Behavioral Economics at Work: Findings from a Field Experiment in Health

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Roundtable Discussion on Behavioral Economics and Public Policy: An Overview
NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY
Social Sciences Division

September 29, 2015 – New World Manila Bay Hotel
Pedro Gil corner M.H. Del Pilar, Malate, Manila

QIDS

QURE HEALTHCARE

Quality Improvement Demonstration Study, 2003-08/2013-14
(Philippine Child Health Experiment, NICHD #R01HD042117)

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Agenda

- **Introduction**
- Study Design and Innovations
- Research Questions and Results
- Conclusion

Where Are We Falling Behind?

- Children under 5 years still die from preventable and treatable diseases:
  - Pneumonia – nearly 1 million deaths annually in children
  - Diarrhea – 0.6 million deaths annually in children
  - Malnutrition is underlying cause of over half of all child deaths
- Health systems are not delivering this care

Source: WHO Global Health Repository. Methods and Data Sources.2000-2013. Available at: http://www.who.int/gho/child_health/mortality/causes/en/

Challenges We Faced at Outset of QIDS

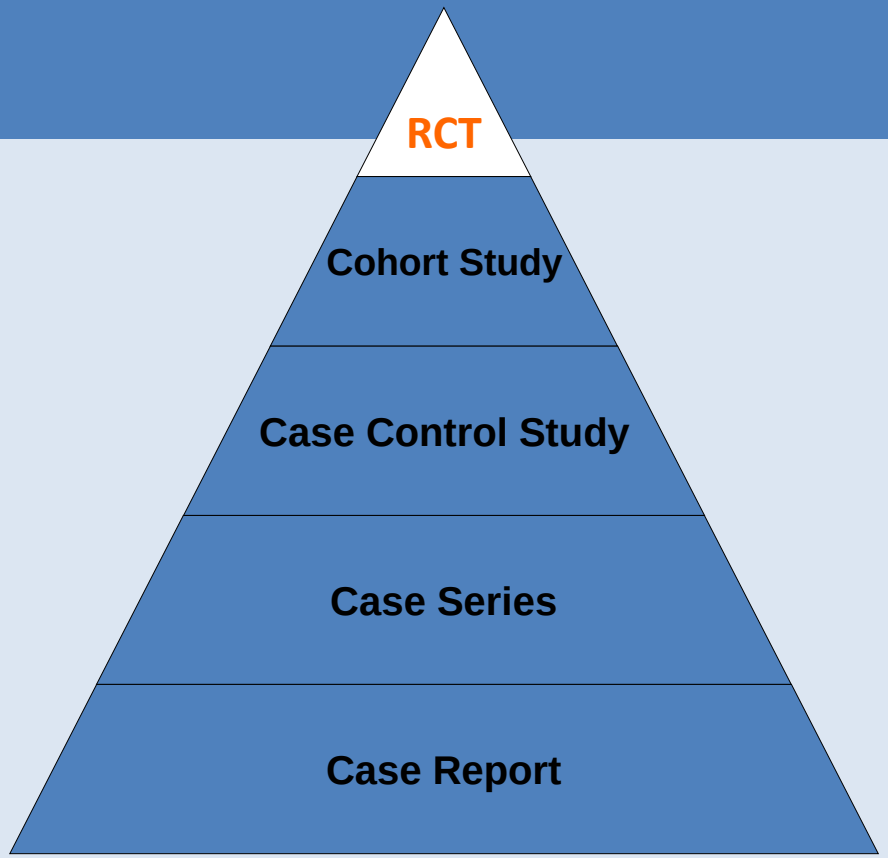
Premises then and now

- ✓ Technologies save lives, but are not implemented appropriately
- ✓ Policy needs to incentivize efficient use of the health care system by providers (not just patients)
- ✓ Pilots are many, national scale studies are rare
- ✓ Evidence-based policy research is wanting

RCTs Are the Single Greatest Scientific Advance of the Last 100 Years

RCT's contribute to the policy evidence base

- Providing rigor and causality
- Challenging and so rarely done for large-scale social experiments
- But are the best means of generating scientific evidence of policy effects.



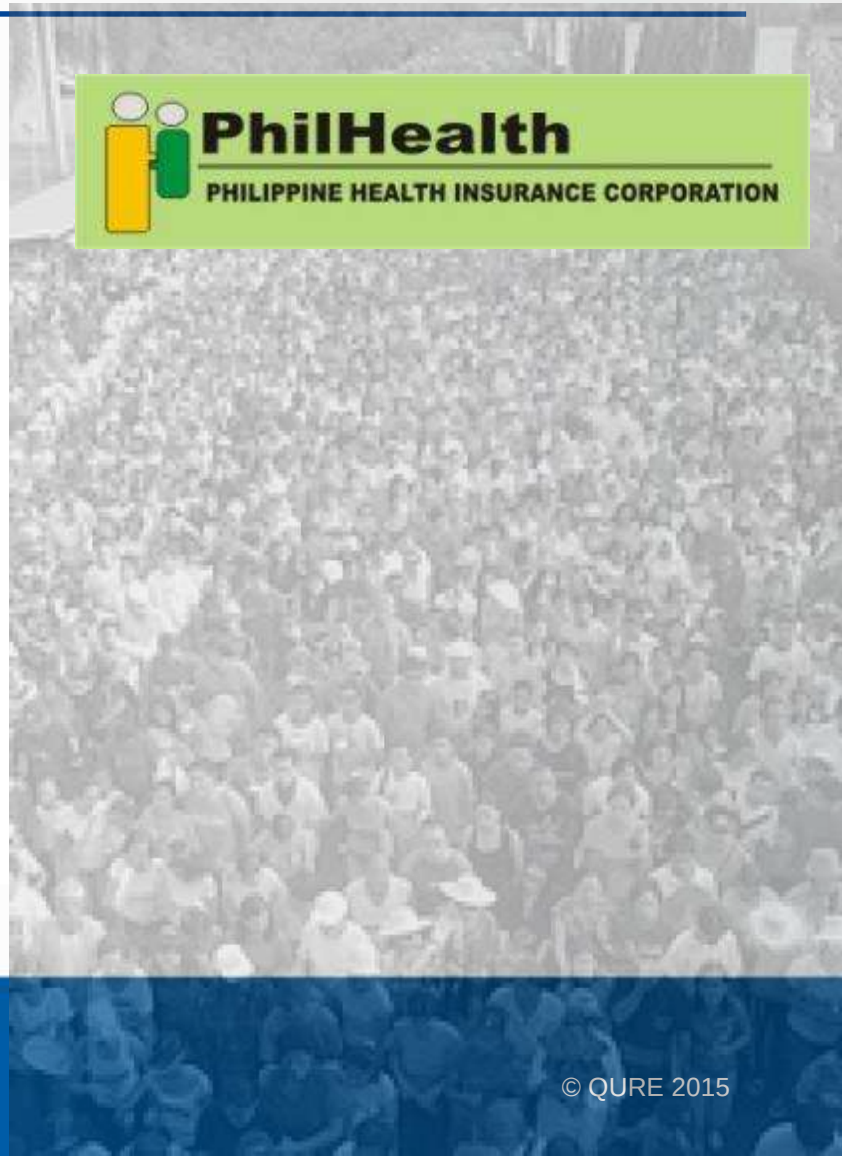
Main Research Question

Can policy improve children's health?

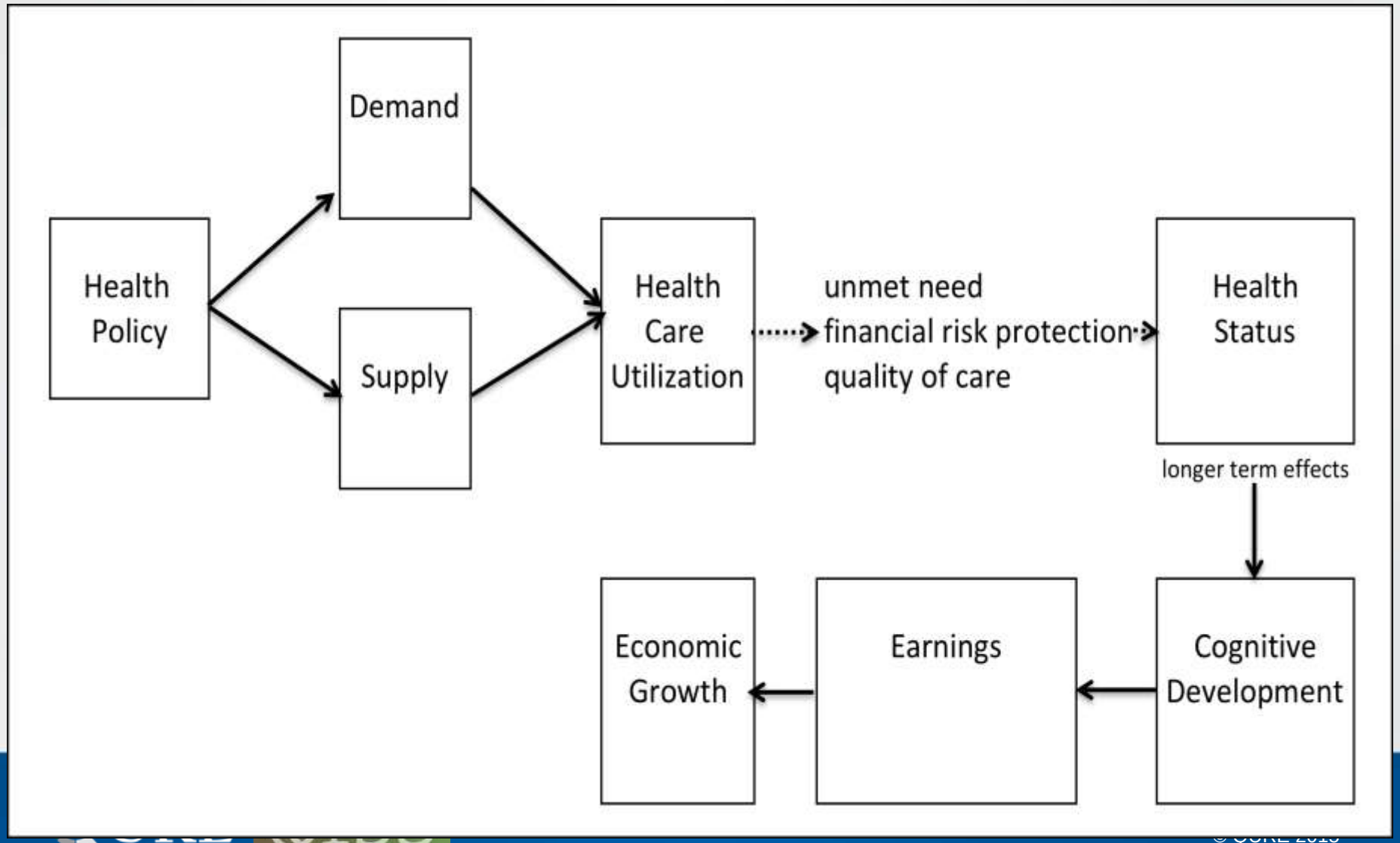
social health insurance

Policy Context:
The National Health Insurance Program

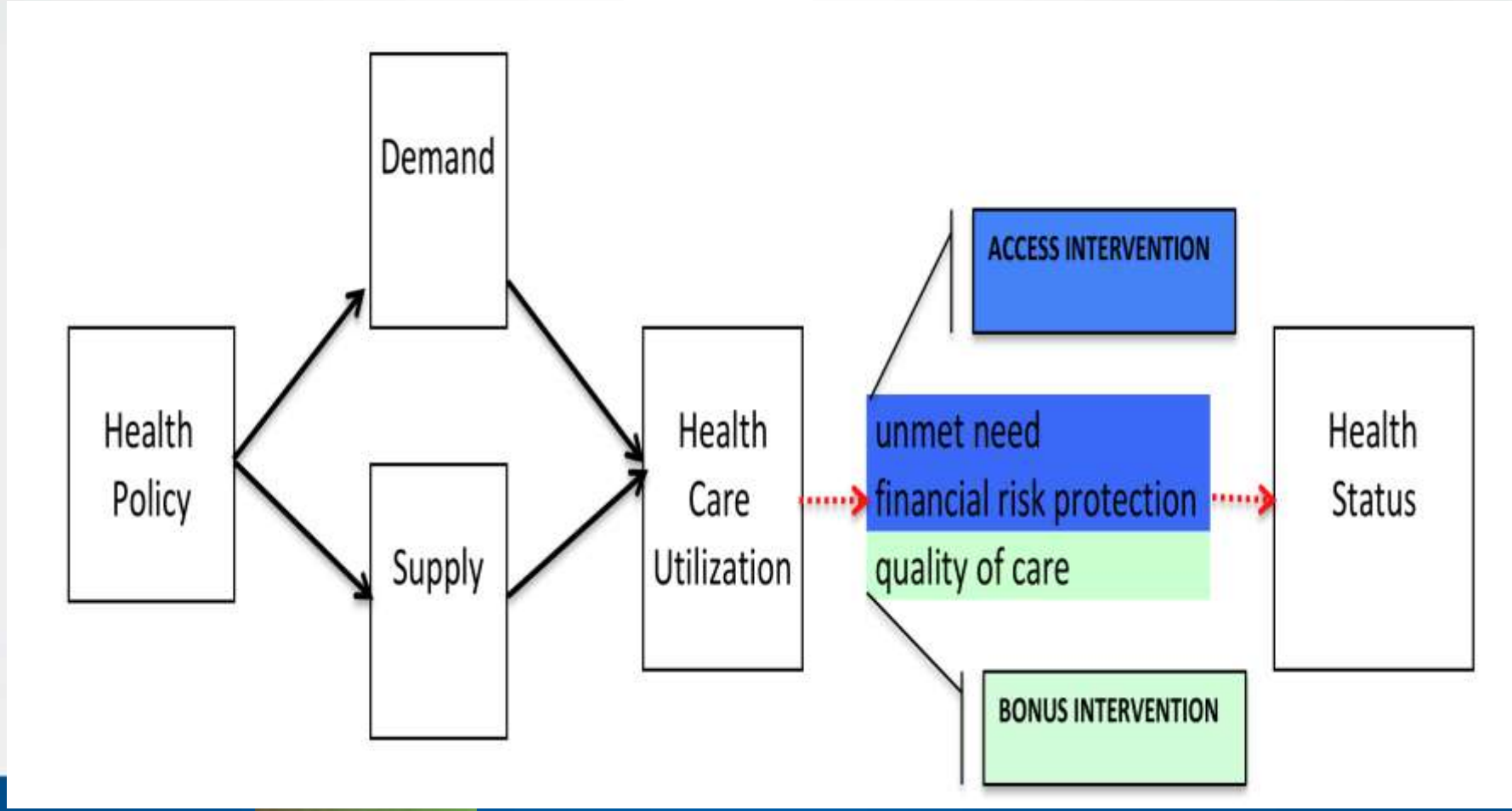
- Mandate:
  - Universal coverage by 2010
  - Provide financial risk protection
- Enrolment mechanisms (at the time of the study):
  - Mandatory: formal sector
  - Sponsored: indigent
  - Automatic: retirees
  - Voluntary: informal sector



Pathways to Health (and beyond)



QIDS Policy Interventions



ABCs of QIDS

A = ACCESS	B = BONUS	C = CONTROL
Expanded insurance benefits for children 5 years and under	Bonus payments tied to quality scores	Business-as-usual
Policy Navigators	Quality Monitoring through: - Clinical practice vignettes - Patient satisfaction surveys - Case load monitoring Feedback	Quality Monitoring through: - Clinical practice vignettes - Patient satisfaction surveys - Case load monitoring

The Challenge of Measuring the Quality of Clinical Practice: Accuracy, Flexibility and Affordability

We want a measure that is:

1. Valid, reliable and consistent determination of actual clinical practice
2. Case-mix adjusted so comparisons among physicians and disparate sites and health care systems can be made
3. Inexpensive and can be used for repeated measures

CPV® Vignettes Provide a Standard Measure of Practice

1. **CPV® cases** are built around priority disease areas and conditions.

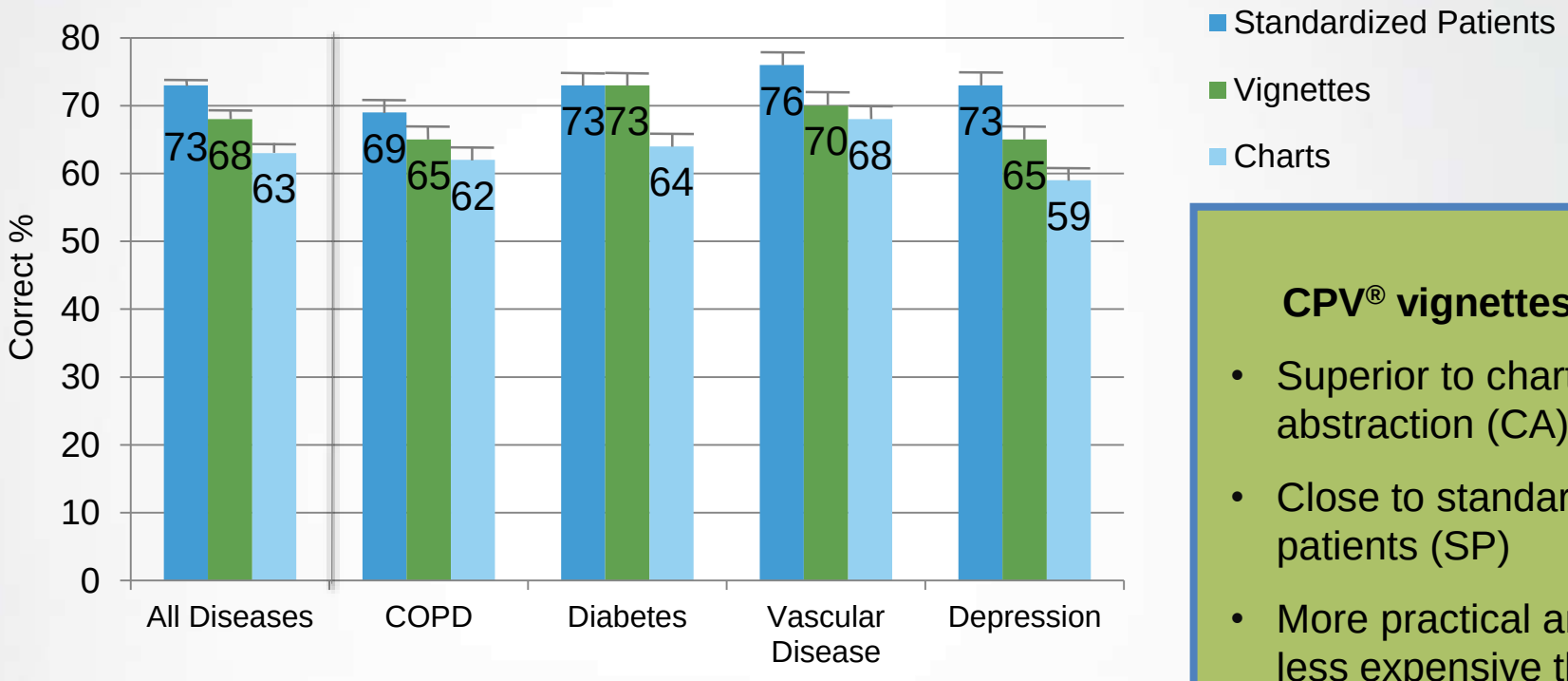
2. **Virtual patient presents** with symptoms in the hospital or clinic.

3. **Physician *cares* for patient**, completing open-ended questions regarding:

- Taking a history
- Conducting a physical examination
- Ordering tests
- Making a diagnosis
- Providing treatment

Vignettes are Valid Measures and Consistently Outperform Charts as a Measure of Quality of Care

Validation papers published in JAMA, Annals of Internal Medicine



CPV® vignettes:

- Superior to chart abstraction (CA)
- Close to standard patients (SP)
- More practical and less expensive than both SP and CA

Peabody JW, Luck J, Glassman P, Jain S, Spell M and Hansen J. "A Prospective Multi-Site Evaluation of Vignettes: Validating an Innovative Method for Measuring the Quality of Physician Practice." *Annals of Internal Medicine*. Vol. 141(10):771-80, November 2004.

QIDS Research Design: Matched blocks

11 Provinces in the Visayas

Matched blocks of 3 provincial districts with shared characteristics (e.g. # specialists, proximity to Manila)

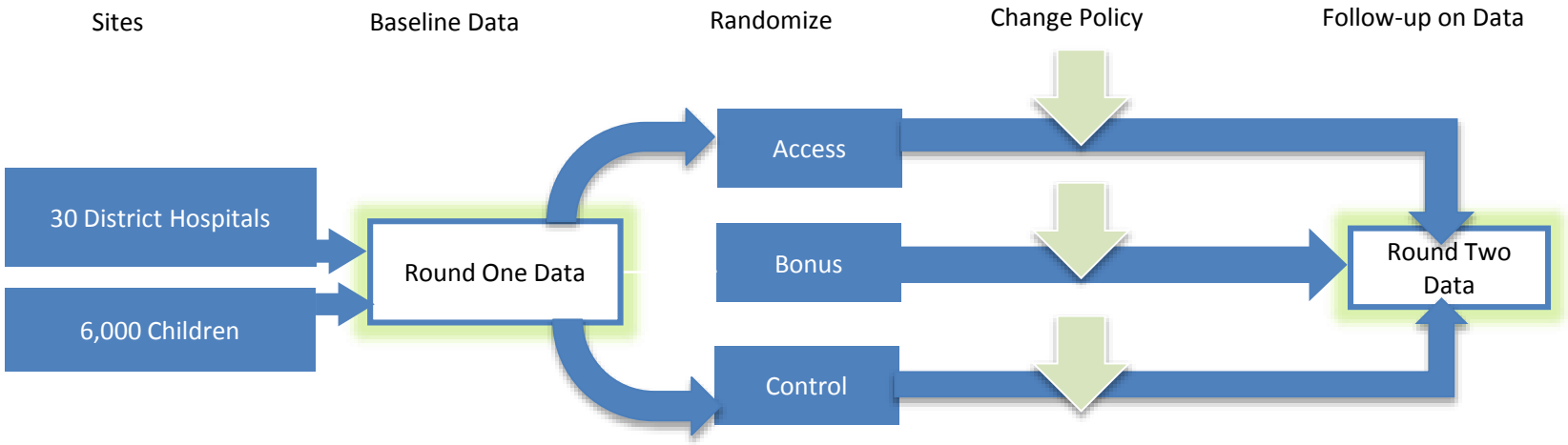
30 provincial districts grouped into 10 blocks of 3

Interventions randomly assigned to districts within each block

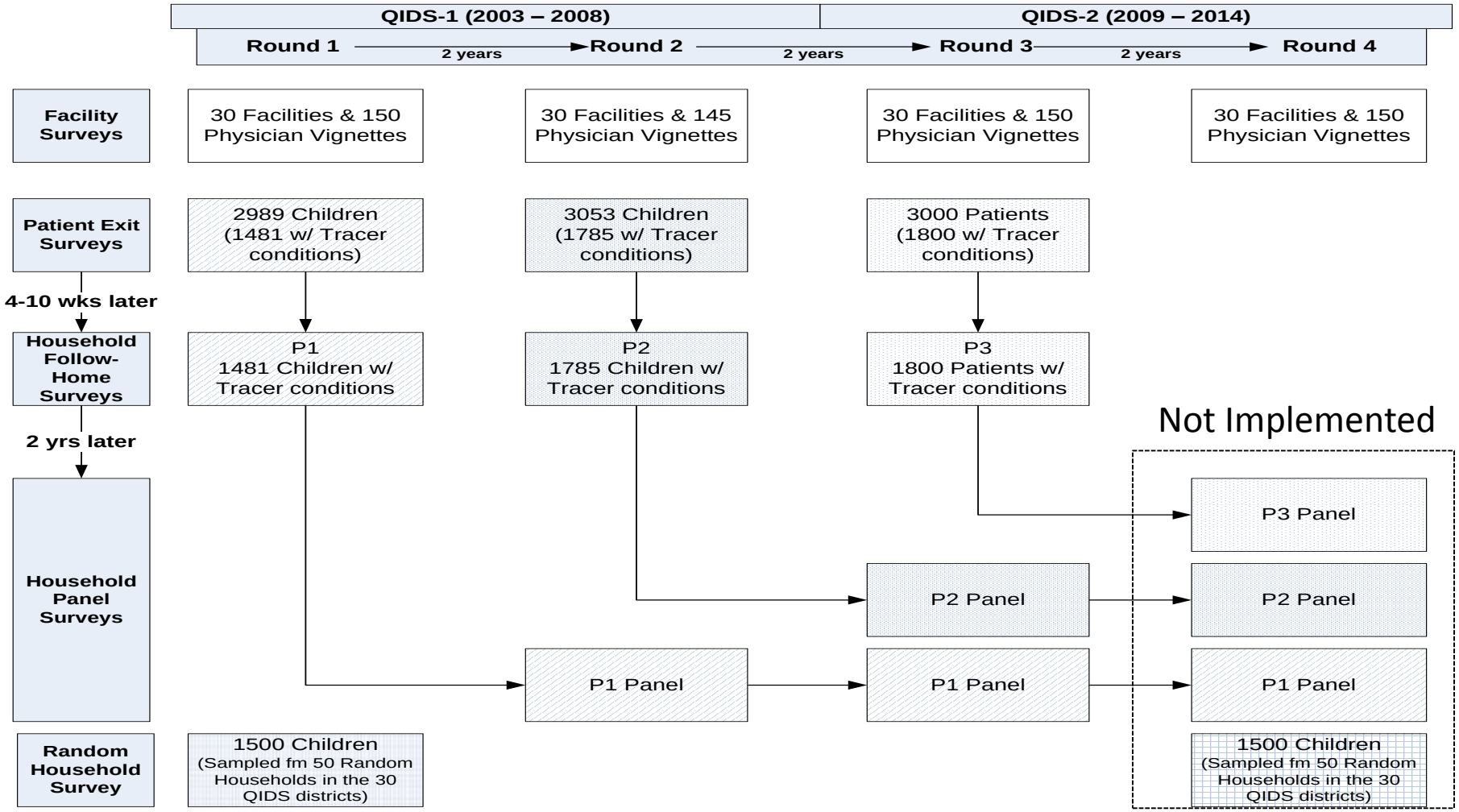
- Intervention A = Increase enrollment in PhilHealth
- Intervention B = Bonus payments for high quality of care
- Control = No changes to existing system

QIDS Research Design

- Randomization
- Multi-level Design
- Longitudinal Follow-up



Sample Frame: Facilities, Physicians, Patients, Random Households Formatting



(Many) Outcome Measures

Patient and Physician Outcomes
Physician Vignette Score (points)
Inpatient utilization (visits during previous yr)
Insurance coverage (%)
Health Care Expenditures (PhP)
Subjective Health
GSRH (scale 1-5)
Health Biomarker
Hemoglobin (g/dl)
CRP Negative (%)
Folate (µg/ml)
Lead (µg/ml)
Anthropometrics
Stunting ratio (Actual Height/Ideal Height)
Wasting ratio (Actual Weight/Ideal Weight-for age)
Cognitive Health (age-dependent measures)
BSID Mental, Behav & Motor Score (age 6-35 mo.) (points)
WPPSI Young IQ Score (age 36-47 mo.) (points)
WPPSI Old IQ Score (age 48-71 mo.) (points)

Methods – Comparing Controls with Intervention Over Time

Difference-in-Difference Model

- used to model correlated data
- robust standard errors
- accounts for clustered correlations between observations taken within a facility and over time within a patient

For example, a binary outcome measure (wasted/not wasted)– logistic regression model:

$$\text{logit}(E[Y_{ijt}]) = \beta_0 + \beta_1 \text{TIME} + \beta_2 \text{INTERV} + \beta_3 \text{TIME} \times \text{INTERV} + \text{control variables}$$

Y_{ijt} = outcome for time t, patient j in facility i

p_{ijt} = probability of an outcome for time t, patient j in facility i

Specific Research Questions

- Q1: What is the effect of expanded insurance on access to care?
- Q2: What is the effect of pay-for-performance on quality of care?
- Q3: Do the policy interventions change more than just behavior? Do they actually improve health?
- Q4: What are the long-term effects of QIDS?

Question 1 – Improving Access to Care with Expanded Insurance

The Access Intervention

Does Providing Insurance Reduce Delays in Seeking Care?

Background

- When a child gets care is critical—
  - Delays may be associated with worse health and higher costs
  - Children presenting late can require more intensive treatment.

- Does insurance fix the problem?
  - Insurance in the U.S. and other developed countries have reduced delays
  - This relationship has not been explored in the developing world, where reducing delay may have an even larger impact

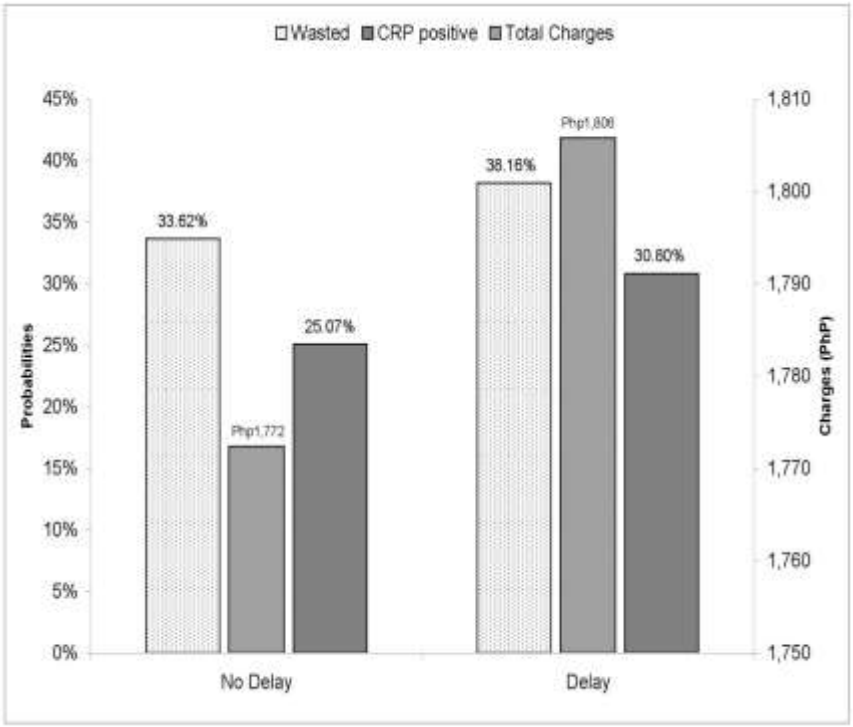
Methods

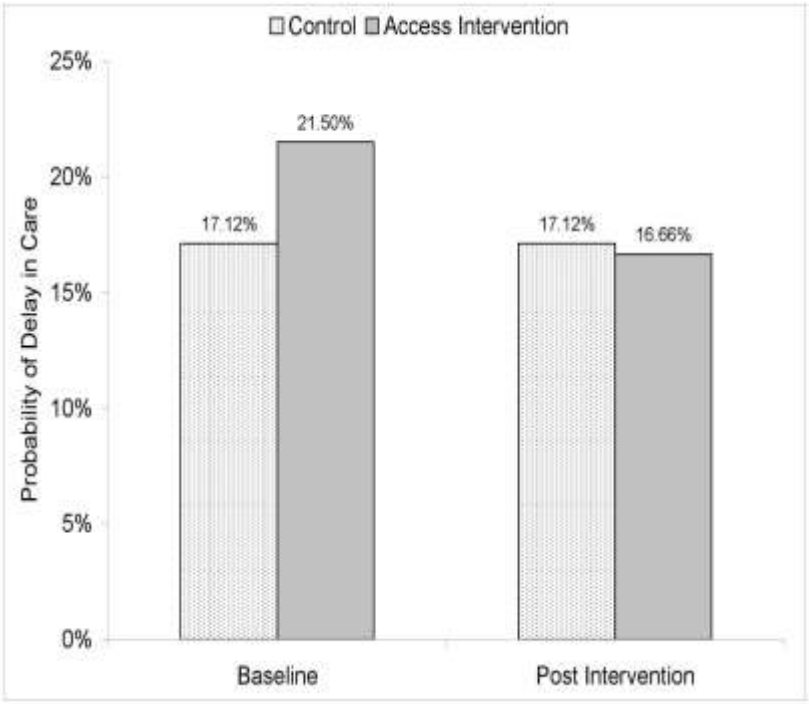
- Defined the delay in care >2Days between the onset of symptoms and the admission to the study district hospitals
- We examined if delay is associated with:
  - Wasting or
  - having positive C-Reactive Protein (CRP) levels upon discharge.
  - Decreases in insurance benefit coverage and enrollment,
- We estimated the effect of insurance on the likelihood of delay.

Data Source
Rounds 1 and 2; Intervention A versus C
Data Collection
Patient Exit Data
Model
Logit $(U_j) = \alpha + \beta I_j + \chi I_j * T_j + \delta C_j * T_j + \zeta ChildChar_j + \gamma HHChar_j + \varepsilon_j$ U_j = delay of >2 days for patient j I = Interventions (dummy variable) C = QIDS control sites (dummy variable) T = Round 2 (dummy variable) ChildCar = vector of child characteristics (mother's education, income, child brought to another facility, illness, sex, and age)

Delay Associated with Worse Health/Higher Costs and Improved Access Reduced the Delays

Better insurance reduced delay so that 5 out of 100 additional children (p<.05) do not delay going to the hospital after the onset of symptoms when insurance is expanded





Kraft AD, Quimbo S, Solon O, Shimkhada R, Florentino J, Peabody JW. "The Health and Cost Impact of Care Delay and the Experimental Impact of Insurance in Reducing These Delays in Children," Journal of Pediatrics

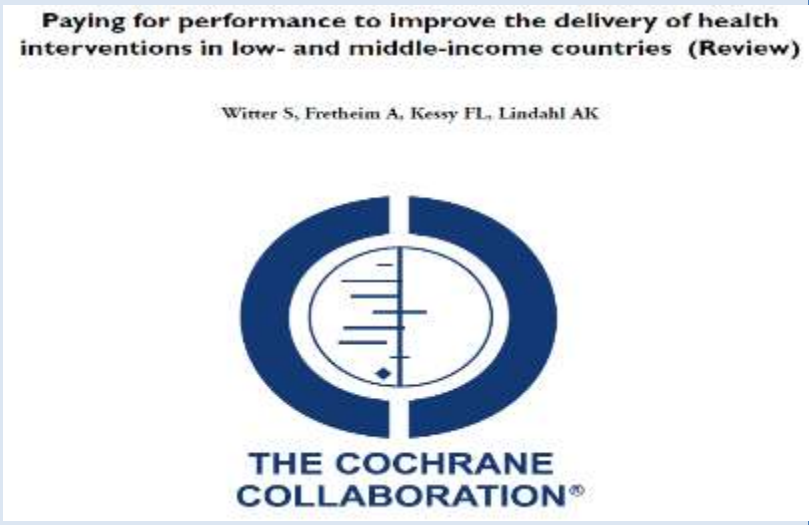
Question 2 - Rewarding Clinicians for Higher Quality Care

The Bonus Intervention

Pay for Performance: Rewarding High Quality Care

Background

- P4P in the U.S. and U.K.
  - Leapfrog, Medicare, HMOs, others
  - Great enthusiasm
- Encouraging but unconvincing results
- Systematic review of P4P: Assessment of QIDS



Overall assessment of risk of bias	Low risk	Our overall assessment was that there was a small risk of biased results from this study

Does the QIDS Bonus Intervention (P4P) Improve Quality?

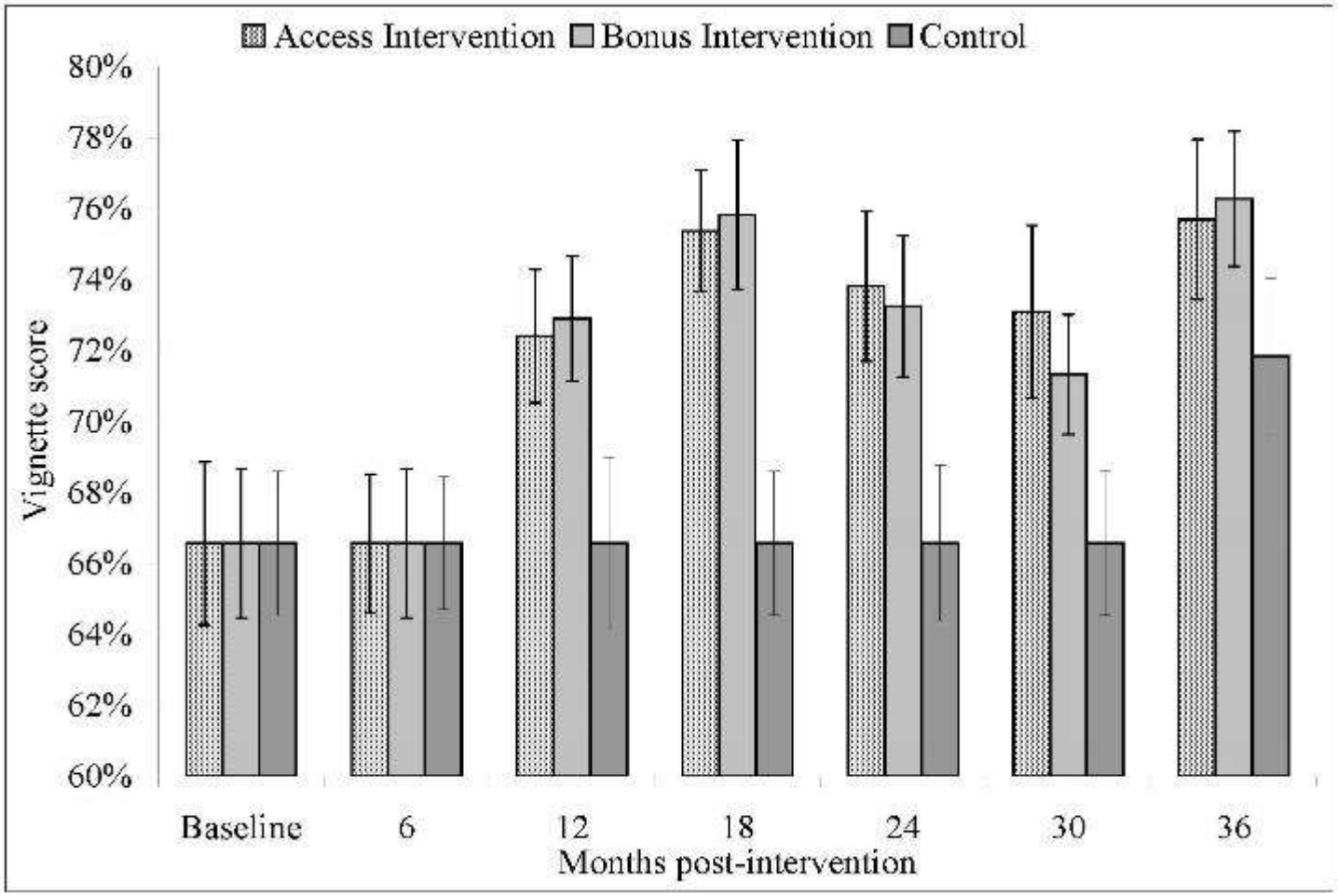
- Little understanding of how incentives incent
- QIDS experimental design – absence of selection bias that plagues non-randomized studies on P4P
- Leverage Multiple QIDS Interventions – able to assess different effects:
  - direct payment incentives plus indirect incentives (Bonus Intervention)
  - indirect participation incentives (Access Intervention) on quality
  - the effect of simple dissemination on quality (Control group)

Methods

- Data from 617 physicians in the 2 Intervention,1 Control sites
- Surveys and clinical vignettes completed at baseline and every 6 months post-intervention
- Estimated the effects of the interventions on the average vignette scores (AVS) before (pre) and after (post) intervention periods.
- We used random effects regression to account for the clustering at the facility level and control for heteroskedasticity.

Data Source
Round 1, 2 and semestral monitoring (6 post-intervention periods); Interventions A, B vs C
Data Collection
Six Rounds of Clinical vignettes; Physician survey for 3 years
Model
$AVS_{it} = \alpha + \beta A_i + \gamma B_i + \Sigma_{t=2,3,4,\ldots,8}\sigma B_t A_i Pt + \Sigma_{t=2,3,4,\ldots,8} \eta B_i P_t + \Sigma_{t=2,3,4,\ldots,8} \lambda C_t P_t + \Sigma_{t=2,3,4,\ldots,8} \sigma X_{ijt} + e_{ij}$ AVS_{it} = Average vignette score per semester of physician i in time period t for patient j. A, B, C = dummy variables indicating whether the doctor is in an A, B, C site C_tP_t and B_iP_t = interaction terms between the intervention and time variables X_{ijt} = physician characteristics (age, sex, specialization)

Bonus Leads to Improvements in Quality: Direct and System Level Effects



Peabody JW, Shimkhada R, Quimbo S, Florentino J, Bacate MF, McCulloch C, Solon O. "Financial Incentives and Measurement Improved Physicians' Quality of Care in the Philippines." Health Affairs 10 (4) 773-81 April 2011.

Do Improvements in Quality Among Public Providers Affect Private Providers?

Background

- Private and public docs serve different market segments
  - poor consumers trade-off lower quality for lower out-of-pocket cost by seeking care in public facilities
- Quality policy works readily through the public providers
- Is there a signal that can be conveyed to private practitioners:
  - Policy Awareness?
  - Quality Improvement?
  - Patient Volume and Mix?

Methods

- Used patient data from exits, CPV quality scores and clinical data from public and private doctors
- Compared quality before and after the policy change
- We tested our hypothesis that when public providers improve the quality of care, the quality of care of private doctors also improved

Data Source
Round 1 and 2; Intervention A, B, C; public and private doctors
Data Collection
Physician survey; Clinical vignettes; random household survey and patient exit surveys
Model

$AVS_{it} = \alpha + \beta AVSP_i + \chi A_i + \delta B_i + \Sigma B_t A_i P_t + \Sigma \eta B_i P_t + \Sigma \rho C_t P_t + \Sigma \theta X_{ijt} + e_{ij}$

AVS_{it} = Average vignette score per semester of private physician i in time period t.

AVSP = Average vignette score of public doctors in the same district

A, B, C = dummy variables indicating whether the doctor is in an A, B, C site

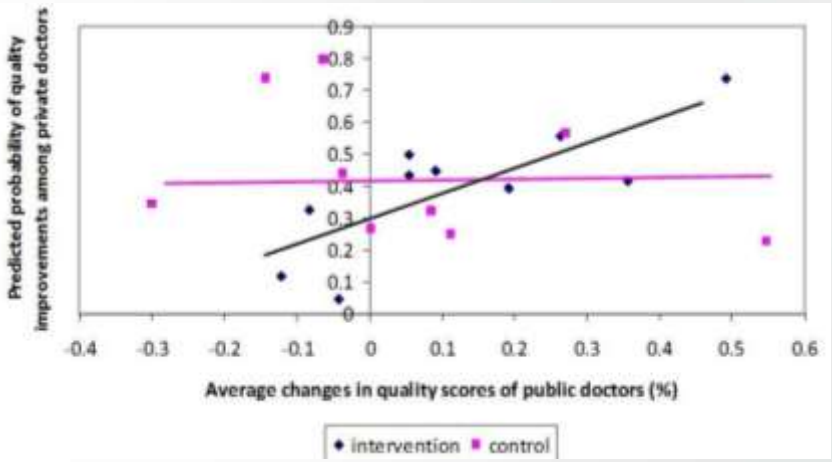
CtPt and BiPt = interaction terms between the intervention and time variables

Xijt = physician characteristics (age, sex, specialization, PHIC accredited)

Public Sector Improvements in Quality Affect Private Providers in Access Intervention Sites

When the district-level quality of public providers rose:

- the probability of quality increased among private doctors within the same site by 41% (p=0.03).
- Quality increase was associated with an increase in insured patients in the public facilities.



Higher quality in a group of physicians improves quality in a competitive market

Quimbo SA, Peabody JW, Javier X, Shimkhada R, Solon O. "Pushing on a String: How Policy Might Encourage Private Doctors to Compete with the Public Sector on the Basis of Quality," *Economics Letters* 110 (2011) 101–103 December 2010

Question 3 – Effects of Policy on Health Outcomes

Do the Policy Interventions Change More than Just Behavior?

Do They Actually Improve Health?

Policy and Health

Policy works through changing behavior expected to lead to better health outcomes

Health outcomes are the ultimate measures of importance and interest to policy makers and us all

- Studies examining the effects of insurance and payment incentives most often stop at behavioral changes
- Health outcomes research requires more sophisticated measures, large samples and careful follow-up of patients over time
- Irony is that policies cost the most but are studied the least

When Health Insurance is Expanded, Does it Lead to Better Health Outcomes?

Background:

- RAND Health Experiment first to examine the association
- No other studies since RAND – challenge of designing experimental studies in the U.S.
- Child health outcomes are of special importance

Methods

- We compared objective health status measures taken upon discharge before and after universal coverage
  - Blood tests
  - Anthropometrics
- If there was a benefit, would the insurance benefits appear immediately or be lagged, only manifested after a recovery period?
  - We also compared measures between discharge (exit) and the 4-10 week follow-up in Round 1 and Round 2

Data Source
Round 1 and 2; Intervention A, C
Data Collection
Patient exits (biomarkers, anthropometrics)
Model
$\text{Logit}(Y_{it}) = \alpha_0 + \alpha_1 N_i + \beta_0 T_i + \beta_1 N_i T_i + \Sigma\theta_j X_{jit} + U_{it}$ Y_{it} = Health measure of ith individual in survey round t N = dummy variable for intervention site T = dummy variable for post-intervention period X = patient and household characteristics (age, illness, severity, household income)

Expanded Insurance Improves Health Outcomes

- There were reductions in the likelihood of wasting or of having an infection, as measured by a common biomarker C-Reactive Protein
- Better Health, yes, but not seen until 4-10 week follow-up period

	Difference-in-Difference	
Improvement in Round 2 vs Round 1	**CRP +**	**Wasting**
At discharge	No diff. (2.8)	No diff. (-2.8)
At 8 wk follow-up (average)	-4.4 percentage pts*	-9.5 percentage pts*
Rate of improvement (discharge to 8 wks)	-10.6 percentage pts**	-8.5 percentage pts **

*p<0.01
**p<0.001

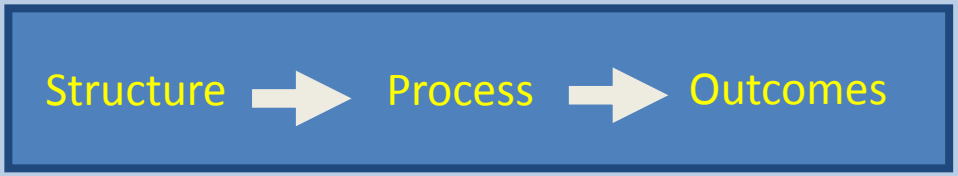
Quimbo S, Peabody JW, Shimkhada R, Solon O. "Evidence of a Causal Link Between Health Outcomes, Insurance Coverage and a Policy to Expand Access: Experimental Data from Children in the Philippines," Health Econ. 20(5): 620-30 May 2011.

When Pay for Performance Bonuses are Earned, Does it Produce Better Health Outcomes?

Background:

- Better quality (earning a bonus) means better process
- P4P studies to date have not been able to link improvements in quality structures and processes with better child health outcomes

Quality of care framework:



Methods

- Linked patients with physicians
- Difference-in-difference models assessed the impact of Bonus Intervention on many health outcomes:
  - hemoglobin, GSRH, CRP, wasting, and stunting,
- Controlled for patient characteristics, such as age, mother's education, income, condition, and length of stay

Data Source
Round 1 and 2; Intervention A, C
Data Collection
Patient exits (biomarkers, anthropometrics)
Model
$\text{Logit}(Y_{it}) = \alpha_0 + \alpha_1 N_i + \beta_0 T_i + \beta_1 N_i T_i + \Sigma\theta_j X_{jit} + U_{it}$ Y_{it} = Health measure of ith individual in survey round t N = dummy variable for intervention site T = dummy variable for post-intervention period X = patient and household characteristics (age, illness, severity, household income)

Physicians with Higher CPV Vignette Scores Also Had Patients with Better Outcomes

- Quality improved by an average of 9.7% in the CPV Vignette linked P4P Intervention arm (p<.001)
- Health Outcomes in the Intervention: Reductions in wasting or reported health status (GSRH) at discharge and 4-10 week follow-up

Health Indicator	Baseline	Post-intervention	Difference	p-value
CRP negative				
Intervention	97.69	98.07	0.38	
Control	96.06	95.6	-0.46	
Difference	1.63	2.47	0.84	0.497
Not Anemic				
Intervention	93.8	91.95	-1.85	
Control	89.59	92.61	3.02	
Difference	4.21	-0.66	-4.97	0.253
Not wasted				
Intervention	70.09	69.57	-0.51	
Control	75.02	65.25	-9.77	
Difference	-4.93	4.32	9.25	<0.0001
GSRH at least good				
Intervention	78.5	85.02	6.53	
Control	86.79	85.94	-0.85	
Difference	-8.29	-0.92	7.37	0.001

QURE HEALTHCARE QIDS

Peabody, John W., Riti Shimkhada, Stella Quimbo, Orville Solon, Xylee Javier, and Charles McCulloch. The impact of performance incentives on child health outcomes: results from a cluster randomized controlled trial in the Philippines. Health Policy and Planning. Health Policy Plan. (2014) 29 (5): 615-621.

Question 4 – Long-term impact of QIDS

Are the effects of the QIDS intervention sustained?

What is the long-term effect of QIDS on physician performance?

- Evidence of long-term effects of public health interventions is scant.
- Issues of sustainability of programs and their impact have not routinely been addressed.
- Results from QIDS were impressive, with important increases in physician quality of care and public health outcomes.
- We asked if this intervention of measurement and feedback of physicians' CPV scores had a long-term impact on their care delivery processes.

HEALTH ECONOMICS
Health Econ. (2015)
Published online in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/hec.3129

DO HEALTH REFORMS TO IMPROVE QUALITY HAVE LONG-TERM EFFECTS? RESULTS OF A FOLLOW-UP ON A RANDOMIZED POLICY EXPERIMENT IN THE PHILIPPINES

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[b]*EUR, International Institute for Social Studies, The Hague, the Netherlands*
[c]*University of California San Francisco, San Francisco, California, USA*

Methods

- We contacted and surveyed original QIDS Study physicians (95% tracking rate).
- Also surveyed new (non-QIDS) cross section of doctors
- Applied CPVs for pneumonia and diarrhea.
- Data collection carried out in 2013, 9 years after the intervention started.

Data Source

5-year follow up; Intervention A, B, C

Data Collection

Physician survey; Clinical vignettes

Model

$$S_{iht} = \alpha_0 + \alpha_1 A_{ih} + \alpha_2 B_{ih} + \sum_t \gamma_t^A A_{ih} T_t + \sum_t \gamma_t^B B_{ih} T_t + \sum_t \gamma_t^C C_{ih} T_t + \gamma_{LT}^A A_{ih} T_{LT} + \gamma_{LT}^B B_{ih} T_{LT} + \gamma_{LT}^C C_{ih} T_{LT} + \Sigma_j \theta_j X_{jiht} + \lambda_h + u_{iht}$$

Where:

S_{iht} skill of the doctor in *i* province in *h* in period t as measured by CPVs.

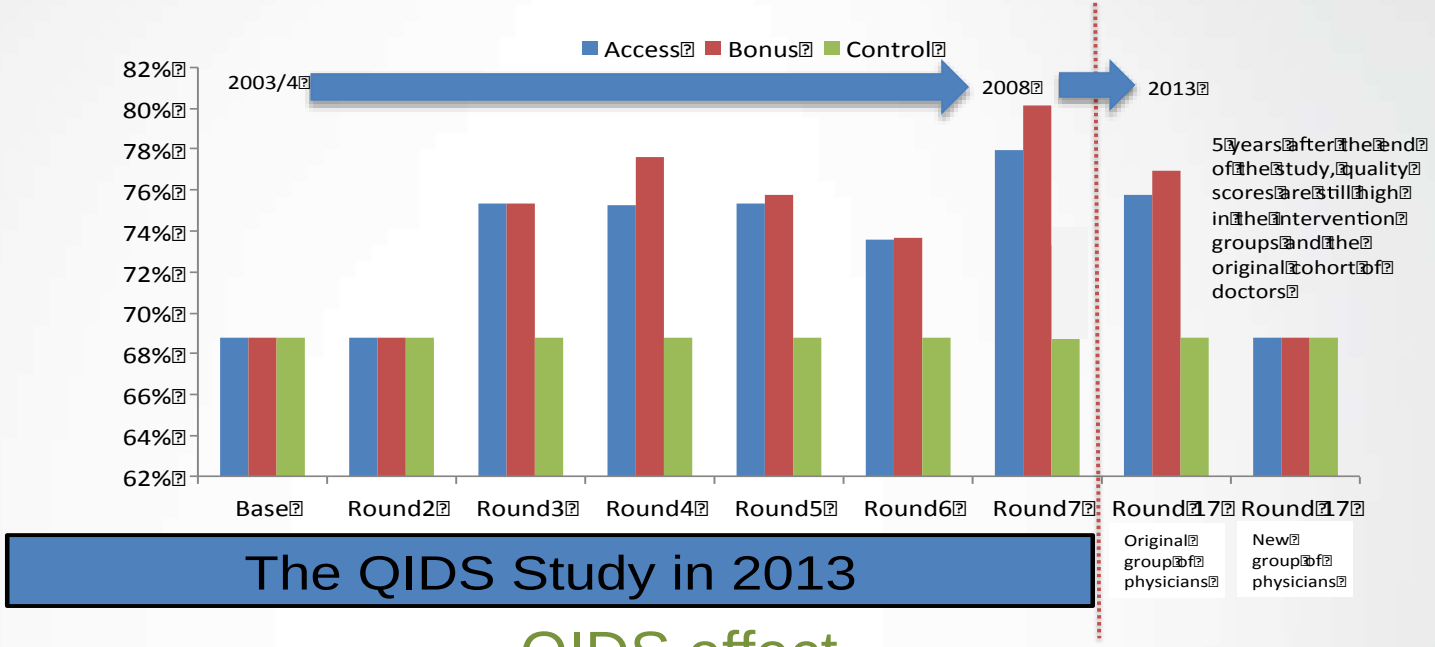
A_{ih}, B_{ih}, C_{ih} are the Access(A), Bonus (B) and Control (C) sites

A_{ihTt}, B_{ihTt},C_{ihTt} are interaction terms between the intervention and time variables

γ is the coefficient estimates

X_{jiht} is the vector for control variables

QURE, Measurement Quality Improvements Are Sustained Over Time



QIDS effect

A new culture of self-awareness and continual improvement

Launch → Continual measurements → Transformation → Culture change

Quimbo S, Wagner N, Florentino J, Solon O , and Peabody J. **Do Health Reforms To Improve Quality Have Long-term Effects? Results of a Follow-up on a Randomized Policy Experiment in the Philippines . Health Economics, 2014.**

Conclusions

- QIDS provides evidence for behavioral changes resulting from “nudges” (financial incentives)
  - When financial incentives are sufficiently strong, seemingly irrational behavior can be overcome
- QIDS contributes to innovation of global health research
  - Use of CPV vignettes, a validated and effective tool to measure quality of care
  - Involved physicians in the measurement process and feeding back results to them
  - Found health gains from behavioral change
  - Found evidence for long-term effects of interventions

THANK YOU