Cost Effectiveness Analysis:
Quality Improvement Initiative In Maryland

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Background: 8 Counties

- QI Strategy targeted 9 Counties
- Each county:
  - Obtained different investments out of the 1305 Grant
  - Implemented various policy and process improvement strategies depending on their needs
    - Aimed at improving diabetes and blood pressure

Source: MD Department of Transportation
Background: Project Overview

Maryland Department of Health (MDH)

- CDC Fund Allocation
  - Local Health Department #1
  - Local Health Departments #2 through 8

- Fund Allocation
  - Federally Qualified Health Center (FQHC)
    - Clinic #1
      - QI Process Implementation
    - Clinics #2...n
      - QI Process Implementation

- Fund Allocation
  - Individual Practices
    - Clinic
      - QI Process Implementation
  - Other Health Systems
    - Clinic #1
      - QI Process Implementation
    - Clinics #2...n
      - QI Process Implementation

Clinic-Level Outcomes: National Quality Forum Metrics 18 (BP) and 59 (Diabetes)
## Background: NQF Definitions

<table>
<thead>
<tr>
<th>NQF18: Hypertension</th>
<th>NQF59: Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Percentage of patients 18 to 85 years of age who had a diagnosis of hypertension and whose blood pressure (BP) was <strong>adequately controlled</strong> (&lt;140/90) during the measurement year.</td>
<td>• Percentage of patients 18 to 75 years of age with diabetes (type 1 or type 2) whose most recent HbA1c level during the measurement year was <strong>poorly controlled</strong> (greater than 9.0%) or was missing a result, or if an HbA1c test was not done during the measurement year.</td>
</tr>
<tr>
<td></td>
<td><strong>Narrative</strong></td>
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</tbody>
</table>
| **PLAN** | - Objective is to **increase rate of annual foot exams for diabetic patients**  
- Contract with a podiatrist for a weekly session at our Rollins clinic; started seeing patients in late March  
- Internally promote annual foot exams through:  
  - Reinforcement of clinic policy & procedure at upcoming clinical team meeting  
  - Clinic teams’ morning huddles  
  - Awareness of podiatry services available by internal referral  
  - Track rates by clinic site to motivate improvement  
- Prediction is that rate will increase from 50% to 75% for the diabetic population; we will track how many diabetic patients seen during April-May-June have a “current” foot exam documented |
| **DO** | - One challenge for the huddles will be that CDSS does not include diabetic foot exams for visit planning  
- Medical Director Steve Wiggins has individually reinforced with staff PCPs the importance and ease of LEAP testing  
- We confirmed with PCC how best to document the foot exam in eCW to ensure structured data. Clinical Director Kathy Luton shared this info with PCPs and in-house podiatrist, and will reinforce at June clinical team meeting. |
| **STUDY** | - Baseline rate is 51% in CY2017 Q4.  
- For the quarter (April – June) during this process change, screening rate went up to 56%. |
| **ACT** | 1. Adopt – expand the changes  
- Continue doing what we are doing with our Podiatry referrals.  
- As CDSS does not include DM foot exam as one of the parameters, try to incorporate the ‘flowsheets’ during the clinic prep.  
- Re-learn how to best document on eCW to satisfy the above mentioned ‘flowsheet’, and reinforcing the same with the staff PCPs.  
- Foot exam focus oriented clinic prep, huddles and adding a reminder note for the appointment provider.  
- We will continue tracking this indicator going forward. |
Research Questions

• Did the MDH investment in quality improvement (QI) lead to any significant results?
• Did the MDH investment in QI lead to an increase in hypertension and/or diabetes control?
• What was the incremental cost-effectiveness ratio of the intervention?
Methods: Data Collection

- 25 Practices reported effect data
- 19 Practices reported consistent and reliable effect data
- Cost data was collected from local health departments and assumed to have been distributed based on patient volume for the associated practices for each LHD
Results: Exploratory Analysis & Trends

Hypertension NQF18 Data across Years and Counties
Results: Exploratory Analysis & Trends

Hypertension NQF Data by Practice Type

- FQHC
- Private Practice
Results: Exploratory Analysis & Trends

Diabetes NQF Data by County
Results: Exploratory Analysis & Trends

Diabetes NQF Data by Practice Type

- FQHC
- Private Practice

Year: 2014, 2015, 2016, 2017, 2018

NQF59 Scale: 0.1, 0.2, 0.3, 0.4, 0.5, 0.6
Results: NQF18

\[ \Delta NQF18 = \beta_0 + \beta_1 \text{Intervention} + \beta_2 \text{Baseline} \]

- \( \beta_1 \) is a dummy variable that equals 1 for all of the intervention sites, and 0 for the control
- \( \beta_2 \) controls for the baseline 2016 levels of NQF18

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Value</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_0 )</td>
<td>0.18</td>
<td>0.553</td>
</tr>
<tr>
<td>( \beta_1 )</td>
<td>-0.026</td>
<td>0.357</td>
</tr>
<tr>
<td>( \beta_2 )</td>
<td>-0.35</td>
<td>0.438</td>
</tr>
</tbody>
</table>

- Increasing NQF18 trend overtime: NQF2016 is lower than NQF2018 (\( \beta_2 < 0 \))
- Negative effect of intervention: Intervention areas have lower NQF18 than control (\( \beta_1 < 0 \))
- Non significant values: p-values < 0.05
### Results: NQF18

\[ \Delta \text{NQF18} = \beta_0 + \beta_1 \text{Intervention} + \beta_2 \text{Baseline} + \beta_3 \text{Median County Income} + \beta_4 \text{County Poverty Rate} \]

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<tr>
<th>Coefficient</th>
<th>Definition</th>
<th>Value</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_0 )</td>
<td>Constant</td>
<td>1.59</td>
<td>0.553</td>
</tr>
<tr>
<td>( \beta_1 )</td>
<td>equals 1 for all of the intervention sites, and 0 for the control</td>
<td>0.103</td>
<td>0.386</td>
</tr>
<tr>
<td>( \beta_2 )</td>
<td>controls for the baseline 2016 levels of NQF18</td>
<td>-0.553</td>
<td>0.118</td>
</tr>
<tr>
<td>( \beta_3 )</td>
<td>Controls for median household income</td>
<td>-0.000013</td>
<td>0.045</td>
</tr>
<tr>
<td>( \beta_4 )</td>
<td>Control for poverty rates</td>
<td>-3.369</td>
<td>0.406</td>
</tr>
</tbody>
</table>

- Treatment effect is larger but not significant
- Median County Income Suggests an effect (p<0.05)
Results: NQF59

\[ \Delta NQF59 = \beta_0 + \beta_1 Intervention + \beta_2 Baseline \]

- \( \beta_1 \) is a dummy variable that equals 1 for all of the intervention sites, and 0 for the control
- \( \beta_2 \) controls for the baseline 2016 levels of NQF59

<table>
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<tr>
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<th>P-Value</th>
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<tbody>
<tr>
<td>( \beta_0 )</td>
<td>0.018</td>
<td>0.437</td>
</tr>
<tr>
<td>( \beta_1 )</td>
<td>-0.025</td>
<td>0.012</td>
</tr>
<tr>
<td>( \beta_2 )</td>
<td>0.012</td>
<td>0.886</td>
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</tbody>
</table>

- Decreasing NQF59 trend overtime: NQF2016 is higher than NQF2018 (\( \beta_2 > 0 \))
- Significant positive effect of intervention: Intervention areas have lower NQF59 than control (\( \beta_1 < 0 \))
- No control for confounding or effect modifying factors
Results: NQF59

\[ \Delta NQF59 = \beta_0 + \beta_1 \text{Intervention} + \beta_2 \text{Baseline} + \beta_3 \text{County} + \beta_4 \log(\text{Practice Volume}) + \beta_5 \text{Median County Income} \]

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<th>Coefficient</th>
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<th>Value</th>
<th>P-Value</th>
</tr>
</thead>
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<tr>
<td>( \beta_0 )</td>
<td>Constant</td>
<td>-0.0195</td>
<td>0.916</td>
</tr>
<tr>
<td>( \beta_1 )</td>
<td>equals 1 for all of the intervention sites, and 0 for the control</td>
<td>0.0071</td>
<td>0.700</td>
</tr>
<tr>
<td>( \beta_2 )</td>
<td>controls for the baseline 2016 levels of NQF59</td>
<td>-0.023</td>
<td>0.704</td>
</tr>
<tr>
<td>( \beta_3 )</td>
<td>Controls for median household income</td>
<td>0.000005</td>
<td>0.682</td>
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<tr>
<td>( \beta_4 )</td>
<td>Control for poverty rates</td>
<td>0.838</td>
<td>0.452</td>
</tr>
</tbody>
</table>

- Treatment effect is smaller and no longer significant
- Median Household Income and Poverty Rates suggest confounding
Planning for future QI projects

Pre-Intervention

At what level is the intervention taking place?
How many intervention sites are there? Is the sample size big enough to warrant statistical analysis?
Where is the funding from? Is funding data available at the same level as the intervention was conducted? At the same level as the effect data was collected?
Are there appropriate controls?

During Intervention

Is data reported in a reliable manner?
Can the data be double checked?
Is data complete? If no, can we do anything to gather more information?
What are the trends in the data?

Post-Intervention

What kind of data was collected? Can it be complemented by available resources?
What do the trends look like post intervention?
Is an econometric analysis appropriate? Which one?
Planning for future QI projects

Is the data reliable?
- Yes → Practices
- No → No

At what level is this intervention taking place?
- Practices
- LHD
- MDH

Is the intervention sample size big enough?
- No → Collect More Data
- Yes → Are there appropriate controls at the same level?

Are there appropriate controls at the same level?
- No → Can data be aggregated to match available control?
- Yes → Run Exploratory Analysis

Can data be aggregated to match available control?
- No → No
- Yes → Yes
Appendix
Background: CDC 1305 Grant

CDC 1305: 4-Domain Grant to prevent and control diabetes, heart disease, obesity and associated risk factors, and promoting school health in MD

- Epidemiology and Surveillance
- Environmental approaches that promote health and support and reinforce healthful behaviors
- Health Systems
  - Increase implementation of Quality Improvement (QI) processes in health systems
  - Increase use of team-based care in health systems
- Community-clinical linkages
. reg deltnqf18 tx nqf182016, robust

Linear regression

|              | Coef.   | Std. Err. | t    | P>|t|  | [95% Conf. Interval] |
|--------------|---------|-----------|------|------|----------------------|
| deltnqf18    |         |           |      |      |                      |
| tx           | -.0282502 | .0466716 | -0.61 | 0.553 | -.1267187 to .0702183 |
| nqf182016    | -.3541858 | .3744182 | -0.95 | 0.357 | -1.144139 to .4357676 |
| _cons        | .1854546  | .2335995 | 0.79  | 0.438 | -.3073973 to .6783066 |
. reg deltnqf18 tx nqf182016 patients2018 countyid practiceid, robust
note: tx omitted because of collinearity

Linear regression

Number of obs = 19
F(4, 14) = 1.20
Prob > F = 0.3521
R-squared = 0.2507
Root MSE = 0.14955

| deltnqf18       | Robust Coef. Std. Err. | t     | P>|t|   | [95% Conf. Interval] |
|-----------------|------------------------|-------|-------|----------------------|
| tx              | 0 (omitted)            |       |       |                      |
| nqf182016       | -.4902173              | .3602237 | -1.36 | 0.195 | -1.26282 .2823857    |
| patients2018    | .0000127               | 8.27e-06 | 1.54  | 0.145 | -4.99e-06 .0000305   |
| countyid        | -.0031018              | .0806959 | -0.04 | 0.970 | -.1761773 .1699736   |
| practiceid      | -.010277               | .0241602 | -0.43 | 0.677 | -.0620955 .0415415   |
| _cons           | .3044722               | .3136189 | 0.97  | 0.348 | -.3681736 .9771179   |
```
. reg deltnqf59 tx nqf592016, robust

Linear regression

Number of obs = 20
F(1, 17) = .
Prob > F = .
R-squared = 0.0056
Root MSE = 0.03418
```

<table>
<thead>
<tr>
<th>deltnqf59</th>
<th>Robust</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef.</td>
</tr>
<tr>
<td>tx</td>
<td>-.0077061</td>
</tr>
<tr>
<td>nqf592016</td>
<td>.0124367</td>
</tr>
<tr>
<td>_cons</td>
<td>.0014088</td>
</tr>
</tbody>
</table>
. reg deltnqf59 tx nqf592016 patients2018 countyid practiceid, robust
  note: tx omitted because of collinearity

Linear regression

|                  | Robust Coef. | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|------------------|--------------|-----------|-------|-----|----------------------|
| deltnqf59        |              |           |       |     |                      |
| tx               | 0 (omitted)  |           |       |     |                      |
| nqf592016        | 0.0855778    | 0.0686962 | 1.25  | 0.233 | -0.0617609 to 0.2329166 |
| patients2018     | 1.44e-06     | 1.63e-06  | 0.89  | 0.391 | -2.05e-06 to 4.93e-06 |
| countyid         | -0.0404973   | 0.0150473 | -2.69 | 0.018 | -0.0727706 to -0.0082239 |
| practiceid       | 0.0116848    | 0.0043408 | 2.69  | 0.018 | 0.0023747 to 0.020995 |
| _cons            | 0.0099344    | 0.0294273 | 0.34  | 0.741 | -0.0531808 to 0.0730496 |

Number of obs = 19
F(4, 14) = 2.01
Prob > F = 0.1487
R-squared = 0.3386
Root MSE = 0.03067