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Health care delivery science: a primer

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UVM Legislative Policy Summit

Davis Center

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Objectives

- Distinguish health care delivery science from basic science
- Offer a conceptual overview of different kinds of health care delivery science
- Provide examples from UVM researchers

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Basic science versus health care delivery science

	Basic biomedical science	Health care delivery science
Data sources	Tissues, blood samples, tissue cultures, proteins, DNA, RNA	Interviews, questionnaires, health care claims, electronic health records, public health data
Disciplines	Anatomy, physiology, biochemistry, molecular biology, biophysics, bioinformatics	Epidemiology, biostatistics, social sciences, implementation science, improvement science, clinical informatics
Objectives	Understand basic human biology; develop basis for new therapies	Measure the health of individuals and populations, determine how to apply therapies most effectively to individuals and populations

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Delivery science questions

- Which patients/populations are in need of health care services?
- What would work to improve their health status?
- Under what circumstances would interventions work?
- How can interventions already known to work be disseminated more broadly in the population?
- What would be the cost?

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Delivery science methods issues

- Data sources
  - *Primary* data collected for research purposes from patients or clinicians
    - Interviews, surveys
  - *Secondary* data collected for another purpose but used for study
    - Claims (billing) data
    - Electronic health record data
- Data collection
  - Retrospective – looking backward
  - Prospective – looking forward
- Experimental, quasi-experimental, nonexperimental
  - Randomized controlled trial (RCT) – true experiment, the "gold standard"
  - For issues that cannot be studied experimentally…
    - Observational designs controlling through statistical methods
    - Uncontrolled investigations

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Variations in Mental Health Diagnosis and Prescribing Across Pediatric Primary Care Practices

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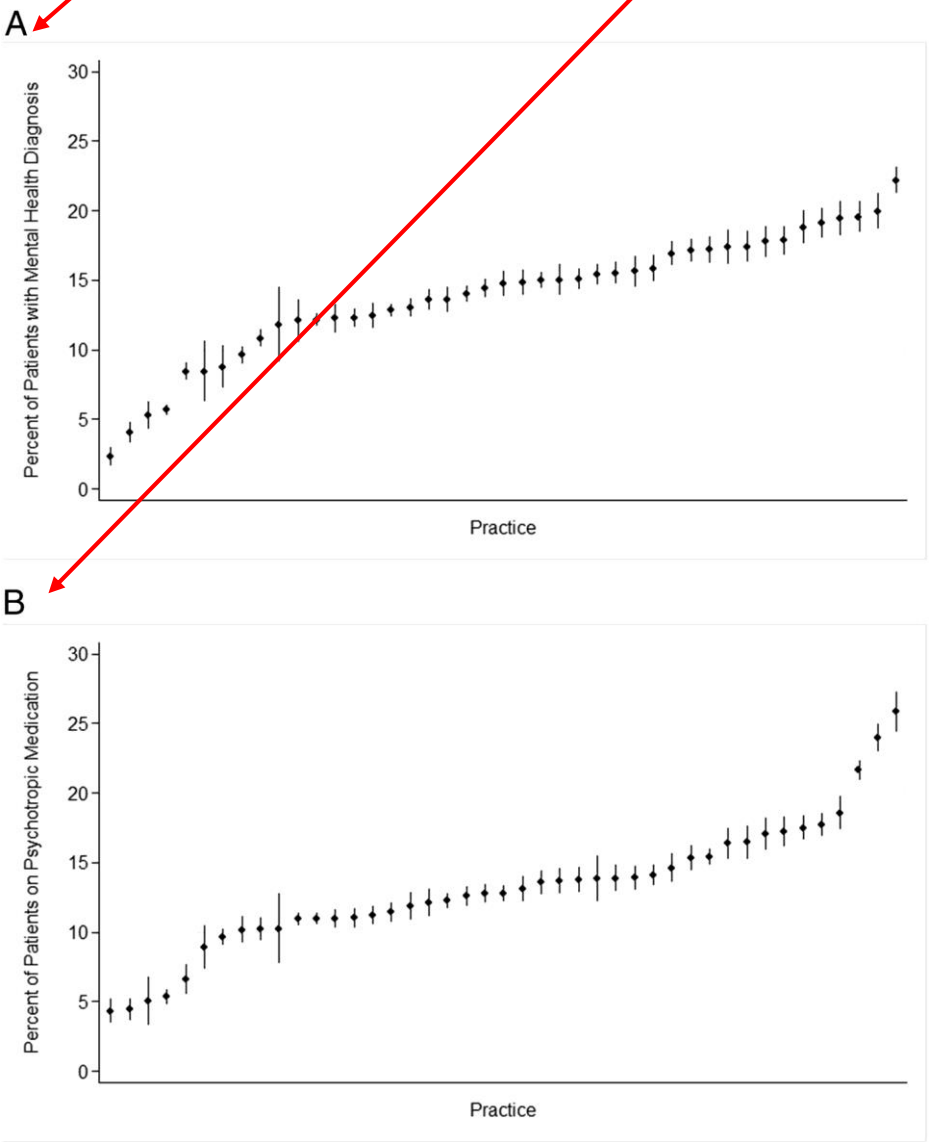
- Design
  - Electronic health record data (secondary) analyzed *retrospectively*
  - Patients 4-18 years of age seen in 43 U.S. primary care pediatric practices from 2009-2014
- Findings
  - Among ~295,000 patients, 15% received a mental health diagnosis and 14% were prescribed psychotropic medication
  - Wide between-practice variation in rate of diagnosis (2.3% - 22.2%)
  - Wide between-practice variation in proportion of children receiving prescription (4.3% - 25.8%)
  - Variations associated only with availability of psychiatrist in community

Variation in any mental health diagnosis (A) and any psychotropic medication (B) across 43 primary care practices, with 95% confidence intervals.



Stephanie L. Mayne et al. *Pediatrics* doi:10.1542/peds.2015-2974

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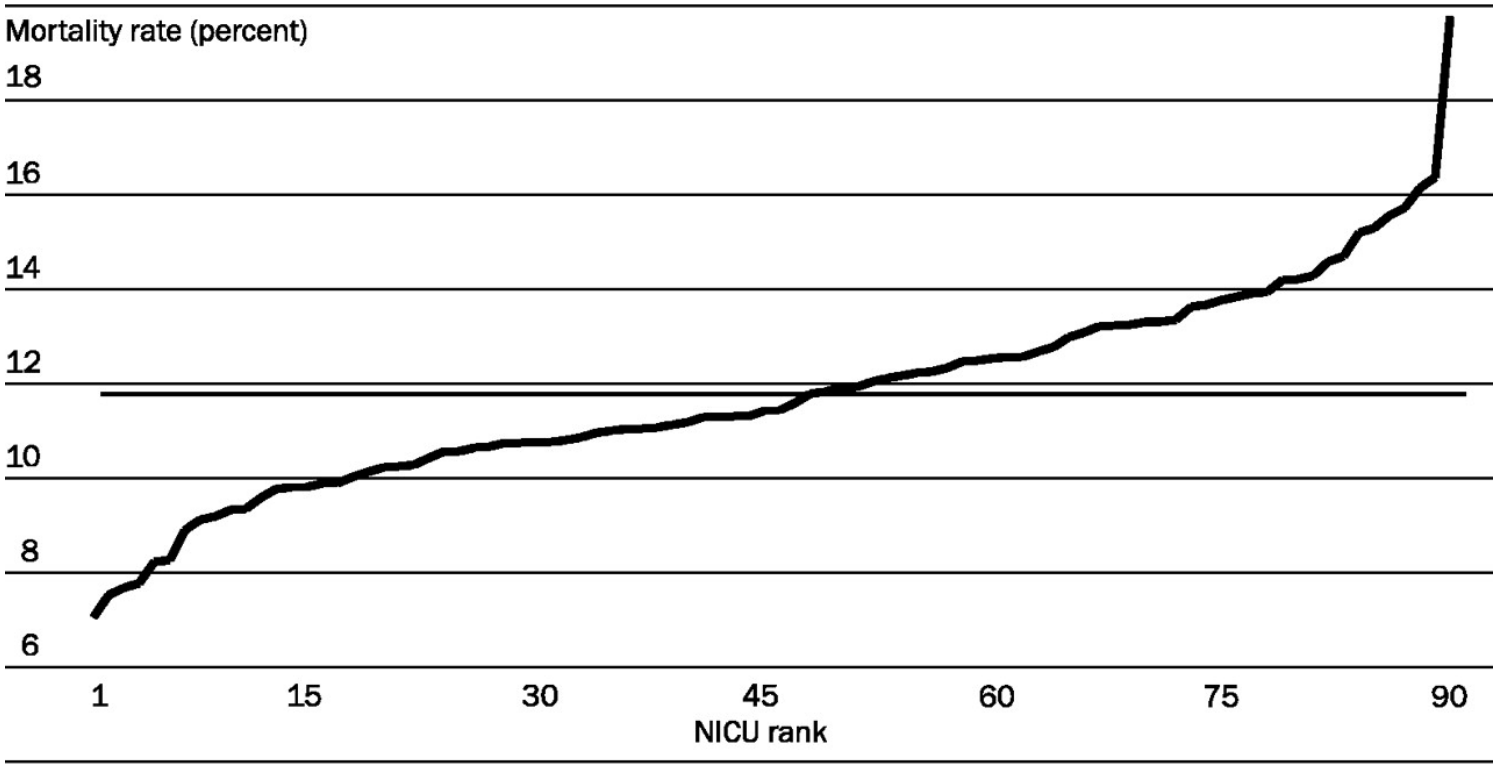
Vermont Oxford Network (https://public.vtoxford.org/)

- Headquartered in Vermont
  - Jeffrey Horbar, MD – Chief Executive & Scientific Officer
  - Roger Soll, MD – President
- International network of >1,000 neonatal intensive care units (NICUs)
- 2.2 million infants enrolled since 1990
- Participating NICUs participate in quality improvement initiatives as well as clinical trials
- Voluntary structured data are collected *prospectively* for research and quality improvement on very low birthweight (VLBW) newborns < 1500 grams (< 3lbs 5oz)
- 90% of VLBW infants in U.S.
- Striking variation in risk-adjusted mortality rates between hospitals

Rankings Of Selected Neonatal Intensive Care Units (NICUs) Based On Estimates Of Risk-Adjusted Twenty-Eight-Day Mortality For 1999.

EXHIBIT 1

Rankings Of Selected Neonatal Intensive Care Units (NICUs) Based On Estimates Of Risk-Adjusted Twenty-Eight-Day Mortality For 1999



SOURCE: Authors' calculations based on data from the Vermont Oxford Network (VON) database.

NOTES: Fifteen NICUs with above-average mortality rates had significantly higher mortality than thirteen NICUs with below-average mortality rates. The horizontal line denotes the national average. The sample of NICUs shown includes all VON member hospitals that were members of the network continuously from 1994 to 1999. Estimates for twenty-eight-day mortality rates in 1999 pool information from all years 1994–1999 and are adjusted for reliability using a hierarchical method. Standard errors for the estimates range from one to two percentage points of the mean.

Jeannette A. Rogowski et al. Health Aff 2004;23:88-97

HealthAffairs

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Health care delivery science

- What's in a name?
  - Health services research versus health care delivery science
- Health care delivery science adds "improvement science," a systematic, scientific approach to quality improvement to traditional health services research
- Improvement science is new, with methodologies still under development
- Improvement science requires genuine partnerships between academicians and front-line clinicians
  - e.g., Vermont Oxford Network
- Several other examples at UVM's Larner College of Medicine
  - Vermont Child Health Improvement Program (VCHIP)

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VCHIP
VERMONT CHILD HEALTH IMPROVEMENT PROGRAM

Mission

to optimize the health of Vermont children
by initiating and supporting *measurement-based* efforts to
enhance private and public child health practice

A partnership of:

University of Vermont Department of Pediatrics, OB, FM & Psychiatry
Vermont Chapter of the American Academy of Pediatrics
Vermont Chapter of the American Academy of Family Physicians
Vermont Department of Health
Department of Vermont Health Access (Medicaid)
Vermont Agency of Human Services
Managed Care Organizations

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Vermont Child Health Improvement Program (VCHIP)

- Founded in 1999 in the Department of Pediatrics with funding from the College of Medicine, Packard Foundation, and Medicaid matching funds
- Judy Shaw, MPH, EdD – Director
- Senior Advisory Committee meets monthly to inform VCHIP direction
- Numerous one-time quality improvement projects
- More recently, developed a quality improvement network of 40+ pediatric and family medicine practice sites – Child Health Advances Measured in Practice (CHAMP)
  - Longitudinal data collection via chart audit
  - Yearly quality improvement projects

ARTICLE

Statewide Quality Improvement Outreach Improves Preventive Services for Young Children

Judith S. Shaw, RN, MPH, Richard C. Wasserman, MD, MPH, Sara Barry, MPH, Thomas Delaney, PhD, Paula Duncan, MD, Wendy Davis, MD, Patricia Barry, MPH

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The authors have indicated they have no financial relationships relevant to this article to disclose.

ARTICLE

Improving Newborn Preventive Services at the Birth Hospitalization: A Collaborative, Hospital-Based Quality-Improvement Project

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The authors have indicated they have no financial relationships relevant to this article to disclose.

QUALITY REPORT

Improvement in Adolescent Screening and Counseling Rates for Risk Behaviors and Developmental Tasks

AUTHORS: Paula Duncan, MD,[a] Barbara Frankowski, MD, MPH,[a] Peggy Carey, MD,[b] Emily Kallock, LICSW,[a] Thomas Delaney, PhD,[a] Rebecca Dixon, MD,[c] Ana Garcia, MPA,[d] and Judith S. Shaw, EdD, MPH, RN[a]

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abstract

BACKGROUND: High-quality preventive services for youth aged 11 to 18 include assessment and counseling regarding health behavior risks and developmental tasks/strengths of adolescence. Nationally, primary care health behavior risk screening and counseling rates lag considerably behind other preventive health services. The purpose of this project was to assist pediatric and family medicine practices to make

Increasing Immunization Compliance by Reducing Provisional Admittance

The Journal of School Nursing
1-12

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jsn.sagepub.com
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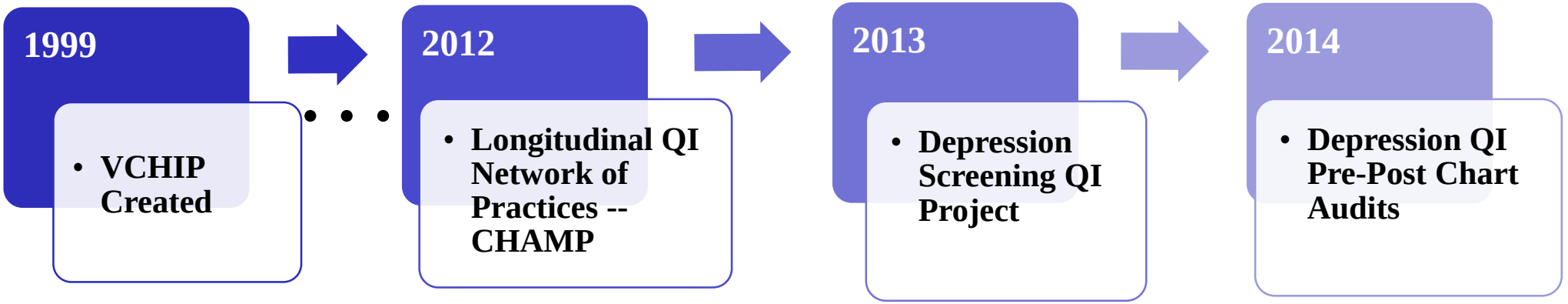
Quality Improvement in Primary Care for over 16 years



VCHIP's CHAMP, 5th year, over 40 practices, yearly QI efforts

- Immunizations
- **Depression Screening**
- Healthy Weight
- Asthma Plans
- Accountable Care

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Background:
Adolescent depression screening in primary care

Why is this important?

- Major depression occurs in 11.0% of adolescents lifetime and 7.5% annually (Avenevoli et al., 2015)
- 17% considered suicide and 8% attempted (CDC, 2014)

What can be done?

- Universal depression screening is recommended for adolescents in primary care (United States Preventive Services Task Force, 2016)

How are we doing?

- Universal depression screening in primary care remains low, and effective quality improvement (QI) efforts are needed

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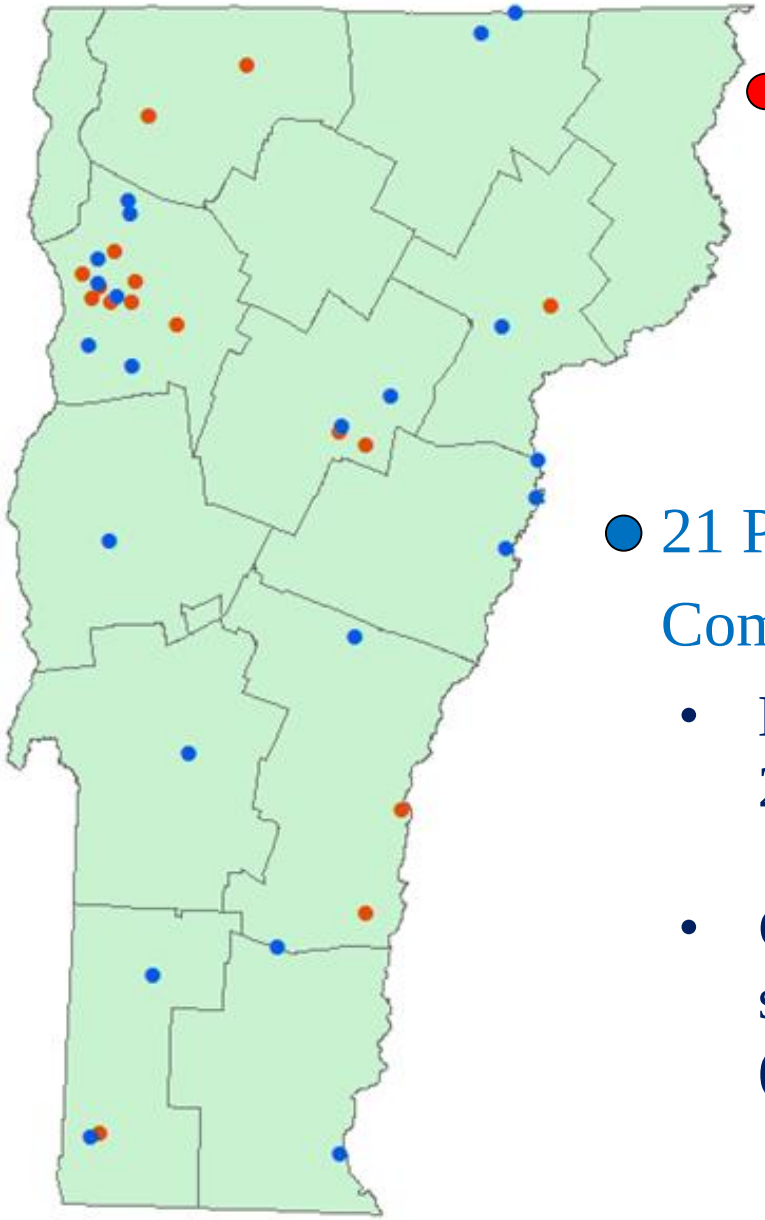
Methods:
Adolescent depression screening QI project



- 17 Pediatric Practices participating in 2013 Depression Quality Improvement (QI)
  - N=17 of 35 practices in 2012 QI network
  - Monthly MOC data reports (N=10/practice)

- 21 Pediatric and Family Medicine Comparison Practices
  - N=17 QI-participating vs. N=21 controls in 2014 QI network
  - **Outcome**: Proportion of 14-16 year olds screened for depression from chart audits (N=50/practice)

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Methods:

Research Question 1: Did adolescent depression screening improve over time at practices participating in QI?

- **Target:** 95% screened for depression

Research Question 2: Were adolescent depression screening rates higher at participating practices compared to controls practices?

- **Hypothesis**: Depression screening is higher at QI-participating practices compared to control practices
- **Statistics**: Generalized linear mixed effects logistic regression model, accounting for the correlation due to clustering of patients within practices and controlling for confounders

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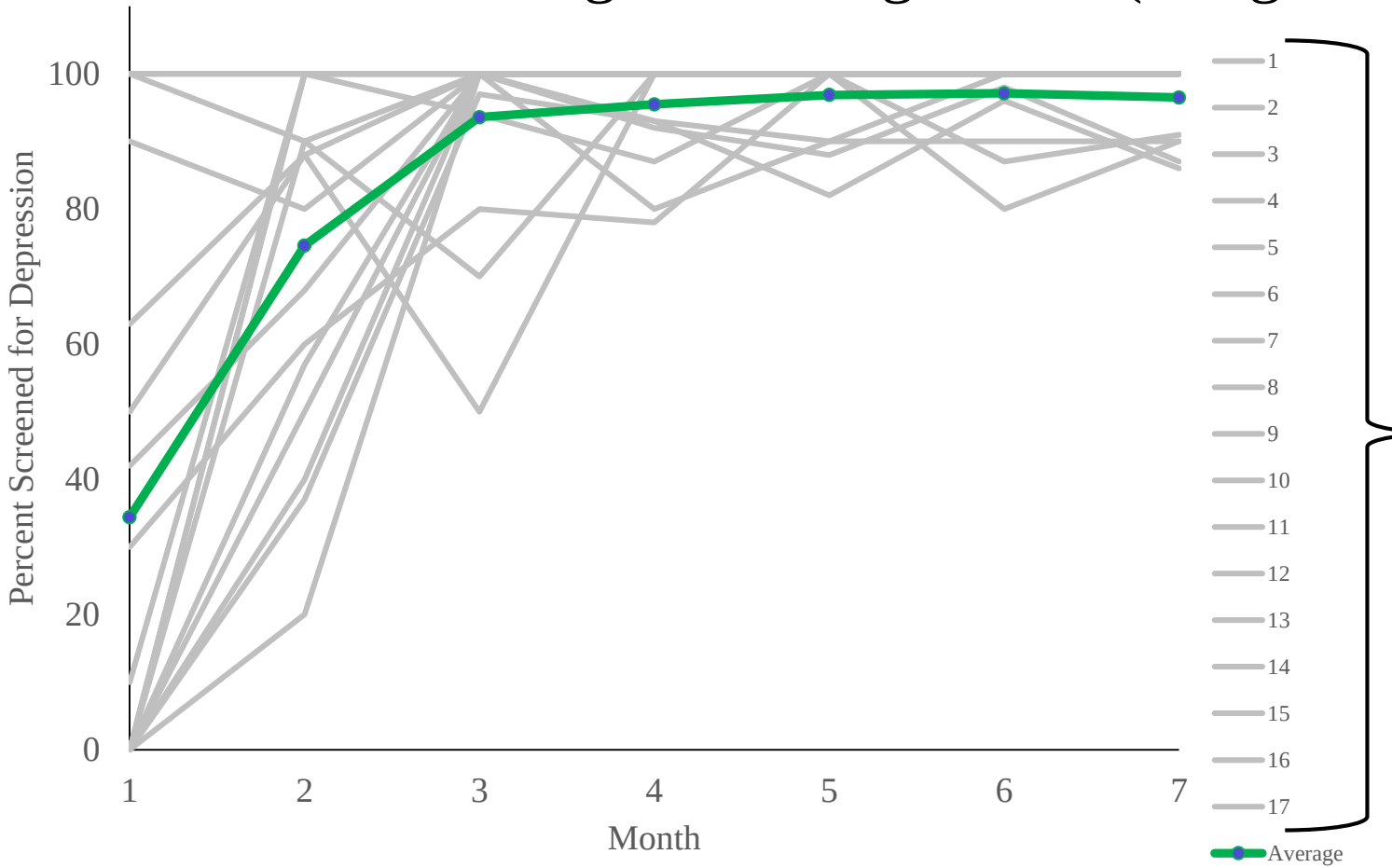
Results: Depression Screening Increased Over Time

- Goal set at 95% universal depression screening
- Month 1: Average screening = 34% (Range 0 – 100%)
- Months 5,6,7: Average screening = 97% (Range 82 – 100%)



At least 10 patient records sampled from each of 17 practices

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Results:
Differences Between Participants and Controls

Table 1:
QI-participating vs. control practices' patient & practice characteristics

	QI-Participating Practices (N=17)	Control Practices (N = 21)	*P*-value
Practice Characteristics n* (%)			
Largest Metropolitan Area	398 (47)	289 (31)	<.0005
Federally Qualified / Certified Rural	99 (12)	258 (28)	<.0005
Patient Characteristics n (%)			
Male	404 (48)	441 (48)	0.976
Medicaid	290 (34)	358 (39)	0.047
Depression Screening n (%)			
2014 Yes	756 (89)	692 (75)	<.0005
2012 Yes	264 (33)	261 (34)	0.366
2012 No visit	73 (9)	104 (13)	0.005

* n = number of adolescents

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Results: QI-participants better than controls

Table 2: Odds of Receiving Depression Screening in 2014 for patients at QI-participating practices compared to controls, adjusting for listed confounders

Variable	Adjusted Odds Ratio	Standard Error	95% Confidence Interval Lower (-)	95% Confidence Interval Higher (+)	*P*-value
QI Participant (Yes vs. No)	**3.53**	**2.04**	**1.13**	**10.98**	**0.029**
Patient Insurance (Medicaid vs. Other)	0.83	0.15	0.59	1.18	0.300
Sex (Male vs. Female)	0.68	0.12	0.48	0.95	0.023
Screened in 2012					
(Yes vs. No)	2.88	0.71	1.78	4.67	<.0005
(Missed Visit vs. No)	1.41	0.37	0.83	2.37	0.201
Largest Metropolitan Area (Yes vs. No)	1.74	1.05	0.53	5.65	0.358
Practice Federally Qualified (Yes vs. No)	0.59	0.41	0.15	2.34	0.451

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Several limitations

- Practice selection was not random
- No baseline trend data
- Limited follow up so far
- Small samples in each practice

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Conclusion

- Health care delivery science differs in many ways from basic science and extends beyond traditional health services research
- Some of health care delivery science is a “work in progress”
- The gold standard for health care delivery science remains the true experiment, the randomized controlled trial (RCT)
- Dr Littenberg will present an example of an important and ambitious RCT now under way