Collaboration for Vaccine Education and Research

Barbara Pahud MD MPH

Associate Professor of Pediatrics

Children's Mercy Hospital, Kansas City

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Resident training on vaccines

- There are no standard methods for training physician residents on important factors related to vaccines and vaccination
- We assume they are being adequately trained and have sufficient knowledge, but they don't!
- Majority of pediatric program directors and residents report that vaccine education is valuable and needed

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COVER

[1]CDC, Ten Great Public Health Achievements, MMWR, 2011
[2]Williams, Formal training in vaccine safety to address parental concerns not routinely conducted in U.S. pediatric residency programs, Vaccine, 2014

What is CoVER?

- The Collaboration for Vaccination Education and Research
- Created to develop, evaluate and improve vaccine education for health care professionals and trainees
  - First project: create a comprehensive curriculum for FM and Pediatric residency programs

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CoVER

Objectives-Pilot

- **Objective 1**: To establish the Collaboration for Vaccination Education and Research (CoVER), its structure, and plan for resident curriculum development.
- **Objective 2:** To design and develop a competency-based vaccine curriculum for pediatric and FM residents that will utilize a flipped learning approach and in–person training.
- **Objective 3:** To implement and evaluate the effectiveness of the vaccine curriculum.
- **Objective 4**: To analyze collected data from the project and disseminate the results.

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CMH

Barbara Pahud, MD, MPH (Principal Investigator)-Children's Mercy Hospital, Pediatric Infectious Diseases bapahud@cmh.edu

Sharon Humiston, MD, MPH, FAAP (Co-Investigator)-Children's Mercy Hospital Emergency Medicine, Primary Investigator, AAP/CDC vaccine co-op agreements, Associate Director for Research, Immunization Action Coalition sghumiston@cmh.edu

Kadrive Lewis, Ed.D (Co-Investigator)-Children's Mercy Hospital, Director of Evaluation and Program Development, Graduate Medical Education kolewis@cmh.edu

STFM

Donald Middleton, MD (Co-Investigator)-University of Pittsburgh School of Medicine, Family Medicine, University of Pittsburgh Medical Center St. Margaret's Vice President of Family Practice Education, Society for Teachers of Family Medicine Immunization Education Chair middletondb@upmc.edu

Vanderbilt

Elizabeth Williams, MD, MPH (Co-Investigator)-Vanderbilt University School of Medicine, General Pediatrics, Vanderbilt Vaccine Research Program elizabeth.williams@Vanderbilt.edu

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Objectives

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CoVER Roundtable 2016

- Medical education experts, vaccine experts and residency program directors met to determine critical components and structure for optimal vaccine resident training

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Roundtable, October 2016

Henry Bernstein, DO-Steven and Alexandra Cohen Children's Medical Center of NY, General Pediatrics Hbernstein@northwell.edu

Sean T. O'Leary, MD-Children's Hospital Colorado, Pediatric Infectious Diseases Sean.O'Leary@childrenscolorado.org

Mark Sawyer, MD (webex)-Rady Children's Hospital San Diego, Pediatric Infectious Diseases mhsawyer@ucsd.edu

Michael T. Brady, MD-Nationwide Children's, Pediatric Infectious Diseases Michael.Brady@nationwidechildrens.org

Gary S. Marshall, MD-University of Louisville Physicians, Pediatric Infectious Diseases gary.marshall@louisville.edu

Edgar Marcuse MD, MPH-University of Washington, Emeritus Professor, Pediatrics ekmarcuse@gmail.com

Tina Q. Tan, MD-Ann & Robert H. Lurie Children's Hospital of Chicago, Pediatric Infectious Diseases titan@luriechildrens.org

Ada M. Fenick, MD-Yale School of Medicine, General Pediatrics, Editor, Yale Primary Care Pediatrics ada.fenick@yale.edu

Pamela Georgia Rockwell, DO-University of Michigan, Family Medicine prockwel@med.umich.edu

Jonathan Temte, MD, PhD-University of Wisconsin School of Medicine and Public Health, Family Medicine jon.temte@fammed.wisc.edu

Melissa Klein, MD, MEd-Cincinnati Children's, Director, Residency Primary Care and Community Pediatrics, Associate Program Director, Education Section, General and Community Pediatrics melissa.klein@cchmc.org

Katherine Connor, MD, MSPH-Johns Hopkins University School of Medicine, General Pediatrics and Adolescent Medicine kconno14@jhmi.edu

Katie Milewski, MPH (webex)-AAP, Program Manager, Immunizations KMilewski@aap.org

Jasjit Singh, MD-Children's Hospital of Orange County, Associate Director, Pediatric Infectious Diseases jsingh@CHOC.org

Paul M. Darden, MD-University of Oklahoma Health Sciences Center, General and Community Pediatrics Paul-Darden@ouhsc.edu

Stacy Brungardt, CAE-Society for Teachers of Family Medicine, Executive Director sbrungardt@stfm.org

(Terri) Christine Phillips-Executive Director, Pediatric Infectious Diseases Society cphillips@idsociety.org

Raymond A. Strikas, MD, MPH, FACP-CDC, Lead, Education Team, Immunization Services Division ras8@cdc.gov

Andrew Kroger, MD, MPH-National Center for Immunization and Respiratory Diseases at the CDC, Medical Officer aok2@cdc.gov

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The CoVER Curriculum

- 4 modules were developed using interactive e-learning software (Rise Articulate)
  - Vaccine fundamentals
  - Vaccine preventable diseases
  - Vaccine safety
  - Vaccine hesitancy and communication
- 1 in-person training guide developed
  - Focus on vaccine communication techniques for HPV and influenza vaccine

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The Modules

- Vaccine Fundamentals
- VPDs
- Vaccine Safety
- Vaccine Communication

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CoVER RCT

26 FM and Peds programs participated in an RCT

- July 2017: Pre-Survey
- August 2017 → Randomization
  - adjusting for residency type FM vs Peds
- September 2017-May 2018
  - 14 sites randomized to receive the **CoVER Curriculum**
  - 12 sites randomized to be **Controls**
- May - July 2018 : Post-Survey

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Survey Pre and Post

Anonymous 29-item survey with items including

1) Vaccine ***knowledge*** *CoVER* n-14
2) ***Attitudes/hesitancy**** n-7
3) Vaccine **confidence** *CoVER* n-3
4) Demographics *CoVER* n-5

*Adapted from Parent Attitudes about Childhood Vaccines (PACV) Survey[1]

Created by CoVER

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[1] Opel, Human Vaccines, 2011

Example ? Module 2

8. A college student presents with the acute onset of fever, difficulty eating, and marked enlargement and tenderness of the parotid gland. Which one of the following is a complication of this suspected vaccine-preventable viral infection?

a. Congenital malformations

b. Permanent hearing loss

c. Intussusception

d. Aplastic anemia

60% correct

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Example ? Module 3

9. Which one of the following conditions is a contraindication to receiving MMR vaccine?

a. HIV infection with 20% of total CD4+ cell count
b. Liver transplant
c. End stage renal disease on hemodialysis
d. Asplenia and persistent complement deficiency

25% correct

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Survey Completion

26 Sites, N-1447 Residents			
	Pre-Survey	**Pre+Post Survey**	**Post-Survey**
Answered	N-737 (51%)	N-268 (19%)	N-540 (37%)
Excluded (no institution listed)	N-7		N-13
Total Included	**N-730 (50%)**	**N-268 (19%)**	**N-527 (36%)**
CoVER	N-400/730 (55%)	N-129 (48%)	N-233/527 (44%)
Control	N-330/730 (45%)	N- 139 (52%)	N- 294/527 (56%)

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Demographics
Pre & Pre/Post

		Pre-Survey Only (N=469)	Pre/Post-Survey (N=268)
Study Arm			
0.006	CoVER -- freq. (col%)	271 (58.7%)	129 (48.1%)
Resident Year			
	PGY1	164 (35.5%)	98 (36.6%)
	PGY2	138 (29.9%)	92 (34.3%)
	PGY3	145 (31.4%)	74 (27.6%)
	PGY4	15 (3.2%)	4 (1.5%)
Resident Type			
	Pediatrics	273 (58.2%)	165 (61.6%)
	Family Medicine	129 (27.5%)	79 (29.5%)
	Med/Peds	46 (9.8%)	20 (7.5%)
	Other	21 (4.5%)	4 (1.5%)

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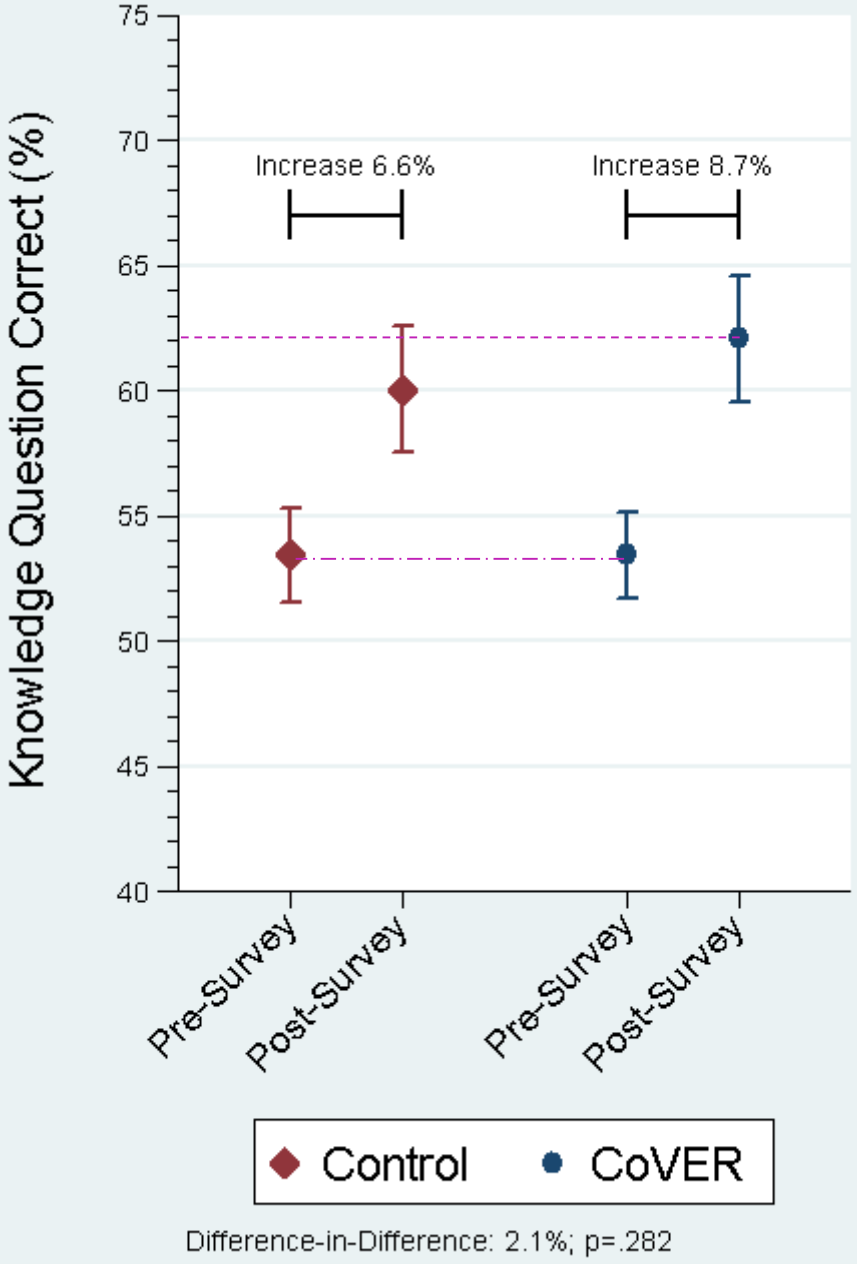
Resident Knowledge

Knowledge by Arm

- Randomization worked
- Knowledge increased in both groups
  - Cover > control
- Effect based on “intention to treat”



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Knowledge by Program Type

Resident Type	*Arm*	*Pre-Survey*	*Post-Survey*	*Delta*	*Difference-in-Difference*	*p-value*
Pediatrics						
	Control	54.9%	63.1%	8.2%	1.7%	0.4695
	CoVER	56.2%	66.1%	9.9%		
Family Medicine						
	Control	51.1%	52.5%	1.4%	6.5%	0.0809
	CoVER	47.9%	55.8%	7.9%		

- FM started with lower knowledge than Peds
- Greater benefit in FM programs with Cover

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Resident Attitudes/Hesitancy

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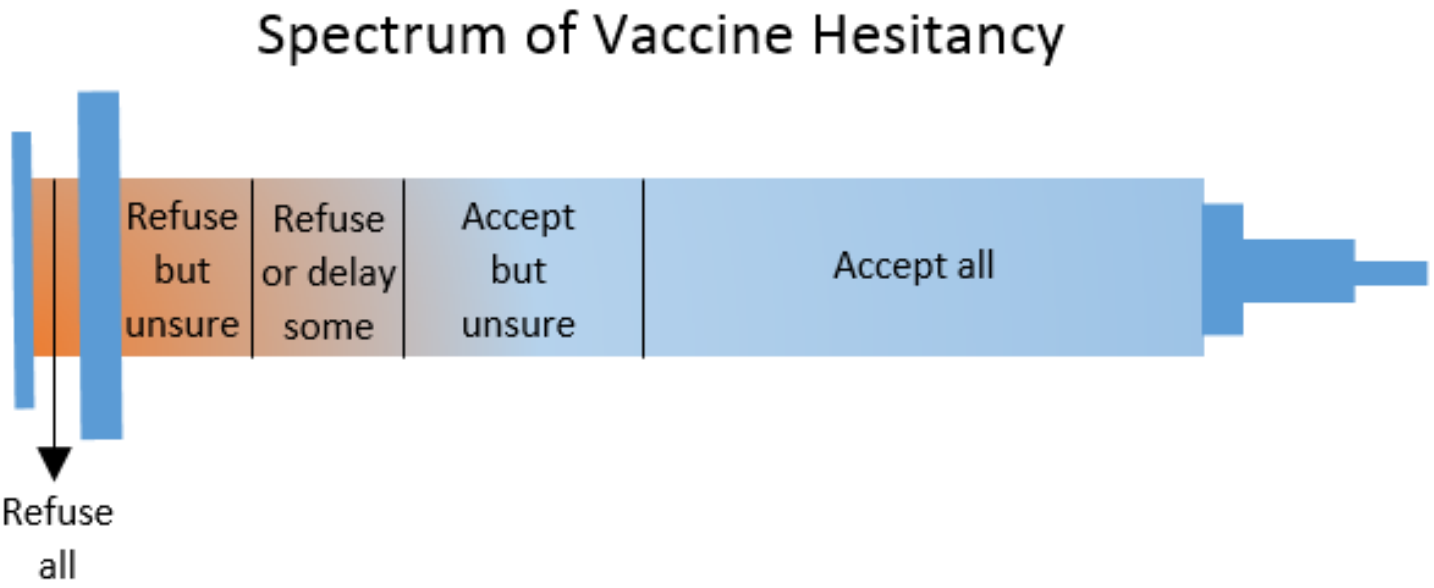
Vaccine Hesitancy

- Express the spectrum of attitudes toward vaccines
- Heterogenous group who tend to have beliefs that fall between those of vaccine acceptors and rejectors on an immunization continuum[1]



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[1] Benin, Pediatrics 2006

Hesitancy

Overall, how hesitant about childhood vaccines would you consider yourself to be?

a. Not at all hesitant

b. Not too hesitant

c. Not sure

d. Somewhat hesitant

e. Very hesitant

'The response category "not sure" was used in the Likert scale formats because we felt that this was an answer that reflected vaccine hesitancy'[1]

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1 Opel, Development of a survey to identify vaccine-hesitant parents, Human Vaccines, 2011

Overall, how hesitant about childhood vaccines would you consider yourself to be?

	Freq (N=730)	Percent
Not at all hesitant	627	86.1%
Not too hesitant	79	10.9%
Not sure	8	0.1%
Somewhat hesitant	14	1.9%

**there are two respondents who didn't answer this question*

12.9%

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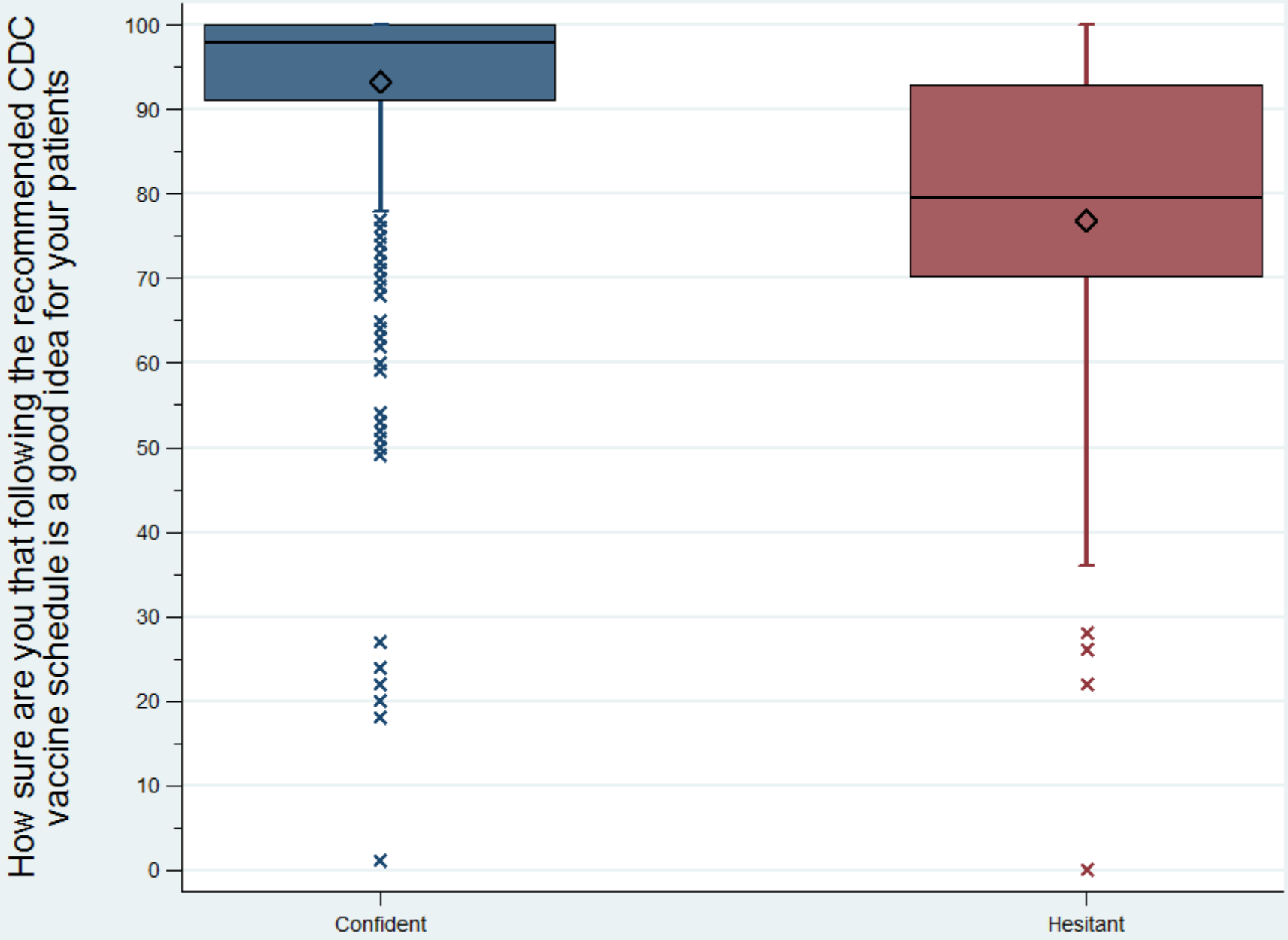
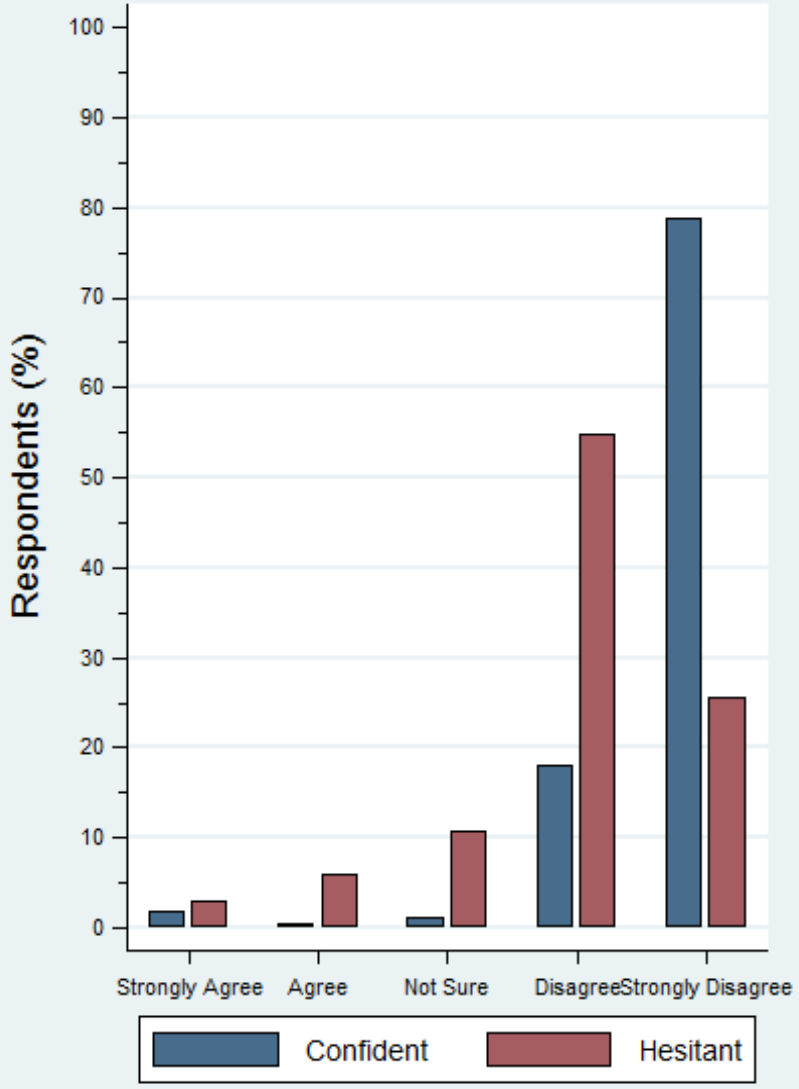
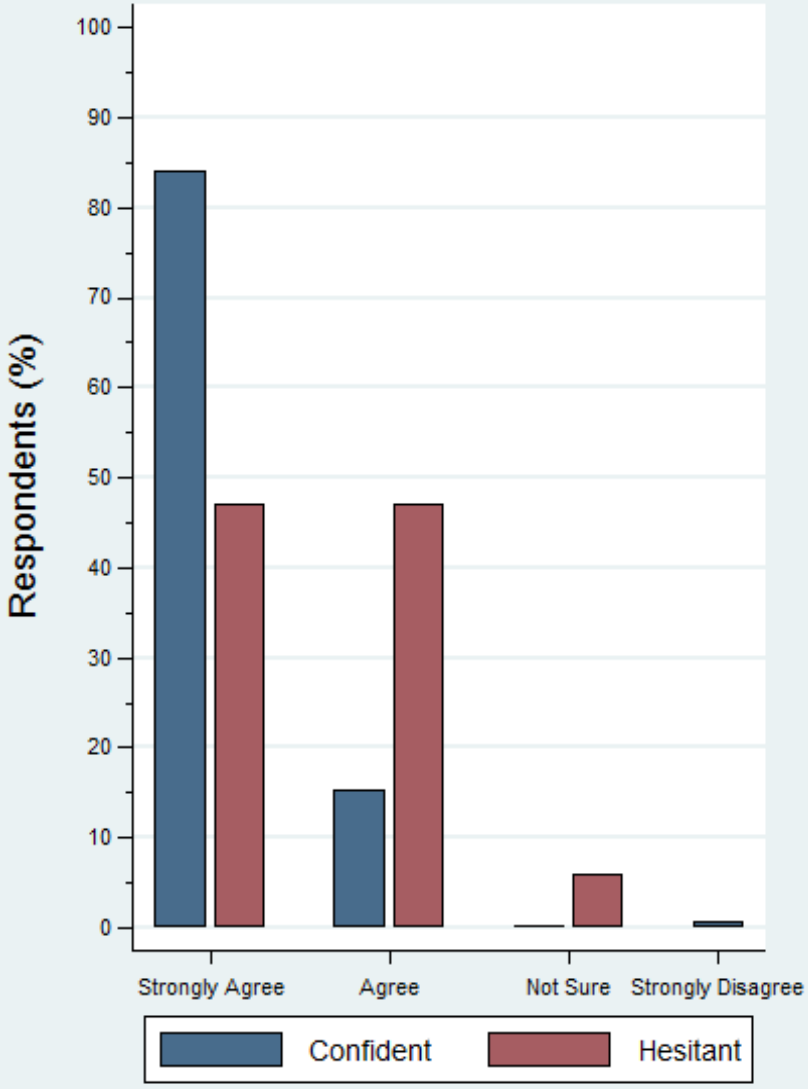

How sure are you that following the recommended CDC vaccine schedule is a good idea for your patients
100
90
80
70
60
50
40
30
20
10
0
Confident
Hesitant

Children get more vaccines than are good for them



I trust the information I receive about vaccines from the CDC



Hesitancy Among Residents who completed both pre and post-survey

- There were 101 hesitant residents in the pre only (12.9%)
- There were 44 resident that completed the pre-post defined as hesitant
  - FM 24/44 (54.5%)
  - One third of them (n-14/44) moved to the confident category in the post.
    - 9/14 were FM (64%)

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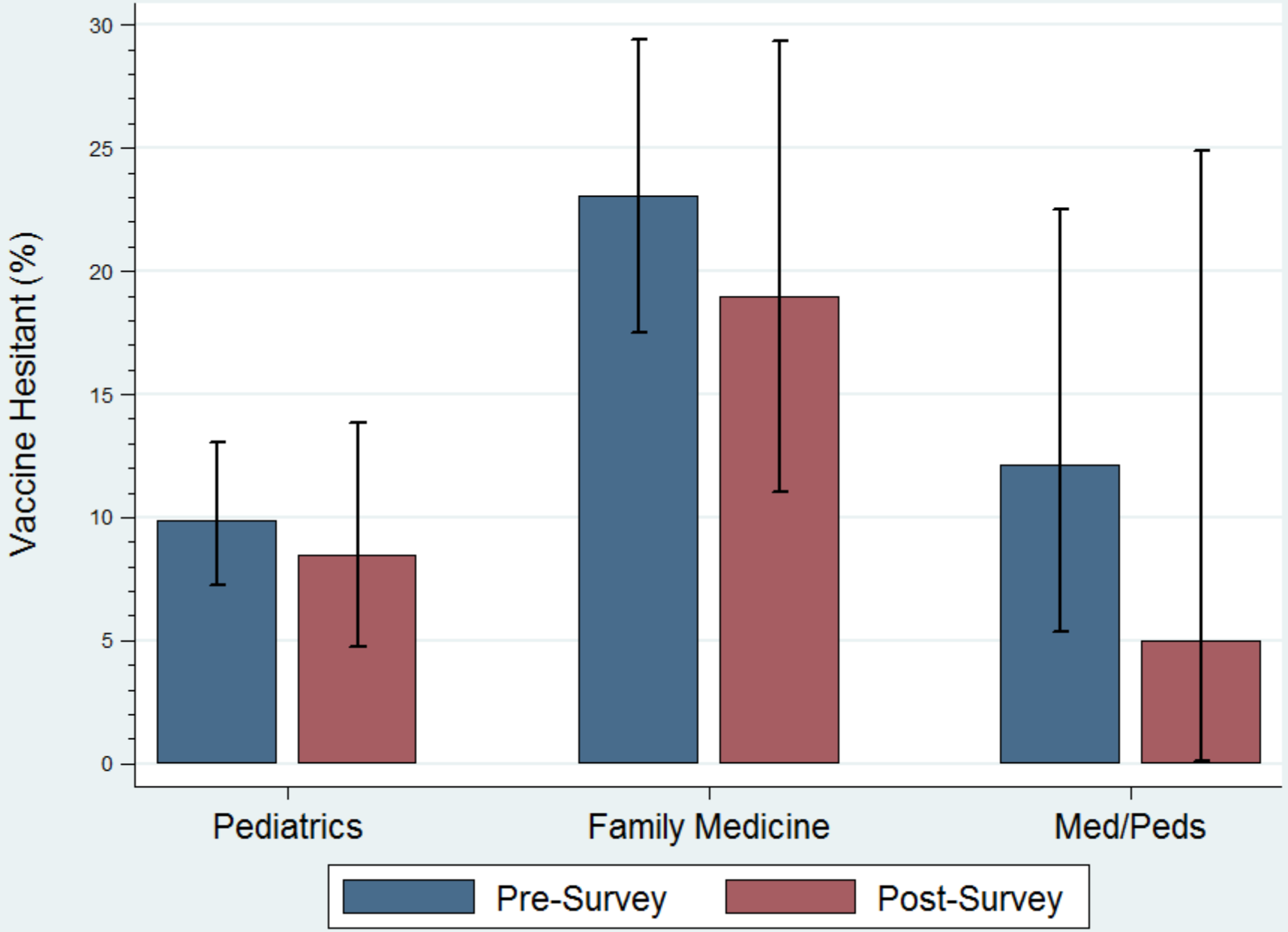
Vaccine Hesitant (%)
30
25
20
15
10
5
0
Pediatrics
Family Medicine
Med/Peds
Pre-Survey
Post-Survey

Resident Confidence

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Confidence

On a scale of [1-100] do you consider yourself a vaccine novice or expert ?

	Adjusted [a]					
Factor	***Pre-Survey***	***Post-Survey***	***Change***	***p-value***	***Difference-in-Difference***	***p-value***
Non-CoVER	48.97	56.71	7.73	0.0001	8.95	0.001
CoVER	47.06	63.74	16.68	<.0001		

[a] *After adjusting for residency year and type*

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Vaccine Scale by Program

Resident Type	Arm	Pre-Survey	Post-Survey	Delta	Difference-in-Difference	p-value
Pediatrics						
	Control	49.03	56.81	7.78	7.96	0.0278
	CoVER	49.84	65.59	15.74		
Family Medicine						
	Control	48.78	47.71	-1.06	19.51	0.0012
	CoVER	41.93	60.38	18.45		
Med/Peds						
	Control	52.98	63.47	10.49	11.84	0.335
	CoVER	50.00	72.33	22.33		
Other						
	Control	47.88	79.25	31.37	---	---
	CoVER	36.00	---	---		

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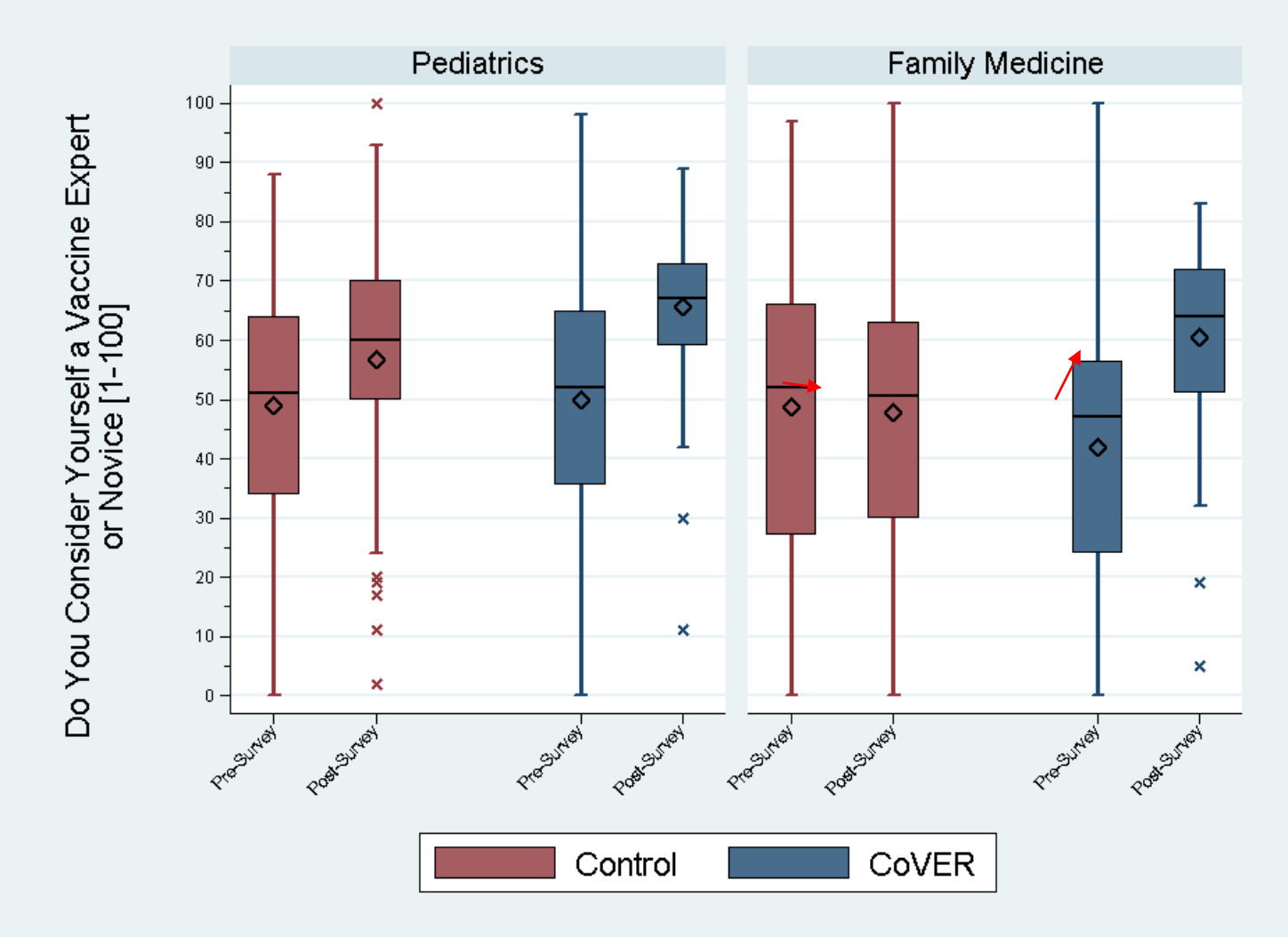
Vaccine Scale by Program



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Vaccine Scale by PGYs

Resident Year	Arm	Pre-Survey	Post-Survey	Delta	Difference-in-Difference	p-value
PGY1						
	Control	41.58	51.54	9.96	15.93	0.002
	CoVER	36.89	62.77	25.89		
PGY2						
	Control	51.16	55.39	4.24	9.17	0.0499
	CoVER	50.23	63.63	13.40		
PGY3						
	Control	56.23	64.41	8.17	-0.20	0.965
	CoVER	55.94	63.91	7.97		
PGY4						
	Control	55.90	74.00	18.10	-5.93	0.710
	CoVER	64.17	76.33	12.17		

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Confidence

How confident do you feel in your ability to discuss vaccines with a parent who would like to delay or withhold one or more vaccines?

[scale 1-100]

	Adjusted [a]			
	Score	**Delta**	**p-value**	**95% CI**
Pre, Control	56.30	-6.25	0.001	-9.93, -2.57
Post, Control	62.54	*-ref-*	---	---
Pre, CoVER	54.08	-8.46	<.001	-13.20, -3.72
Post, CoVER	70.45	**7.91**	0.005	2.42, 13.40

[a] *After adjusting for residency year and type*

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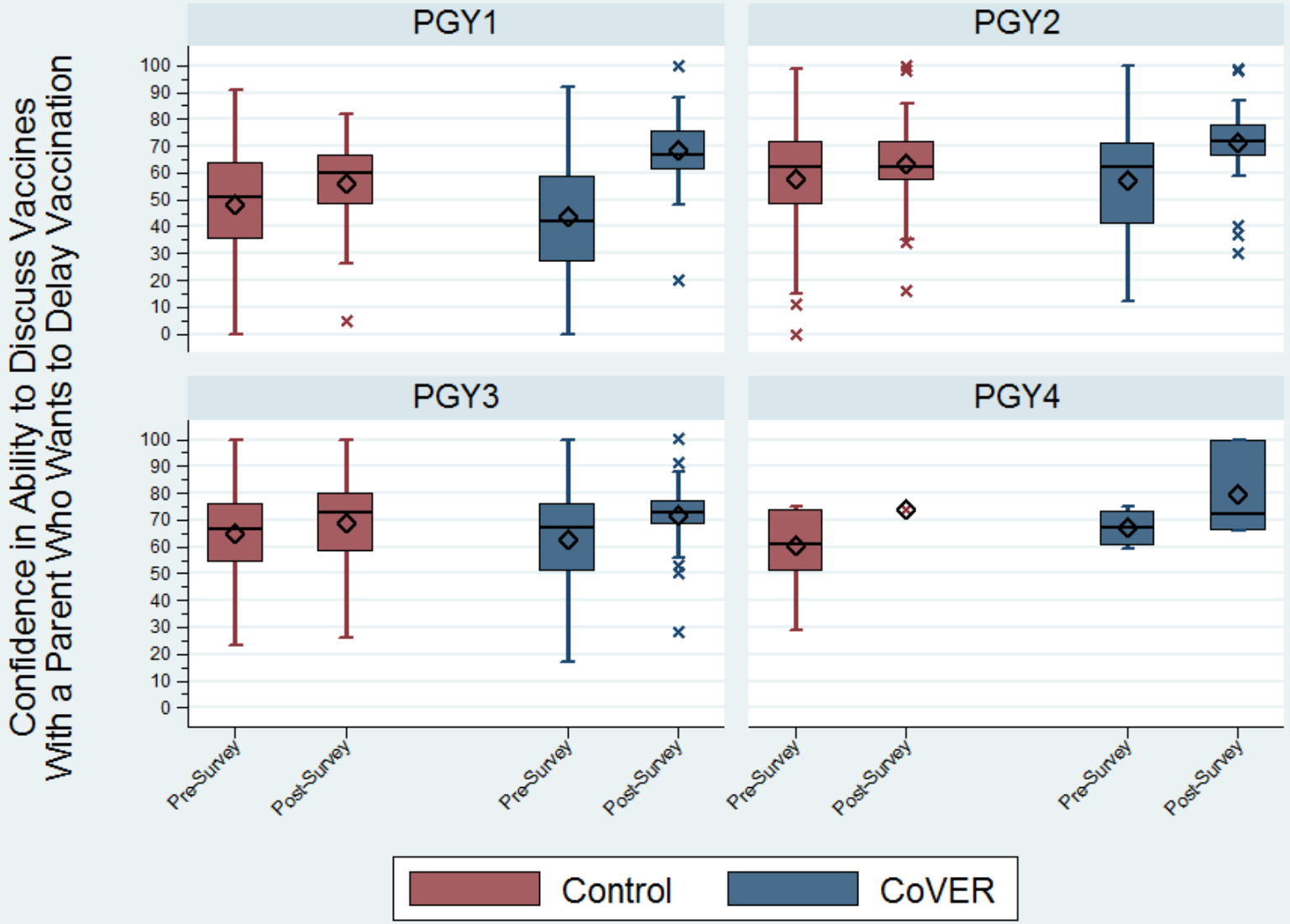

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Confidence

How well prepared do you feel to answer parental concerns regarding vaccines [scale 1-100]?

	Adjusted [a]			
	Score	**Delta**	**p-value**	**95% CI**
Pre, Control	56.87	-5.23	0.004	-8.77, -1.68
Post, Control	62.10	*-ref-*	---	---
Pre, CoVER	55.51	-6.58	0.013	-11.76, -1.40
Post, CoVER	71.18	**7.03**	0.002	3.27, 14.90

[a] *After adjusting for residency year and type*

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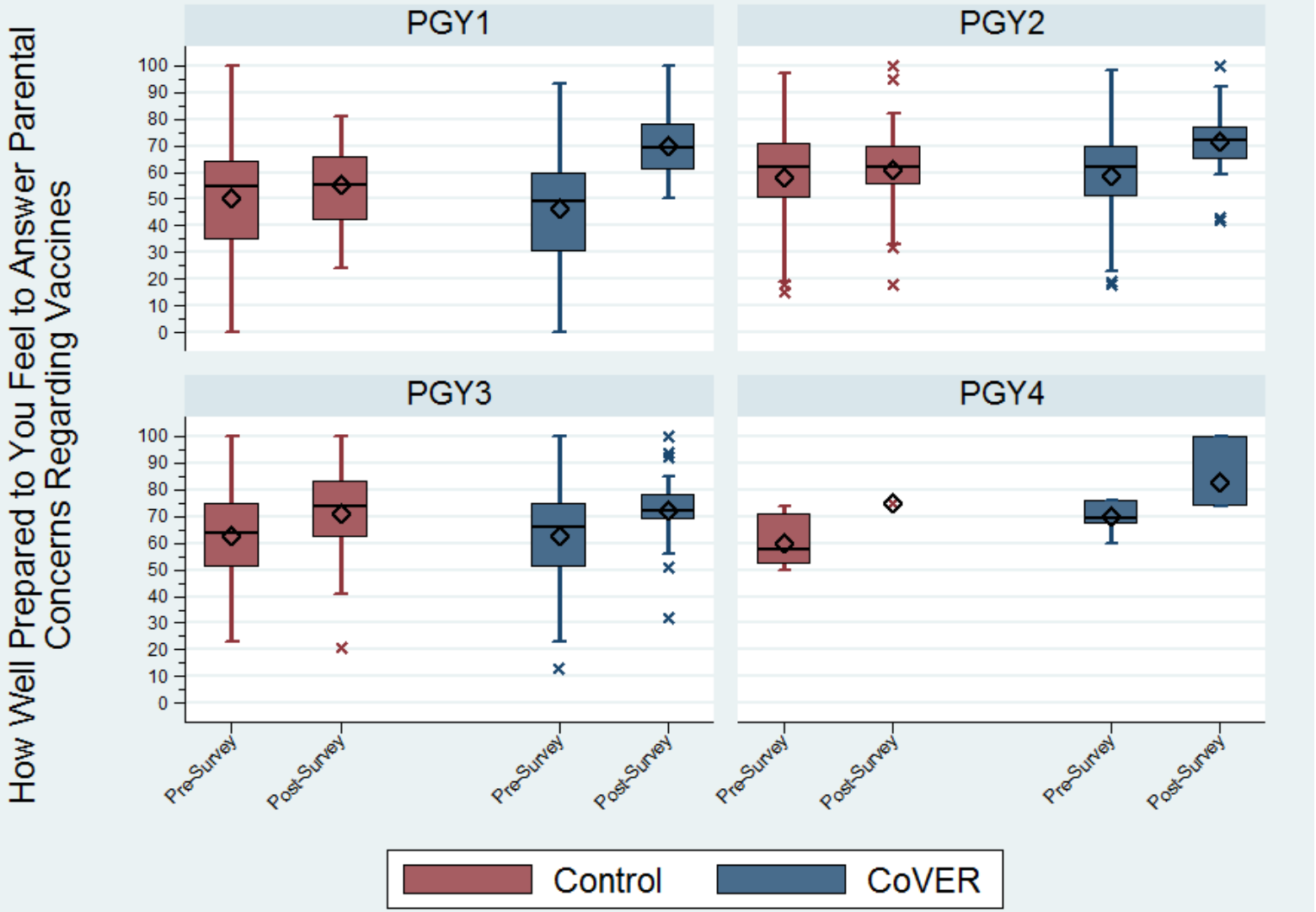

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Focus Group Comments-Pros

"I liked the length and the amount of information contained within them. I thought it was a very good resource, just a quick reference, a good reminder of the timing of the vaccines and whatnot."

"It was super easy to click through everything, and there was interactions through it."

"It didn't take hours to complete it, and I think it hit the top facts that you need to know and gave resources if you wanted more information on further things."

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Focus Group Comments-Pros

"I struggled with a family that did not want to immunize their children, and after taking all the modules, I was able to talk to them with my new found knowledge and confidence and the family is now immunized!"

"It was nice having that in my pocket. It gave me more to talk with those families and engage with them as best as possible."

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Focus Group Comments-Pros

“They're far and away the best modules that we have to do. They blow the others out of the water by miles.”

“I have noticed as I practice for the boards that I can get all the vaccine questions right, and now they seem super easy after taking the CoVER curriculum.”

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Conclusions- Residents

- Peds and FM resident trainees have baseline sub-optimal confidence in ability to counsel families about vaccines
- FM lower knowledge ($p<0.001$) at baseline and higher hesitancy
- Vaccine hesitancy exists among Peds and FM resident US trainees, ranging from 2-13%

Conclusions-CoVER Impact

- Knowledge improved more with CoVER curriculum, especially among FM ($p=0.08$)
- Self reported vaccine expertise increased significantly with CoVER ($p < 0.001$), especially among FM ($p=0.0012$) and PGY1s ($p=0.002$)
- Confidence discussing vaccine questions with parents ($p=0.002$) and vaccine delays ($p=0.005$) increased with CoVER

Next Steps

- Roundtable Discussion, Kansas City November 2018
- R01
  - Develop PGY2 and PGY3 training modules
  - Create/Validate HCP hesitancy survey (volunteers? Call me!)
  - Behavior- Evaluate impact on vaccination rates (?)
  - Not optional, but mandatory training program
    - Data analytics on module use
    - CME, MOC possibilities?
- Other HCP- rural, med students, nurses, etc

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The Modules

- Vaccine Fundamentals
- VPDs
- Vaccine Safety
- Vaccine Communication

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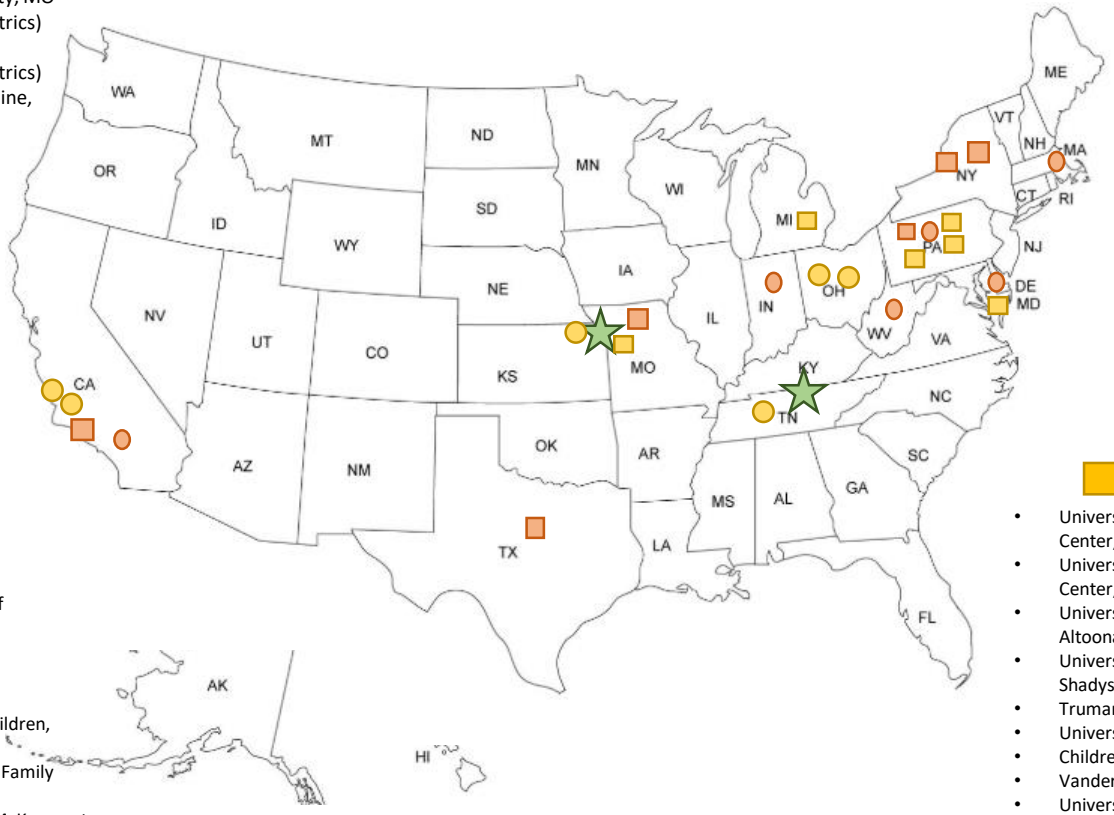
CoVER

Lead Institutions:

- Children's Mercy Hospital, Kansas City, MO (Received CoVER Curriculum – Pediatrics)
- Vanderbilt University, Nashville, TN (Received CoVER Curriculum – Pediatrics)
- Society for Teachers of Family Medicine, Leawood, KS



Family Practice

Pediatrics

Control Sites:

- South Nassau Communities Hospital, Oceanside, NY
- Indiana University School of Medicine, Indianapolis, IN
- St. Christopher's Hospital for Children, Philadelphia, PA
- University of Missouri, Columbia, MO
- Children's Hospital of Orange County, Orange, CA
- Baystate Children's Hospital/University of Massachusetts Medical School, Springfield, MA
- West Virginia University, Morgantown, WV
- Nemours Alfred I. duPont Hospital for Children, Wilmington, DE
- Ventura County Medical Center/Ventura Family Medicine, Ventura, CA
- University of Pittsburgh Medical Center McKeesport, McKeesport, PA
- Methodist Charlton Medical Center, Dallas, TX
- Albany Medical Center/Albany Medical College, Albany, NY

CoVER Sites:

- University of Maryland Prince Georges Hospital Center, Cheverly, MD
- University of Pittsburgh, Pittsburgh Medical Center, St. Margaret, Philadelphia, PA
- University of Pittsburgh Medical Center Altoona, Altoona, PA
- University of Pittsburgh Medical Center Shadyside, Shadyside, PA
- Truman Medical Center, Kansas City, MO
- University of Michigan, Ann Arbor, MI
- Children's Mercy Hospital, Kansas City, MO
- Vanderbilt University, Nashville, TN
- University of California, Los Angeles, Los Angeles, CA
- Children's Hospital Los Angeles, Los Angeles, CA
- Kansas University Medical Center, Kansas City, KS
- East Tennessee State University, Johnson City, TN
- Weill Cornell Medical College, Toledo, OH
- University of Toledo, Toledo, OH

Limitations

- Resident uptake of self-led training is challenging given time constraints and overlapping obligations
- Limited amount of material in modules due to Program Director request
- Ability to evaluate impact on resident knowledge, attitudes/hesitancy and confidence depends on resident completion of end-of-year survey
  - Survey not validated for healthcare professionals
- Did not determine impact on patient vaccine uptake

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The Sky Is The Limit!

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Knowledge by PGY-Year

PGY1 < PGY2 < PGY3

Resident Year	*Arm*	*Pre-Survey*	*Post-Survey*	*Delta*	*Difference-in-Difference*
PGY1					
	Control	49.4%	59.3%	9.9%	-0.9%
	CoVER	49.2%	58.2%	9.0%	
PGY2					
	Control	53.2%	58.1%	4.9%	3.4%
	CoVER	56.1%	64.4%	8.3%	
PGY3					
	Control	55.8%	60.9%	5.1%	1.9%
	CoVER	52.9%	59.9%	7.0%	

Demographics Pre and Pre/Post

		Pre-Survey Only (N=469)	Pre- and Post-Survey (N=268)
Age (in Years)			
	<30	328 (70.2%)	206 (76.9%)
	30-34	109 (23.3%)	54 (20.1%)
	35-39	19 (4.1%)	3 (1.1%)
	40+	3 (0.6%)	3 (1.1%)
	Refused	8 (1.7%)	2 (0.7%)
Gender	Female	313 (67.3%)	191 (71.3%)
Race	White	286 (61.0%)	179 (66.8%)
	Black	18 (3.8%)	11 (4.1%)
	Asian	86 (18.3%)	42 (15.7%)
	Hispanic	30 (6.4%)	9 (3.4%)
	Other	11 (2.3%)	4 (1.5%)
	Unknown/Refused	38 (8.1%)	23 (8.6%)

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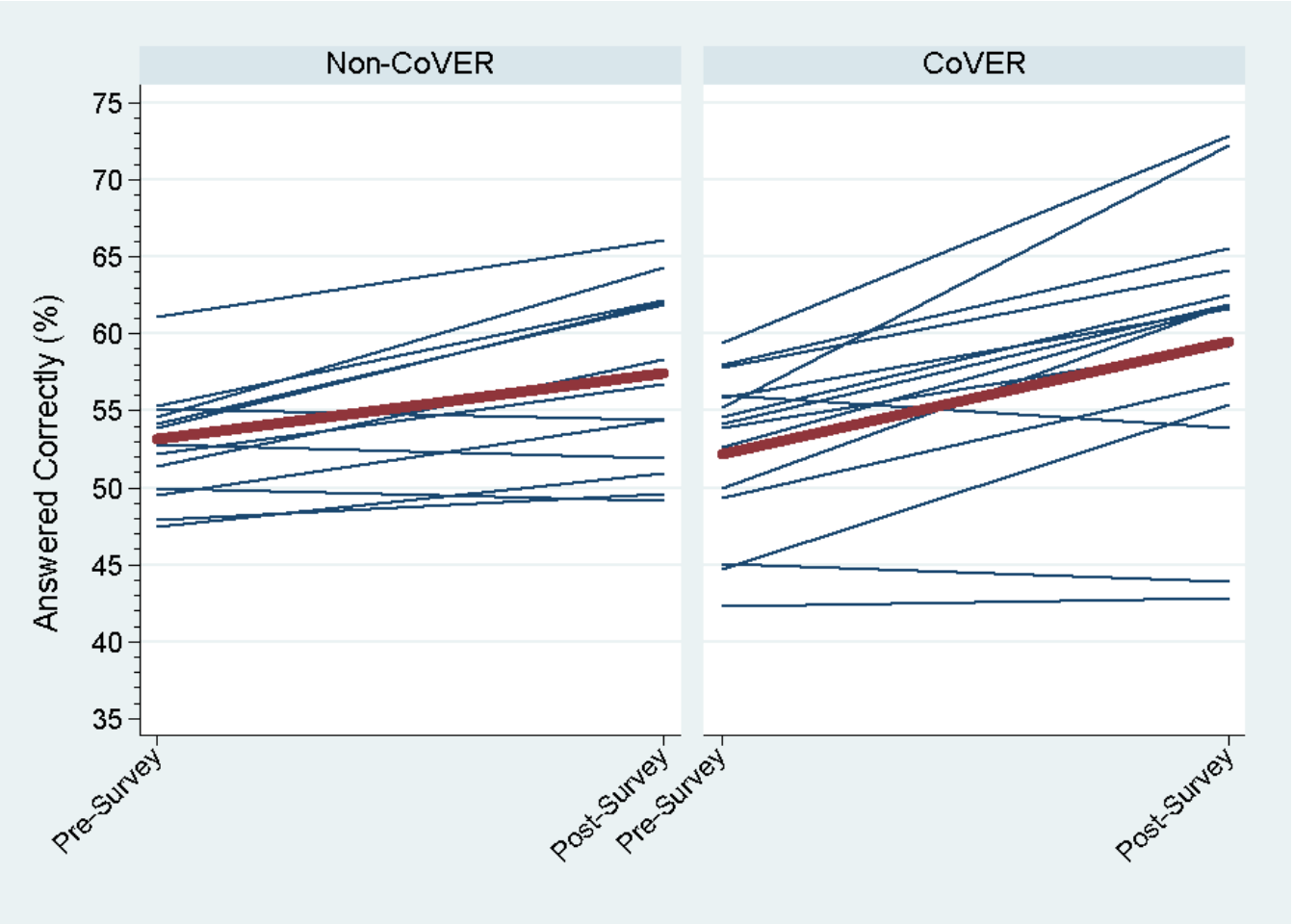
Knowledge by Programs+Arm



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