2-27-2020

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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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

Acknowledgements

- Marianna LaNoue, PhD, MS, Director of the Doctoral Program at JCPH
- Willie Oglesby, PhD, MBA, MSPH, FACHE, Interim Dean of JCPH
- 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.

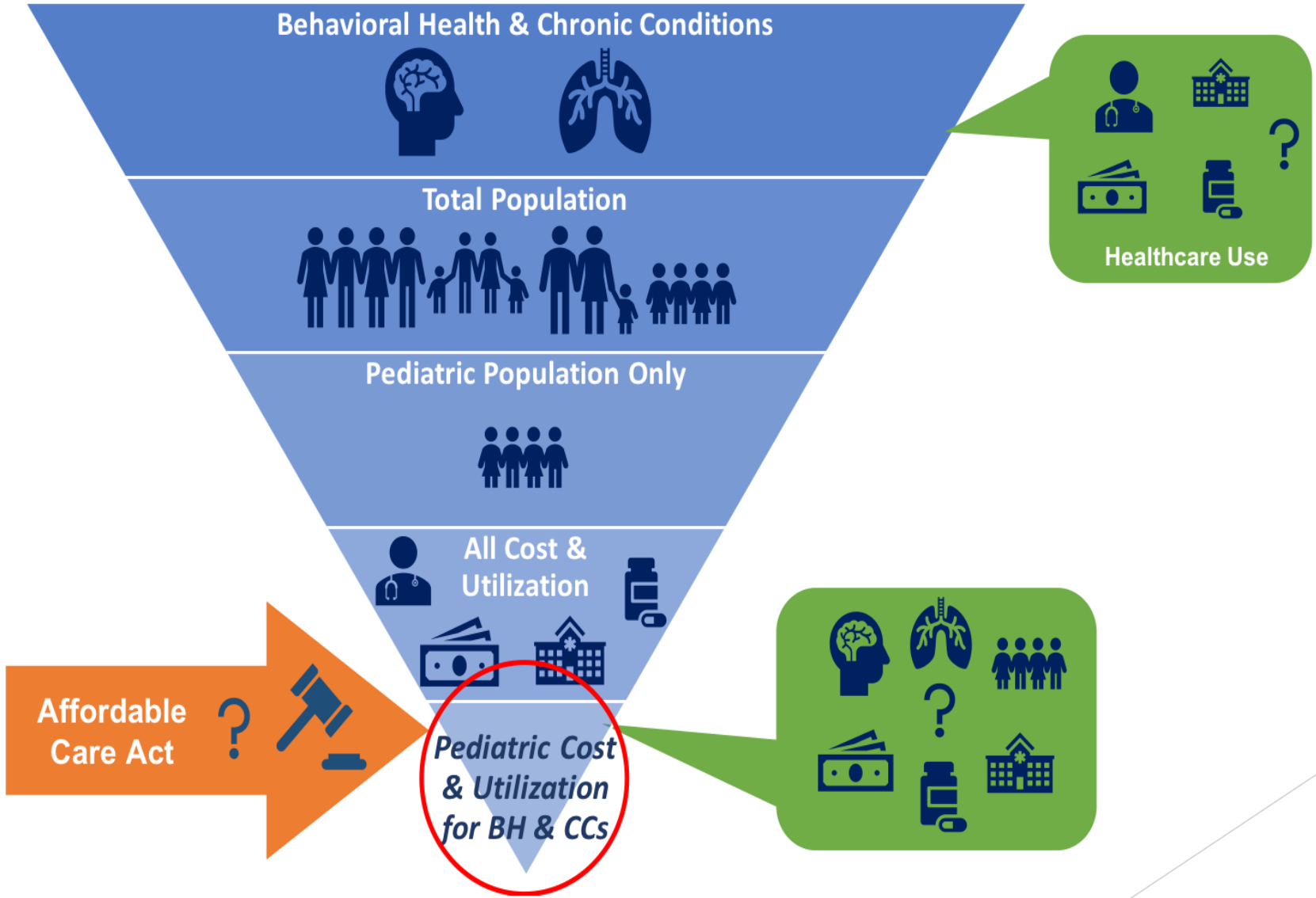
Introduction: Behavioral Health

- 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



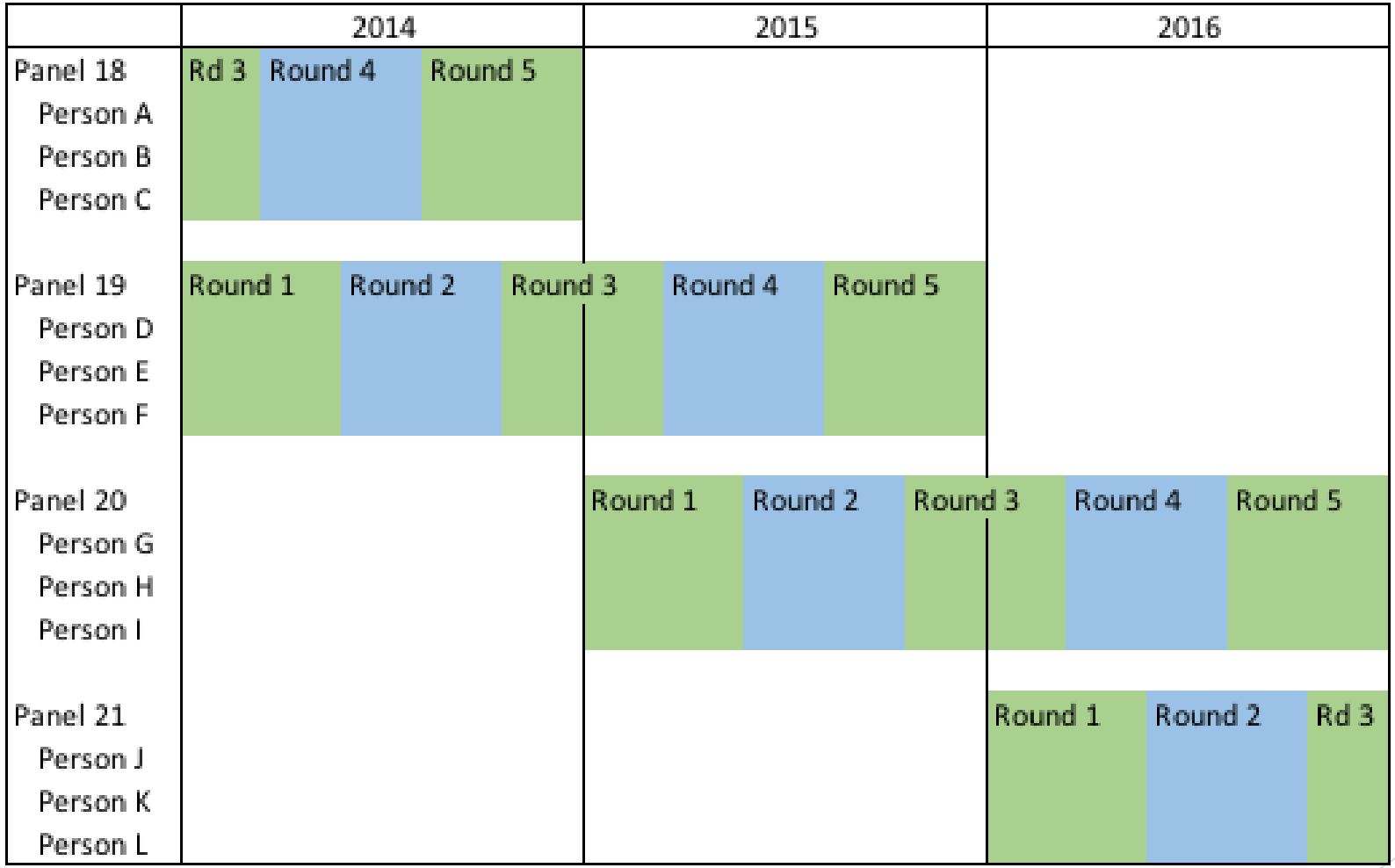
Methodology: Medical Expenditures Panel Survey (MEPS)

- 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



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.

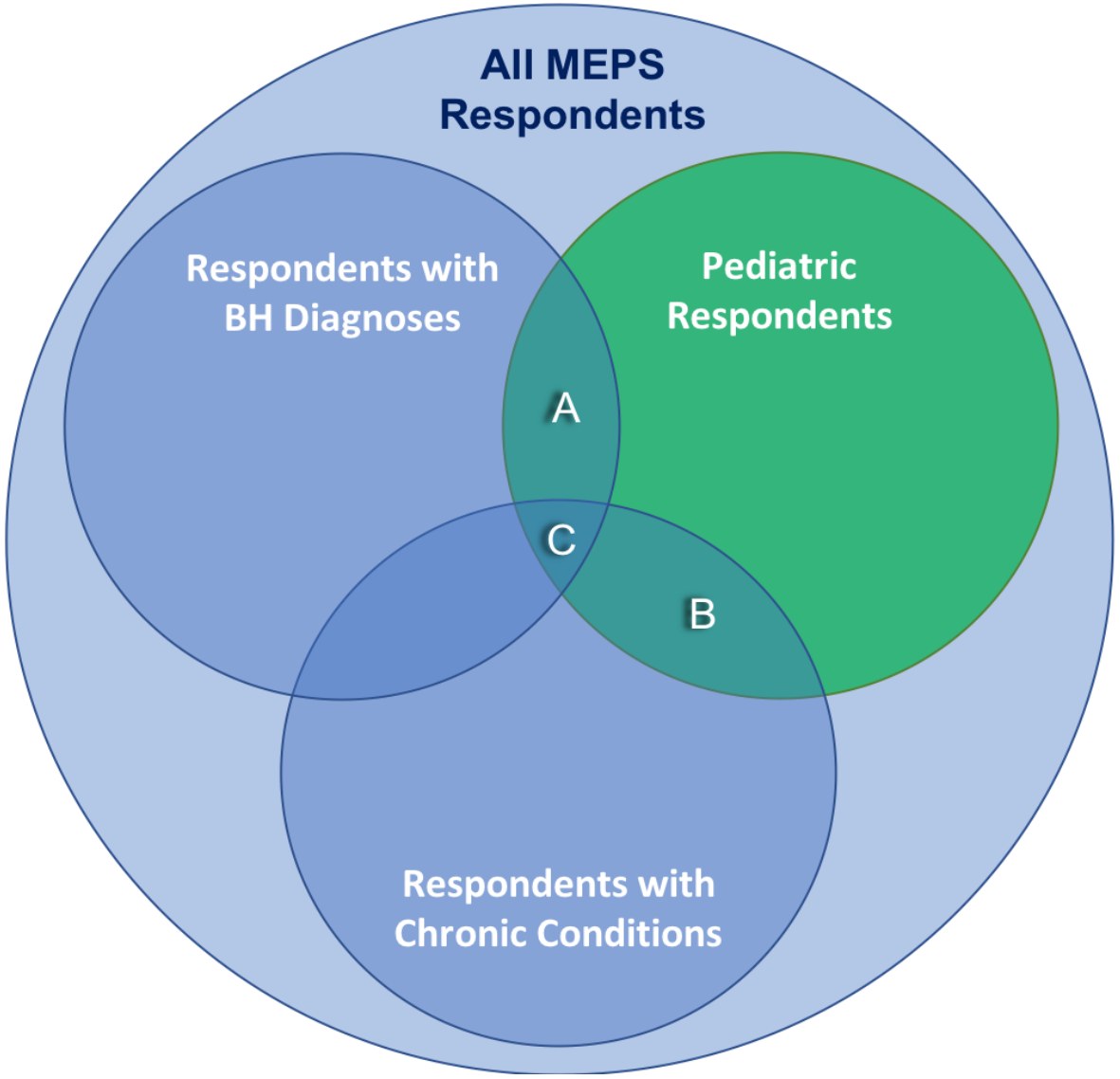
Methodology

- 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



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

- χ^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)

Type of Utilization	Mean	Median
Total expenditures	$3,736	$980
Office-based expenditures	$950	$352
Prescription medications	$596	$33
Office-based Visits	6.1	3
Prescription medications	5	2

Results: Table 3, Total Population with Diagnoses (2007-2016)

Percent of Total Population with Disease Diagnoses	% of Pediatric Population in MEPS, 2007-2016
Behavioral Health diagnosis	16.7%
Asthma	15.5%
Diabetes	0.6%
Gastrointestinal Disease	5.1%

Results: Table 4, Population Demographics Among Children, with Behavioral Health Diagnoses (2007-2016)

Demographic	Without BH Diagnosis	With BH Diagnosis
Age 10-17	38.3%	70.1%
Male	49.4%	61.5%
White	79.5%	79.7%
Non-Hispanic	78.7%	86.1%
Insured	96.5%	97.2%
Poor/ Near-Poor/ Low-Income	37.1%	42.3%
2007-2011	85.5%	14.5%
2012-2016	81.1%	18.9%

Results: Table 5, Mean and Median Utilization, Behavioral Health (2007-2016)

Type of use	With BH dx		Without BH dx	
	Mean	Median	Mean	Median
Total expenditures ($)	6,290*	2,545	3,224*	817
Office-based exp ($)	1,741*	670	792*	313
Prescription exp ($)	1,618*	481	391*	22
Office-based visits (#)	12.6*	6	4.8*	3
Prescription meds (#)	12.1*	8	3.6*	1

* p≤ .000

Results: Table 6, Mean and Median Utilization, Behavioral Health & Asthma (2007-2016)

Type of use	With BH Diagnosis				Without BH Diagnosis			
	With Asthma dx		Without Asthma dx		With Asthma dx		Without Asthma dx	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Total exp ($)	8,255***	3,591	5,757*	2,355	5,501***	1,514	2,845*	748
Office-based exp ($)	2,068*	860	1,653*	611	1,156*	401	731*	300
Prescription exp ($)	2,190*	1,141	1,463*	345	1,047*	236	282*	15
Office-based visits (#)	15.9*	8	11.7*	6	6.5*	4	4.5*	3
Prescription meds (#)	19.6*	14	10.1*	6	8.5*	5	2.8*	1

*p≤ .000. ***p≤ .05.

Results: Table 7, Mean and Median Utilization, Behavioral Health & Diabetes (2007-2016)

Type of use	With BH Diagnosis				Without BH Diagnosis			
	With Diabetes dx		Without Diabetes dx		With Diabetes dx		Without Diabetes dx	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Total exp ($)	8,623	5,715	6,261*	2,518	17,874	4,630	3,148*	811
Office-based exp ($)	2,106	1,522	1,737*	662	1,906	674	786*	312
Prescription exp ($)	5,330	3,147	1,572*	460	3,641	1,654	374*	22
Office-based visits (#)	18.2**	11	12.5*	6	7.1**	5	4.8*	3
Prescription meds (#)	31.2***	32	11.9*	7	19.6***	15	3.5*	1

*p≤ .000. **p≤ .005. ***p≤ .05.

Results: Table 8, Mean and Median Utilization, Behavioral Health & GI Diagnoses (2007-2016)

Type of use	With BH Diagnosis				Without BH Diagnosis			
	With GI dx		Without GI dx		With GI dx		Without GI dx	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Total exp ($)	7,724	3,093	6,112*	2,501	9,677	1,269	2,636*	791
Office-based exp ($)	2,264***	914	1,677*	638	1,183***	455	756*	301
Prescription exp ($)	2,600	668	1,496*	466	905	61	344*	20
Office-based visits (#)	15.2*	8	12.3*	6	6.8*	4	4.6*	3
Prescription meds (#)	16*	12	11.6*	7	7.5*	3	3.2*	1

*p≤ .000. **p≤ .005. ***p≤ .05.

Results: Table 9, Mean and Median Utilization, Behavioral Health & Before/After ACA

Type of use	With BH Diagnosis				Without BH Diagnosis			
	Before ACA (2007-2011)		After ACA (2012-2016)		Before ACA (2007-2011)		After ACA (2012-2016)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Total exp ($)	4,516*	2,333	7,649**	2,733	2,723*	750	3,750**	898
Office-based exp ($)	1,329*	578	2,057*	767	666*	274	926*	363
Prescription exp ($)	1,273*	526	1,882*	429	310*	23	476*	22
Office-based visits (#)	10.6*	5	14.2*	6	4.5*	3	5.1*	3
Prescription meds (#)	11.1*	7	12.8*	8	3.6*	2	3.5*	1

*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 side 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

	Mean Total Healthcare Expenditures	
	Before ACA (2007-2011)	After ACA (2012-2016)
Top 10th percentile, with BH diagnosis	$1,869	$1,198
Top 10th percentile, without BH diagnosis	$1,011	$1,083
Top 10th percentile, all children	$1,096	$1,192

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.

References

- Bell, J., Turbow, S., George, M., & Ali, M. K. (2017). Factors associated with high-utilization in a safety net setting. *BMC Health Serv Res, 17*(1), 273.
- Fondow, M., Zeidler Schreiter, E., Thomas, C., Grosshans, A., Serrano, N., & Kushner, K. (2017). Initial examination of characteristics of patients who are high utilizers of an established primary care behavioral health consultation service. *Fam Syst Health, 35*(2), 184-192.
- Hardy, M., Cho, A., Stavig, A., Bratcher, M., Dillard, J., Greenblatt, L., & Schulman, K. (2018). Understanding Frequent Emergency Department Use Among Primary Care Patients. *Popul Health Manag, 21*(1), 24-31.
- Heincelman, M., Schumann, S. O., Riley, J., Zhang, J., Marsden, J. E., Mauldin, P. D., & Rockey, D. C. (2016). Identification of High Utilization Inpatients on Internal Medicine Services. *Am J Med Sci, 352*(1), 63-70.
- Berry, J. G., Ash, A. S., Cohen, E., Hasan, F., Feudtner, C., & Hall, M. (2017). Contributions of Children With Multiple Chronic Conditions to Pediatric Hospitalizations in the United States: A Retrospective Cohort Analysis. *Hosp Pediatr, 7*(7), 365-372.
- Leininger, L. J., Saloner, B., & Wherry, L. R. (2015). Predicting high-cost pediatric patients: derivation and validation of a population-based model. *Med Care, 53*(8), 729-735.

Questions?

Thank you for your time.