

Iowa Health Home Program

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October 1, 2019

Objectives

- Welcome and Introductions
- Message from Director Randol
- Recap
- Review of the Health Home (HH) and Integrated Health Home (IHH) Programs Feedback
- Next Steps

Recap

Processes Not People

Processes not people

Reflect on what each of us can do better

Goal to improve the program

First meeting

- Review SPA
- Discuss Iowa's Health Home model
- Overview of system review
- System review findings – being discussion
 - File reviews offer snap shot of systemic strengths and weaknesses
 - Will save value analysis discussion for deeper dive at second meeting

System Review

- Donabedian model of quality assessment
 - Structure – file review of agency files
 - Process – file review of member files
 - Outcomes – bio statistical value analysis

Recommendations

- Further data analysis was recommended to better understand the value and outcomes generated by the Health Home programs.
- Continued work to improve communication between the MCO's, Health Home providers, and Medicaid.
 - Development of guidance materials for Health Home providers,
 - Increased technical assistance
 - provider oversight
 - establishment regular meetings between providers, MCO's and Medicaid
- Additional work to align the two SPAs to improve the ability of the State to gather the data needed to illustrate SPA compliance.

Lance's Slides

Next Steps

- Putting together a provider workgroup to have feedback on the Learning Collaboratives and Performance Measures.
- By November MCOs will have a plan for 2020 for providers
- Increased oversight of providers and MCOs by the State.

Questions?



Iowa Health Home Programs Analytical Review

Lance Roberts
October 1, 2019

Healthcare Intelligence

Objectives

- Review General Analytic Approach
 - Integrated Health Homes (IHH and IHH-ICM)
 - Chronic Condition Health Home (CCHH Tiers 1 – 4)
- Review General Analytic Methods
- Review Analytic Results
 - Top 10 primary diagnosis (DX) conditions
 - Cost (Allowed Amounts, Expenditures)
 - Utilization
 - Inpatient Hospitalizations
 - Emergency Department (ED) Visits
 - Observation Room Visits

6 Analytical Target Populations

| | | | |
|--------------|---|------------------|--------------------------|
| IHH – ICM | { | Tier 7 – IHH-ICM | Adult ICM |
| | | Tier 8 – IHH-ICM | Child ICM |
| IHH | { | Tier 5 – IHH | Adult Non-ICM |
| | | Tier 6 – IHH | Child Non-ICM |
| 4 CCHH Tiers | { | Tier 1 - CCHH | 1 – 3 chronic conditions |
| | | Tier 2 - CCHH | 4 – 6 chronic conditions |
| | | Tier 3 - CCHH | 7 – 9 chronic conditions |
| | | Tier 4 - CCHH | 10+ chronic conditions |

General Methods

– Quasi-Experimental Design

- 2 Cohorts - Treatment and Control
- Time Periods

15-Month Pre/Baseline period

21-Month Post/Evaluation period

- PRE/BASELINE Period - \$PMPM average (15-month average)
- POST/EVAL Period – Monthly Difference in \$PMPM costs

“Change” or “Difference” = (Current \$PMPM – Baseline \$PMPM)

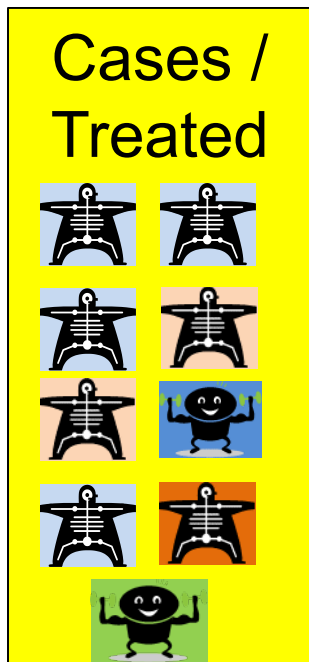
PRE – BASELINE Period

POST – EVALUATION Period

| PRE – BASELINE Period | | | | | | | | | | | | | | | POST – EVALUATION Period | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|-----|--|-----|-----|---------------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|--|
| Magellan | | | | | | | | | | | | Magellen End >>> | | | >>> FFS Span | | | >>> MCO / FFS | | | | | | | | | | | | | | | | | | | | | |
| 2015 | | | | | | | | | | | | 2016 | | | | | | | | | | | | 2017 | | | | | | | | | | | | | | | |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | | | | |
| Case/Trmt BASELINE Period (up to 15 months) | | | | | | | | | | | | | | | Case/ Trmt POST Period (up to 21 months) | | | | | | | | | | | | | | | | | | | | | | | | |
| Control BASELINE Period (up to 15 months) | | | | | | | | | | | | | | | Control POST Period (up to 21 months) | | | | | | | | | | | | | | | | | | | | | | | | |

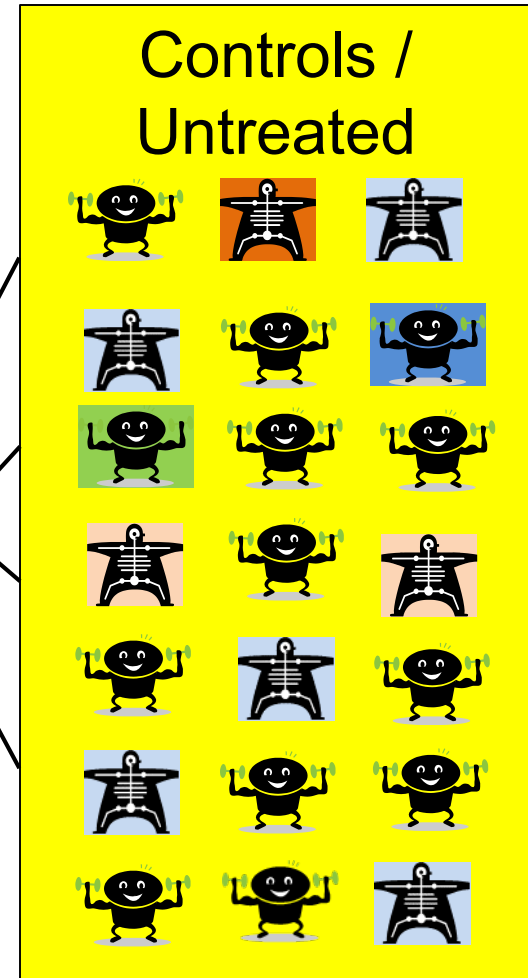
General Methods – Cohort Construction

Matching - Propensity Scoring - Predictive Modeling



Match By:

- Age (caliper +/- 5 years)
- Gender (exact)
- Comorbidities (exact)
- Propensity Score (caliper)
- Predicted Future Cost (caliper)



General Methods

Key Exclusions:

- Age < 2 at end of baseline period
- Medicare/Medicaid dual-eligible (no Medicare data available)
- Members w/o ≥ 15 months Pre and Post period enrollment

Dose Criteria:

- “Pure”/“Strong” dose:
- TRMT and CNTL members could not switch Tiers
- TRMT cohort 15 months treatment status in PRE period and $\geq 50\%$ months treatment status in POST period

IHH Analyses – Comparability Criteria:

- IHH and IHH-ICM CNTL cohort – must have SMI/SED diagnoses
- IHH-ICM CNTL cohort must have ≥ 1 inpatient hospitalization or ≥ 1 ED visit during PRE period

CCHH Analyses - Comparability Criteria:

- TRMT and CNTL count of chronic conditions must match CCHH Tier criteria (among 28 nationally salient chronic conditions)

Risk Adjustment

Outcomes = f (treatment, demographics, health status, setting)

“Case mix” “risk” “intensity” “severity” “sickness”
“complexity” “comorbidity” “health status” “controlled”

Contextual Use – risk adjustment used to isolate the relationship between the outcome of interest and the treatment provided by controlling for the effects of other relevant material

Sources:

Iezzoni L (Ed.). Risk Adjustment for Measuring Health Outcomes (3rd ed.). (2003). Chicago, Illinois: Health Administration Press.

Kane RL (Ed). (2006). Understanding Health Care Outcomes Research (2nd ed.). Sudbury, Massachusetts: Jones and Bartlett Publishers.

General Methods – Cost-based Analyses

Repeated measures linear multiple regression

Dependent / Response Variable:

Change in \$PMPM (Current PMPM – Baseline PMPM)

Independent Variables:

Cohort Group (TRMT or CONTROL)

Month

Cohort Group * Month

Baseline \$PMPM

Age

Gender

LTSS – Long-term Services & Support

County of Residence

Multiple Chronic Conditions, Severity Indicator, and several Emergent Health Status risk adjustment variables

General Methods – Utilization-based Analyses

Cross-sectional (POST/EVAL period) multiple regression. Count-based models.

Key Exclusions - Counts of Primary DX1-diagnosed Mat/OB and Neonatal events

Dependent / Response Variables:

- Count of Inpatient Hospitalizations

- Count of ED Visits

- Count of Observation Room Visits

Independent Variables:

- Cohort Group (TRMT or CONTROL)

- Baseline \$PMPM

- Age

- Gender

- Long-term Services & Support indicator (≥ 1 month LTSS)

- County of Residence in an Iowa metropolitan area (most common county of residence)

IHH (Tiers 5 and 6)



IHH (Tiers 5 and 6)

N = 4,087

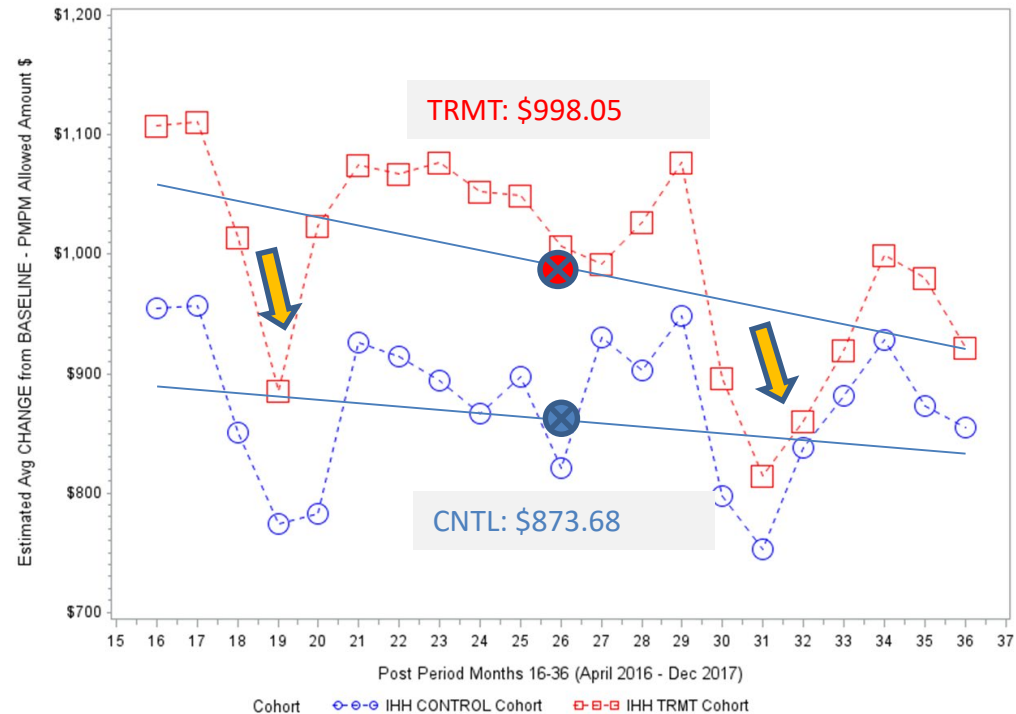
| Rank | Chronic Condition | N | Prevalence (%) |
|------|--|-------|----------------|
| 1 | Attention Deficit/Conduct/Disrupt Behavior | 2,703 | 66.1% |
| 2 | Mood (Depression) Disorder | 1,940 | 47.5% |
| 3 | Anxiety Disorder | 1,893 | 46.3% |
| 4 | Adjustment Disorder | 1,184 | 29.0% |
| 5 | Back Problems | 987 | 24.1% |
| 6 | Mental Health Disorders in Child/Infancy/Adolesc | 635 | 15.5% |
| 7 | Asthma | 612 | 15.0% |
| 8 | Screen/Hist of Mental Health and Subst Abuse | 514 | 12.6% |
| 9 | Substance-related Disorder | 503 | 12.3% |
| 10 | Obesity | 473 | 11.6% |

IHH (Tiers 5 and 6) - Cost

| Cohort | N |
|---------|-------|
| TRMT | 3,969 |
| CONTROL | 3,969 |

| TRMT Cohort compared to CONTROL Cohort | | |
|--|---------------|----------------|
| LCL (95% C.I.) | Diff in Means | UCL (95% C.I.) |
| \$84 | \$124 | \$165 |

IHH – Run 13



Other Notes:

Response profiles are different

TRMT - \$7.76 CONTROL - \$1.45 [Linear trends “cross” in Oct 2018]

IHH (Tiers 5 and 6) - Cost

Sensitivity Analyses

| Program / Sensitivity Analysis | Difference in Average Change in PMPM cost (Treatment – Control) | 95% C.I. |
|---|---|-----------------|
| <i>IHH</i> | | |
| Sensitivity Dataset #2 | \$174 | \$135 - \$212 |
| Primary Dataset #1 – With Acute/Severe Members Excluded | \$195 | \$135 - \$255 |
| Sensitivity Dataset #2 – With Acute/Severe Members Excluded | \$186 | \$124 - \$247 |
| Primary Dataset #1 – Adults Only (\geq 18 yrs. old) | (\$2) | (\$87) - \$82 |
| Sensitivity Dataset #2 – Adults Only (\geq 18 yrs. old) | \$24 | (\$65) - \$112 |
| Primary Dataset #1 – Adults Only (\geq 18 yrs. old) and With Acute/Severe Members Excluded | \$182 | \$31 - \$333 |
| Sensitivity Dataset #2 – Adults Only (\geq 18 yrs. old) and With Acute/Severe Members Excluded | \$32 | (\$169) - \$232 |
| Primary Dataset #1 – Children Only ($<$ 18 yrs. old) | \$167 | \$112 - \$222 |
| Sensitivity Dataset #2 – Children Only ($<$ 18 yrs. old) | \$197 | \$153 - \$241 |
| Primary Dataset #1 – Children Only ($<$ 18 yrs. old) and With Acute/Severe Members Excluded | \$209 | \$143 - \$275 |
| Sensitivity Dataset #2 – Children Only ($<$ 18 yrs. old) and With Acute/Severe Members Excluded | \$204 | \$137 - \$270 |

IHH (Tiers 5 and 6) - Utilization

| Control Cohort | | | Treatment Cohort | | |
|--|-----------|---------|--|-----------|---------|
| Total Count - Inpatient Hospitalizations | Frequency | Percent | Total Count - Inpatient Hospitalizations | Frequency | Percent |
| 0 | 3,611 | 90.98 | 0 | 3,346 | 84.3 |
| 1 | 271 | 6.83 | 1 | 394 | 9.93 |
| 2 | 56 | 1.41 | 2 | 118 | 2.97 |
| 3 | 18 | 0.45 | 3 | 58 | 1.46 |
| 4 | 6 | 0.15 | 4 | 18 | 0.45 |
| 5 | 4 | 0.1 | 5 | 11 | 0.28 |
| 6 | 2 | 0.05 | 7 | 4 | 0.1 |
| 7 | 1 | 0.03 | 8 | 4 | 0.1 |
| | | | 9 | 2 | 0.05 |
| | | | 11 | 1 | 0.03 |
| | | | 12 | 1 | 0.03 |
| | | | 13 | 1 | 0.03 |
| | | | 14 | 2 | 0.05 |
| | | | 16 | 1 | 0.03 |

IHH (Tiers 5 and 6) - Utilization

| Cohort | Inpatient Event Sum | Inpatient LOS Sum | Total Days Eligibility | Rate - Inpatient Events per 1,000 Days | Rate - Inpatient LOS per 1,000 Days |
|-----------|---------------------|-------------------|------------------------|--|-------------------------------------|
| Control | 500 | 6,504 | 249,1350 | 0.20069 | 2.61 |
| Treatment | 1,137 | 27,713 | 251,2281 | 0.45258 | 11.03 |

Maternal/OB-related Events and LOS

| | | | | | |
|-----------|----|-----|----------|---------|---------|
| Control | 35 | 84 | 249,1350 | 0.01405 | 0.03372 |
| Treatment | 53 | 190 | 251,2281 | 0.02110 | 0.07563 |

Neonatal-related Events and LOS

| | | | | | |
|-----------|---|---|----------|---|---|
| Control | 0 | 0 | 249,1350 | 0 | 0 |
| Treatment | 0 | 0 | 251,2281 | 0 | 0 |

Mental Health-related Events and LOS

| | | | | | |
|-----------|-----|--------|----------|---------|------|
| Control | 243 | 4,179 | 249,1350 | 0.09754 | 1.68 |
| Treatment | 764 | 22,817 | 251,2281 | 0.30411 | 9.08 |

External Cause of Injury-related Events and LOS

| | | | | | |
|-----------|---|---|----------|---|---|
| Control | 0 | 0 | 249,1350 | 0 | 0 |
| Treatment | 0 | 0 | 251,2281 | 0 | 0 |

764/1,137 = 67.2% of events are primary DX1 mental health-related conditions

22,817/27,713 = 82.3% of LOS days are primary DX1 mental health-related conditions

IHH (Tiers 5 and 6) - Utilization

| Percent Difference in Expected Count of Inpatient Stay Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|---------|
| IHH | | |
| 91.06% | 63.26% | 123.56% |

IHH (Tiers 5 and 6) - Utilization

| Control Cohort | | | Treatment Cohort | | |
|-------------------------|-----------|---------|-------------------------|-----------|---------|
| Total Count - ED Visits | Frequency | Percent | Total Count - ED Visits | Frequency | Percent |
| 0 | 2,323 | 58.53 | 0 | 1,703 | 42.91 |
| 1 | 870 | 21.92 | 1 | 873 | 22 |
| 2 | 410 | 10.33 | 2 | 497 | 12.52 |
| 3 | 189 | 4.76 | 3 | 283 | 7.13 |
| 4 | 79 | 1.99 | 4 | 175 | 4.41 |
| 5 | 50 | 1.26 | 5 | 120 | 3.02 |
| 6 | 16 | 0.4 | 6 | 88 | 2.22 |
| 7 | 7 | 0.18 | 7 | 41 | 1.03 |
| 8 | 11 | 0.28 | 8 | 44 | 1.11 |
| 9 | 6 | 0.15 | 9 | 24 | 0.6 |
| 10 | 2 | 0.05 | 10 | 28 | 0.71 |
| 11 | 2 | 0.05 | 11 | 24 | 0.6 |
| 12 | 2 | 0.05 | 12 | 8 | 0.2 |
| 14 | 1 | 0.03 | 13 | 10 | 0.25 |
| 25 | 1 | 0.03 | 14 | 11 | 0.28 |
| | | | 15 | 7 | 0.18 |
| | | | 16 | 7 | 0.18 |
| | | | 17 | 2 | 0.05 |
| | | | 18 | 3 | 0.08 |
| | | | 19 | 2 | 0.05 |
| | | | 20 | 2 | 0.05 |
| | | | 21 | 5 | 0.13 |
| | | | 23 | 1 | 0.03 |
| | | | 24 | 2 | 0.05 |
| | | | 25 | 1 | 0.03 |
| | | | 26 | 2 | 0.05 |
| | | | 29 | 1 | 0.03 |
| | | | 35 | 1 | 0.03 |
| | | | 40 | 1 | 0.03 |
| | | | 45 | 1 | 0.03 |
| | | | 47 | 1 | 0.03 |
| | | | 57 | 1 | 0.03 |

IHH (Tiers 5 and 6) - Utilization

| Cohort | ED Visit Event Sum | Total Days Eligibility | Rate - ED Visit Events per 1,000 Days |
|-----------|--------------------|------------------------|---------------------------------------|
| Control | 3,215 | 2,491,350 | 1.29 |
| Treatment | 7,212 | 2,512,281 | 2.87 |

Maternal/OB-related Events

| | | | |
|-----------|-----|-----------|---------|
| Control | 42 | 2,491,350 | 0.01686 |
| Treatment | 111 | 2,512,281 | 0.04418 |

Neonatal-related Events

| | | | |
|-----------|---|-----------|---|
| Control | 0 | 2,491,350 | 0 |
| Treatment | 0 | 2,512,281 | 0 |

Mental Health-related Events

| | | | |
|-----------|-----|-----------|---------|
| Control | 393 | 2,491,350 | 0.15775 |
| Treatment | 877 | 2,512,281 | 0.34909 |

External Cause of Injury-related Events

| | | | |
|-----------|---|-----------|---------|
| Control | 4 | 2,491,350 | 0.00161 |
| Treatment | 5 | 2,512,281 | 0.00199 |

877/7,212 = 12.2% of events are primary DX1 mental health-related conditions

IHH (Tiers 5 and 6) - Utilization

| Percent Difference in Expected Count of ED Visit Events – Treatment vs. Control | | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|--------|---|--|
| IHH | | | |
| 97.25% | 83.82% | 111.64% | |

IHH (Tiers 5 and 6) - Utilization

| Control Cohort | | | Treatment Cohort | | |
|---------------------------------------|-----------|---------|---------------------------------------|-----------|---------|
| Total Count – Observation Room Visits | Frequency | Percent | Total Count – Observation Room Visits | Frequency | Percent |
| 0 | 3905 | 98.39 | 0 | 3895 | 98.14 |
| 1 | 52 | 1.31 | 1 | 65 | 1.64 |
| 2 | 8 | 0.2 | 2 | 6 | 0.15 |
| 4 | 1 | 0.03 | 3 | 3 | 0.08 |
| 9 | 3 | 0.08 | | | |

IHH (Tiers 5 and 6) - Utilization

| Cohort | Observation Room Event Sum | Total Days Eligibility | Rate - Observation Room Events per 1,000 Days |
|--|----------------------------|------------------------|---|
| Control | 99 | 2,491,350 | 0.03974 |
| Treatment | 86 | 2,512,281 | 0.03423 |
| <i>Maternal/OB-related Events</i> | | | |
| Control | 3 | 2,491,350 | 0.00120 |
| Treatment | 11 | 2,512,281 | 0.00438 |
| <i>Neonatal-related Events</i> | | | |
| Control | 0 | 2,491,350 | 0 |
| Treatment | 0 | 2,512,281 | 0 |
| <i>Mental Health-related Events</i> | | | |
| Control | 7 | 2,491,350 | 0.00281 |
| Treatment | 19 | 2,512,281 | 0.00756 |
| <i>External Cause of Injury-related Events</i> | | | |
| Control | 0 | 2,491,350 | 0 |
| Treatment | 1 | 2,512,281 | 0.00040 |

IHH (Tiers 5 and 6) - Utilization

| Percent Difference in Expected Count of Observation Room Visit Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|--------|
| IHH | | |
| (10.58%) | (38.30%) | 29.62% |

IHH (Tiers 5 and 6) – Observations

Observations:

- Higher expenditures
 - Expenditure trend was decreasing
 - Expenditures “lower” during summer months (both cohorts)
 - Children – incurred higher expenditures on average compared to adults
- Incidence of hospitalizations was higher (almost double)
- Incidence of ED visit events was higher (almost double)
- Several “high” hospitalization and ED visit utilizers
- Hospitalization events – “high” proportion mental health related
- ED visit events – “moderately high” proportion mental health related

IHH-ICM (Tiers 7 and 8)



IHH-ICM (Tiers 7 and 8)

N = 770

| Rank | Chronic Condition | N | Prevalence (%) |
|------|--|-----|----------------|
| 1 | Anxiety Disorder | 456 | 59.2% |
| 2 | Mood (Depression) Disorder | 411 | 53.4% |
| 3 | Schizophrenia | 380 | 49.4% |
| 4 | Attention Deficit/Conduct/Disrupt Behavior | 286 | 37.1% |
| 5 | Back Problems | 285 | 37.0% |
| 6 | Hyperlipidemia | 248 | 32.2% |
| 7 | Screen/Hist of Mental Health and Subst Abuse | 246 | 31.9% |
| 8 | Hypertension - Essential | 236 | 30.6% |
| 9 | Substance-related Disorder | 225 | 29.2% |
| 10 | Obesity | 207 | 26.9% |

IHH-ICM (Tiers 7 and 8) - Cost

IHH-ICM – Run 4

| Cohort | N |
|---------|-----|
| TRMT | 525 |
| CONTROL | 525 |

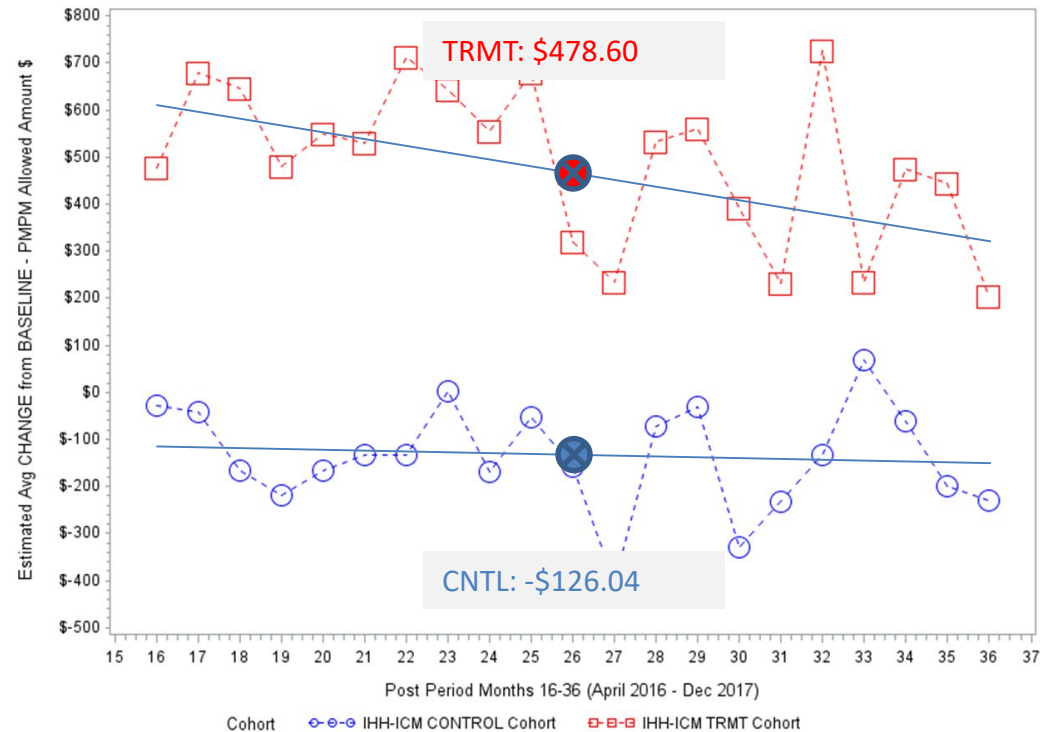
| TRMT Cohort compared to CONTROL Cohort | | |
|--|---------------|----------------|
| LCL (95% C.I.) | Diff in Means | UCL (95% C.I.) |
| \$415 | \$605 | \$794 |

Other Notes:

Response profiles not different

TRMT - \$13.46 CONTROL - \$2.50 [Linear trends “cross” in Dec 2021]

IHH-ICM Treatment cohort are individuals, by definition, receiving either 1915(i) Habilitation Services or 1915(c) Children’s Mental Health Waiver Services that individuals in the Control group are not receiving. These costs are reflected in the total costs in these data.



IHH-ICM (Tiers 7 and 8) - Cost

Sensitivity Analyses

| Program / Sensitivity Analysis | Difference in Average Change in PMPM cost (Treatment – Control) | 95% C.I. |
|---|---|-----------------|
| <i>IHH-ICM</i> | | |
| Sensitivity Dataset #2 | \$455 | \$264 - \$647 |
| Primary Dataset #1 – With Acute/Severe Members Excluded ¹ | \$545 | \$208 - \$881 |
| Sensitivity Dataset #2 – With Acute/Severe Members Excluded ² | \$761 | \$333 - \$1,190 |
| Primary Dataset #1 – With Habilitation/CMH Waiver Costs Excluded | \$295 | \$136 - \$455 |
| Primary Dataset #1 – With Habilitation/CMH Waiver Costs Excluded ¹ | \$291 | \$132 - \$449 |
| Sensitivity Dataset #2 – With Habilitation/CMH Waiver Costs Excluded ² | \$352 | \$211 - \$493 |
| Primary Dataset #1 – With Habilitation/CMH Waiver Costs Excluded and Acute/Severe Members Excluded ¹ | \$274 | \$8 - \$541 |
| Sensitivity Dataset #2 – With Habilitation/CMH Waiver Costs Excluded and Acute/Severe Members Excluded ² | \$615 | \$260 - \$971 |

IHH-ICM (Tiers 7 and 8) - Cost

Sensitivity Analyses

| | | |
|---|-------|-------------------|
| Primary Dataset #1 – Adults Only (\geq 18 yrs. old) | \$851 | \$604 - \$1,099 |
| Sensitivity Dataset #2 – Adults Only (\geq 18 yrs. old) | \$629 | \$277 - \$980 |
| Primary Dataset #1 – Adults Only (\geq 18 yrs. old) and With Acute/Severe Members Excluded | \$671 | \$277 - \$1,066 |
| Sensitivity Dataset #2 – Adults Only (\geq 18 yrs. old) and With Acute/Severe Members Excluded | \$509 | (\$289) - \$1,307 |
| Primary Dataset #1 – Adults Only (\geq 18 yrs. old) and With Habilitation/CMH Waiver Costs Excluded | \$283 | \$89 - \$476 |
| Sensitivity Dataset #2 – Adults Only (\geq 18 yrs. old) and Habilitation/CMH Waiver Costs Excluded | \$275 | \$37 - \$513 |
| Primary Dataset #1 – Adults Only (\geq 18 yrs. old) and With Habilitation/CMH Waiver Costs Excluded and With Acute/Severe Members Excluded | \$149 | (\$135) - \$433 |
| Sensitivity Dataset #2 – Adults Only (\geq 18 yrs. old) and With Habilitation/CMH Waiver Costs Excluded and With Acute/Severe Members Excluded | \$535 | \$177 - \$893 |

IHH-ICM (Tiers 7 and 8) - Cost

Sensitivity Analyses

| | | |
|---|-------|------------------|
| Primary Dataset #1 – Children Only (< 18 yrs. old) | \$211 | (\$46) - \$468 |
| Sensitivity Dataset #2 – Children Only (< 18 yrs. old) | \$279 | \$53 - \$503 |
| Primary Dataset #1 – Children Only (< 18 yrs. old) and With Acute/Severe Members Excluded | \$250 | (\$390) - \$890 |
| Sensitivity Dataset #2 – Children Only (< 18 yrs. old) and With Acute/Severe Members Excluded | \$541 | (\$72) - \$1,154 |
| Primary Dataset #1 – Children Only (< 18 yrs. old) and With Habilitation/CMH Waiver Costs Excluded | \$297 | \$87 - \$506 |
| Sensitivity Dataset #2 – Children Only (< 18 yrs. old) and With Habilitation/CMH Waiver Costs Excluded | \$369 | \$157 - \$582 |
| Primary Dataset #1 – Children Only (< 18 yrs. old) and With Habilitation/CMH Costs Excluded and With Acute/Severe Members Excluded | \$221 | (\$308) - \$750 |
| Sensitivity Dataset #2 – Children Only (< 18 yrs. old) and With Habilitation/CMH Waiver Costs Excluded and With Acute/Severe Members Excluded | \$638 | \$9 - \$1,267 |

Notes: Acute/Severe Members excluded analyses excluded entire matched

Pairs/sets of members in which at least one of the members had an acute/severe condition.

1 = analysis also excluded 4 treatment cohort member months with unusually “high” change in PMPM costs.

2 = analysis also excluded 1 treatment cohort member month with an unusually “high” change in PMPM cost.

IHH-ICM (Tiers 7 and 8) - Utilization

| Control Cohort | | | Treatment Cohort | | |
|--|-----------|---------|--|-----------|---------|
| Total Count - Inpatient Hospitalizations | Frequency | Percent | Total Count - Inpatient Hospitalizations | Frequency | Percent |
| 0 | 404 | 76.95 | 0 | 396 | 75.43 |
| 1 | 78 | 14.86 | 1 | 76 | 14.48 |
| 2 | 23 | 4.38 | 2 | 22 | 4.19 |
| 3 | 10 | 1.9 | 3 | 12 | 2.29 |
| 4 | 5 | 0.95 | 4 | 8 | 1.52 |
| 5 | 4 | 0.76 | 5 | 5 | 0.95 |
| 7 | 1 | 0.19 | 6 | 1 | 0.19 |
| | | | 7 | 2 | 0.38 |
| | | | 8 | 2 | 0.38 |
| | | | 10 | 1 | 0.19 |

IHH-ICM (Tiers 7 and 8) - Utilization

| Cohort | Inpatient Event Sum | Inpatient LOS Sum | Total Days Eligibility | Rate - Inpatient Events per 1,000 Days | Rate - Inpatient LOS per 1,000 Days |
|-----------|---------------------|-------------------|------------------------|--|-------------------------------------|
| Control | 201 | 14,507 | 329,586 | 0.60986 | 44.02 |
| Treatment | 259 | 11,176 | 334,776 | 0.77365 | 33.38 |

Maternal/OB-related Events and LOS

| | | | | | |
|-----------|---|----|---------|---------|---------|
| Control | 9 | 29 | 329,586 | 0.02731 | 0.08799 |
| Treatment | 4 | 11 | 334,776 | 0.01195 | 0.03286 |

Neonatal-related Events and LOS

| | | | | | |
|-----------|---|---|---------|---|---|
| Control | 0 | 0 | 329,586 | 0 | 0 |
| Treatment | 0 | 0 | 334,776 | 0 | 0 |

Mental Health-related Events and LOS

| | | | | | |
|-----------|-----|-------|---------|---------|-------|
| Control | 72 | 8,001 | 329,586 | 0.21846 | 24.28 |
| Treatment | 163 | 8,586 | 334,776 | 0.48689 | 25.65 |

External Cause of Injury-related Events and LOS

| | | | | | |
|-----------|---|---|---------|---|---|
| Control | 0 | 0 | 329,586 | 0 | 0 |
| Treatment | 0 | 0 | 334,776 | 0 | 0 |

163/259 = 62.9% of events are primary DX1 mental health-related conditions

8,586/11,176 = 76.8% of LOS days are primary DX1 mental health-related conditions

IHH-ICM (Tiers 7 and 8) - Utilization

| Percent Difference in Expected Count of Inpatient Stay Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|--------|
| IHH-ICM | | |
| 13.70% | (14.54%) | 51.26% |

IHH-ICM (Tiers 7 and 8) - Utilization

| Control Cohort | | | Treatment Cohort | | |
|-------------------------|-----------|---------|-------------------------|-----------|---------|
| Total Count - ED Visits | Frequency | Percent | Total Count - ED Visits | Frequency | Percent |
| 0 | 160 | 30.48 | 0 | 256 | 48.76 |
| 1 | 118 | 22.48 | 1 | 100 | 19.05 |
| 2 | 72 | 13.71 | 2 | 51 | 9.71 |
| 3 | 54 | 10.29 | 3 | 31 | 5.9 |
| 4 | 36 | 6.86 | 4 | 13 | 2.48 |
| 5 | 15 | 2.86 | 5 | 15 | 2.86 |
| 6 | 15 | 2.86 | 6 | 17 | 3.24 |
| 7 | 8 | 1.52 | 7 | 6 | 1.14 |
| 8 | 11 | 2.1 | 8 | 1 | 0.19 |
| 9 | 6 | 1.14 | 9 | 3 | 0.57 |
| 10 | 4 | 0.76 | 10 | 4 | 0.76 |
| 11 | 6 | 1.14 | 11 | 5 | 0.95 |
| 12 | 4 | 0.76 | 12 | 4 | 0.76 |
| 13 | 3 | 0.57 | 13 | 1 | 0.19 |
| 14 | 3 | 0.57 | 14 | 1 | 0.19 |
| 15 | 1 | 0.19 | 15 | 3 | 0.57 |
| 16 | 1 | 0.19 | 16 | 1 | 0.19 |
| 17 | 2 | 0.38 | 17 | 3 | 0.57 |
| 18 | 2 | 0.38 | 18 | 1 | 0.19 |
| 19 | 2 | 0.38 | 19 | 2 | 0.38 |
| 23 | 2 | 0.38 | 20 | 1 | 0.19 |
| | | | 21 | 1 | 0.19 |
| | | | 22 | 1 | 0.19 |
| | | | 28 | 1 | 0.19 |
| | | | 37 | 1 | 0.19 |
| | | | 38 | 1 | 0.19 |
| | | | 41 | 1 | 0.19 |

IHH-ICM (Tiers 7 and 8) - Utilization

| Cohort | ED Visit Event Sum | Total Days Eligibility | Rate - ED Visit Events per 1,000 Days |
|--|--------------------|------------------------|---------------------------------------|
| Control | 1,351 | 329,586 | 4.10 |
| Treatment | 1,146 | 334,776 | 3.42 |
| <i>Maternal/OB-related Events</i> | | | |
| Control | 12 | 329,586 | 0.03641 |
| Treatment | 36 | 334,776 | 0.10753 |
| <i>Neonatal-related Events</i> | | | |
| Control | 0 | 329,586 | 0 |
| Treatment | 0 | 334,776 | 0 |
| <i>Mental Health-related Events</i> | | | |
| Control | 143 | 329,586 | 0.43388 |
| Treatment | 229 | 334,776 | 0.68404 |
| <i>External Cause of Injury-related Events</i> | | | |
| Control | 1 | 329,586 | 0.00303 |
| Treatment | 0 | 334,776 | 0 |

229/1,146 = 20.0% of events are primary DX1 mental health-related conditions

IHH-ICM (Tiers 7 and 8) - Utilization

| Percent Difference in Expected Count of ED Visit Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | | |
|---|---|---------|--|
| IHH-ICM | | | |
| (24.62%) | (36.99%) | (9.82%) | |

IHH-ICM (Tiers 7 and 8) - Utilization

| Control Cohort | | | Treatment Cohort | | |
|---|-----------|---------|---|-----------|---------|
| Total Count – Observation Room Visits | Frequency | Percent | Total Count – Observation Room Visits | Frequency | Percent |
| 0 | 507 | 96.57 | 0 | 508 | 96.76 |
| 1 | 14 | 2.67 | 1 | 10 | 1.9 |
| 2 | 2 | 0.38 | 2 | 6 | 1.14 |
| 4 | 1 | 0.19 | 3 | 1 | 0.19 |
| 6 | 1 | 0.19 | | | |

IHH-ICM (Tiers 7 and 8) - Utilization

| Cohort | Observation Room Event Sum | Total Days Eligibility | Rate - Obs Room Events per 1,000 Days |
|--|----------------------------|------------------------|---------------------------------------|
| Control | 28 | 329,586 | 0.08496 |
| Treatment | 25 | 334,776 | 0.07468 |
| <i>Maternal/OB-related Events</i> | | | |
| Control | 0 | 329,586 | 0 |
| Treatment | 3 | 334,776 | 0.00896 |
| <i>Neonatal-related Events</i> | | | |
| Control | 0 | 329,586 | 0 |
| Treatment | 0 | 334,776 | 0 |
| <i>Mental Health-related Events</i> | | | |
| Control | 3 | 329,586 | 0.00910 |
| Treatment | 4 | 334,776 | 0.01195 |
| <i>External Cause of Injury-related Events</i> | | | |
| Control | 0 | 329,586 | 0 |
| Treatment | 0 | 334,776 | 0 |

IHH-ICM (Tiers 7 and 8) - Utilization



| Percent Difference in Expected Count of Observation Room Visit Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|--------|
| IHH-ICM | | |
| (45.36%) | (73.49%) | 12.63% |

IHH-ICM (Tiers 7 and 8) – Observations

Observations:

- Higher expenditures
 - Adults – incurred higher expenditures on average compared to children
- Incidence of ED visits was lower
- A few “high” hospitalization and ED visit utilizers
- Hospitalization events – “high” proportion mental health related
- ED visit events – “moderately high” proportion mental health related

CCHH (Tier 1)



CCHH (Tier 1)

N = 120

| Rank | Chronic Condition | N | Prevalence (%) |
|------|----------------------------|----|----------------|
| 1 | Asthma | 70 | 58.3% |
| 2 | Obesity | 32 | 26.7% |
| 3 | Mood (Depression) Disorder | 21 | 17.5% |
| 4 | Back Problems | 20 | 16.7% |
| 5.5 | Hypertension - Essential | 4 | 3.3% |
| 5.5 | Cardiac Dysrhythmia | 4 | 3.3% |
| 7 | Autism | 4 | 3.3% |
| 8 | Hyperlipidemia | 3 | 2.5% |
| 9.5 | Substance-related Disorder | 2 | 1.7% |
| 9.5 | Severe/Acute Conditions | 2 | 1.7% |

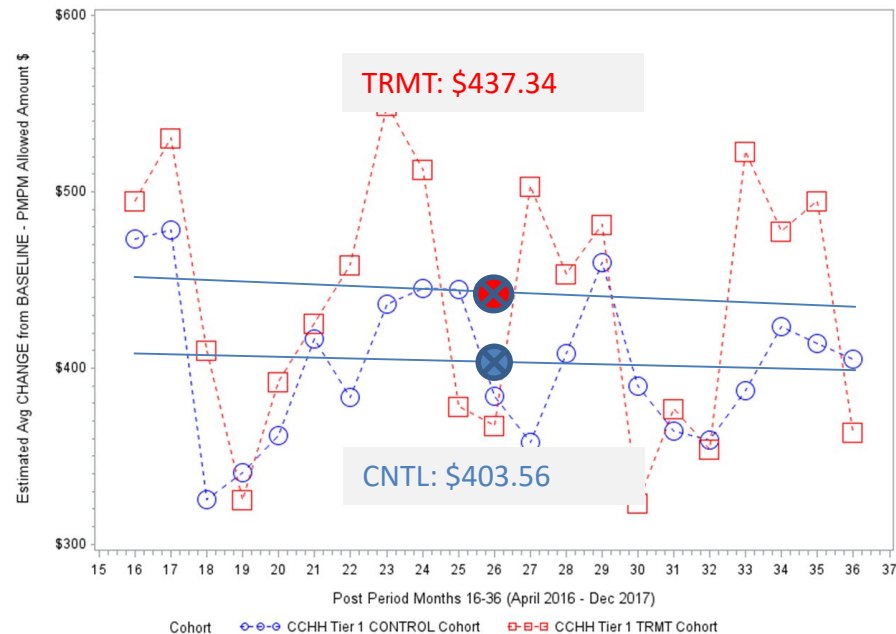
Note: Severe/Acute Conditions include any one or more of the following events/conditions: septicemia, shock, peritonitis/intestinal abscess, pulmonary embolism (PE)/deep vein thrombosis (DVT), gastrointestinal hemorrhage, epilepsy/convulsions, coma/stupor/brain damage, respiratory failure and cardiac arrest/ventricular fibrillation.

CCHH (Tier 1) - Cost

CCHH Tier 1 – Run 1

| Cohort | N |
|---------|-----|
| TRMT | 117 |
| CONTROL | 578 |

| TRMT Cohort compared to CONTROL Cohort | | |
|--|---------------|----------------|
| LCL (95% C.I.) | Diff in Means | UCL (95% C.I.) |
| - \$33 | \$34 | \$100 |



Other Notes:

1 TRMT Member-month “outlier” removed

Response profiles not different

TRMT - \$1.21 CONTROL - \$0.64 [Linear trends “cross” in May 2022]

CCHH (Tier 1) - Cost

Sensitivity Analyses

| Program / Sensitivity Analysis | Difference in Average Change in PMPM cost (Treatment – Control) | 95% C.I. |
|---|---|-----------------|
| <i>CCHH Tier 1</i> | | |
| Primary Dataset #1 – With Acute/Severe Members Excluded | ### | ### |
| Primary Dataset #1 – Adults Only (≥ 18 yrs. old) ¹ | \$210 | (\$331) - \$751 |
| Primary Dataset #1 – Children Only (< 18 yrs. old) | \$24 | (\$45) - \$94 |

Notes: ### - Sensitivity analysis not conducted as only 8 of 117 (6.8%) of matched pairs in the analysis had no acute/severe events.

1 = only 9 of 117 (7.7%) of dataset were adults.

CCHH Tier 1 - Utilization

| Control Cohort | | | Treatment Cohort | | |
|--|-----------|---------|--|-----------|---------|
| Total Count - Inpatient Hospitalizations | Frequency | Percent | Total Count - Inpatient Hospitalizations | Frequency | Percent |
| 0 | 532 | 92.04 | 0 | 113 | 96.58 |
| 1 | 37 | 6.4 | 1 | 4 | 3.42 |
| 2 | 7 | 1.21 | | | |
| 3 | 2 | 0.35 | | | |

CCHH Tier 1 - Utilization

| Cohort | Inpatient Event Sum | Inpatient LOS Sum | Total Days Eligibility | Rate - Inpatient Events per 1,000 Days | Rate - Inpatient LOS per 1,000 Days |
|-----------|---------------------|-------------------|------------------------|--|-------------------------------------|
| Control | 57 | 1485 | 362,862 | 0.15708 | 4.09 |
| Treatment | 4 | 11 | 73,871 | 0.05415 | 0.15 |

Maternal/OB-related Events and LOS

| | | | | | |
|-----------|----|----|---------|---------|---------|
| Control | 17 | 42 | 362,862 | 0.04685 | 0.11575 |
| Treatment | 2 | 6 | 73,871 | 0.02707 | 0.08122 |

Neonatal-related Events and LOS

| | | | | | |
|-----------|---|---|---------|---|---|
| Control | 0 | 0 | 362,862 | 0 | 0 |
| Treatment | 0 | 0 | 73,871 | 0 | 0 |

Mental Health-related Events and LOS

| | | | | | |
|-----------|----|-----|---------|---------|--------|
| Control | 22 | 707 | 362,862 | 0.06063 | 1.9484 |
| Treatment | 2 | 5 | 73,871 | 0.02707 | 0.0677 |

External Cause of Injury-related Events and LOS

| | | | | | |
|-----------|---|---|---------|---|---|
| Control | 0 | 0 | 362,862 | 0 | 0 |
| Treatment | 0 | 0 | 73,871 | 0 | 0 |

CCHH Tier 1 - Utilization

| Percent Difference in Expected Count of Inpatient Stay Events – Treatment vs. Control | | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|--|---|---------|
| CCHH Tier 1 | | | |
| (75.44%) | | (97.12%) | (5.29%) |

CCHH Tier 1 - Utilization

| Control Cohort | | | Treatment Cohort | | |
|-------------------------|-----------|---------|-------------------------|-----------|---------|
| Total Count - ED Visits | Frequency | Percent | Total Count - ED Visits | Frequency | Percent |
| 0 | 308 | 53.29 | 0 | 68 | 58.12 |
| 1 | 115 | 19.9 | 1 | 26 | 22.22 |
| 2 | 56 | 9.69 | 2 | 10 | 8.55 |
| 3 | 48 | 8.3 | 3 | 5 | 4.27 |
| 4 | 20 | 3.46 | 4 | 2 | 1.71 |
| 5 | 15 | 2.6 | 5 | 1 | 0.85 |
| 6 | 3 | 0.52 | 6 | 2 | 1.71 |
| 7 | 5 | 0.87 | 7 | 2 | 1.71 |
| 8 | 3 | 0.52 | 11 | 1 | 0.85 |
| 9 | 2 | 0.35 | | | |
| 10 | 2 | 0.35 | | | |
| 18 | 1 | 0.17 | | | |

CCHH Tier 1 - Utilization

| Cohort | ED Visit Event Sum | Total Days Eligibility | Rate - ED Visit Events per 1,000 Days |
|--|--------------------|------------------------|---------------------------------------|
| Control | 659 | 362,862 | 1.82 |
| Treatment | 111 | 73,871 | 1.50 |
| <i>Maternal/OB-related Events</i> | | | |
| Control | 10 | 362,862 | 0.02756 |
| Treatment | 2 | 73,871 | 0.02707 |
| <i>Neonatal-related Events</i> | | | |
| Control | 0 | 362,862 | 0 |
| Treatment | 0 | 73,871 | 0 |
| <i>Mental Health-related Events</i> | | | |
| Control | 36 | 362,862 | 0.09921 |
| Treatment | 6 | 73,871 | 0.08122 |
| <i>External Cause of Injury-related Events</i> | | | |
| Control | 0 | 362,862 | 0 |
| Treatment | 0 | 73,871 | 0 |

CCHH Tier 1 - Utilization

| Percent Difference in Expected Count of ED Visit Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|-------|
| CCHH Tier 1 | | |
| (23.67%) | (45.21%) | 6.34% |

CCHH Tier 1 - Utilization

| Control Cohort | | | Treatment Cohort | | |
|---------------------------------------|-----------|---------|---------------------------------------|-----------|---------|
| Total Count – Observation Room Visits | Frequency | Percent | Total Count – Observation Room Visits | Frequency | Percent |
| 0 | 571 | 98.79 | 0 | 115 | 98.29 |
| 1 | 5 | 0.87 | 1 | 2 | 1.71 |
| 2 | 2 | 0.35 | | | |

CCHH Tier 1 - Utilization

| Cohort | Observation Room Event Sum | Total Days Eligibility | Rate - Observation Room Events per 1,000 Days |
|--|----------------------------|------------------------|---|
| Control | 9 | 362,862 | 0.02480 |
| Treatment | 2 | 73,871 | 0.02707 |
| <i>Maternal/OB-related Events</i> | | | |
| Control | 4 | 362,862 | 0.01102 |
| Treatment | 1 | 73,871 | 0.01354 |
| <i>Neonatal-related Events</i> | | | |
| Control | 0 | 362,862 | 0 |
| Treatment | 0 | 73,871 | 0 |
| <i>Mental Health-related Events</i> | | | |
| Control | 0 | 362,862 | 0 |
| Treatment | 0 | 73,871 | 0 |
| <i>External Cause of Injury-related Events</i> | | | |
| Control | 0 | 362,862 | 0 |
| Treatment | 0 | 73,871 | 0 |

CCHH Tier 1 - Utilization

| Percent Difference in Expected Count of Observation Room Visit Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|---------|
| CCHH Tier 1 | | |
| (1.76%) | (97.92%) | 777.96% |

CCHH Tier 1 – Observations

Observations:

- No difference in expenditures
- Incidence of hospitalizations was lower

CCHH (Tier 2)



CCHH (Tier 2)

N = 41

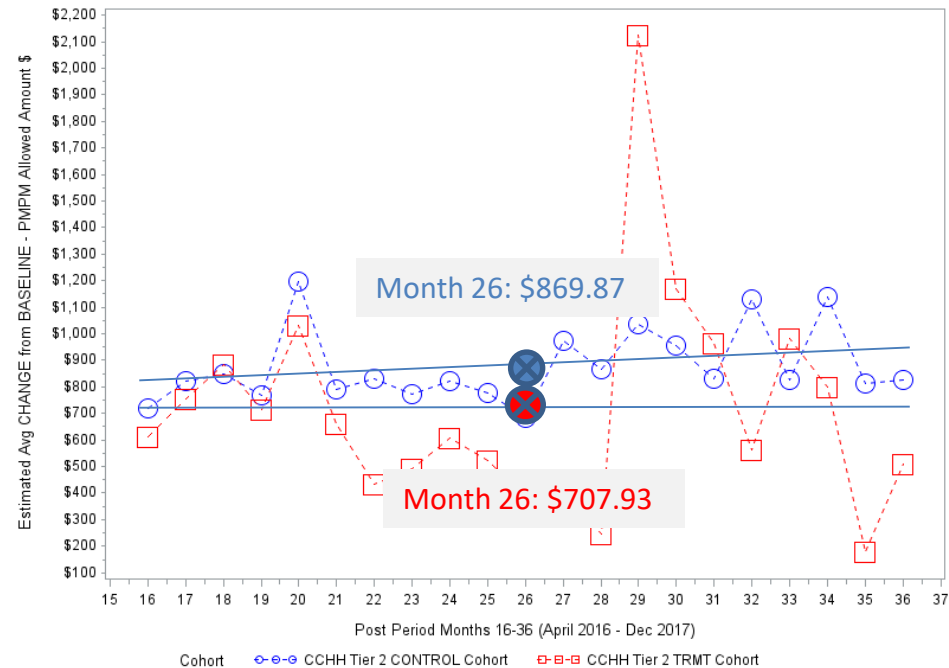
| Rank | Chronic Condition | N | Prevalence (%) |
|------|--------------------------------|----|----------------|
| 1.5 | Hypertension - Essential | 26 | 63.4% |
| 1.5 | Mood (Depression) Disorder | 26 | 63.4% |
| 3 | Substance-related Disorder | 23 | 56.1% |
| 4 | Back Problems | 22 | 53.7% |
| 5 | Hyperlipidemia | 20 | 48.8% |
| 6 | Obesity | 18 | 43.9% |
| 7 | Diabetes Without Complications | 11 | 26.8% |
| 8.5 | COPD | 9 | 22.0% |
| 8.5 | Asthma | 9 | 22.0% |
| 10 | Schizophrenia | 8 | 19.5% |

CCHH (Tier 2) - Cost

CCHH Tier 2 – Run 11

| Cohort | N |
|---------|-----|
| TRMT | 41 |
| CONTROL | 325 |

| TRMT Cohort compared to CONTROL Cohort | | |
|--|---------------|----------------|
| LCL (95% C.I.) | Diff in Means | UCL (95% C.I.) |
| - \$392 | - \$162 | \$69 |



Other Notes:

Response profiles not different

TRMT \$0.92 CONTROL \$6.67 [Linear trends diverge]

CCHH (Tier 2) - Cost

Sensitivity Analyses

| Program / Sensitivity Analysis | Difference in Average Change in PMPM cost (Treatment – Control) | 95% C.I. |
|---|---|-----------------|
| <i>CCHH Tier 2</i> | | |
| Primary Dataset #1 – With Acute/Severe Members Excluded | *** | *** |
| Primary Dataset #1 – Remove “high” cost outliers ² | (\$210) | (\$411) - (\$9) |
| Sensitivity Dataset #2 | (\$380) | (\$779) - \$19 |
| Primary Dataset #1 – Adults Only (>= 18 yrs. old) | (\$158) | (\$402) - \$85 |
| Sensitivity Dataset #2 – Adults Only (>= 18 yrs. old) | (\$368) | (\$808) - \$73 |
| Primary Dataset #1 – Children Only (< 18 yrs. old) | +++ | +++ |

Notes: *** - Sensitivity analysis not conducted as 41 of 41 (100%) of matched Treatment/Control sets in the analysis had no acute/severe events.

+++ - Sensitivity analysis not conducted as no children met the “child” inclusion criteria for the analysis.

2 = removed 2 Treatment cohort-related “high” cost member months (Month 29) from analysis.

CCHH Tier 2 - Utilization

| Control Cohort | | | Treatment Cohort | | |
|--|-----------|---------|--|-----------|---------|
| Total Count - Inpatient Hospitalizations | Frequency | Percent | Total Count - Inpatient Hospitalizations | Frequency | Percent |
| 0 | 264 | 81.23 | 0 | 34 | 82.93 |
| 1 | 47 | 14.46 | 1 | 3 | 7.32 |
| 2 | 11 | 3.38 | 2 | 2 | 4.88 |
| 3 | 1 | 0.31 | 3 | 1 | 2.44 |
| 5 | 1 | 0.31 | 4 | 1 | 2.44 |
| 8 | 1 | 0.31 | | | |

CCHH Tier 2 - Utilization

| Cohort | Inpatient Event Sum | Inpatient LOS Sum | Total Days Eligibility | Rate - Inpatient Events per 1,000 Days | Rate - Inpatient LOS per 1,000 Days |
|--|---------------------|-------------------|------------------------|--|-------------------------------------|
| Control | 85 | 521 | 203,639 | 0.41741 | 2.56 |
| Treatment | 14 | 69 | 26,056 | 0.53730 | 2.65 |
| <i>Maternal/OB-related Events and LOS</i> | | | | | |
| Control | 4 | 9 | 203,639 | 0.01964 | 0.04420 |
| Treatment | 1 | 2 | 26,056 | 0.03838 | 0.07676 |
| <i>Neonatal-related Events and LOS</i> | | | | | |
| Control | 0 | 0 | 203,639 | 0 | 0 |
| Treatment | 0 | 0 | 26,056 | 0 | 0 |
| <i>Mental Health-related Events and LOS</i> | | | | | |
| Control | 11 | 38 | 203,639 | 0.05402 | 0.18660 |
| Treatment | 3 | 12 | 26,056 | 0.11514 | 0.46055 |
| <i>External Cause of Injury-related Events and LOS</i> | | | | | |
| Control | 0 | 0 | 203,639 | 0 | 0 |
| Treatment | 0 | 0 | 26,056 | 0 | 0 |

CCHH Tier 2 - Utilization

| Percent Difference in Expected Count of Inpatient Stay Events – Treatment vs. Control | | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|----------|---|--|
| CCHH Tier 2 | | | |
| 40.52% | (29.71%) | 180.92% | |

CCHH Tier 2 - Utilization

| Control Cohort | | | Treatment Cohort | | |
|-------------------------|-----------|---------|-------------------------|-----------|---------|
| Total Count – ED Visits | Frequency | Percent | Total Count - ED Visits | Frequency | Percent |
| 0 | 117 | 36 | 0 | 17 | 41.46 |
| 1 | 70 | 21.54 | 1 | 10 | 24.39 |
| 2 | 51 | 15.69 | 2 | 4 | 9.76 |
| 3 | 27 | 8.31 | 3 | 2 | 4.88 |
| 4 | 14 | 4.31 | 4 | 1 | 2.44 |
| 5 | 14 | 4.31 | 5 | 1 | 2.44 |
| 6 | 8 | 2.46 | 7 | 2 | 4.88 |
| 7 | 10 | 3.08 | 8 | 1 | 2.44 |
| 8 | 2 | 0.62 | 9 | 1 | 2.44 |
| 9 | 2 | 0.62 | 11 | 1 | 2.44 |
| 10 | 1 | 0.31 | 39 | 1 | 2.44 |
| 11 | 4 | 1.23 | | | |
| 13 | 1 | 0.31 | | | |
| 14 | 2 | 0.62 | | | |
| 29 | 2 | 0.62 | | | |

CCHH Tier 2 - Utilization

| Cohort | ED Visit Event Sum | Total Days Eligibility | Rate - ED Visit Events per 1,000 Days |
|--|--------------------|------------------------|---------------------------------------|
| Control | 684 | 203,639 | 3.36 |
| Treatment | 114 | 26,056 | 4.38 |
| <i>Maternal/OB-related Events</i> | | | |
| Control | 6 | 203,639 | 0.02946 |
| Treatment | 0 | 26,056 | 0 |
| <i>Neonatal-related Events</i> | | | |
| Control | 0 | 203,639 | 0 |
| Treatment | 0 | 26,056 | 0 |
| <i>Mental Health-related Events</i> | | | |
| Control | 39 | 203,639 | 0.19152 |
| Treatment | 2 | 26,056 | 0.07676 |
| <i>External Cause of Injury-related Events</i> | | | |
| Control | 2 | 203,639 | 0 |
| Treatment | 0 | 26,056 | 0 |

CCHH Tier 2 - Utilization

| Percent Difference in Expected Count of ED Visit Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|--------|
| CCHH Tier 2 | | |
| 21.23% | (21.93%) | 88.25% |

CCHH Tier 2 - Utilization

| Control Cohort | | | Treatment Cohort | | |
|---------------------------------------|-----------|---------|---------------------------------------|-----------|---------|
| Total Count – Observation Room Visits | Frequency | Percent | Total Count – Observation Room Visits | Frequency | Percent |
| 0 | 311 | 95.69 | 0 | 40 | 97.56 |
| 1 | 11 | 3.38 | 1 | 1 | 2.44 |
| 2 | 3 | 0.92 | | | |

CCHH Tier 2 - Utilization

| Cohort | Observation Room Event Sum | Total Days Eligibility | Rate - Observation Room Events per 1,000 Days |
|--|----------------------------|------------------------|---|
| Control | 17 | 203,639 | 0.08348 |
| Treatment | 1 | 26,056 | 0.03838 |
| <i>Maternal/OB-related Events</i> | | | |
| Control | 1 | 203,639 | 0.00491 |
| Treatment | 0 | 26,056 | 0 |
| <i>Neonatal-related Events</i> | | | |
| Control | 0 | 203,639 | 0 |
| Treatment | 0 | 26,056 | 0 |
| <i>Mental Health-related Events</i> | | | |
| Control | 2 | 203,639 | 0 |
| Treatment | 0 | 26,056 | 0 |
| <i>External Cause of Injury-related Events</i> | | | |
| Control | 0 | 203,639 | 0 |
| Treatment | 0 | 26,056 | 0 |

CCHH Tier 2 - Utilization

| Percent Difference in Expected Count of Observation Room Visit Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|---------|
| CCHH Tier 2 | | |
| (51.15%) | (93.52%) | 268.33% |

CCHH Tier 2 – Observations

Observations:

- No difference in expenditures
 - Sensitivity analysis – lower expenditures when 2 “high-cost” member-months removed from the analysis.

CCHH (Tier 3)



CCHH (Tier 3)

N = 19

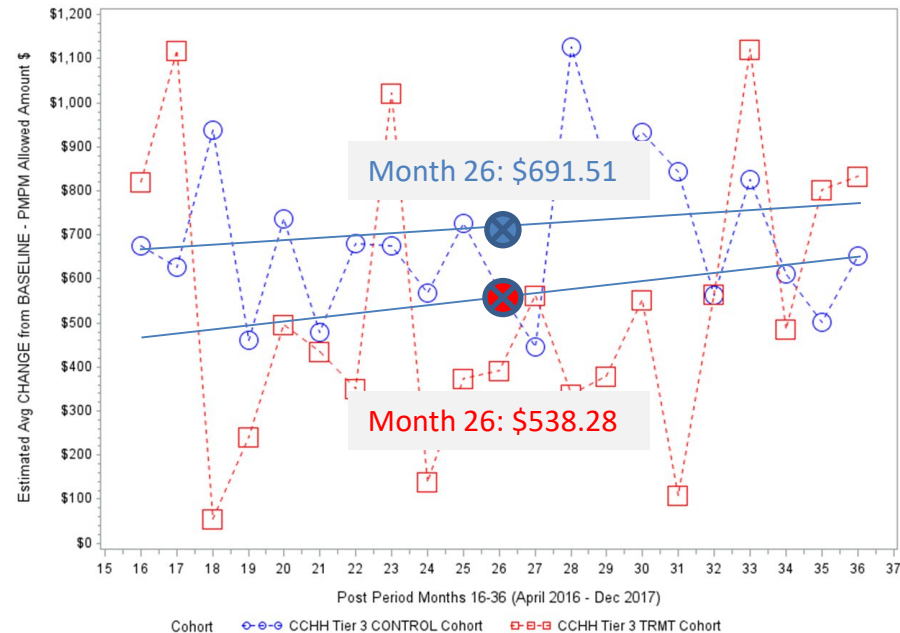
| Rank | Chronic Condition | N | Prevalence (%) |
|------|--------------------------------|----|----------------|
| 1 | Hypertension - Essential | 15 | 78.9% |
| 3 | Hyperlipidemia | 14 | 73.7% |
| 3 | Back Problems | 14 | 73.7% |
| 3 | Obesity | 14 | 73.7% |
| 5 | Mood (Depression) Disorder | 12 | 63.2% |
| 6 | Substance-related Disorder | 10 | 52.6% |
| 7.5 | Diabetes Without Complications | 8 | 42.1% |
| 7.5 | Asthma | 8 | 42.1% |
| 9 | COPD | 7 | 36.8% |
| 10 | Cardiac Dysrhythmia | 6 | 31.6% |

CCHH (Tier 3) - Cost

CCHH Tier 3 – Run 3

| Cohort | N |
|---------|-----|
| TRMT | 19 |
| CONTROL | 152 |

| TRMT Cohort compared to CONTROL Cohort | | |
|--|---------------|----------------|
| LCL (95% C.I.) | Diff in Means | UCL (95% C.I.) |
| - \$ 606 | - \$153 | + \$ 299 |



Other Notes:

3 TRMT Member-months “outliers” removed

Response profiles not different

TRMT + \$6.70 CONTROL + \$2.28 [Linear trends “cross” in Feb 2020]

CCHH (Tier 3) - Cost

Sensitivity Analyses

| Program / Sensitivity Analysis | Difference in Average Change in PMPM cost (Treatment – Control) | 95% C.I. |
|--|---|----------|
| <i>CCHH Tier 3</i> | | |
| Primary Dataset #1 – Adults Only (≥ 18 yrs. old) | ^ ^ ^ | ^ ^ ^ |
| Primary Dataset #1 – Children Only (< 18 yrs. old) | + + + | + + + |

Notes:

+ + + - Sensitivity analysis not conducted as no children met the “child” inclusion criteria for the analysis.

^ ^ ^ - Sensitivity analysis not conducted as all (100%) members of Treatment cohort were adults.

CCHH Tier 3 - Utilization

| Control Cohort | | | Treatment Cohort | | |
|--|-----------|---------|--|-----------|---------|
| Total Count - Inpatient Hospitalizations | Frequency | Percent | Total Count - Inpatient Hospitalizations | Frequency | Percent |
| 0 | 103 | 67.76 | 0 | 12 | 63.16 |
| 1 | 27 | 17.76 | 1 | 5 | 26.32 |
| 2 | 13 | 8.55 | 4 | 2 | 10.53 |
| 3 | 5 | 3.29 | | | |
| 4 | 2 | 1.32 | | | |
| 5 | 2 | 1.32 | | | |

CCHH Tier 3 - Utilization

| Cohort | Inpatient Event Sum | Inpatient LOS Sum | Total Days Eligibility | Rate - Inpatient Events per 1,000 Days | Rate - Inpatient LOS per 1,000 Days |
|-----------|---------------------|-------------------|------------------------|--|-------------------------------------|
| Control | 86 | 1,228 | 95,545 | 0.9001 | 12.85 |
| Treatment | 13 | 57 | 12,160 | 1.06908 | 4.69 |

Maternal/OB-related Events and LOS

| | | | | | |
|-----------|---|---|--------|--------|--------|
| Control | 2 | 6 | 95,545 | 0.0209 | 0.0628 |
| Treatment | 0 | 0 | 12,160 | 0.0000 | 0.0000 |

Neonatal-related Events and LOS

| | | | | | |
|-----------|---|---|--------|---|---|
| Control | 0 | 0 | 95,545 | 0 | 0 |
| Treatment | 0 | 0 | 12,160 | 0 | 0 |

Mental Health-related Events and LOS

| | | | | | |
|-----------|---|----|--------|--------|--------|
| Control | 9 | 70 | 95,545 | 0.0942 | 0.7326 |
| Treatment | 5 | 30 | 12,160 | 0.4112 | 2.4671 |

External Cause of Injury-related Events and LOS

| | | | | | |
|-----------|---|---|--------|---|---|
| Control | 0 | 0 | 95,545 | 0 | 0 |
| Treatment | 0 | 0 | 12,160 | 0 | 0 |

CCHH Tier 3 - Utilization

| Percent Difference in Expected Count of Inpatient Stay Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|---------|
| CCHH Tier 3 | | |
| 20.56% | (50.39%) | 192.94% |

CCHH Tier 3 - Utilization

| Control Cohort | | | Treatment Cohort | | |
|-------------------------|-----------|---------|-------------------------|-----------|---------|
| Total Count - ED Visits | Frequency | Percent | Total Count - ED Visits | Frequency | Percent |
| 0 | 32 | 21.05 | 0 | 6 | 31.58 |
| 1 | 43 | 28.29 | 1 | 6 | 31.58 |
| 2 | 24 | 15.79 | 2 | 1 | 5.26 |
| 3 | 20 | 13.16 | 3 | 3 | 15.79 |
| 4 | 7 | 4.61 | 11 | 1 | 5.26 |
| 5 | 10 | 6.58 | 13 | 1 | 5.26 |
| 6 | 4 | 2.63 | 17 | 1 | 5.26 |
| 7 | 1 | 0.66 | | | |
| 8 | 2 | 1.32 | | | |
| 9 | 2 | 1.32 | | | |
| 10 | 4 | 2.63 | | | |
| 11 | 1 | 0.66 | | | |
| 19 | 1 | 0.66 | | | |
| 28 | 1 | 0.66 | | | |

CCHH Tier 3 - Utilization

| Cohort | ED Visit Event Sum | Total Days Eligibility | Rate - ED Visit Events per 1,000 Days |
|--|--------------------|------------------------|---------------------------------------|
| Control | 392 | 95,545 | 4.10 |
| Treatment | 58 | 12,160 | 4.77 |
| <i>Maternal/OB-related Events</i> | | | |
| Control | 15 | 95,545 | 0.1570 |
| Treatment | 0 | 12,160 | 0.0000 |
| <i>Neonatal-related Events</i> | | | |
| Control | 0 | 95,545 | 0 |
| Treatment | 0 | 12,160 | 0 |
| <i>Mental Health-related Events</i> | | | |
| Control | 25 | 95,545 | 0.2617 |
| Treatment | 3 | 12,160 | 0.2467 |
| <i>External Cause of Injury-related Events</i> | | | |
| Control | 0 | 95,545 | 0 |
| Treatment | 0 | 12,160 | 0 |

CCHH Tier 3 - Utilization

| Percent Difference in Expected Count of ED Visit Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|---------|
| CCHH Tier 3 | | |
| 27.56% | (23.76%) | 113.40% |

CCHH Tier 3 - Utilization

| Control Cohort | | | Treatment Cohort | | |
|---------------------------------------|-----------|---------|---------------------------------------|-----------|---------|
| Total Count – Observation Room Visits | Frequency | Percent | Total Count – Observation Room Visits | Frequency | Percent |
| 0 | 140 | 92.11 | 0 | 19 | 100 |
| 1 | 10 | 6.58 | | | |
| 2 | 2 | 1.32 | | | |

CCHH Tier 3 - Utilization

| Cohort | Observation Room Event Sum | Total Days Eligibility | Rate - Observation Room Events per 1,000 Days |
|--|----------------------------|------------------------|---|
| Control | 14 | 95,545 | 0.14653 |
| Treatment | 0 | 12,160 | 0 |
| <i>Maternal/OB-related Events</i> | | | |
| Control | 0 | 95,545 | 0 |
| Treatment | 0 | 12,160 | 0 |
| <i>Neonatal-related Events</i> | | | |
| Control | 0 | 95,545 | 0 |
| Treatment | 0 | 12,160 | 0 |
| <i>Mental Health-related Events</i> | | | |
| Control | 3 | 95,545 | 0 |
| Treatment | 0 | 12,160 | 0 |
| <i>External Cause of Injury-related Events</i> | | | |
| Control | 0 | 95,545 | 0 |
| Treatment | 0 | 12,160 | 0 |

CCHH Tier 3 - Utilization

| Percent Difference in Expected Count of Observation Room Visit Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|--------|
| CCHH Tier 3 | | |
| (60.12%) | (100.00%) | 87.47% |

CCHH Tier 3 – Observations

Observations:

- No difference in expenditures
- No difference in the incidence of utilization services

CCHH (Tier 4)

CCHH (Tier 4)

N = 15

| Rank | Chronic Condition | N | Prevalence (%) |
|------|--------------------------------|----|----------------|
| 1 | Hyperlipidemia | 13 | 86.7% |
| 2.5 | Hypertension - Essential | 12 | 80.0% |
| 2.5 | Back Problems | 12 | 80.0% |
| 4.5 | Mood (Depression) Disorder | 11 | 73.3% |
| 4.5 | Obesity | 11 | 73.3% |
| 7 | Substance-related Disorder | 10 | 66.7% |
| 7 | Cardiac Dysrhythmia | 10 | 66.7% |
| 7 | Severe/Acute Conditions | 10 | 66.7% |
| 9 | COPD | 9 | 60.0% |
| 10 | Diabetes Without Complications | 8 | 53.3% |

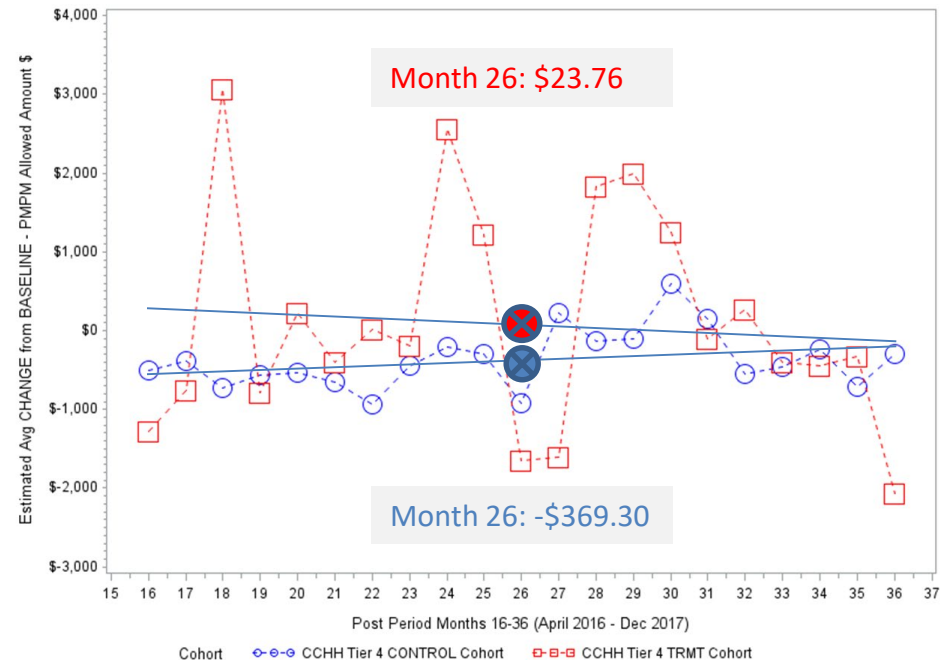
Note: Severe/Acute Conditions include any one or more of the following events/conditions: septicemia, shock, peritonitis/intestinal abscess, pulmonary embolism (PE)/deep vein thrombosis (DVT), gastrointestinal hemorrhage, epilepsy/convulsions, coma/stupor/brain damage, respiratory failure and cardiac arrest/ventricular fibrillation.

CCHH (Tier 4) - Cost

CCHH Tier 4 – Run 24

| Cohort | N |
|---------|----|
| TRMT | 14 |
| CONTROL | 64 |

| TRMT Cohort compared to CONTROL Cohort | | |
|--|---------------|----------------|
| LCL (95% C.I.) | Diff in Means | UCL (95% C.I.) |
| - \$649 | \$393 | + \$1,436 |



Other Notes:

1 TRMT Member-month “outlier” removed

Response profiles not different

TRMT - \$26.60 CONTROL + \$20.29 [Linear trends “cross” in Jan 2018]

CCHH (Tier 4) - Cost

Sensitivity Analyses

| Program / Sensitivity Analysis | Difference in Average Change in PMPM cost (Treatment – Control) | 95% C.I. |
|--|--|----------|
| <i>CCHH Tier 4</i> | | |
| Primary Dataset #1 – Adults Only (\geq 18 yrs. old) | ^ ^ ^ | ^ ^ ^ |
| Primary Dataset #1 – Children Only ($<$ 18 yrs. old) | + + + | + + + |

Notes:

+ + + - Sensitivity analysis not conducted as no children met the “child” inclusion criteria for the analysis.

^ ^ ^ - Sensitivity analysis not conducted as all (100%) members of Treatment cohort were adults.

CCHH Tier 4 - Utilization

| Control Cohort | | | Treatment Cohort | | |
|--|-----------|---------|--|-----------|---------|
| Total Count - Inpatient Hospitalizations | Frequency | Percent | Total Count - Inpatient Hospitalizations | Frequency | Percent |
| 0 | 37 | 57.81 | 0 | 6 | 42.86 |
| 1 | 12 | 18.75 | 1 | 5 | 35.71 |
| 2 | 6 | 9.38 | 2 | 1 | 7.14 |
| 3 | 4 | 6.25 | 4 | 1 | 7.14 |
| 4 | 1 | 1.56 | 5 | 1 | 7.14 |
| 5 | 1 | 1.56 | | | |
| 6 | 2 | 3.13 | | | |
| 8 | 1 | 1.56 | | | |

CCHH Tier 4 - Utilization

| Cohort | Inpatient Event Sum | Inpatient LOS Sum | Total Days Eligibility | Rate - Inpatient Events per 1,000 Days | Rate - Inpatient LOS per 1,000 Days |
|--|---------------------|-------------------|------------------------|--|-------------------------------------|
| Control | 65 | 1,972 | 40,304 | 1.61 | 48.93 |
| Treatment | 16 | 156 | 8,960 | 1.79 | 17.41 |
| <i>Maternal/OB-related Events and LOS</i> | | | | | |
| Control | 0 | 0 | 40,304 | 0.0 | 0 |
| Treatment | 0 | 0 | 8,960 | 0.0 | 0 |
| <i>Neonatal-related Events and LOS</i> | | | | | |
| Control | 0 | 0 | 40,304 | 0 | 0 |
| Treatment | 0 | 0 | 8,960 | 0 | 0 |
| <i>Mental Health-related Events and LOS</i> | | | | | |
| Control | 5 | 707 | 40,304 | 0.1241 | 17.54 |
| Treatment | 3 | 14 | 8,960 | 0.3348 | 1.56 |
| <i>External Cause of Injury-related Events and LOS</i> | | | | | |
| Control | 0 | 0 | 40,304 | 0 | 0 |
| Treatment | 0 | 0 | 8,960 | 0 | 0 |

CCHH Tier 4 - Utilization

| Percent Difference in Expected Count of Inpatient Stay Events – Treatment vs. Control | | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|----------|---|--|
| CCHH Tier 4 | | | |
| 11.62% | (54.46%) | 173.55% | |

CCHH Tier 4 - Utilization

| Control Cohort | | | Treatment Cohort | | |
|-------------------------|-----------|---------|-------------------------|-----------|---------|
| Total Count - ED Visits | Frequency | Percent | Total Count - ED Visits | Frequency | Percent |
| 0 | 12 | 18.75 | 0 | 5 | 35.71 |
| 1 | 10 | 15.63 | 1 | 3 | 21.43 |
| 2 | 11 | 17.19 | 2 | 2 | 14.29 |
| 3 | 5 | 7.81 | 5 | 2 | 14.29 |
| 4 | 7 | 10.94 | 19 | 1 | 7.14 |
| 6 | 3 | 4.69 | 31 | 1 | 7.14 |
| 7 | 2 | 3.13 | | | |
| 8 | 5 | 7.81 | | | |
| 9 | 1 | 1.56 | | | |
| 10 | 1 | 1.56 | | | |
| 11 | 1 | 1.56 | | | |
| 12 | 1 | 1.56 | | | |
| 14 | 1 | 1.56 | | | |
| 15 | 1 | 1.56 | | | |
| 16 | 1 | 1.56 | | | |
| 21 | 1 | 1.56 | | | |
| 23 | 1 | 1.56 | | | |

CCHH Tier 4 - Utilization

| Cohort | ED Visit Event Sum | Total Days Eligibility | Rate - ED Visit Events per 1,000 Days |
|--|--------------------|------------------------|---------------------------------------|
| Control | 278 | 40,304 | 6.90 |
| Treatment | 67 | 8,960 | 7.48 |
| <i>Maternal/OB-related Events</i> | | | |
| Control | 0 | 40,304 | 0 |
| Treatment | 0 | 8,960 | 0 |
| <i>Neonatal-related Events</i> | | | |
| Control | 0 | 40,304 | 0 |
| Treatment | 0 | 8,960 | 0 |
| <i>Mental Health-related Events</i> | | | |
| Control | 9 | 40,304 | 0.22 |
| Treatment | 5 | 8,960 | 0.56 |
| <i>External Cause of Injury-related Events</i> | | | |
| Control | 1 | 40,304 | 0 |
| Treatment | 0 | 8,960 | 0 |

CCHH Tier 4 - Utilization

| Percent Difference in Expected Count of ED Visit Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|---------|
| CCHH Tier 4 | | |
| (1.00%) | (51.31%) | 102.67% |

CCHH Tier 4 - Utilization

| Control Cohort | | | Treatment Cohort | | |
|---------------------------------------|-----------|---------|---------------------------------------|-----------|---------|
| Total Count – Observation Room Visits | Frequency | Percent | Total Count – Observation Room Visits | Frequency | Percent |
| 0 | 61 | 95.31 | 0 | 14 | 100 |
| 1 | 3 | 4.69 | | | |

CCHH Tier 4 - Utilization

| Cohort | Observation Room Event Sum | Total Days Eligibility | Rate - Observation Room Events per 1,000 Days |
|--|----------------------------|------------------------|---|
| Control | 3 | 40,304 | 0.074 |
| Treatment | 0 | 8,960 | 0.000 |
| <i>Maternal/OB-related Events</i> | | | |
| Control | 0 | 40,304 | 0 |
| Treatment | 0 | 8,960 | 0 |
| <i>Neonatal-related Events</i> | | | |
| Control | 0 | 40,304 | 0 |
| Treatment | 0 | 8,960 | 0 |
| <i>Mental Health-related Events</i> | | | |
| Control | 0 | 40,304 | 0 |
| Treatment | 0 | 8,960 | 0 |
| <i>External Cause of Injury-related Events</i> | | | |
| Control | 0 | 40,304 | 0 |
| Treatment | 0 | 8,960 | 0 |

CCHH Tier 4 - Utilization

| Percent Difference in Expected Count of Observation Room Visit Events – Treatment vs. Control | 95% Confidence Interval (C.I.) – Lower and Upper Limits | |
|---|---|---------|
| CCHH Tier 4 | | |
| 16.92% | (100.00%) | 671.18% |

CCHH Tier 4 – Observations

Observations:

- No difference in expenditures
- No difference in the incidence of utilization services



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References

- Shadish WR, Cook TD, Campbell DT. (2002). Experimental and Quasi-Experimental Designs for Generalized Causal Inference. Boston, MA: Houghton Mifflin Company.
- Kane RL (Ed). (2006). Understanding Health Care Outcomes Research (2nd ed.). Sudbury, Massachusetts: Jones and Bartlett Publishers.
- Iezzoni L (Ed.). Risk Adjustment for Measuring Health Outcomes (3rd ed.). (2003). Chicago, Illinois: Health Administration Press.
- Isaac S, Michael WB. (1997). Handbook in Research and Evaluation (3rd ed.). San Diego, California: EdITS/Educational and Industrial Testing Services.
- Mattke S, Bergamo G, Balakrishnan A, Martino S, Vakkur N. (August, 2006). Measuring and Reporting the Performance of Disease Management Programs. (Rand Health Working Paper – WR-400).
- D'Agostino Jr. RB. (1998). Tutorial in Biostatistics – Propensity Score Methods for Bias Reduction in the Comparison of a Treatment to a Non-Randomized Control Group. Statistics in Medicine, 17: 2265-2281.
- Rosenbaum PR, Rubin DB. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects, Biometrika; 70: 45-55.
- Rosenbaum PR, Rubin DB. (Feb 1985). Constructing a Control Group Using Multivariate Matched Sampling Methods That Incorporate the Propensity Score. The American Statistician, 39(1): 33-38.
- Sturmer T, Joshi M, Glynn RJ, Avorn J, Rothman KJ, Schneeweiss S. (2006). A Review of the Application of Propensity Score Methods Yielded Increasing Use, Advantages in Specific Settings, but not Substantially Different Estimates Compared with Conventional Multivariable Methods. Journal of Clinical Epidemiology, 59: 437-447.

References

- Faries DE, Leon AC, Haro JM, Obenchain RL. (2010). Analysis of Observational Health Care Data Using SAS. Cary, NC: SAS Institute Inc.
- Stock S, Drabik A, Buscher G, Graf C, Ullrich W, Gerber A, Lauterbach KW, Lungen M. (Dec., 2010). German Diabetes Management Programs Improve Quality of Care and Curb Costs. Health Affairs, 29(12): 2197-2205.
- Haukos JS, Lewis RJ. (Oct 20, 2015). The Propensity Score. JAMA, 314(15):1637-1638.
- Austin PC. (2008). The Performance of Different Propensity-score Methods for Estimating Relative Risk. Journal of Clinical Epidemiology, 61: 537-545.
- Austin PC. (2011). An Introduction to Propensity Score Methods for Reducing the Effects of Confounding in Observational Studies. Multivariate Behavioral Research, 46:339-424.
- Austin PC. (2010). Optimal Caliper Widths for Propensity-score Matching When Estimating Differences in Means and Differences in Proportions in Observational Studies. Pharmaceutical Statistics, 10:150-161.
- Austin PC, Laupacis A. (2011). A Tutorial on Methods to Estimating Clinically and Policy-meaningful Measures of Treatment Effects in Prospective Observational Studies: A Review. The International Journal of Biostatistics, 7(1): 1-31.
- Austin PC, Grootendorst P, Anderson GM. (2007). A Comparison of the Ability of Different Propensity Score Models to Balance Measured Variables Between Treated and Untreated Subjects: A Monte Carlo Study. Statistics in Medicine, 26:734-753.
- Austin PC. (2011). A Tutorial and Case Study in Propensity Score Analysis: An Application to Estimating the Effect of In-hospital Smoking Cessation Counseling on Mortality. Multivariate Behavioral Research, 46:119-151.

References

- Austin PC. (2007). Propensity-score Matching in the Cardiovascular Surgery Literature from 2004 to 2006: A Systematic Review and Suggestions for Improvement. *Journal of Thoracic and Cardiovascular Surgery*, 134(5): 1128-1135.
- Austin PC. (2010). Comparing Paired vs Non-paired Statistical Methods of Analyses When Making Inferences About Absolute Risk Reductions in Propensity-score Matched Samples. *Statistics in Medicine*, 30: 1292-1301.
- Austin PC. (2014). A Comparison of 12 Algorithms for Matching on the Propensity Score. *Statistics in Medicine*, 33:1057-1069.
- Hinnant L, Razi S, Lewis R, Sun A, Alva M, Hoerger T, Jacobs S, Halpern M. (Mar 2016). Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring – Annual Report 2015. RTI International.
- Caloyeras JP, Liu H, Exum E, Broderick M, Matke S. (Jan., 2014). Managing Manifest Diseases, But Not Health Risks, Saved PepsiCo Over Seven Years. *Health Affairs*, 33(1): 124-131.
- Lanehart RE, Rodriguez de Gil P, Kim ES, Bellara AP, Kromrey JD, Lee RS. (2012). Propensity Score Analysis and Assessment of Propensity Score Approaches Using SAS Procedures. *Proceedings of the SAS Global Forum 2012 Conference*, Orlando, Florida.
- Schmitz A, Navratil-Strawn J, Hartley S, Ozminkowski R. (2015). Reducing the Bias: Practical Application of Propensity Score Matching in Healthcare Program Evaluation. *SAS Global Forum 2015*, Dallas, Texas.

- Fronstin P, Roebuck CM. (Sept 2014). Quality of Health Care After Adopting a Full-replacement High-deductible Health Plan With a Health Savings Account: A Five-year Study. Employee Benefit Research Institute Issue Brief, No. 404.
- Crowson CS, Schenck LA, Green AB, Atkinson EJ, Therneau TM. (Aug 2013). The Basics of Propensity Scoring and Marginal Structural Models. Mayo Clinic – Technical Report #84.
- Bergstralh EJ, Kosanke JL. (Apr 1995). Computerized Matching of Cases to Controls. Mayo Foundation – Technical Report #56.
- Delate T, Olson KL, Rasmussen J, Hutka K, Sandhoff B, Hornak R, Merenich J. (2010). Reduced Health Care Expenditures After Enrollment in a Collaborative Cardiac Care Service. *Pharmacotherapy*, 30(11): 1127-1135.
- Holden DJ, Smith LR, Hoerger T, Renaud J, Council M. (Oct 2014). Evaluation of the Health Care Innovation Awards: Community Resource Planning, Prevention, and Monitoring – Annual Report. RTI International.
- Moss RR, Humphries KH, Gao M, Thompson CR, Abel JG, Fradet G, Munt BI. (Sep 2003). Outcome of Mitral Valve Repair or Replacement: A Comparison by Propensity Score Analysis. *Circulation*, 108:II-90-II-97.
- Shah BR, Laupacis A, Hux JE, Austin PC. (2005). Propensity Score Methods Give Similar Results to Traditional Regression Modeling in Observational Studies: A Systematic Review. *Journal of Clinical Epidemiology*, 58: 550-559.
- Parsons LS. (2001). Reducing Bias in a Propensity Score Matched-pair Sample Using Greedy Matching Techniques. Proceedings of the 26th Annual SAS Users Group International Conference, Long Beach, California.

References

- Gao Y. (2013). Propensity Score-based Analysis of Short-term Complications in Patients with Lumbar Discectomy in the ASC-NSQIP Database. SAS Global Forum 2013 – Paper 220-2013.
- Girman CJ, Gokhale M, Kou TD, Brodovicz KG, Wyss R, Sturmer T. (Mar 2014). Assessing the Impact of Propensity Score Estimation and Implementation on Covariate Balance and Confounding Control Within and Across Important Subgroups in Comparative Effectiveness Research. Medical Care, 52(3):280-287.
- Gondara L, McGahan C. (2014). Case Control Matching: Comparing Simple Distance and Propensity Score-based Methods. SAS Methods – Paper 1861-2014.
- Heller T, Owen R, Mitchell D, Keys C, Viola J, Eisenberg Y, Bowers A, Gibbons H, Yamaki K, Wing C. (May 2014). An Independent Evaluation of the Integrated Care Program – Findings from Baseline Through Year Two [FY 13]. Institute on Disability and Human Development – University of Chicago.
- Roberts L. (Nov 18, 2009). Exploring the Real Cost of Patient Safety. Research presented at 2009 Iowa Healthcare Collaborative Annual Conference, Des Moines, Iowa.
- Kauter J, Pope GC, Ingber M, Freeman S, Patterson L, Cohen M, Keenan P. (2014). The HHS-HCC Risk Adjustment Model for Individual and Small Group Markets Under the Affordable Care Act, 4(3):E1-E46.

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Chronic Conditions

| 28 Major Chronic Condition Categories | 50 Detailed Chronic Conditions |
|--|--|
| Hypertension | Essential Hypertension |
| | Secondary Hypertension |
| Hyperlipidemia | Hyperlipidemia |
| Diabetes | Diabetes Without Complications |
| | Diabetes With Complications |
| Heart Arrhythmias | Conduction Disorders |
| | Cardiac Dysrhythmias |
| Arthritis | Rheumatoid |
| | Osteoarthritis |
| Osteoporosis | Osteoporosis |
| Cancer | Head/Neck |
| | Upper Gastrointestinal |
| | Lower Gastrointestinal |
| | Liver/Pancreas |
| | Lung |
| | Skin/Bone |
| | Breast |
| | Female |
| | Male |
| | Urinary |
| | Brain/Nervous |
| | Thyroid |
| | Lymphoma |
| | Leukemia |
| | Other/Secondary |
| | Malignant Neoplasm |
| Coronary Artery Disease (CAD) | Heart Attack (AMI) |
| | Atherosclerosis/Other Heart Disease |
| Chronic Obstructive Pulmonary Disease (COPD) | Chronic Obstructive Pulmonary Disease (COPD) |
| Chronic Kidney Disease (CKD) | Chronic Kidney Disease (CKD) |
| | Nephritis/Nephrosis/Sclerosis |
| Congestive Heart Failure (CHF) | Congestive Heart Failure (CHF) |
| Asthma | Asthma |
| Stroke | Acute Cerebrovascular |
| | Occlusion/Stenosis of Precerebral Arteries |
| | Other/III-defined Cerebrovascular Disease |
| | Transient Cerebral Ischemia |
| Dementia | |
| Depression | |
| Schizophrenia | |
| Substance Abuse Disorder | Alcohol-related Substance Abuse |
| | Substance-related Substance Abuse |
| Parkinson's Disease | Parkinson's Disease |
| Multiple Sclerosis | Multiple Sclerosis |
| Hepatitis | Hepatitis |
| Sickle Cell Anemia | Sickle Cell Anemia |
| Cystic Fibrosis | Cystic Fibrosis |
| HIV | HIV |
| Back Problems | Back Problems |
| Autism | Autism |
| Obesity | Obesity |
| Hypothyroidism | Hypothyroidism |
| Liver Disease/Cirrhosis/Other Liver Conditions (non-viral) | Liver Disease/Cirrhosis/Other Liver Conditions (non-viral) |

Health Status – Emergent Events

| | |
|--------------------------|--|
| External Cause of Injury | CCSDX codes 2601-2616, 2618-2621 |
| Maternity/OB | CCSDX codes 176-196 |
| Renal Dialysis | Util Flag Rev codes 0800-0804, 0809; POS = 65 (ESRD/Dialysis Trmt Facility) |
| Organ Acquisition | Util Flag Rev codes 0810-0814, 0819 |
| Hospice Utilization | POS = 34 (Hospice Facility) |
| ICU/NICU/CCU Utilization | Util Flag Rev codes 0200-0204, 0206-0209, 0172-0174, 0210-0214, 0219 |

Severity Indicator - Components

| CCS Cat | Severity Indicator - Short Description |
|---------|--|
| CCS_2 | Septicemia (except in labor) |
| CCS_83 | Epilepsy, convulsions |
| CCS_85 | Coma, stupor, and brain damage |
| CCS_107 | Cardiac Arrest and Ventricular Fibrillation |
| CCS_118 | Phlebitis, Thrombophlebitis and Thromboembolism |
| CCS_131 | Respiratory Failure, Insufficiency, arrest (adult) |
| CCS_148 | Peritonitis and Intestinal Abscess |
| CCS_153 | Gastrointestinal hemorrhage |
| CCS_221 | Respiratory Distress Syndrome (neonatal) |
| CCS_249 | Shock |

Telligen-modeled – Using HHS-HCC Risk-Adjustment Model Severity Indicators

Used within ACA Marketplace risk-adjustment/cost-sharing algorithms in commercial insurance market

Kauter, Pope, Ingber et. al. MMRR, 2014