits per 100 patients (p-value < 0.001). (See **Tables 1b** and **1c**.)
- Emergency Department (ED) Visits: Both enrolled patients and matched non-enrolled patients had declining ED visits post-intervention, but non-enrolled patients declined slightly more. Therefore, enrolled patients had comparatively higher ED visits post intervention (+8.1 visits per 100 patients, p-value < 0.05). (See **Tables 1b** and **1c**.)
- Hospitalization: We found no significant difference between enrolled patients and matched non-enrolled patients on inpatient admissions and inpatient length of stay. (See **Tables 1b** and **1c**.)
- Healthcare Expenditures: Both enrolled patients and matched non-enrolled patients had declining expenditures post-intervention, but the non-enrolled patients declined more substantially. As a result, the change in overall spending remained 50% higher among enrolled patients compared to matched non-enrolled patients, even as both groups spent less on medical services. (See **Tables 1b** and **1c**.)

Table 1a. Characteristics of patients enrolled in the House Calls Program and matched non-enrolled patients

Characteristics	House Calls Patients (n=122)	Potential Non-enrolled (n=3118)	Matched Non-enrolled Patients (n=122)
Age (years)	N(%)	N(%)	N(%)
Mean (SD*)	45(12.5)	37(12.6)	46(14)
18-45	49(40.2)	2360(75.7)	49(40.2)
45+	73(59.8)	758(24.3)	73(59.8)
Female	84(68.9)	2195(70.4)	88(72.1)
Race			
Hispanic	20(16.4)	497(15.9)	18(14.8)
Non-Hispanic Black	2(1.6)	70(2.2)	5(4.1)
Non-Hispanic Other	5(4.1)	171(5.5)	8(6.6)
Non-Hispanic White	95(77.9)	2380(76.3)	91(74.6)
Speaks English at Home	122(100)	3056(98)	117(95.9)
Married	22(18)	1003(32.2)	25(20.5)
Number of Chronic Conditions**			
Mean (SD)	2.19(4.22)	0.56(1.33)	1.66(2)
0	47(38.5)	2347(75.3)	56(45.9)
1	27(22.1)	354(11.4)	12(9.8)
2	12(9.8)	165(5.3)	16(13.1)
3+	36(29.5)	252(8.1)	38(31.1)
Average Monthly Visits in Baseline per 1000 (Mean (SD))			
Outpatient Visits	1026(782.6)	455(489.5)	984(636.2)
ED Visits	323(519.9)	69(153.2)	242(297.3)
Inpatient Admissions	43(84.6)	14(40)	36(66)

*SD: Standard Deviation

**Number of chronic conditions for each patient was calculated using the Charlson Comorbidity Index (CCI)

Table 1b. Healthcare utilization and cost in the pre- and post-intervention periods for House Calls enrollees and matched non-enrolled patients

	Pre-Intervention			Post-Intervention		
	Enrolled	Matched Non-enrolled	SMD*	Enrolled	Matched Non-enrolled	SMD*
Average Monthly Visits per 100 Patients						
Well Visits	0.8	1.1	-0.09	1.7	1.1	0.10
Outpatient Visits	102.6	98.4	0.06	110.7	90.6	0.25
ED Visits	32.3	24.2	0.19	25.3	16.6	0.23
Inpatient Admissions	4.3	3.6	0.09	4.6	3.1	0.14
Length of Stay	17.3	14.2	0.08	14.9	15.3	-0.01
Average Monthly Payment per Patient						
Total	$981	$880	0.08	$875	$534	0.30
Medical Services	$645	$609	0.04	$534	$344	0.27
Pharmacy	$121	$79	0.20	$153	$76	0.33

*SMD: Standardized Mean Difference

Table 1c. Adjusted effects of House Calls Program on healthcare utilization and cost

	Change from Pre- to Post-intervention			Marginal Effect of House Calls Program on Outcomes***			
	Enrolled	Matched Non-enrolled	SMD*	Estimate	Confidence Interval		P Value
					Lower Bound	Upper Bound	
Average Monthly Visits per 100 Patients							
Well Visits	0.9	0.0	0.13	5.5	-8.7	19.6	0.445
Outpatient Visits	8.1	-7.9	0.24	28.2**	11.7	44.7	0.001
ED Visits	-7.0	-7.6	0.02	8.1**	2.1	14.2	0.008
Inpatient Admissions	0.3	-0.5	0.07	1.4	-0.3	3.1	0.109
Inpatient Stay Length	-2.4	1.1	-0.05	43.4	-67.8	154.5	0.442
Average Monthly Payment per Patient							
Total	$235	-$433	0.27	1.5**	1.0	2.1	0.026
Medical Services	-$56	-$329	0.13	1.5**	1.0	2.1	0.040
Pharmacy	$291	-$104	0.28	1.4	1.0	2.0	0.054

*SMD: Standardized Mean Difference
**Indicates findings that are statically significant ($p < 0.05$)
***The marginal effects on service use are expressed as the difference in utilization per 100 patients for enrolled patients vs. matched non-enrolled patients; the marginal effects on average monthly payment can be interpreted as the ratio of payments for enrolled patients vs. matched non-enrolled patients.

Summary of results for the House Calls Program:

Patients enrolled in the House Calls Program demonstrated higher utilization of outpatient visits during the study period compared to matched non-enrolled patients with similar characteristics. During a period in which use of services overall declined due to the pandemic, the effect of the House Calls Program seems to have been to sustain utilization of outpatient services. While we noted no demonstrable effects on inpatient care, the follow-up period was likely insufficient to detect lagged effects that may have occurred following the utilization of comparatively higher outpatient services.

2.4 Results for the Community Health Worker (CHW) Program

- Enrolled Cohort: The CHW Program enrolled the most patients in the outpatient setting, with 85% of enrollees having outpatient visits in the 2 months prior to enrollment. We included 94 out of 269 enrolled adults (18-65 years of age) in the analysis. We excluded 171 of them from the analysis due to insufficient coverage duration (many were later enrollees for whom outcome data was not available). (See **Figure A2** in the appendix for details.)
- Matched Non-enrolled Cohort: The comparison group of matched non-enrolled patients were comparable on observed characteristics to the enrolled patients, indicating we achieved a suitable matching process. Balanced characteristics at baseline between the two groups included demographic characteristics, baseline comorbidity, and healthcare utilization during the enrollment period. (See **Table 2a.**)
- Well Visits: Well visits increased by +2.1 per 100 among enrolled patients, while there was a slight decline in well visits among matched non-enrolled patients (-0.2 visits per 100 patients) in the post-intervention period. The marginal effect of the CHW intervention on well visits was higher between enrolled patients and their matched non-enrolled patients at +11.6 per 100 patients (p-value < 0.01). (See **Tables 2b and 2c.)**
- Outpatient (OP) Visits: OP visits increased by +10.3 per 100 among enrolled patients, while there was a decline in OP visits among matched non-enrolled patients (-15.6 visits per 100 patients) in the post-intervention period. The marginal effect of the CHW intervention on outpatient visits was notably higher among enrolled patients and their matched non-enrolled patients at +22.9 per 100 patients (p-value < 0.001). (See **Tables 2b and 2c**.)
- Emergency Department (ED) Visits: ED visits declined among patients enrolled in the CHW Program and their matched non-enrolled patients during the follow-up period. The matched non-enrolled patients declined more substantially. The marginal effect of the CHW intervention on ED visits was notably higher among enrolled patients and their matched non-enrolled patients at +5.1 per 100 patients (p-value < 0.01). (See **Tables 2b and 2c.)**
- Hospitalization: We observed similar declines in hospitalizations and length of stay among both CHW Program-enrolled patients and their non-enrolled patients during the post-intervention period. (See **Tables 2b and 2c.)**
- Healthcare Expenditures: Both CHW Program-enrolled patients and matched non-enrolled patients experienced reduced healthcare expenditures post-intervention, but the matched non-enrolled patients declined more substantially. This greater decline in expenditures among matched non-enrolled patients explains a 90% relative marginal increase in the expenditure trend of enrolled patients compared to matched non-enrolled patients during the follow-up period. (See Tables **2b and 2c.)**

Table 2a. Characteristics of patients enrolled in the Community Health Worker (CHW) Program and matched non-enrolled patients

Characteristics	CHW Program-enrolled Patients (n=94)	Potential Non-enrolled (n=2927)	Matched Non-enrolled Patients (n=94)
Age (years)	N(%)	N(%)	N(%)
Mean (SD*)	46(12.4)	37(12.7)	46(14.2)
18-45	39(41.5)	2172(74.2)	39(41.5)
45+	55(58.5)	755(25.8)	55(58.5)
Female	65(69.1)	2045(69.9)	60(63.8)
Race			
Hispanic	27(28.7)	476(16.3)	23(24.5)
Non-Hispanic Black	3(3.2)	55(1.9)	4(4.3)
Non-Hispanic Other	6(6.4)	149(5.1)	2(2.1)
Non-Hispanic White	58(61.7)	2247(76.8)	65(69.1)
Speaks English at Home	89(94.7)	2852(97.4)	87(92.6)
Married	17(18.1)	917(31.3)	21(22.3)
Number of Chronic Conditions**			
Mean (SD)	1.8(2.44)	0.61(1.49)	1.54(1.92)
0	41(43.6)	2154(73.6)	39(41.5)
1	15(16)	358(12.2)	19(20.2)
2	14(14.9)	170(5.8)	13(13.8)
3+	24(25.5)	245(8.4)	23(24.5)
Average (SD) Monthly Visits in Baseline per 1000			
Outpatient Visits	834(760.1)	482(504.5)	919(778)
ED Visits	322(514.1)	71(165.5)	327(499.2)
Inpatient Admissions	44(88)	15(41.5)	43(79.8)

*SD: Standard Deviation

**Number of chronic conditions for each patient was calculated using the Charlson Comorbidity Index (CCI)

Table 2b. Healthcare utilization and cost in the pre- and post-intervention periods for Community Health Worker (CHW) Program enrollees and matched non-enrolled patients

	Pre-intervention			Post-intervention		
	Enrolled	Matched Non-enrolled	SMD*	Enrolled	Matched Non-enrolled	SMD*
Average Monthly Visits per 100 Patients						
Well Visits	0.3	0.6	-0.11	2.4	0.3	0.39
Outpatient Visits	83.4	91.9	-0.11	93.7	76.2	0.21
ED Visits	32.2	32.7	-0.01	21.3	18.2	0.08
Inpatient Admissions	4.4	4.3	0.02	3.0	2.6	0.07
Length of Stay	17.1	14.8	0.05	8.0	10.4	-0.07
Average Monthly Payment per Patient						
Total	$690	$645	0.04	$643	$316	0.38
Medical Services	$462	$491	-0.04	$392	$183	0.40
Pharmacy	$75	$48	0.21	$99	$64	0.20

*SMD: Standardized Mean Difference

Table 2c. Adjusted effects of Community Health Worker (CHW) Program on healthcare utilization and cost

	Change from Pre- to Post-intervention			Marginal Effect of CHW Program on Outcomes***			
	Enrolled	Matched Non-enrolled	SMD*	Estimate	Confidence Interval		P Value
					Lower Bound	Upper Bound	
Average Monthly Visits per 100 Patients							
Well Visits	2.1	-0.2	0.39	11.6**	3.1	20.1	0.007
Outpatient Visits	10.3	-15.6	0.40	22.9**	9.0	36.8	0.001
ED Visits	-10.9	-14.5	0.11	5.1**	1.2	8.9	0.009
Inpatient Admissions	-1.4	-1.7	0.03	5.7	-10.2	21.6	0.480
Inpatient Stay Length	-9.1	-4.3	-0.09	8.4	-49.0	65.8	0.773
Average Monthly Payment per Patient							
Total	-$104	-$161	0.03	1.9**	1.2	2.8	0.003
Medical Services	-$192	-$309	0.06	2.1**	1.4	3.3	0.001
Pharmacy	$88	$148	-0.06	1.1	0.8	1.5	0.644

*SMD: Standardized Mean Difference
**Indicates findings that are statically significant ($p < 0.05$)
***The marginal effects on service use are expressed as the difference in utilization per 100 patients for enrolled patients vs. matched non-enrolled patients; the marginal effects on average monthly payment can be interpreted as the ratio of payments for enrolled patients vs. matched non-enrolled patients.

Summary of results for the CHW Program:

The CHW Program, having enrolled many of their patients from outpatient settings, demonstrated strong continuity and growth in well visits and outpatient services among their enrolled patients in the follow-up period. The short follow-up period of one year may have been insufficient to evaluate whether the relative increase in outpatient coordination might have altered subsequent inpatient or ED use over time.

2.5 Results for the Pediatric Social Determinants of Health (SDOH) Screening Program

- Screened Cohort: We included 1,627 out of 5,561 screened pediatric patients (0-18 years of age) in the analysis. We excluded 3,748 children from the analysis due to insufficient coverage duration, most of them being patients screened later in the study for whom sufficient follow-up data was lacking. (See **Figure A3** in the Appendix for details.)
- Matched Non-screened Cohort: The matched non-screened patients were comparable on observed characteristics to the screened cohort, indicating we achieved a suitable matching process. Balanced characteristics at baseline between the two groups included demographic characteristics, baseline comorbidity, and healthcare utilization during the enrollment period. (See **Table 3a**.)
- Well Visits: Well visits declined for both screened children and matched non-screened children, but the rate of decline was substantially greater for those who had not been screened. These disparate rates of decline yielded a marginal difference of +11.3 well visits per 100 patients for screened vs. unscreened patients (p-value < 0.001). (See **Tables 3b and 3c**.)
- Outpatient (OP) Visits: OP visits declined for both screened children and their matched non-screened comparison patients with a slightly greater rate of decline for matched non-screened children. (See **Tables 3b and 3c**.)
- Emergency Department (ED) Visits: We observed similar rates of decline in ED visits for both screened and matched non-screened children in the post-intervention period. (See **Tables 3b and 3c**.)
- Hospitalization: We observed similar declines in hospitalization and length of stay for screened and matched non-screened children. (See **Tables 3b and 3c**.)
- Healthcare Expenditures: Healthcare expenditures declined in both groups, but declines were greater in matched non-screened children, due to their relatively greater declines in outpatient and primary care utilization. The standardized comparative trend was, therefore, 50% higher for screened patients over time given these differential rates of decline between the two groups for outpatient utilization. (See **Tables 3b and 3c**.)

Table 3a. Characteristics of pediatric patients screened for social determinants of health (SDOH) and the matched non-screened pediatric patients

Characteristics	SDOH Screened Patients (n=1627)	Potential Non-screened (n=6251)	Matched Non-screened Patients (n=1627)
Age (years)	N(%)	N(%)	N(%)
Mean (SD*)	7(5.4)	7(5.2)	7(5.5)
0-2	426(26.2)	1531(24.5)	426(26.2)
3-5	368(22.6)	1282(20.5)	368(22.6)
6-11	396(24.3)	1800(28.8)	396(24.3)
12-18	437(26.9)	1638(26.2)	437(26.9)
Female	804(49.4)	3065(49)	780(47.9)
Race			
Hispanic	512(31.5)	1912(30.6)	427(26.2)
Non-Hispanic Black	40(2.5)	145(2.3)	48(3)
Non-Hispanic Other	108(6.6)	1034(16.5)	90(5.5)
Non-Hispanic White	967(59.4)	3160(50.6)	1062(65.3)
Speaks English at Home	1548(95.1)	5718(91.5)	1547(95.1)
Married	512(31.5)	1917(30.7)	561(34.5)
Number of Pediatric Chronic Conditions			
Mean (SD)	0.1(0.42)	0.06(0.3)	0.14(0.47)
0	1504(92.4)	5974(95.6)	1465(90)
1	91(5.6)	215(3.4)	116(7.1)
>=2	32(2)	62(1)	46(2.8)
Average Monthly Visits in Baseline per 1000 (Mean (SD))			
Outpatient Visits	244(293.9)	203(247.8)	257(316.6)
ED Visits	44(93.2)	31(74.3)	41(85.8)
Inpatient Admissions	11(40.7)	6(27.6)	12(37.6)

*SD: Standard Deviation

Table 3b. Healthcare utilization and cost in the pre- and post-intervention periods for pediatric patients screened for social determinants of health and matched non-screened patients

	Pre-intervention			Post-intervention		
	Enrolled	Matched Non-screened	SMD*	Enrolled	Matched Non-screened	SMD*
Average Monthly Visits per 100 Patients						
Well Visits	10.8	10.6	0.01	5.3	4.2	0.16
Outpatient Visits	24.4	25.7	-0.04	18.9	17.7	0.05
ED Visits	4.4	4.1	0.04	2.9	2.5	0.06
Inpatient Admissions	1.1	1.2	-0.01	0.4	0.3	0.05
Inpatient Length of Stay	2.9	3.3	-0.02	1.0	0.7	0.03
ED Visits for Injury**	0.53	0.48	0.032	0.57	0.52	0.029
Average Monthly Payment per Patient						
Total	$58	$55	0.03	$31	$21	0.20
Medical Services	$50	$48	0.03	$26	$18	0.21
Pharmacy	$4	$4	-0.03	$3	$3	0.05

*SMD: Standardized Mean Difference
**Among children 0-2 years of age

Table 3c. Adjusted effect of pediatric SDOH screening program on healthcare utilization and cost

	Change from Pre- to Post-intervention			Marginal Effect of Pediatric SDOH Screening Program on Outcomes***			
					Confidence Interval		
	Screened	Matched Non-screened	SMD*	Estimate	Low Bound	Upper Bound	P Value
Average Monthly Visits per 100 Patients							
Well Visits	-5.5	-6.5	0.078	11.3**	7.5	15.1	0.000
Outpatient Visits	-5.4	-8.0	0.087	2.2**	0.9	3.5	0.001
ED Visits	-1.5	-1.6	0.007	0.3	-0.1	0.7	0.109
Inpatient Admissions	-0.7	-0.9	0.039	0.1	0.0	0.2	0.080
Inpatient Stay Length	-2.0	-2.6	0.037	2.2	-2.8	7.3	0.388
Average Monthly Payment per Patient							
Total	-$55	-$98	0.061	1.5**	1.3	1.7	0.000
Medical Services	-$60	-$87	0.040	1.5**	1.3	1.7	0.000
Pharmacy	$5	-$11	0.105	1.1**	1.0	1.2	0.004

*SMD: Standardized Mean Difference
**Indicates findings that are statically significant ($p < 0.05$)
***The marginal effects on service use are expressed as the difference in utilization per 100 patients for screened patients vs. matched non-screened patients; the marginal effects on average monthly payment can be interpreted as the ratio of payments for screened patients vs. matched non-screened patients.

Summary of results the Pediatric SDOH Screening Program:

The SDOH Screening Program in pediatric care locations increased the utilization of well visits—and to some degree outpatient services—during the pandemic year, when healthcare utilization and expenditures were declining overall. Future evaluations should consider replicating this analysis during a period beyond the pandemic, as well as including other public health outcomes, such as injury rates for children, which might be more directly impacted by the screening (and referral for community services) program.

Note about the evaluation analyses for the SelectHealth Care Management Program:

The sample size for the analysis cohorts of the SelectHealth Care Management Program was very small: 39 eligible enrolled patients matched with 39 non-enrolled patients. Analysis of small cohorts is more likely to be impacted by random variation in outcomes, substantially limiting our ability to detect meaningful program effects. Therefore, we have opted to not include evaluation results for the SelectHealth Care Management Program in this report.

2.6 Conclusions

In a limited evaluation of the Alliance's programs during a public health emergency and as the program was just beginning, it was clear that Alliance programs were likely responsible for sustaining and often increasing the utilization of outpatient services among adults and children receiving services. At the same time, there was no observed benefit for inpatient care and the relative expenditures among those enrolled in the program remained higher than for their matched non-enrolled patients.

These findings need to be interpreted cautiously because of the highly unusual period in which the evaluation took place and without sufficient follow-up time to examine outcomes among those exposed to programs following the public health emergency, when Alliance programs were maturing. We would note that nearly two-thirds of patients who were enrolled in Alliance programs during this period could not be evaluated because of insufficient follow-up time in the post-intervention period. We also would highlight that the impacts we observed cover a period of declining utilization and access overall, so they may not be generalizable to a period when regular healthcare access is restored. It is quite possible that impacts from the program were, therefore, attenuated during the public health emergency; it may be helpful to compare outcomes post 2021, when societal routines and healthcare access were normalizing.

Apart from the findings themselves, there are other limitations that may have biased results. The most significant of these was the absence of substance abuse and mental health histories on enrolled patients and their potential matches who were not enrolled. Omitting these histories may have resulted in selection differences between those enrolled vs. not enrolled in Alliance programs that were not captured in our matched analyses. Future work should seek to capture these data in a deidentified fashion to ensure comparability between Alliance program-enrolled patients and their matched non-enrolled peers.

Nevertheless, these results are promising for illustrating the ability of these valued programs and partners to sustain access to care during a period in which many people were unable to obtain it. As the Alliance programs mature, we would suggest building upon these analyses by capturing data in real-time for quality improvement purposes. We would also consider measuring other outcomes pursuant to quality of life, employment, and—for children—other public health outcomes that measure the full array of impacts the programs might have.

3. Population-level Outcomes in Weber and Washington Counties

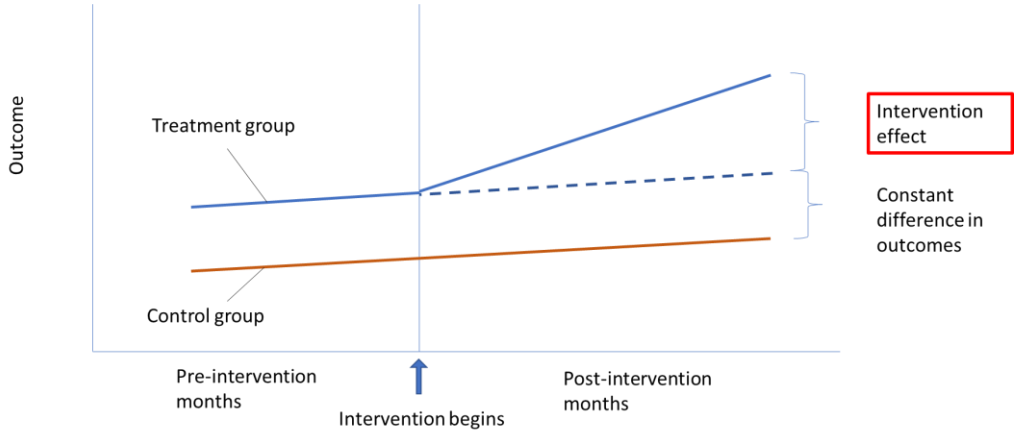
3.1 Overview

In the previous section, we examined the effect of the Alliance's programs on individual patients who enrolled in them. This allowed us to understand whether the interventions changed healthcare service utilization and cost for Alliance program enrollees compared to a non-enrolled analysis cohort.

In this analysis, we further examine whether the Alliance's programs affected population-level outcomes observed at the county level. The Alliance's programs were targeted to socially vulnerable patients and those in Intermountain's registries of at-risk patients. If Alliance programs were successful in reducing ED utilization, hospitalizations, and cost of care among those patients who used a disproportionate share of healthcare services, then these individual-level changes might manifest in changes to population-level metrics of healthcare service utilization and expenditures across a region. To examine this possibility, we used a quasi-experimental statistical approach called ***differences-in-differences*** analysis to examine county-level effects.[2]

3.2 Methods

Differences-in-differences analysis examines outcomes of interest (in this case, healthcare service utilization and expenditures) at the population level as opposed to the individual level. By comparing outcomes in two populations over time—the population receiving the intervention and a nearby population that did not—changes in outcomes among the intervention population relative to the nearby unexposed population can estimate the population-level effect of the intervention, so long as the two populations are otherwise similar. Represented as a theoretical example in the figure below, two populations have similar trends in outcomes prior to an intervention, while the intervention population's outcomes diverge from this trend following the beginning of the intervention. **This difference in outcomes between the exposed and unexposed populations in the post-intervention period can be thought of as the intervention effect**.



In the context of the Alliance, the intervention that began in summer 2019 includes the introduction of the **Community Health Worker (CHW) Program** and **Unite Us** to Weber

[2] Dimick JB, et al. Methods for evaluating changes in health care policy: the difference-in-differences approach. JAMA. 2014 Dec 10;312(22):2401-2. doi: 10.1001/jama.2014.16153.

and Washington Counties. Though House Calls (formerly known as ICCT) and SelectHealth Care Management constituted important parts of the Alliance, these services were being offered prior to 2019. Therefore, the following analysis should be thought of as evaluating the relative contribution of the CHW Program and Unite Us to county-level outcomes during this period.

3.3 Results for the Weber vs. North Davis County Comparison

Table 4a. Characteristics of SelectHealth Community Care members in Weber County (exposed county) and North Davis County (unexposed county), average during 2018-2021

Characteristics		Weber (N = 10,810)		North Davis (N = 4,200)	
		N	%	N	%
Age Group					
	Children	7142	66%	2807	67%
	Adults	3668	34%	1393	33%
Sex					
	Female	5898	55%	2302	55%
	Male	4912	45%	1898	45%
Race and Ethnicity					
	Black	365	3%	153	4%
	White	8286	77%	3163	75%
	Other Race	334	3%	157	4%
	Hispanic	3742	35%	902	21%
Number and Percent of SelectHealth Community Care members with ≥2 Chronic Conditions*					
	Among Children	183	2%	85	2%
	Among Adults	2257	21%	711	17%

*For each SelectHealth Community Care member 19-65 years of age, number of chronic conditions was calculated based on Charlson Comorbidity Index using medical claims in the past 12 months; for each SelectHealth Community Care member 18 years of age and younger, number of chronic conditions was calculated using an algorithm developed and validated by Children's Hospital of Philadelphia.

Table 4b. Differences-in-differences estimates of healthcare utilization and cost for the SelectHealth Community Care members in Weber County (exposed county) compared to North Davis County (unexposed county)

Outcomes*	Pre-intervention January 2018 – August 2019		Post-intervention September 2019 – December 2021		Pre-Post Difference		Intervention Effect (Differences-in-Differences)			
							Unadjusted		Adjusted**	
	Mean	95% CI	Mean	95% CI	Mean	95% CI	Coefficient	p-value	Coefficient	p-value
Monthly Admissions per 1000										
Weber	11.5	(10.7, 12.3)	9.3	(8.5, 10.2)	-2.2	(-3.3, -1.1)	0.9	0.31	-0.9	0.42
North Davis	12.2	(11.2, 13.1)	9.1	(8.2, 10.0)	-3.1	(-4.3, -1.8)				
Monthly Bed Days per 1000										
Weber	47.0	(43.0, 51.0)	40.6	(37.2, 44.0)	-6.4	(-11.4, -1.4)	7.3	0.07	1.4	0.78
North Davis	49.7	(45.0, 54.5)	36.0	(32.5, 39.6)	-13.7	(-19.3, -8.1)				
Monthly ED Visits per 1000										
Weber	86.1	(82.1, 90.0)	79.0	(73.5, 84.4)	-7.1	(-13.5, -0.72)	-7.2	0.16	-1.3	0.83
North Davis	66.1	(59.7, 72.4)	66.1	(61.3, 70.9)	0.1	(-7.5, 7.6)				
Monthly Payment per 1000, in dollars										
Weber	197633	(190846, 204416)	211618	(204820, 218417)	13985	(4910, 23061)	23382	0.002 ***	16799	0.09
North Davis	227128	(217734, 236521)	217730	(210196, 225265)	-9397	(-20745, 1950)				

*COVID-related inpatient and ED claims have been excluded.
**Models adjusted for: month of the year, monthly new COVID-19 cases per 100,000 people, the proportion of the SelectHealth Community Care members who were non-Hispanic Black in each month, proportion of pediatric SelectHealth Community Care members with 2 or more chronic conditions in each month, and proportion of adult SelectHealth Community Care members with 2 or more chronic conditions in each month
***Indicates a statistically significant finding

3.4 Results for the Washington vs. Cache County Comparison

Table 5a. Characteristics of the SelectHealth Community Care members in Washington County (exposed county) and Cache County (unexposed county) from 2018-2021

Characteristics	Washington (N = 5634)		Cache (N = 3145)	
	N	%	N	%
Age Group				
Children	3794	67%	2186	70%
Adults	1839	33%	958	30%
Sex				
Female	3054	54%	1648	52%
Male	2580	46%	1497	48%
Race and Ethnicity				
Black	90	2%	66	2%
White	4626	82%	2613	83%
Other Race	338	6%	135	4%
Hispanic	845	15%	560	18%
Number and Percent of SelectHealth Community Care members with ≥2 chronic conditions*				
Among Children	124	2%	58	2%
Among Adults	800	14%	459	15%

*For each SelectHealth Community Care member 19 years of age and older, number of chronic conditions was calculated based on Charlson Comorbidity Index using medical claims in the past 12 months; for each SelectHealth Community Care member 18 years of age and younger, number of chronic conditions was calculated using an algorithm developed and validated by Children's Hospital of Philadelphia.

Table 5b. Differences-in-differences estimates of healthcare utilization and cost for the SelectHealth Community Care members in Washington County (exposed county) compared to Cache County (unexposed county)

Outcomes	Pre-intervention		Post-intervention		Pre-Post Difference		Intervention Effect (Differences-in-Differences)			
							Unadjusted		Adjusted**	
	Mean	95% CI	Mean	95% CI	Mean	95% CI	Coefficient	p-value	Coefficient	p-value
Monthly ED Visits per 1000*							7.1	0.12	4.5	0.35
Washington	59.0	(55.4, 62.6)	51.0	(46.2, 55.7)	-8.1	(-13.8, -2.4)				
Cache	71.4	(67.2, 75.7)	56.2	(51.7, 60.7)	-15.2	(-21.1, -9.3)				
Monthly Payment per 1000*, in dollars							7723	0.39	13665	0.2
Washington	210778	(202202, 219353)	226906	(218773, 235040)	16128	(4967, 27290)				
Cache	187507	(175544, 199471)	195912	(186550, 205274)	8405	(-5906, 22716)				

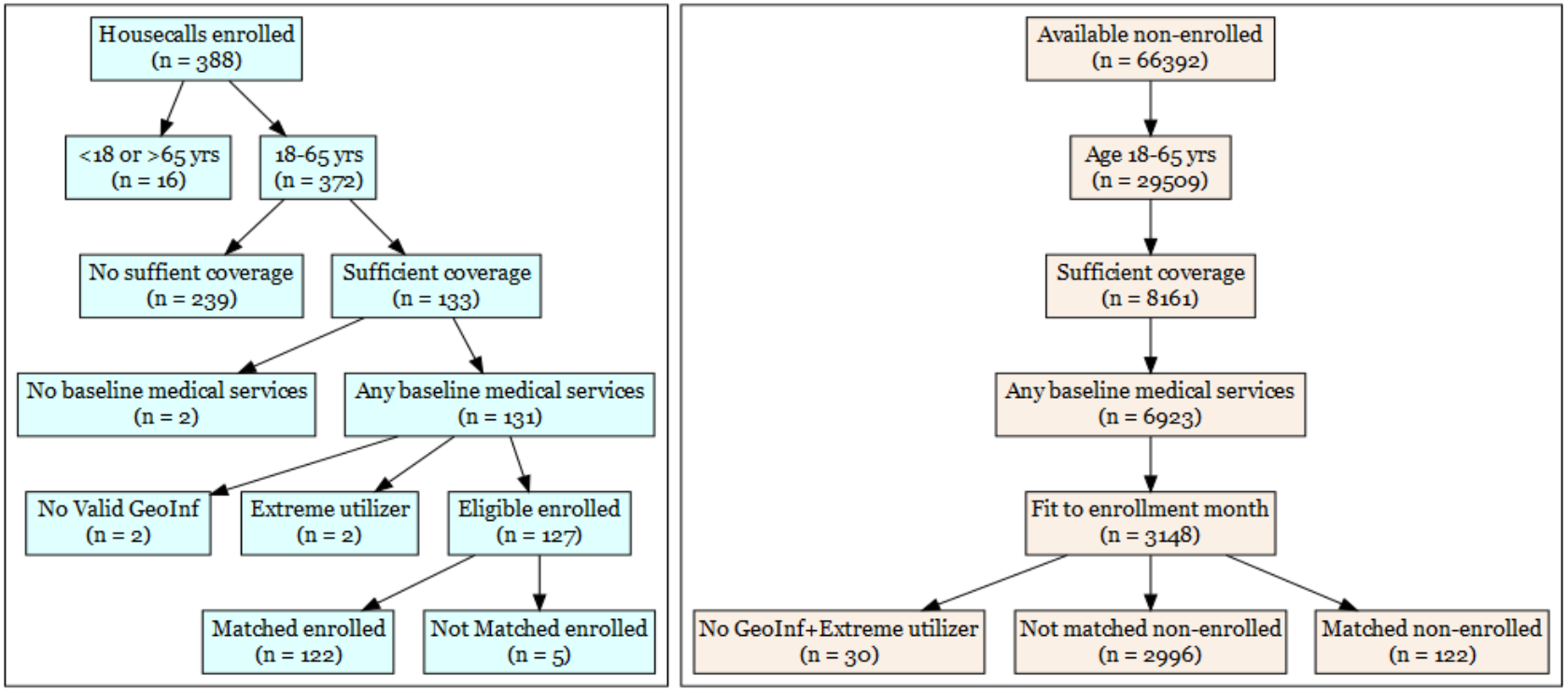
*COVID-related inpatient and ED claims have been excluded.
**Models adjusted for: month of the year, monthly new COVID-19 cases per 100,000 people, the proportion of the SelectHealth Community Care members who were non-Hispanic Black in each month, proportion of pediatric SelectHealth Community Care members with 2 or more chronic conditions in each month, and proportion of adult SelectHealth members with 2 or more chronic conditions in each month

3.5 Conclusions

Consistent with individual-level propensity score matching analyses that identified null effect on ED and inpatient utilization, population-level impacts were not detected across counties in the differences-in-differences analysis. We would caution that the generalizability of this null effect is uncertain to more stable periods when healthcare access is more assured. Overall, this was a period of declining utilization and expenditures for most individuals given the public health emergency. The length of follow up was also insufficient to examine periods beyond the pandemic.

4. Appendix

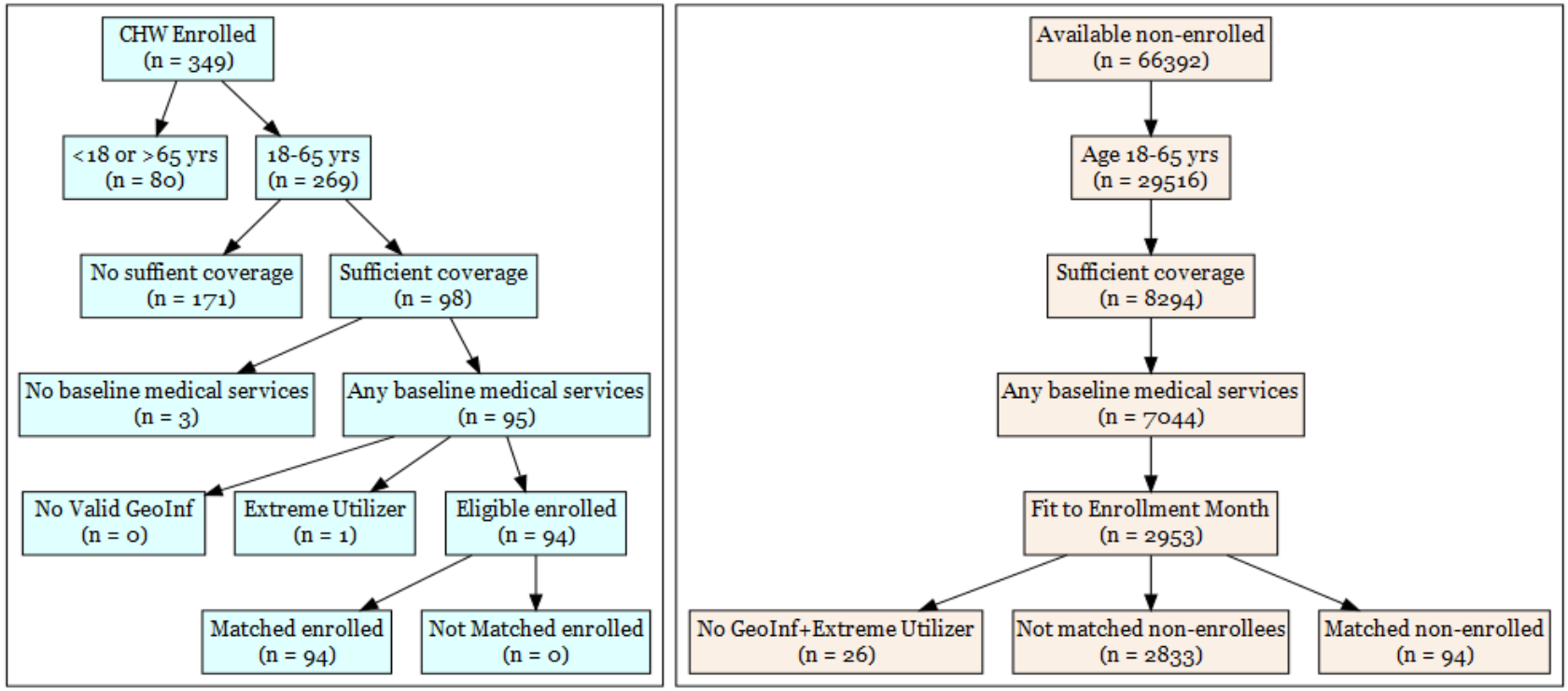
Figure A1. Creation of the Analysis Cohorts for the House Calls Program



Notations:

- Sufficient coverage: >=10 months of SelectHealth Community Care coverage in the year prior to enrollment date *and* >=10 months of coverage in the year after enrollment date
- Geoinf: Geographic information (census tract) of the residence of each SelectHealth member
- Extreme utilizer: Monthly average payment >=$12,000 *or* Baseline inpatient visits >=5 *or* Baseline inpatient length of stay >= 35 days *or* Baseline monthly average number of ED visits >=4

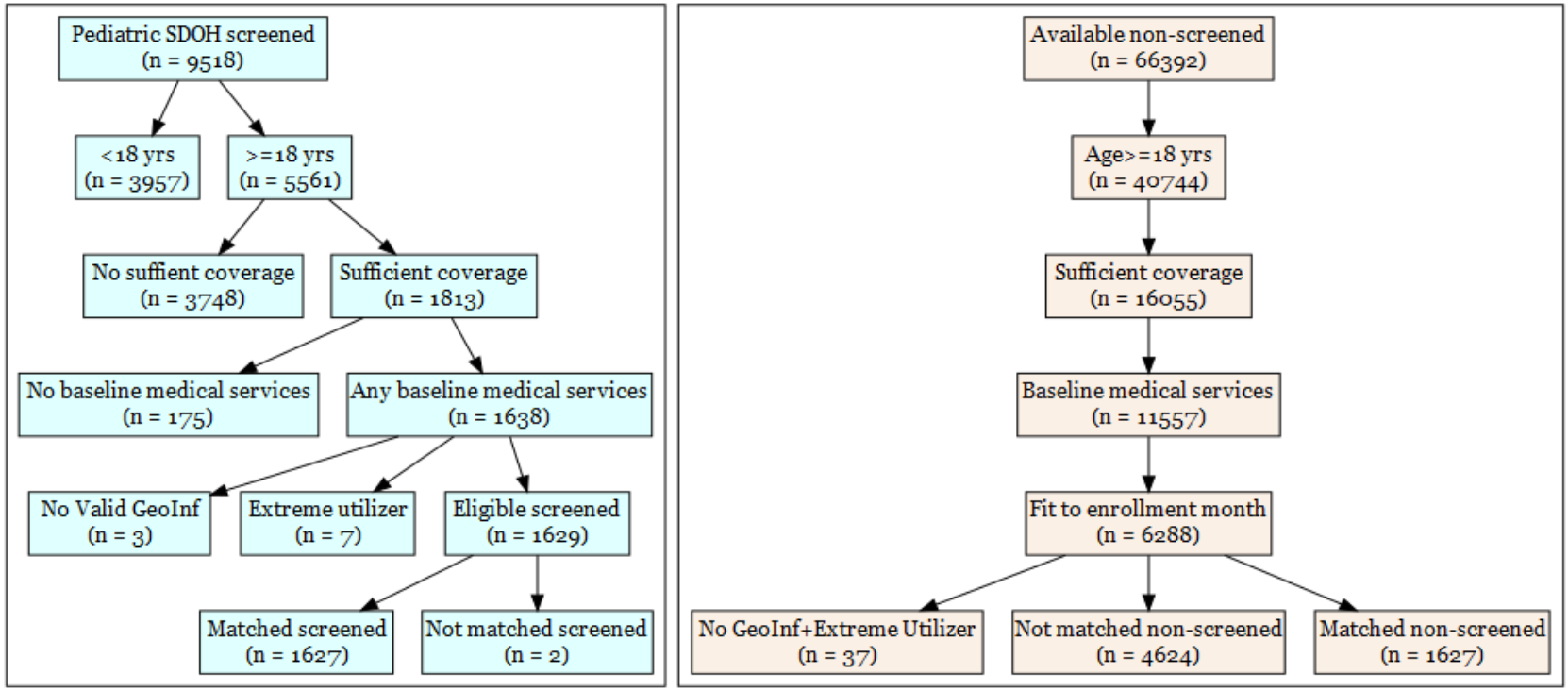
Figure A2. Creation of the Analysis Cohorts for the Community Health Worker (CHW) Program



Notations:

- Sufficient coverage: >=10 months of SelectHealth Community Care coverage in the year prior to enrollment date *and* >=10 months of coverage in the year after enrollment date
- Geoinf: Geographic information (census tract) of the residence of each SelectHealth member
- Extreme utilizer: Monthly average payment >=$12,000 *or* Baseline inpatient visits >=5 *or* Baseline inpatient length of stay >= 35 days *or* Baseline monthly average number of ED visits >=4

Figure A3. Creation of the Analysis Cohorts for the Pediatric SDOH Screening Program



Notations:

- Sufficient coverage: >=10 months of SelectHealth Community Care coverage in the year prior to enrollment date and >=10 months of coverage in the year after enrollment date
- Geoinf: Geographic information (census tract) of the residence of each SelectHealth member
- Extreme utilizer: Monthly average payment >=$12,000 *or* Baseline inpatient visits >=5 *or* Baseline inpatient length of stay >= 35 days *or* Baseline monthly average number of ED visits >=4

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