**Methodology to calculate CM and DM ROI:**

**Calculate savings/case due to engagement of members by CM or DM case managers**

1. **Identification of CM /DM cases:**
   1. CM or DM cases are identified based on episode type code in JIVA. . DM episodes are related to core chronic conditions such as Asthma, Diabetes, COPD, CHF and CAD. CM episodes include all other episodes such as related to General case management, Rare conditions, Oncology, Transplants etc.
   2. Exclusions:
      1. Programs: Retail Health
      2. Closure Reasons: 'Auto Closure','Disenrolled from Plan','FEP: Coverage no longer with FEP','FEP: Member expired after CM services began','FEP: Other treatments','FEP: Transfered to other FEP Plan','Fetal Demise/Miscarriage','Florida Blue not primary', 'Initial assessment: no member needs identified','Not Eligible due to Carve Out','Opened in Error','Pending OOS Vendor Referral', 'Program criteria not met', 'System Error'
   3. Includes both OPEN and CLOSED Cases
2. **Identification Time period:**
   1. The episodes opened for intervention during 1 year time period (Rolling 12 months) are considered for calculation of ROI
3. **Population:** Medicare and Commercial
4. **Intervention group:** Cases closed with the reason “Care Plan Goals Met”. Case Managers decide whether a case has been met with all the goals or not.
5. **Control Group:** Identified cases that did not meet the Goals met criteria or cases with invalid telephone numbers/unable to reach etc. are treated as control group as they are eligible for engagement but are not engaged due to various reasons. Case managers do not have impact on costs of the control group.
6. **Costs :**
   1. Medical costs (Institutional and professional costs)
   2. Pharmacy costs (RX costs)
7. **Time period to analyze cost differences between control and Intervention groups:**
   1. Pre Period: 6 months prior to first engagement date (1 intervention and 1 assessment).If there is no intervention then assessment date is taken as a proxy to engagement date

Identification date is taken as a proxy for control group as assessment or intervention dates are not available

* 1. Post Period 1: 6 months after engagement date.
  2. Post period 2: 12 months after engagement date.

1. **Enrollment Criteria:** A member should be enrolled continuously during pre and post periods so as to have their full claim history.
2. **Exclusion of Outlier costs:** Trimmed 1% mean method is used to exclude outliers. This means if cost for a member is >99 percentile then trim it to 99 percentile cost. In the same way, if the cost is less than 1 percentile then trim it to 1 percentile cost. If outliers are not taken care of then the results would be skewed. Outlier capping also applied to service category level.
3. **Statistical Models used:** Logistic Regression and Generalized Linear models
   1. Logistic regression is used to develop a risk score for the members by taking into consideration the risk factors between control and intervention groups. (Note: not all members will get a risk score due to missing values in some of the factors used in developing the risk)
   2. Generalized linear model is used to estimate post period costs by adjusting risk score developed in the logistic model along with pre period costs
   3. The expected costs were tested for significance using Tukey test
   4. **Adjusted Risk Factors:** Retrospective ERG Risk, Age, gender, region, race, major disease categories and program name

**Questions:**

1. Why do we need to compare control and intervention groups to calculate savings/case?
   1. The reason is that we are trying to evaluate the effect of intervention and even without the intervention the control group reduces costs naturally. This should be accounted.
2. Why is trimmed means method used for outliers ?
   1. Outlier removal method can be used but it impacts sample size, hence trimmed means method is considered
3. Why is propensity score matching not chosen?
   1. To perform propensity score matching the sample sizes should be big enough to get matched control and intervention pairs. Generalized linear models adjust the costs with smaller sample sizes. Both models ultimately help in estimating the costs by adjusting the risk factors.
4. Why do we need to adjust pre period costs? Due to self-selection bias high risk members are more likely to participate in the programs . The below data shows that although intervention post period costs look higher than control group, in reality if both groups had same pre period costs then the reduction in intervention group would be higher than control group.

**Discussion:**

1. Which method is preferred?
   1. Statistical models –more Realistic but hard to explain to non-statistics people
   2. Calculate average/case- Less Realistic as risk factors are not adjusted, but easy to understand and may be well received
2. Which identification time periods to be used?
   1. 1 year rolling 12 months
   2. Calendar year: 6 months (Jan-Jun) and (Jul-Dec) and 1 year Jan-Dec in the calendar year?
3. Post Period:
   1. Currently it is 6 months. In long term we can evaluate both 6 months and 12 months post period costs