Total Cost of Care Report

Study Demonstrates **Crossover Health** Can Reduce Medical Spend by 9% PMPM and 24%-38% PUPM

crossover

Table of Contents

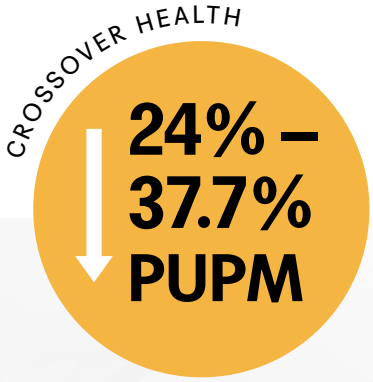
Executive Summary

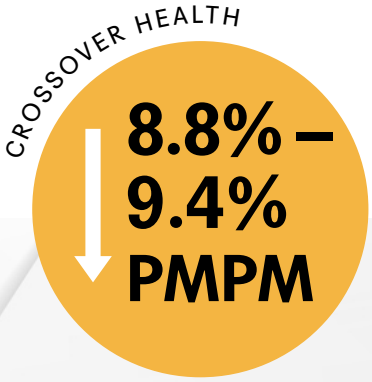
Crossover Health Management Services, Inc conducted an analysis of five customers across seven markets to understand the impact of services provided by Crossover Health Medical Group, APC on healthcare costs. Two study methodologies were employed to analyze total cost of care — difference-in-difference regression for clients who provided claims data before and after the implementation of Crossover Health services and propensity-matched cohort design for clients with provided claims data following implementation. This report evaluates absolute and relative claims cost.

The study findings suggest that on average, individuals who engaged in primary care through Crossover Health had lower medical spend than comparable controls from 2017 through 2021. More specifically:

- Based on our primary study design, which leveraged longitudinal data in a difference-in-difference regression, we observed 8.8% ($p<0.01$) and 9.4% ($p<0.01$) reductions in total cost of care per member per month (PMPM) associated with implementation of Crossover Health in two separate populations.
- When limited to post-implementation claims data, we leveraged a propensity score matched cohort study design. Total cost of care per user per month (PUPM) was 24% - 37.7% lower among employees attributed to Crossover Health for primary care when compared to matched controls.

TOTAL COST OF CARE





Background

Crossover Health Medical Group, APC (San Clemente, CA) partners with employers across the United States to provide on-site, near site and virtual advanced primary health care for employees and their dependents. These employer-sponsored health clinics offer integrated multidisciplinary care, including primary care, physical medicine (i.e., physical therapy, chiropractic care and/or acupuncture); mental health (i.e., psychiatry, social worker and/or psychology); health coaching; and care navigation. Patients may be referred within clinical disciplines (e.g physical therapy to a chiropractor), between clinical disciplines (e.g., primary care to mental health) or self-refer to any of the service lines as appropriate. Referrals to external providers or services are facilitated by a centralized care navigation team that leverages a curated directory of high quality providers and facilities.

A subset of employer clients provide Crossover Health with full enrollment, medical and pharmacy claims for their employee and dependent populations.

> **The purpose of this study is to quantify the impact of Crossover Health's advanced primary health model on total medical costs across our book of business, within the boundaries of the limitations of our available data. Following the conclusion of our study, our methodologies were independently reviewed using industry standards.**

Objectives

The primary objectives of these studies were to:

1. Assess whether implementation of Crossover Health's advanced primary care model was associated with changes in overall total medical cost; and
2. Identify service categories where Crossover Health's model had an impact or has additional opportunity.

Data Preparation

Available data included enrollment and medical and pharmacy claims data for a subset of our employer clients, with nuances unique to each of those data sets. All raw claims data from third-party administrators (TPAs) were received by our enterprise data warehouse partner and processed into a standardized format. A retrospective risk score was assigned to each person using the Department of Health and Human Services Hierarchical Condition Category model (HHS-HCC). In rare cases, members moved across multiple employer clients; these were reconciled by an algorithm that identified and linked unique persons across multiple data sources.

Total Cost of Care

To determine cost of care, allowed amounts from adjudicated claims were aggregated and standardized in the following steps:

1. Determine baseline per member per month claims (medical and pharmacy) cost using at least 8 months prior to the clinic opening.
2. Determine follow-up per member per month claims (medical and pharmacy) cost using a minimum of 12 months after clinic opening.
3. Exclude outliers with ≥$500,000 annualized claims cost or ≥95th percentile in either the baseline or follow-up period.
4. Aggregate per member per month claims by major service categories.

Inclusion Criteria

All study designs used members with a minimum of 8 months of continuous enrollment within each measurement period and excludes those with over $500,000 in claims during those measurement periods. The propensity matched cohort studies also excluded those who did not access any care in the measurement period, and those who were not matched in the propensity analysis.

Study Design

We applied the most robust statistical methodologies that each data set allowed for, while taking appropriate steps to minimize the effects of potential bias, such as selection bias, regression-toward-the-mean and other confounders. In particular, because randomization is not feasible or ethical in our setting, we employed quasi-experimental research designs with the following structural features:

Concurrent control groups (quasi- or matched): Our analyses were conducted retrospectively at both the employer-level and overall. Comparing groups within an employer increases the likelihood that cohorts of individuals are similar, particularly in demographics. While prospective randomization is the gold standard for causal inference, it is not feasible in our setting. Therefore, steps were taken to simulate appropriate control or quasi-control groups. To minimize the effects of underlying secular trends or a regression toward the mean phenomenon, concurrent control groups with a pre-implementation period were used when possible. Where appropriate, propensity score matching with logistic regression and k-nearest neighbors were used.

Weighting for population selection: Employers offer direct primary care benefits through Crossover Health along with traditional health care coverage. Because of an employee's ability to self-select into either or both benefits, it is possible that Crossover Health attracts healthier employees or those with different underlying health needs than employees that do not engage with Crossover Health. To mitigate selection bias, we utilized risk adjustment and propensity score techniques (inverse weighting and/or matching) when examining outcomes. Probabilities were estimated with logistic regression.

Geographic adjustments: Fixed effects at the state and core-based statistical area (CBSA) level were included in regression models on primary outcomes and in propensity score matching models to adjust for any residual variations due to location.

Longitudinal Study Leveraging Difference-in-Difference (DID) Regression

For clients who provide us with pre- and post- implementation claims data, our primary design was a longitudinal difference-in-differences study intended to measure the association of Crossover Health implementation with total cost of care. This design compares change over time with the treatment group relative to the control group, thereby removing the effects of externalities that may impact both groups. We interpret impact as the residual change in allowed amounts after removing the trends observed in the non-Crossover Health population.

We used 12 months of pre-implementation data and a minimum of 12 months of available post-implementation data. A longer post-implementation time period was used if data were available. Controls were drawn from populations of the same employer in geographies where Crossover Health was not available. The treatment variable was a binary indicator for the CBSA where Crossover Health was made available. A binary pre-post variable indicated the time period of a person's observation period (i.e., 1 for post-period).

- In addition to the DID specification, the following independent variables were included in the model:
- State level fixed effects to control for geographic differences
- A binary variable for gender
- Age in years
- HHS-HCC risk score
- Binary variables for observed chronic conditions in the population
- Binary variable for whether or not the member uses Crossover Health, as an additional control for selfselection bias

We used generalized linear regression models with a gamma distribution and log link function to address the heteroskedasticity commonly seen in positively skewed cost outcome data. Consequently, our effects are exponentiated and interpreted as percent changes. Parallel trends were assessed via graphical examination of PMPMs in the treatment and control groups. Cluster robust standard errors are applied at the member and state levels to account for regional correlations and member autocorrelation across time periods. The full list of all variable levels may be found with accompanying supplementary data in the appendix.

Propensity Matched Cohort Study

When pre-implementation data were unavailable, we used a concurrent period comparison methodology in which we compare Crossover Health attributed users to non-attributed users. A critical difference to this methodology is that we are only analyzing users of care; anyone who interacted with the health system during the measurement period. Thus, the primary outcome of this design is PUPM cost of care vs. PMPM cost of care.

Crossover Health attribution was defined as a user with an attribution score of 75% or higher. The attribution score was calculated as the percentage of primary care evaluation and management (E&M) encounters that occurred with a Crossover Health clinician.

Results

Longitudinal Study

We conducted longitudinal studies leveraging data pre- and post-implementation on two employer populations. Population A and B were for the same employer in two distinct geographies and Population C was a distinct employer and geography. **Table 1** includes descriptive statistics for each population during the baseline and follow-up periods, stratified by treatment group.

Figure 1 includes an examination of trends over time of each study population, pre- and post-implementation. The trends are approximately parallel in both the user and non-user cohorts for the primary outcome, thus satisfying the parallel trend assumption required for internal validity of DID estimates. We noted that population A changed their TPA in the same time period as Crossover Health implementation, which may have impacted the underlying data.

Table 2 includes a summary of adjusted DID coefficient estimates. Following implementation of Crossover Health, we observed average reductions in total cost of care of $26.05 PMPM (-8.8%, p <0.01) and $38.56 PMPM (-9.4%, p<0.01) in Population A and Population B, respectively.

Figure 1. Total Cost of Care Trends per Member per Month (PMPM)

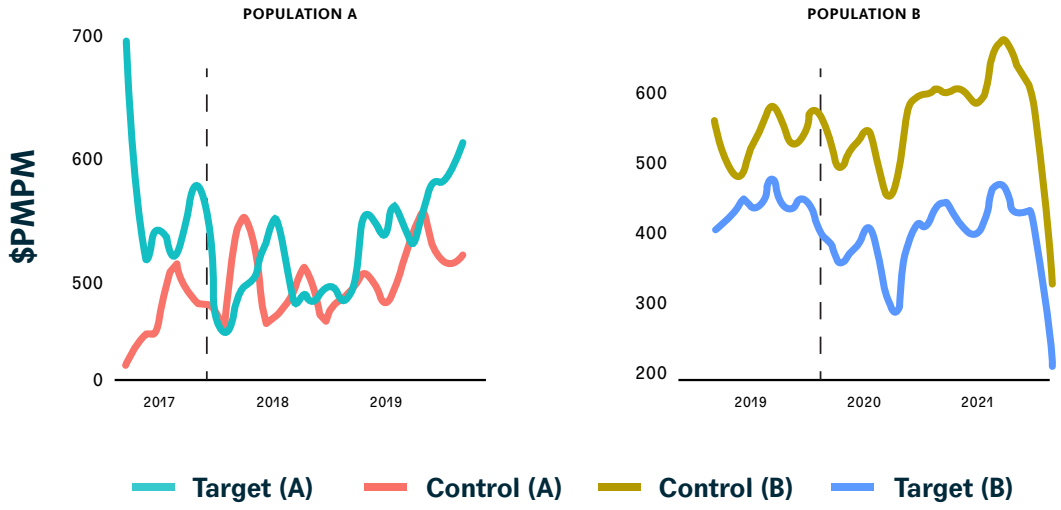


Table 1. Study Population Characteristics, by Study Period and Treatment Arm

	Population A				Population B			
	Baseline October 1, 2016 - June 30, 2017		Follow-up July 1, 2017 - September 30, 2019		Baseline October 1, 2018 - September 30, 2019		Follow-up October 1, 2019 - September 30, 2021	
	Control	Test	Control	Test	Control	Test	Control	Test
Sample Size, n	24,230	7,113	43,768	9,965	24,086	9,265	26,463	10,453
Age, mean	45.8	44.9	42.6	41.8	43.2	42.3	41.8	40.8
% male	68%	58%	64%	52%	63%	66%	62%	63%
HHS-HCC risk score, mean	0.78	0.80	0.98	1.02	1.26	1.11	1.52	1.20
Total cost of care (PMPM)	$203	$239	$258	$296	$561	$452	$580	$407

Table 2. Difference-in-Difference Regression Results, by Study Population

	Absolute Difference ($ PMPM)		% Difference		
	Transformed Coeff.	95% CI	Transformed Coeff.	95% CI	p-value
Population A	-$26.05	-40.95, -10.27	-8.8%	-13.8%, -3.4%	<0.01
Population B	-$38.56	-69.26, -5.07	-9.4%	-17.0%, -1.2%	<0.01

Propensity Matched Cohort Study

We conducted a propensity matched study by pooling data from seven populations. The analysis was computed over three consecutive, rolling 24 month time periods in 12 month increments. Claims data were aggregated into four major categories; emergent care (e.g., hospital, urgent care and ambulatory surgical settings), pharmacy, specialty and primary health. Primary health encompasses all services that are available at Crossover Health clinics. Cost of care results presented are representative of reductions in paid claims only, and are not reflective of the fees associated with operating a Crossover Health center.

Table 3 includes post-match characteristics by treatment arm and study period. Following matching, overall treatment groups were balanced within each study period of interest.

Table 3. Propensity-Matched Cohort Characteristics, by Study Period and Treatment Arm

	2018-01-01 to 2019-12-01		2019-01-01 to 2020-12-01		2020-01-01 to 2021-12-01	
	Control	Test	Control	Test	Control	Test
Sample size, n	5,128	5,128	4,576	4,579	3,886	3,886
Age, mean	43	44	43	43	43	43
% male	59.8	60.0	60.8	60.8	60.2	60.8
Miles from site, median	14.2	12.6	13.5	12.8	13.5	11.3
Risk score (HHS-HCC), mean	0.8	0.8	0.7	0.7	0.7	0.7

Between January 2018 and December 2019, Crossover's highly engaged patients had $150 (37.7%) lower PUPM, on average, when compared to non-Crossover matched controls. This period demonstrates trends that prevailed prior to the COVID-19 pandemic and are graphically represented in **Figure 2**. During subsequent study periods, we observed mean PUPM reductions of $132 (36.3%) between January 2019 and December 2020 and $86 (24%) between January 2020 and December 2021. Overall study results by period are presented in **Table 4.** Across three study periods, Crossover attributed patients tended to have lower spend across all major service categories, offset by the primary health services offered within Crossover health centers.

Figure 2. Mean Difference in Claims Cost of Care, January 1, 2018 - December 31, 2019

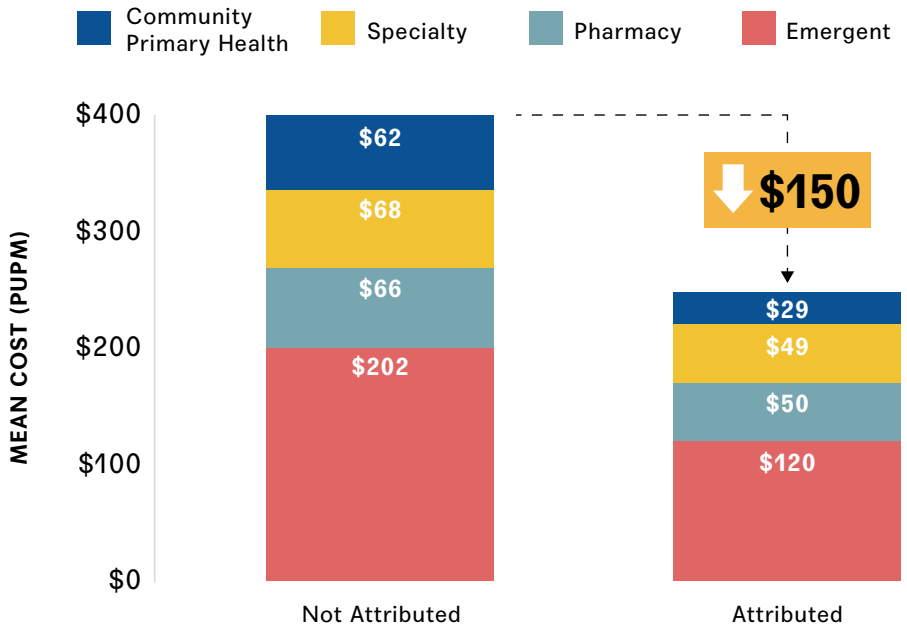


Table 4. Absolute and Relative Difference in Claims Cost of Care, by Study Period and Treatment Arm

	January 1, 2018 - December 31, 2019		January 1, 2019 - December 31, 2020		January 1, 2020 - December 31, 2021	
	Not Attributed	Attributed	Not Attributed	Attributed	Not Attributed	Attributed
Emergent	$202	$120	$171	$111	$149	$125
Pharmacy	$66	$50	$73	$53	$83	$65
Specialty	$68	$49	$64	$41	$66	$48
Community Primary Health	$62	$29	$56	$27	$60	$34
Total cost of care (PUPM)	$398	$248	$364	$232	$358	$272
$ Difference		**-$150**		**-$132**		**-$86**
% Difference		**-37.7%**		**-36.3%**		**-24%**

Discussion

Crossover Health provides integrated, team-based care, which includes primary care, physical medicine, mental health, health coaching and care navigation in in-person and virtual settings. Our study designs were grounded in robust methodologies that minimize the effects of potential bias, such as selection bias, regression-toward-the-mean and other confounders, thereby allowing us to understand effects likely attributed to our care model.

The study findings suggest that through its primary care model, Crossover Health lowered total cost of care across diverse clients, geographies and time periods. In particular, we observed reduced emergent care and specialist encounter costs. These reductions may be related to the robust preventive care, condition management and concierge care navigation that Crossover Health provides. Future studies will seek to understand key drivers of reduced cost, specific services that were avoided and additional areas that Crossover Health can further lower health care spending.

Limitations

Because randomization was not feasible or ethical in our setting, we employed quasi-experimental research designs to minimize the impact of biases and measurement challenges, which were described previously. It is important to acknowledge additional limitations of our study.

Each claims data set had different constraints unique to the employer source. Those without pre-implementation data may be more susceptible to selection bias, because we can only control for the observable variables present in the matching model. For example, the convenience factor of an onsite health center may factor into patient decision making but is not observed in the data. However, because the potential for unmeasured confounders exists across the entire population, we assumed that they would be distributed similarly across our comparison groups.

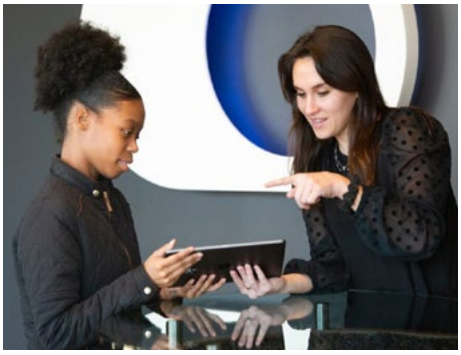
Control populations for pre-post studies are limited to satellite geographies for the same employer and time period. These sites may be smaller and have fundamentally different characteristics that are unobserved in the data. The time periods available for these sites may also be limited to periods prior to a staggered rollout of Crossover Health to those locations. Further, it is theoretically possible that some members may have relocated across sites during the study period. These populations may not have the same size or scope as the primary population of interest. We used the longest available time periods of post implementation data for controls prior to Crossover Health being introduced, if applicable. To deal with serial correlation of members across time periods and correlation within geographies, a cluster robust standard error estimate was used to generate confidence intervals and inferences.

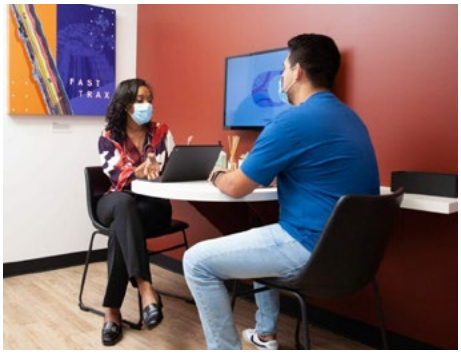
Analyses at the user level of analysis are more susceptible to the variation in user behavior at points in time. Many of our analyses overlap with the COVID-19 pandemic, when many changes were made to both employee work policies and patient utilization preferences. Consequently, future cost impacts may be inconsistent if/when utilization patterns normalize. We believe the impacts of the pandemic were distributed evenly across all our populations, and changes in outcomes as we come out of the pandemic will be a key focal point for future study.

Employer clients are constantly optimizing benefit offerings for their employees. Consequently, fundamental changes to their benefit design, insurer, or other wellness offerings over time periods that overlap with Crossover Health availability may introduce additional confounders. We believe these changes impact all study cohorts evenly, however we worked closely with our client partners to understand how these benefit alterations impact our members and how they may fit within the overall scope of their population health strategy.

About Crossover Health:

Crossover Health is a leader in delivering value-based hybrid care. The company's national medical group delivers at scale Primary Health—a proven care model driven by an interdisciplinary team comprised of primary care, physical medicine, mental health, health coaching, and care navigation. With a focus on wellbeing and prevention that extends beyond traditional sick care, Crossover builds trusted relationships with its members and flexibly surrounds them with care—in person, online and anytime—based on member preference. Combined with a sophisticated approach to data analytics that incorporates of social determinants of health, Crossover delivers concrete results and measurable value for employers, payers, and most importantly, members. Together we are building health as it should be and engaging a community of members to live their best health.





Are you interested in learning more about Crossover Health's innovative Primary Health model that brings together virtual and in-person healthcare?

Visit **crossoverhealth.com**, follow us on social media **@crossoverhealth**, or contact us at **connect@crossoverhealth.com** to learn more.