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THE LSU HEALTH PLAN

Louisiana State University Health Plan's Population Health Management Initiative

Cost Savings for a Self-Insured Employer's Care Coordination Program

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Executive Summary

eQHealth Solutions partnered with Louisiana State University (LSU) in January 2014 to implement a Care Coordination Program for LSU employees who were identified and referred to the program using predictive modeling algorithms based on the profile of their medical risk history. Each employee was assigned a risk profile using the John Hopkins Adjusted Clinical Groups® (ACG®) System. The risk score provided insight and projected the next year's resource use based on the claims of the current year and the likelihood that they would consume a high level of resources in the future.

eQHealth Solutions utilized paid claims data to compile the members' cumulative medical services costs (pharmacy costs were excluded) incurred across the months before and after enrollment into eQHealth's Care Coordination Program, respectively. In order to compute the LSU program savings, the difference in each member's medical services costs using five months of completed claims was obtained before and after program implementation. A managed cohort of 159 members was identified. For the managed LSU population, the total savings was $1.24 million over these five months which is equivalent to $2.98 million in annualized cost savings.

For the five months studied, LSU realized $1.24 million in total savings equating to $2.98 million in annualized cost savings.

Population Selection: Managed and Control Group

LSU members referred as potential candidates to receive care coordination services had enrollment dates from July 1, 2014 through June 30, 2015. eQHealth further filtered and identified members that had not opted out of participating in the program. The final identified population was 261 members actively receiving care coordination services and being managed by a team of nurses. (Members were not filtered based on their medical cost thresholds/ outliers.)

The control group consisted of only those members who had specifically chosen to 'opt out' of the Care Coordination Program and did not receive any services. Only 86 members specifically 'opted out', and this constituted the control group. (Control members were not filtered based on their medical cost thresholds/outliers.)

Members not originally referred by eQHealth's predictive modeling methodology could still have a referral to receive care coordination if the patient had an emergency visit or was referred by their physician. Hence, each patient referred was further investigated by creating a longitudinal history of their medical 'risk' profile from predictive modeling. A risk status of 'low', 'medium' or 'high' was attributed and assigned to each member as a result of predictive modeling algorithms analyzing patient claims data.

Based on the profiles of eQHealth's cohort of 261 members, eQHealth was able to further eliminate patients who were always identified as 'low' by predictive modeling. The outcome after elimination was 159 patients in the Care Coordination Program cohort who had at least one instance of 'medium' or 'high' category in their risk profile history during 2014 and 2015. Similarly, eQHealth had 43 control members after eliminating those patients who were only in the 'low' status.

Methodologies of Calculating Savings

eQHealth Solutions utilized claims data for insight into medical services costs for the period January 2014 through December 2015 (eQHealth did not filter any claim occurrence based on medical cost thresholds/outliers).

At least six months of claims data was available at either side of the enrollment time points. In the managed cohort, eQHealth utilized members' enrollment date as the zero-axis reference point. All claims were extracted before (negative months) and after (positive months) the zero reference point and aligned together for all members. As an example, consider two patients: Patient A enrolled on November 1, 2014 and Patient B enrolled on July 1, 2014. The medical costs data from the months of December 2014 and August 2014 respectively can be grouped together as belonging to the first month after enrollment.

Figure 1 below provides a depiction of this concept. Thus, it is possible to combine data each month from different members despite each member having different enrollment times. This allows enough data points to achieve reasonable metrics for each month. More specifically, one of the metrics eQHealth will compute is the average medical services cost incurred each month in addition to the per member per month (PMPM) costs detailed in the next section.

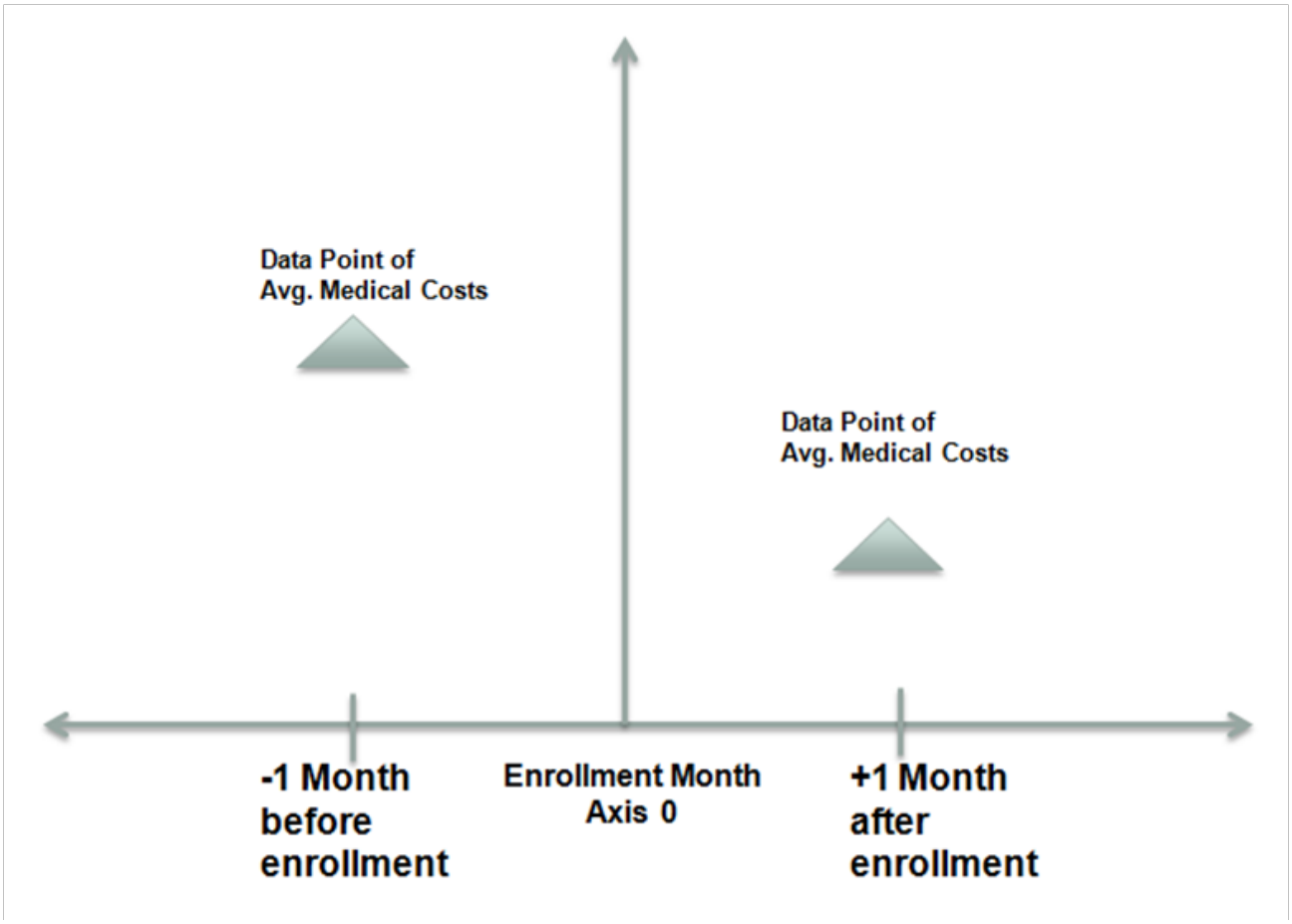

Figure 1 - On the x axis, the enrollment month timeline is displayed. The negative months are before enrollment, and the positive months are after enrollment. The y axis has the average medical services costs incurred each month.

Ideally, eQHealth's goal was to match control members to each intervention cohort member but due to the small pool of the control cohort at this time, this matched-methodology was not viable. For the control cohort, a fixed absolute date of Jan 1, 2015 was exercised as the zero-axis reference point since enrollment dates are not available (unlike the intervention cohort members). All positive and negative months were extracted from the zero reference point for all members to compute average medical services cost incurred each month.

In the following results section, different methodologies were compared to estimate the cost savings from LSU's Care Coordination Program and population health management efforts.

The detailed findings and LSU projected cost savings methodologies are presented in this white paper.

Results

This section presents the results from four different methodologies to compute the cost savings, from conservation to more liberal analyses. The goal was to prove that despite which method was selected to analyze outcomes, the net result of the program was reduced healthcare costs.

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1. Null Hypothesis

   eQHealth tested the null hypothesis stating "there is no difference in the medical costs between the pre and the post enrollment periods ($\mu pre = \mu post$)". The alternative hypothesis states "the average medical costs are greater in the pre than the post enrollment period ($\mu pre > \mu post$)". eQHealth computed the average medical services costs and performed the one-tailed, paired t-test to evaluate the mean costs before and after enrollment. The average medical services costs in the pre enrollment period are found to be statistically greater than the post enrollment period ($p=0.03$, $\alpha=0.05$). Therefore, eQHealth can reject the null and accept the alternate hypothesis and interpret this finding as a positive impact of the management program.

2. Fundamental and Conservative Method

   eQHealth first computed LSU's Care Coordination Program's cost savings increase using a fundamental and conservative approach. Claims data was used to extract the total medical cost differences between the pre enrollment and post enrollment months. Using this approach, eQHealth obtained $1.24 million savings over five months of complete data which is equivalent to $2.98 million in estimated annualized cost savings.

   a. The cost savings was also computed using the decrease in the PMPM (per member per month) cost between the pre and post enrollment period. The total medical services costs in each period were divided by the total members multiplied by the number of enrolled months - the results of those calculations yielded estimated per member per month (PMPM) service costs. The PMPM decrease between the pre and post enrollment period was $1,376 or a total of $2.48 million in annualized savings.

3. Linear Regression Method

A linear regression model was utilized to fit the average medical costs data points before and after enrollment in order to compute the projected cost savings and identify any significant trends. As can be noted from Figure 2, the data points are relatively scattered among the regression lines. Approximately 30% of the variance in medical costs can be attributed to increasing time for the pre enrollment period. The remaining variance can be attributed to other factors such as age, gender, risks, etc. There is no evident trend found in the post enrollment period. An interpretation of this finding may be that medical costs were contained as a result of the management program.

a. Assuming that the regression fit for the pre-intervention period is acceptable, and we projected the blue trend line into the future for 12 months (shown by the blue dotted line in Figure 2) - this represents what would eventually happen to the cohort group if they were left without intervention (projection based on the linear regression trend lines). The Area 1 depicted in Figure 2 represents the difference between the hypothetical dotted trend line if the intervention cohort was not intervened and the solid red line as a result of the intervention program which amounts to $9.7 million in savings increase in an annualized period.

b. eQHealth Solutions also utilized these regression trend lines to compute the medical cost differences between the pre enrollment and post enrollment months. For example, the difference in the total medical costs between Area 2 and Area 3 in Figure 2 is the savings when considering only five months before and after intervention. This resulted in projected annualized savings of $4.5 million.

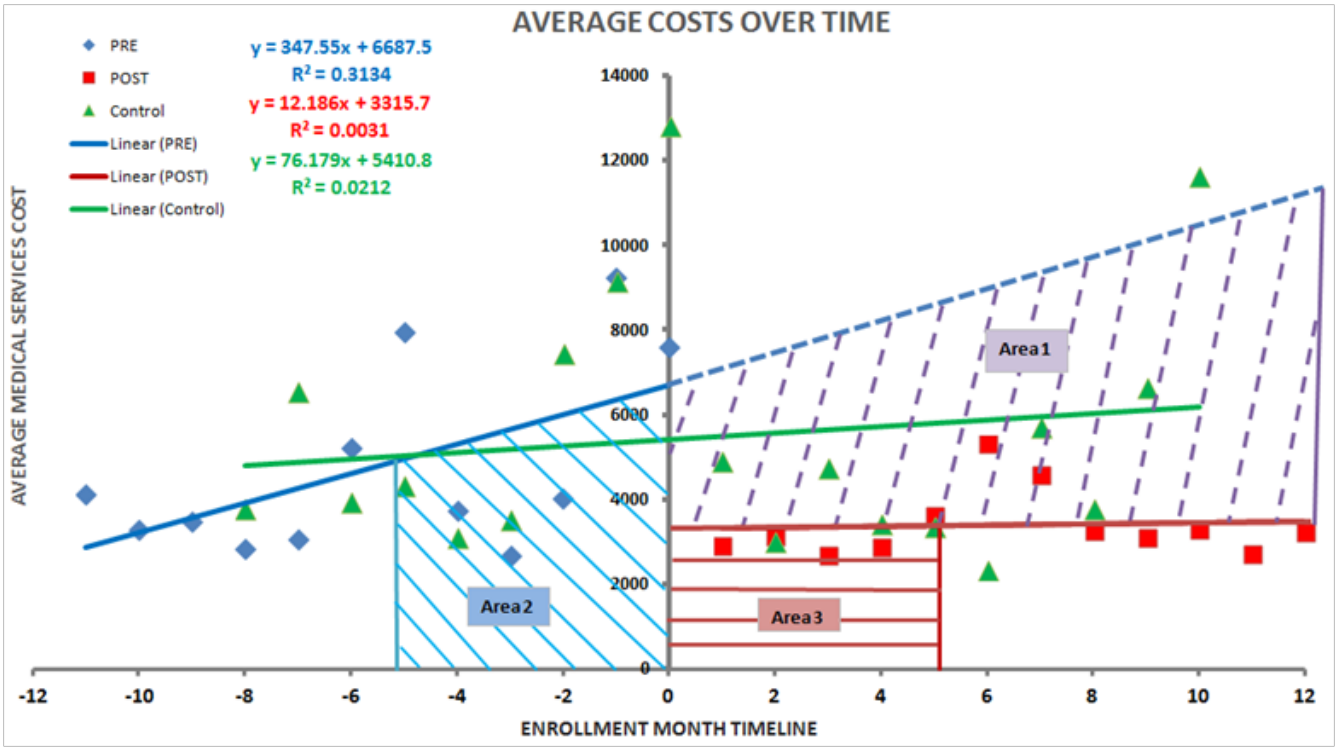

Figure 2 - On the x axis, the enrollment month timeline is displayed. The negative months are before enrollment, and the positive months are after enrollment. The y axis represents the average medical services costs incurred each month. The blue line represents the trend line for pre enrollment period, and the solid red line represents the trend line for the post enrollment period. The control cohort trend is shown by the solid green line.

4. Comparison with the Control Group Method

The control line shown in Figure 2 has no evident trend, but the intercept of the average medical services costs falls in between the pre and post enrollment trend lines. The data points comprising the control trend line are widely scattered about the line. The difficulty of an appropriate control group selection is further explored in the comments section.

Lastly, the cost savings were researched by comparing the regression trend lines between the control cohort and the care managed cohort without breaking the latter group's regression into pre/post enrollment time periods as shown in Figure 3. The difference under the area between the two trends lines (illustrated as Area 4) amounted to annualized cost savings of $3.4 million.

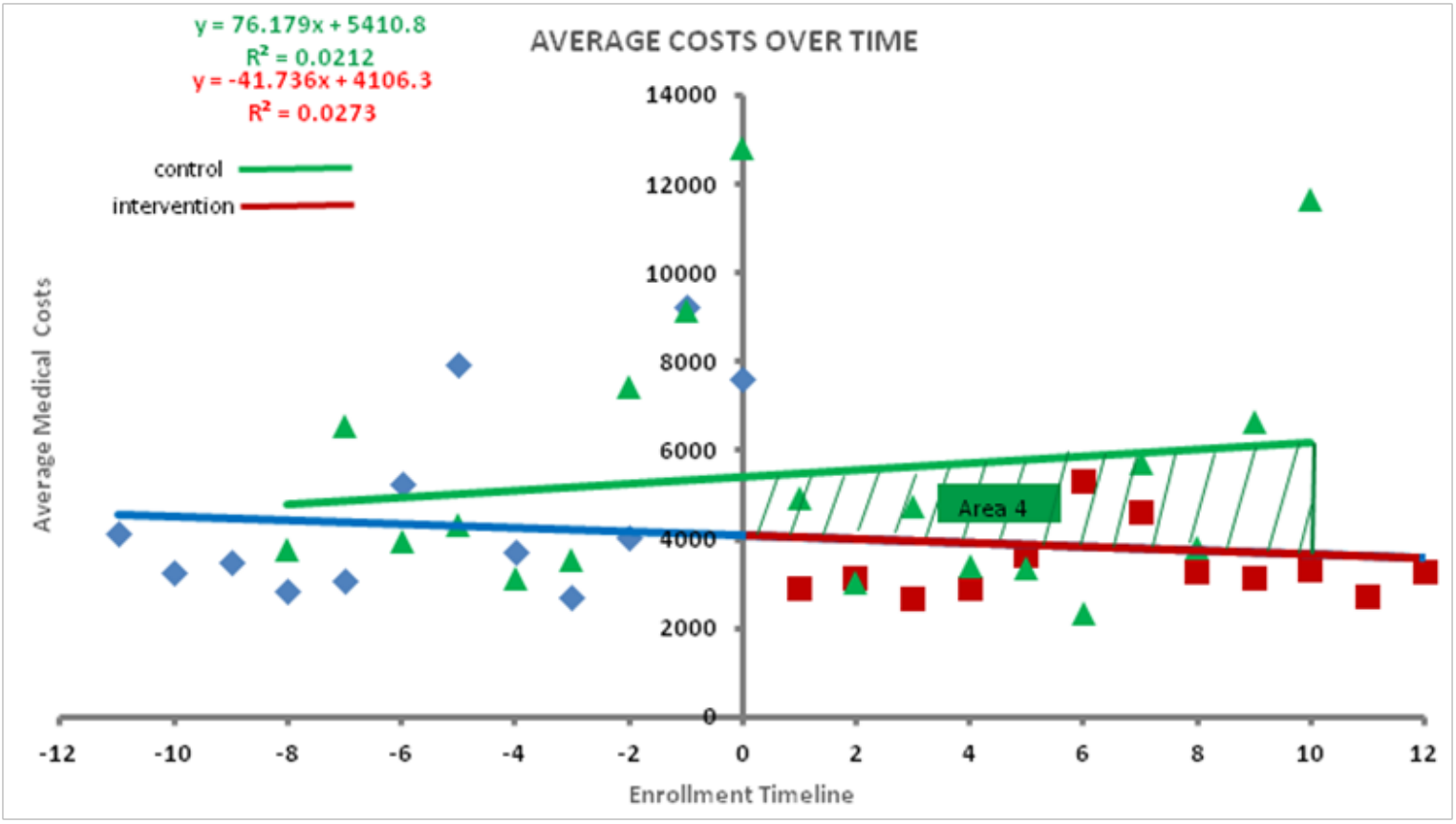

Figure 3 - On the x axis, the enrollment month timeline is displayed. The negative months are before enrollment, and the positive months are after enrollment. On the y axis are the average medical services costs incurred each month. The red line represents the continuous trend line for the managed group, and the green line represents the continuous trend line for the control cohort.

Conclusion

eQHealth Solutions examined and investigated the program cost savings using several methods, ranging from simplistic and conservative estimates to more complex but liberal projections. The net result, in all methods and calculations, the LSU Care Coordination Program resulted in medical cost savings.

In the results section on page 3, the null hypothesis methodology (1) rejects the null of equality of medical cost pre and post enrollment periods is affirmative as it states that there is a positive impact of the management program although it may be confounded by other factors.

The conservative method (2) involves cumulative total costs and average costs before and after enrollment periods. The main distinction between the 2 and 2a of the conservative method is that it is taking into account the member's total enrollment months to obtain the PMPM. These results provide conservative cost savings.

The result in the linear regression method (3) is based on the hypothetical projections up to 12 months post enrollment and thus gives a liberal estimate without accounting for other factors. In between the conservative and liberal estimates, moderate savings are depicted 3b of the linear regression method. The difference in medical costs between the pre and post enrollment periods were obtained using the area under the regression trends without hypothetical projections. Similarly, a middle of the road approach is shown in comparison of control group method (4) where the estimated savings based on the difference in areas under the regression lines between the intervention and control groups is illustrated.

The net result, in all methods and calculations, the LSU Care Coordination Program resulted in medical cost savings.

Comments

In order to improve the size of the control group in our cost projection analyses, eQHealth Solutions researched inclusion criteria for control members in order to expand the group beyond the ones that had chosen specifically to 'opt out' of the program. eQHealth therefore selected 'all' potential non-enrolled members except for those who were undergoing dialysis, had expired, were in nursing homes/hospice, were located outside the geographic area, or those who were ineligible. Again, those whose risk profile status during the study period was always 'low' were eliminated. Control members with a similar risk profile of 'high' and/or 'medium' were chosen for the managed cohort. The reasons behind a member not enrolling (thus a potential control) make the control group selection especially complicated. The control group becomes a grey area – attempts to match similar risk enrolled members to similar risk controls usually begs the question as to why that member had chosen not to enroll in the first place.

We researched further into the history of members' medical risk profile. Of note are the control members who had at least one instance of 'high' and/or 'medium' risk status at any time - they also had relatively low medical services costs on average. This phenomenon is well documented in the literature that there is a tendency for patients who have already had a high risk event to trend towards lower costs soon after the high cost event occurrence which adds yet another layer of complication.

Further, exploration was made into the control cohort by combining member groups using two selection criteria – one criterion includes all control members who had a total of four instances of 'high'/'medium' risks throughout the predictive modeling runs and another criterion includes all those members who had nine or more instances of 'high'/'medium' risks throughout.

The first group that had lower instances of risks may have had the scenario where a 'high' risk event already occurred causing them to be a on a 'low' risk status for most of the other times of the year.

The second group is self-explanatory – these are the at-risk members who are always scoring 'high'/'medium' and should be definitely included among the controls.

This methodology gave a reasonable control cohort of 120 members whose medical costs slope had a slight increasing trend not seen in our intervention cohort's trend lines. Due to scarcity in sample size, the same methodology could not be applied to our intervention cohort. Figure 4 below shows the revised plots - the intervention cohort has the same 159 members as before, and the control population is comprised as discussed above.

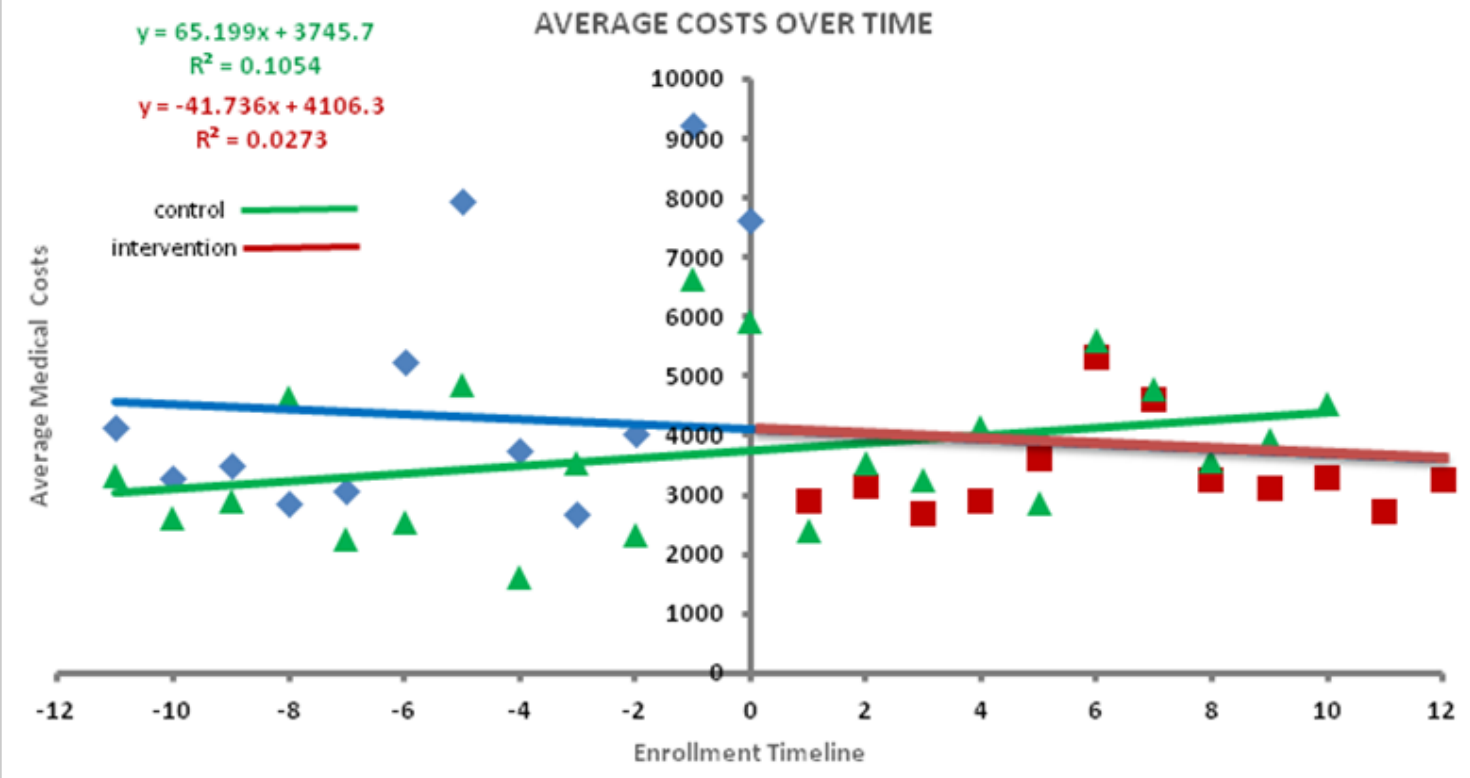

Figure 4 - On the x axis, the enrollment month timeline is displayed. The negative months are before enrollment, and the positive months are after enrollment. The y axis shows the average medical services costs incurred each month. The red line represents the continuous trend line for the intervention group, and the green line represents the continuous trend line for the control cohort.

Future Plans for Study

Research and analysis on the return of investment is essential to the continuous success of the care coordination program. In the future, we will extend the cost savings analyses to include claims incurred in the fiscal year 2016 in order to further support the findings presented in this paper. We will continue to research alternate methods to expand our managed and non-managed cohorts. One of the areas we can explore is to expand our cohort population regardless of the referral source since the end goal is to comprehensively examine the effects of care management.

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