Using the Medical Expenditure Panel Survey to Explore the Association Between High Healthcare Utilization and Behavioral Health Diagnoses in a Pediatric Population with Chronic Conditions

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Using the Medical Expenditure Panel Survey to Explore the Association Between High Healthcare Utilization and Behavioral Health Diagnoses in a Pediatric Population with Chronic Conditions

Marlon D. Satchell
Thomas Jefferson University College of Population Health
Dissertation Defense Presentation
February 27, 2020
Agenda

- Welcome & Introductions
- Introduction
- Purpose of the Study
- Methodology
- Results
- Discussion & Conclusion
- Q & A
Introductions

- Sharon L. Larson, PhD (Committee Chair)
- Albert G. Crawford, PhD, MBA, MSIS
- Lee M. Pachter, DO
- Vanessa L. Short, PhD, MPH
- Marlon D. Satchell, MPH
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- David Nash, MD, MBA, Dean (Emeritus) of JCPH
- Diane Abatemarco, PhD, MSW, Vice Chair of Research, Professor Obstetrics, Gynecology and Pediatrics at Thomas Jefferson University
- Norma Everett, MA, formerly Nemours/A.I. duPont Hospital for Children
- Alisa Haushalter, DNP, RN, PHNA-BC, Director-Shelby County Tennessee Health Department
- Alexander Koster, MA, Director, VBSO Analytics & Technology at Nemours
- Amanda Muir, MD, The Children’s Hospital of Philadelphia
- Rachel Reis, RN, Thomas Jefferson University Hospital
- Gayle and Norman Satchell
Introduction: Patterns of High Healthcare Utilization in a Pediatric Population

- Since the passing and implementation of the Affordable Care Act (ACA) in 2010, those in the healthcare environment have had to re-think the way that care is provided to patients:
  - Improve healthcare outcomes AND
  - Reduce the cost of healthcare
- Particular focus on specific patient populations, including:
  - Children with chronic health conditions
  - Children with behavioral health diagnoses
Introduction: Changing Payment Model

- Transitioning away from fee-for-service model to a value-based care model.

- FFS = healthcare providers reimbursed by payors based on the number of and types of procedures and services that are provided.

- VBC = Emphasis on the value of patient care rather than the quantity.
Introduction: Affordable Care Act and Value Based Care

- VBC = Emphasis on the value of patient care rather than the quantity of services provided.
  - Manage care proactively
  - Care linked to specific goals
- Three main drivers:
  - Reduce “unnecessary” healthcare expenditures
  - Improve health outcomes and improve quality of care
  - Care coordination and population health management
Introduction: Institute for Healthcare Improvement - Triple Aim

- The Triple Aim is a framework developed by the Institute for Healthcare Improvement (IHI) in 2007 to improve the performance of healthcare systems.

- Consists of driving changes in three interconnected dimensions of the healthcare system:
  - Improving the patient experience of care
  - Improving the health of populations
  - Reducing the per capita cost of healthcare

- The IHI proposed the following components as integral to achieving the Triple Aim:
  - Focus on individuals and families
  - Redesign of primary care services and structures
  - Population health management
  - Cost control platform
  - System integration and execution
Introduction: Connection to Triple Aim

- A key aspect of reducing unnecessary or preventable healthcare costs and utilization is the identification of patients who are the highest or most frequent users of healthcare resources.
  - Then identify or develop efforts to reduce unnecessary or preventable healthcare utilization
  - Aligns with component on redesigning primary care services and structures
- At the same time, improve healthcare and healthcare outcomes.
- Existing studies on high utilization look at patient characteristics associated with high utilization of healthcare resources including those with chronic conditions and those with behavioral health diagnoses.
Introduction: Patterns of High Healthcare Utilization in a Pediatric Population

- High utilizing patients are generally described as patients whose healthcare use falls within the top 5-10% of use (Bell, Turbow, George, & Ali, 2017; Fondow et al., 2017; Hardy et al., 2018; Heincelman et al., 2016).

- Like their adult counterparts, pediatric patients with patterns of high healthcare utilization have a considerable impact on the pediatric healthcare system (Berry et al., 2017).

- Children with more than one chronic condition are one of the fastest growing populations within children’s hospitals over the past 10 years (Berry et al., 2017).
Introduction: Patterns of High Healthcare Utilization in a Pediatric Population

- Need to identify and understand pediatric healthcare use, especially for high use patients (Leininger et al., 2015).

- BUT, little is known about the various ways that chronic conditions affect healthcare utilization for pediatric patients.
Introduction: Behavioral Health

- Individuals with Behavioral Health (BH) diagnoses tend to use more healthcare resources than individuals without (Bell et al., 2017).

- BH diagnoses and healthcare use in children is not as well studied as in adults.

- BH diagnoses in children and adolescents can have adverse effect on long-term health and development.

- Gaps in understanding the relationship between healthcare utilization patterns and behavioral health in a pediatric population when comorbidities are taken into consideration.

- Further research can expand our understanding of how behavioral health diagnoses and improving behavioral health management impact short-and long-term health.
Purpose of This Study

- **Expand upon previous work** on high healthcare utilization and behavioral health diagnoses in children.

- Investigate the extent to which BH diagnoses and chronic conditions are **associated with high healthcare use in children**, and if high healthcare use itself is associated with BH or chronic condition diagnoses in children.

- **Identify characteristic** of pediatric patients with high utilization patterns, and **develop a model** that can be tested to predict patients who might have similar patterns in the future.
Conceptual Model

- Behavioral Health & Chronic Conditions
  - Total Population
  - Pediatric Population Only
  - All Cost & Utilization

Affordable Care Act

Pediatric Cost & Utilization for BH & CCs

Healthcare Use
Methodology: Medical Expenditures Panel Survey (MEPS)

- 3 main components:
  - Household Component
  - Medical Provider Component
  - Insurance Component

- Large-scale population-based surveys of civilian, non-institutionalized families and individuals, healthcare providers, and employers in the United States.

- Administered by the Agency for Healthcare Research and Quality (AHRQ).

- Captures data over a 2+ year panel period.

- Captures person-level data on medical events, frequency of healthcare use, cost of healthcare services, how services are paid for and insurance types.
Methodology: MEPS

- Created in 1996.
- First sampling design used from 1996-2006; second from 2007-2016; third from 2017-2025.
- Samples subset of individuals and families from the previous year’s National Health Interview Survey (NHIS), which is also a nationally representative sample of non-institutionalized individuals.
- Overlapping panel design:
  - New panel selected each year
  - Surveys administered to each panel in 5 rounds of computerized self-administered surveys over a 30-month period
### Methodology: MEPS Panel Design

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Person A</td>
<td>Rd 3</td>
<td>Round 4</td>
<td>Round 5</td>
</tr>
<tr>
<td>Person B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<thead>
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<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Person D</td>
<td>Round 1</td>
<td>Round 2</td>
<td>Round 3</td>
</tr>
<tr>
<td>Person E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person F</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel 20</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person G</td>
<td>Round 1</td>
<td>Round 2</td>
<td>Round 3</td>
</tr>
<tr>
<td>Person H</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person I</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel 21</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person J</td>
<td>Round 1</td>
<td>Round 2</td>
<td>Rd 3</td>
</tr>
<tr>
<td>Person K</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person L</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Methodology: MEPS

- Used frequently to assess patterns of healthcare utilization and expenditures.
- Allows for a patient-centered perspective to categorizing medical expenditures.
- Used to compare the different types of costs for medical expenses and different types of utilization for patient populations.
- Also used to assess racial, ethnic and other disparities in healthcare utilization.
- There are other topics of study that could benefit from the MEPS and its study design.
Methodology

- Retrospective longitudinal observational study.
- Data from the MEPS Household Component survey for 2007-2016.
  - Full Year Consolidated Data Files and corresponding Medical Conditions files were used
- MEPS data stratified based on behavioral health diagnosis and chronic condition.
Methodology

- **Independent Variables**
  - Age, sex, race, ethnicity, family income (as % of federal poverty level), and health insurance type

- **Dependent Variables**
  - Presence or absence of a behavioral health diagnoses
  - Presence or absence of a chronic condition diagnosis (asthma, gastrointestinal disorders, diabetes)
  - Healthcare utilization - yes or no, top 10% in terms of frequency
  - Healthcare costs - yes, no, top 10% in terms of cost
  - Office visits (primary care, specialty), Emergency department visits, Hospitalizations, Prescribed medications
Study Population

All MEPS Respondents

Respondents with BH Diagnoses

Pediatric Respondents

Respondents with Chronic Conditions

Relevant Populations

A: Pediatric Patients with Behavioral Health Diagnosis

B: Pediatric Patients with Chronic Conditions (asthma, diabetes, GI)

C: Pediatric Patients with BH diagnoses and CCs
Analysis

- **Descriptive analyses** (means, medians, percentages)

- **Bivariate analyses** - assess differences between pediatric patients with/without behavioral diagnoses, and with/without chronic conditions, controlling for demographic characteristics; tests for significance.

- **Multivariate analyses** - assess associations between independent and dependent variables.

- Analysis done using **IBM SPSS Statistics Software Version 26 Premium Edition, Complex Samples Procedures**.

- Analytical weights applied during analysis provided by AHRQ.
Analysis: Significance

- $\chi^2$ Test
  - Calculates p-value, which can be used to determine significance
    - $p \leq .000$
    - $p \leq .005$
    - $p \leq .05$

- Confidence Intervals
  - Range of acceptable values
Results: Table 1, Descriptive Analysis (2007-2016)

- 2007-2016 unweighted population, age 0-17: 98,004
- Weighted population: 741 million
- Mean age: 8.6 years
- Predominantly white: 74.8%
- Insured (Private or public): 94.6%
- Poor or Near-poor: 26.2%
Results: Table 2, Overall Utilization (2007-2016)

<table>
<thead>
<tr>
<th>Type of Utilization</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total expenditures</td>
<td>$3,736</td>
<td>$980</td>
</tr>
<tr>
<td>Office-based expenditures</td>
<td>$950</td>
<td>$352</td>
</tr>
<tr>
<td>Prescription medications</td>
<td>$596</td>
<td>$33</td>
</tr>
<tr>
<td>Office-based Visits</td>
<td>6.1</td>
<td>3</td>
</tr>
<tr>
<td>Prescription medications</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>
## Results: Table 3, Total Population with Diagnoses (2007-2016)

<table>
<thead>
<tr>
<th>Percent of Total Population with Disease Diagnoses</th>
<th>% of Pediatric Population in MEPS, 2007-2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Health diagnosis</td>
<td>16.7%</td>
</tr>
<tr>
<td>Asthma</td>
<td>15.5%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0.6%</td>
</tr>
<tr>
<td>Gastrointestinal Disease</td>
<td>5.1%</td>
</tr>
</tbody>
</table>
### Results: Table 4, Population Demographics Among Children, with Behavioral Health Diagnoses (2007-2016)

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Without BH Diagnosis</th>
<th>With BH Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 10-17</td>
<td>38.3%</td>
<td>70.1%</td>
</tr>
<tr>
<td>Male</td>
<td>49.4%</td>
<td>61.5%</td>
</tr>
<tr>
<td>White</td>
<td>79.5%</td>
<td>79.7%</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>78.7%</td>
<td>86.1%</td>
</tr>
<tr>
<td>Insured</td>
<td>96.5%</td>
<td>97.2%</td>
</tr>
<tr>
<td>Poor/ Near-Poor/ Low-Income</td>
<td>37.1%</td>
<td>42.3%</td>
</tr>
<tr>
<td>2007-2011</td>
<td>85.5%</td>
<td>14.5%</td>
</tr>
<tr>
<td>2012-2016</td>
<td>81.1%</td>
<td>18.9%</td>
</tr>
</tbody>
</table>
## Results: Table 5, Mean and Median Utilization, Behavioral Health (2007-2016)

<table>
<thead>
<tr>
<th>Type of use</th>
<th>With BH dx</th>
<th>Without BH dx</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>Total expenditures ($)</td>
<td>6,290*</td>
<td>2,545</td>
</tr>
<tr>
<td>Office-based exp ($)</td>
<td>1,741*</td>
<td>670</td>
</tr>
<tr>
<td>Prescription exp ($)</td>
<td>1,618*</td>
<td>481</td>
</tr>
<tr>
<td>Office-based visits (#)</td>
<td>12.6*</td>
<td>6</td>
</tr>
<tr>
<td>Prescription meds (#)</td>
<td>12.1*</td>
<td>8</td>
</tr>
</tbody>
</table>

*p ≤ .000
Results: Table 6, Mean and Median Utilization, Behavioral Health & Asthma (2007-2016)

<table>
<thead>
<tr>
<th>Type of use</th>
<th>With BH Diagnosis</th>
<th>Without BH Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With Asthma dx</td>
<td>Without Asthma dx</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>Total exp ($)</td>
<td>8,255***</td>
<td>3,591</td>
</tr>
<tr>
<td>Office-based exp ($)</td>
<td>2,068*</td>
<td>860</td>
</tr>
<tr>
<td>Prescription exp ($)</td>
<td>2,190*</td>
<td>1,141</td>
</tr>
<tr>
<td>Office-based visits (#)</td>
<td>15.9*</td>
<td>8</td>
</tr>
<tr>
<td>Prescription meds (#)</td>
<td>19.6*</td>
<td>14</td>
</tr>
</tbody>
</table>

*p ≤ .000. ***p ≤ .05.
Results: Table 7, Mean and Median Utilization, Behavioral Health & Diabetes (2007-2016)

<table>
<thead>
<tr>
<th>Type of use</th>
<th>With BH Diagnosis</th>
<th>Without BH Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With Diabetes dx</td>
<td>Without Diabetes dx</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>Total exp ($)</td>
<td>8,623</td>
<td>5,715</td>
</tr>
<tr>
<td>Office-based exp ($)</td>
<td>2,106</td>
<td>1,522</td>
</tr>
<tr>
<td>Prescription exp ($)</td>
<td>5,330</td>
<td>3,147</td>
</tr>
<tr>
<td>Office-based visits (#)</td>
<td>18.2**</td>
<td>11</td>
</tr>
<tr>
<td>Prescription meds (#)</td>
<td>31.2***</td>
<td>32</td>
</tr>
</tbody>
</table>

*p ≤ .000. **p ≤ .005. ***p ≤ .05.
Results: Table 8, Mean and Median Utilization, Behavioral Health & GI Diagnoses (2007-2016)

<table>
<thead>
<tr>
<th>Type of use</th>
<th>With BH Diagnosis</th>
<th>Without BH Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With GI dx</td>
<td>Without GI dx</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>Total exp ($)</td>
<td>7,724</td>
<td>3,093</td>
</tr>
<tr>
<td>Office-based exp ($)</td>
<td>2,264***</td>
<td>914</td>
</tr>
<tr>
<td>Prescription exp ($)</td>
<td>2,600</td>
<td>668</td>
</tr>
<tr>
<td>Office-based visits (#)</td>
<td>15.2*</td>
<td>8</td>
</tr>
<tr>
<td>Prescription meds (#)</td>
<td>16*</td>
<td>12</td>
</tr>
</tbody>
</table>

*p ≤ .000. **p ≤ .005. ***p ≤ .05.
Results: Table 9, Mean and Median Utilization, Behavioral Health & Before/After ACA

<table>
<thead>
<tr>
<th>Type of use</th>
<th>With BH Diagnosis</th>
<th></th>
<th>Without BH Diagnosis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total exp ($)</td>
<td>Mean 4,516*</td>
<td>Median 2,333</td>
<td>Mean 7,649**</td>
<td>Median 2,733</td>
</tr>
<tr>
<td></td>
<td>Office-based exp ($)</td>
<td>Mean 1,329*</td>
<td>Median 578</td>
<td>Mean 2,057*</td>
</tr>
<tr>
<td></td>
<td>Prescription exp ($)</td>
<td>Mean 1,273*</td>
<td>Median 526</td>
<td>Mean 1,882*</td>
</tr>
<tr>
<td></td>
<td>Office-based visits (#)</td>
<td>Mean 10.6*</td>
<td>Median 5</td>
<td>Mean 14.2*</td>
</tr>
<tr>
<td></td>
<td>Prescription meds (#)</td>
<td>Mean 11.1*</td>
<td>Median 7</td>
<td>Mean 12.8*</td>
</tr>
</tbody>
</table>

*p ≤ .000. **p ≤ .005. ***p ≤ .05.
Results: Odds Ratios

- Children with a behavioral health diagnosis were more likely to have any healthcare expenditures than children without a BH diagnosis.
  - OR, 3.5 (2.8, 4.3)*

- Children with asthma and with a BH diagnosis had higher odds of having healthcare expenditures than children with asthma and without a BH diagnosis.
  - OR, 2.2 (1.1, 4.5)**

- Children with a GI diagnosis and a BH diagnosis had higher odds of having healthcare expenditures compared to children with a GI diagnosis and without a BH diagnosis.
  - OR, 8.6 (1.1, 66.3)**

- The sample size was too small to provide accurate odds ratios for the odds of having healthcare expenditures for children with a diabetes diagnosis and a BH diagnosis.

*p ≤ .000. **p ≤ .001.
Results: High Utilizing Children & Odds Ratios

- Children in the top 10th percentile of total healthcare expenditures were more likely to have a BH diagnosis than children in the lowest 10th percentile of total healthcare expenditures.
  - OR, 8.7 (7.4, 10.2)*

- Children with asthma and in the top 10th percentile of total healthcare expenditures were more likely to have a BH diagnosis than children in the lowest 10th percentile.
  - OR, 9.7 (5.8, 16.3)*

- Children with a diabetes diagnosis and in the top 10th percentile of total healthcare expenditures were more likely to have a BH diagnosis than children in the lowest 10th percentile.
  - OR, 4.0 (0.4, 45.2)*

- Children with a GI diagnosis and in the top 10th percentile of total healthcare expenditures were more likely to have a BH diagnosis than children in the lowest 10th percentile.
  - OR, 10.1 (4.4, 23.2)*

*p ≤ .000. **p ≤ .05.
## Results: Table 17, High Utilizing Children, Mean Healthcare Costs

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 10(^{th}) percentile, with BH diagnosis</td>
<td>$1,869</td>
<td>$1,198</td>
</tr>
<tr>
<td>Top 10(^{th}) percentile, without BH diagnosis</td>
<td>$1,011</td>
<td>$1,083</td>
</tr>
<tr>
<td>Top 10(^{th}) percentile, all children</td>
<td>$1,096</td>
<td>$1,192</td>
</tr>
</tbody>
</table>
Conclusion

- Findings support idea that children with behavioral health diagnoses have different, higher mean and median healthcare expenditures compared to children without a BH diagnosis.

- Children with a BH diagnosis had higher odds of using healthcare resources than children without.

- Changes in healthcare expenditures and utilization are closely linked to office-based visits and prescription medications.

- Healthcare expenditures and utilization increase to different degrees with the presence of a BH diagnosis alone, a chronic condition alone, or both a BH and a chronic condition.

- May be useful in predicting which patients may be high utilizing patients in the future.
Implications

- ACA increased healthcare access, however the long-term status of ACA and its impact on the healthcare system in the United States is still unknown.

- Value Based Care model may continue to drive changes in how care is provided.
  - Insert case manager for children with BH diagnoses and a comorbid chronic condition
  - Develop interventions; co-locating specialty care and behavioral health

- Further research should examine healthcare cost and utilization based on order of diagnoses.

- Healthcare resources are finite; need to think creatively about how to provide ideal care to as many patients as possible.

- Possibly use this type of analysis for predictive analytics/ EMR integration.
Future Areas of Study

- Healthcare utilization for multiple complex children within a single household.
- BH diagnoses and number of chronic conditions.
- Consider differences in utilization by types of BH diagnosis.
- Further investigation into why mean total expenditures for children with diabetes alone is higher than for children with a BH diagnosis and diabetes.
- Investigation of utilization outcomes for different types of interventions (care coordination, care management, co-location/integration of services, etc.).
Future Areas of Study, cont’d.

- Impact of parent/caregiver/family characteristics and diagnoses on child healthcare utilization.
- Look at utilization for individual children longitudinally.
- Look at healthcare utilization through lens of clinical guidelines for care.
- Evaluate healthcare cost and utilization based on participant perceptions of healthcare access.
Limitations

- MEPS does not distinguish between prescription fills and refills, so not able to determine medication compliance.
- Dataset does not distinguish between types of office-based visits, such as sick visits or physicals.
- This study does not suggest causality between BH diagnosis, chronic condition, and healthcare utilization.
- MEPS data is self-reported, so it is subject to reporting error.


Questions?

Thank you for your time.