Evaluating Standardized Preventive Care to Reduce Dental Disparities in Children

NIDCR UH2DE025504
PIs: Beth Mertz & Joel White
Outline

• Program Evaluation Design
• Preliminary Data
• Questions
• Feedback
  – Methodology
  – Other approaches to consider in the evaluation
  – Publication options for methodology
Willamette Dental Group (WDG) Caries Prevention Program

**Program Elements:**
- Setting: large risk-bearing dental group practice (full capitation), 53 offices, 3 states, 1,200 employees, 400,000 patient visits
- Access within 10 business days 85% of the time and within 24 hours for emergency care
- Evidence-based, standardized, caries prevention and treatment protocols based on assessed risk status
- Personalized individual dental care plan
- Therapeutic alliance with patients
- Care coordination for high risk children

**Socioeconomic Disparity**
- Medicaid / Oregon Health Plan (OHP)
- Commercially Insured (CP)
Hypothesis

The study’s primary hypothesis is that the WDG caries prevention program will improve oral health and reduce disparities in untreated decay (ds & DS) and caries increment (Δdmfs & ΔDMFS) longitudinally between the Medicaid (OHP) and commercially-insured (CP) pediatric populations from baseline through 2019.
Program Evaluation Questions

1. Patient: Does the caries management program reduce disparities burden over time between Oregon Health Plan (Medicaid) and Commercial Plan children?
2. Organization: Does the caries management program provide value to patients, payers, and society?
3. Policy: How does this policy environment impact the practice and sustainability of the caries management program?
Multi-Level Program Evaluation
Standardized Caries Management Program

Policy Impact

Policy Environment

WDG Caries Management Program

Patient Experience

Patient Outcomes

Provider Experience

Social Value

Program Cost
Evaluation Data Sources

- Longitudinal EHR Data
- Administrative Cost and Clinic Data
- Patient and Provider Surveys and Interviews
- Census Community Data
- Longitudinal Medicaid Claims Data
Key metrics for program evaluation

Patient-level data for OHP and CP patients (axiUm)

Demographics
Age, Sex, Race/ethnicity
Health literacy
RUCA rural/urban continuum
Distance to dental office
Insurance eligibility (proxy for socioeconomic status)

Clinical Information
Access to care timing
Visit type (D0145, D0150, D0120)
Health history
Dental diagnoses
Caries risk (low, med, high, extreme)
Phase of care (1,2,3,4)
Caries indices (e.g., dmfs/DMFS)
Prevention recommended/dispened/applied
Treatment (planned and completed)
Recall visits (planned and completed)
Procedures (planned and completed)
Prescriptions (Rx)
Provider & Clinic IDs

Administrative data for OHP and CP patients and organization costs (WDG)

CDT & DDS codes
Provider/patient ratio per clinic
Payer mix
Specialty referrals (pediatric)
Adherence to protocol – provider
Adherence to protocol – patient
Churn / Retention
Patient engagement & oral health quality of life (i.e., POQL, CHU9D)
Care coordination
Clinic contextual factors (e.g., rural, FTE of providers, patient load)
Patient satisfaction (i.e., CAHPS)

Costs of Care
Program pro forma
Cost of caries-related prevention
Cost of caries-related treatment
Utilization (e.g., CDT codes)
Fee schedule (e.g., National Dental Advisory Service or Fair Health)
Reimbursement for care (e.g., Truven)

Medicaid population data (OHP)

Coordinated Care Organization (CCO) incentive metrics (e.g., sealants)
County contextual factors (e.g., rural, poverty, race/ethnicity, languages, Dental Health Professional Shortage Area status)
WDG / non-WDG status

Early Periodic Screening Diagnosis and Treatment (EPSDT), Dental Quality Alliance (DQA), and Managed Risk Medical Insurance Board (MRMIB) select metrics
Any dental service (i.e., utilization)
Preventive dental services
Diagnostic dental services
Dental treatment services
Caries-related services
Sealant on a permanent molar
Elevated risk for caries

Treatment for or prevention of caries
Comprehensive oral exam
Care continuity
Patient Experience Over Time

- Experience of clinical care
- Experience of system of care

Dyad Interview

Dyad Interviews

- Access to and ongoing use of care
- Preference for treatment options (e.g., SDF vs. Chlrx)

Dyad Interview and EHR

POQL Surveys

- Home care use and experience
- Perceptions about change in risk or lack of change over time
- Frustrations with process

- Oral health quality of life
Examine **acceptability and use of home care prevention** for each comparison group based on pilot research findings from dyad interviews.

<table>
<thead>
<tr>
<th>Caries Risk</th>
<th>OHP</th>
<th>CP</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3-5</td>
<td>6-12</td>
<td>13-18</td>
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<tr>
<td>High</td>
<td>8</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Moderate</td>
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<td>9</td>
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</tr>
<tr>
<td>Low</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>25</td>
<td>21</td>
</tr>
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</table>

Collected at 12 clinics across Oregon, including rural and urban, large and small, among 3 age groups, 2 insurance types and 3 risk levels.
Key Qualitative Findings

Patient education and experiences

• Like report card format and clear recommendations
• Product knowledge and recall of recommendations was good for both parents and children (age dependent)
  – Adherence for toothpaste excellent, mouthwash mixed, and xylitol was seen as optional
• Report being instructed to increase quality of existing non-prescription practices (brush longer, floss properly, etc.)
• Customer service (friendliness) and scheduling ease was highly regarded

Implications for data analysis / interpretation

• Family use of products noted
• Potential confounding issues: orthodontia and wisdom teeth
Child Patient Health Outcomes

Δds & ΔDS, Δdmfs & ΔDMFS indices >0

Does child oral health status improve over time?

Do baseline socioeconomic health disparities decrease over time?
Caries Indices

Validating Caries Indices From An Electronic Health Record

J.M. White¹, E.A. Mertz¹, J.M. Mullins², J.B. Even², T. Guy², E. Blaga², A. Kottek¹, S.V. Kumar³, S. Bangar³, R. Vaderhobli¹, R. Calinisan⁴, R. Brandon², W. Santo¹ and S.A. Gansky¹

All LCCs > 0.99
### Disparities in Mean dmfs+DMFS at Baseline

<table>
<thead>
<tr>
<th></th>
<th>All ages</th>
<th>t-test</th>
<th>Age 0-5</th>
<th>t-test</th>
<th>Age 6-12</th>
<th>t-test</th>
<th>Age 13-18</th>
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<td><strong>All Levels Combined</strong></td>
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<tr>
<td>Total</td>
<td>4.0 ±7.3</td>
<td>4.9 ±8.3</td>
<td>3.1 ±6.0</td>
<td>&lt;0.0001</td>
<td>2.7 ±7.4</td>
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<td>1.5 ±4.3</td>
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<td>Total</td>
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36 indices available including tooth level (t,T), surface and tooth count, incisal edges
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<td>4</td>
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<td>24,958</td>
<td>12.1</td>
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Program Evaluation Analytic Design: Descriptive Context and Matched Sample

WDG Patients

Describe WDG Program

Pre-Program (2013)

Pre-program

Program (2014-2018)

Utilization Risk Profile Treatment Home Care Recall

CP Visit 2013

CP Visit 2014

CP Visit 2019

OHP Visit 2013

OHP Visit 2014

OHP Visit 2019

Matched cohorts created at baseline visit using external and internal variables

Primary Outcome Measure = Δdmfs & ΔDMFS indices >0

WDG Admin & EHR Data

Rolling enrollment of baseline visits across years
Preliminary Cohort Selection (EHR)

Mean Differences

Covariates Included in Propensity Score Matching

- Unadjusted
- Adjusted
Provider Experience Over Time

- **Dental team’s adherence to the program**
  - E-Chart completion
  - Appropriateness of care

- **Perception of program efficacy**
  - Provider interviews
  - Perceptions

- **Provider-patient interaction**
  - Provider interviews
  - Consistency, new care coordination roles
Prevention Program Cost

Traditional Care

WDG Program

10 Day Access
Risk Assessment
Care Protocol
DDS(dx) & CDT

Pro Forma of Caries Prevention Program*
1. D0120/D0150/D0145
2. D1120
3. D1206
4. D0425
5. D0170
6. D1330
7. D1331
8. D0272
9. Recommendations
10. Prescriptions & Prevention Dispensed

* Varies by risk status
Utilization Cost

- Mean utilization cost of CARIES-related treatment for patients at different risk and insurance strata

<table>
<thead>
<tr>
<th>Caries Risk</th>
<th>OHP</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>$282</td>
<td>$245</td>
</tr>
<tr>
<td>Moderate</td>
<td>$281</td>
<td>$257</td>
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<tr>
<td>High</td>
<td>$287</td>
<td>$262</td>
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<tr>
<td>Extreme</td>
<td>$318</td>
<td>$408</td>
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Pediatric Oral Health Quality of Life Instrument Assessments

POQL Scores by Recent Risk Level (n=116)

POQL Scores by Risk Trend (n=116)
Social Value

Program reduces decay overall? and/or
Program reduces disparity in decay?

- Yes (Y)
- No (N)

Program delivery costs are positive

- Yes (Y)
- No (N)

(i.e., “saves money”)

Net costs (over time) are positive

- Yes (Y)
- No (N)

(i.e., “saves money”)

Is health benefit or disparity reduction) worth the cost?

- Yes (Y)
- No (N)

(e.g., $5 per cavity prevented)

(e.g., $25K per cavity prevented)

ICER* = Incremental Cost / Incremental Benefit

Bad Value (unless massively cost saving)

Good Value (unless harmful to health)

Bad Value

Good Value
Policy Environment

Context is critical for data interpretation

- Risk-bearing contractors
- Deliver on metrics

Oregon Health Plan
(Medicaid)

- Affordable Care Act
- Design state quality metrics

DCOs
- Capitated
- Responsive to CCO and OHP

CCOs
- Contractors
- Deliver on metrics

Policy experts & key informants, literature review, tracking local policy
Medicaid annual claims data 2013-2018 with WDG and longitudinal tracking codes

Cross-sectional and matched cohorts

WDG OHP
- Utilization
- Prevention
- Diagnosis
- Treatment
- Costs

Non-WDG OHP
- Utilization
- Prevention
- Diagnosis
- Treatment
- Costs

## Oregon Health Plan
### Oregon Resident Children

<table>
<thead>
<tr>
<th>Year</th>
<th>Total pop 0-18</th>
<th>Total pop &gt;90 continuous days of coverage</th>
<th>Pop &gt;90 continuous days of coverage and any WDG enrollment</th>
<th>100% WDG pop &gt;90 continuous days of coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>n (% of total)</td>
<td>n (% of total)</td>
<td>n (% of total)</td>
</tr>
<tr>
<td>2013</td>
<td>450,006</td>
<td>428,079 (95.13%)</td>
<td>52,767 (14.06%)</td>
<td>38,279 (72.54%)</td>
</tr>
<tr>
<td>2014</td>
<td>497,878</td>
<td>476,156 (95.64%)</td>
<td>43,918 (10.16%)</td>
<td>40,123 (91.36%)</td>
</tr>
<tr>
<td>2015</td>
<td>523,227</td>
<td>503,337 (96.20%)</td>
<td>43,008 (9.34%)</td>
<td>32,054 (74.53%)</td>
</tr>
</tbody>
</table>

- Total pop 0-18: Number of children aged 0-18.
- Total pop >90 continuous days of coverage: Number of children with 90+ days of continuous coverage.
- Pop >90 continuous days of coverage and any WDG enrollment: Number of children with 90+ days of continuous coverage and any WDG enrollment.
- 100% WDG pop >90 continuous days of coverage: Percentage of WDG population with 90+ days of continuous coverage.
Among OHP eligibles receiving any service: Total receiving either treatment for caries or a caries-preventive procedure
(Metric recreated from MRMIB CHIP Quality Report, California)
Medicaid Enrollees

Program Evaluation Analytic Design:
Descriptive Context and Matched Sample

Matched cohorts created at baseline visit using external and internal variables

Standard National Metrics
Utilization Prevention Diagnostics Treatments

Oregon Medicaid Dental Claims Data
Preliminary Cohort Selection (Claims)

Mean Differences

Covariates Included in Propensity Score Matching

Unadjusted  Adjusted
Describe WDG Program Pre-Program (2013)

WDG Patients

- CP Visit 2013 (Pre-program)
- CP Visit 2014 (Program 2014-2018)
- CP Visit 2018 (Program 2014-2018)

Describe Medicaid Secular Trends Pre-Program (2013)

Medicaid Enrollees

- OHP Enrolled
- OHP Visit 2013
- OHP Visit 2014
- OHP Visit 2018

- OHP Non-WDG Enrolled 2013
- OHP Non-WDG Enrolled 2014
- OHP Non-WDG Enrolled 2018

Describe WDG Admin & Electronic Health Record Data

- WDG Admin & Electronic Health Record Data
- Oregon Medicaid Dental Claims Data

Rolling enrollment of baseline visits across years

Static enrollment at baseline year 2014

Relationship of Internal and External Parallel Matched Samples
### Assessing Data Quality

#### Table 1. Data Quality Dimensions Determining Fitness for Use of Research Data

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Conceptual definition</th>
<th>Operational examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completeness</td>
<td>Presence of the necessary data</td>
<td>Presence of necessary data elements, percent of missing values for a data element, percent of records with sufficient data to calculate a required variable (e.g., an outcome)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>Closeness of agreement between a data value and the true value*</td>
<td>Percent of data values found to be in error based on a gold standard, percent of physically implausible values, percent of data values that do not conform to range expectations</td>
</tr>
<tr>
<td>Consistency</td>
<td>Relevant uniformity in data across clinical investigation sites, facilities, departments, units within a facility, providers, or other assessors</td>
<td>Comparable proportions of relevant diagnoses across sites, comparable proportions of documented order fulfillment (e.g., returned procedure report for ordered diagnostic tests)</td>
</tr>
</tbody>
</table>

*Consistent with the International Organization for Standardization (ISO) 8000 Part 2 definition of accuracy, replaced “property value” in the ISO 8000 definition with “data value” for consistency with the language used in clinical research.

WDG Caries Management Program

- Patient Experience
- Patient Outcomes
- Provider Experience
- Efficacy of Approach
- Rich Program Description
- Evidence-Base Documented
- Stakeholder Buy-In

Multi-Factorial Evaluation Design

- Policy Experience
- Policy Impact
- Policy Environment
- Economic Value and Sustainability

Data Validity Checks at Every Stage

Evidence-Base Documented

Program Cost

Social Value

Policy Implications & Replicability

31
Questions?
Feedback?
Publication Suggestions?

Thank you!