Measuring Healthcare Quality in Rural China: An Undercover Study of Clinician Behavior

Pilot Study

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Thank you to N. Grant Miller for support in developing this project.
1950s, 1960s and 1970s
Great Leap Forward
Great Cultural Revolution
Socialism with Chinese Characteristics

• Puzzle:
  – Life expectancy increased by 20 years:
    • From around 45 to 65
  – Income per capita / wages → increased by 0
One explanation:

Emphasis on provision of basic healthcare ➔ through system of barefoot doctors:
Reforms in 1980s / 1990s

• Incomes rose fast …
• Health care in decline …

• Almost no increase in average life expectancy …
• Health care crisis (especially in rural areas)

• Precipitated by fiscal crisis and decentralization:
  – Collapse of fiscal system (especially in rural areas)
  – Collapse of health system
1980s and 1990s Health Care

• 3 words describe the changes:
  – Privatization
  – Privatization
  – Privatization

• Virtually 1 million village barefoot doctors became private clinic operators … no salary / little public health duties / little training …

• No insurance … all fee for service

• At high levels (township health centers and county hospitals ➔ all independent, profit-oriented businesses)
Healthcare Reforms

Beginning in early 2000s:

• Focus: Expanding Healthcare Coverage and Access

• By 2010, 96% of the rural population had insurance coverage under the New Cooperative Medical Scheme (NCMS)

• Public expenditure in healthcare to $155 US per capita in 2011

• Impact of NCMS?
  - Boosted access and utilization

Healthcare Quality in Rural China
Healthcare Reforms

Impact of NCMS?

– Boosted access and utilization

– Evidence that little to NO impact on financial protection

– No clear evidence that NCMS improved health
Private and Public Health Expenditures (Current USD per capita)
Healthcare Reforms

Impact of NCMS?

– Boosted access and utilization

– Evidence that little to NO impact on financial protection
  New paper from the World Bank

– No clear evidence that NCMS improved health

All spending has been taken up with rises in prices and increase in quantity of health care treatments/examines/etc.
Healthcare Reforms

Impact of NCMS?

- Boosted access and utilization

- Evidence that little to NO impact on financial protection

- No clear evidence that NCMS improved health
Even if gov’t health insurance provides more health care, it may not improve health outcomes if the quality of care is poor
What about provider quality?

• Little is known about the quality of healthcare in rural areas
  – Have the reforms expanded access to POOR QUALITY care?

• Two Concerns:
  – Low competence of village and township clinicians
    • Low educational attainment/Little formal medical training?
    • Are providers prepared to handle China’s “epidemiological transition” to prevalence of non-communicable disease?
  – Low/Misdirected effort
    • Incentives for unnecessary care and waste?
    • Under referral of cases to upper tiers?
Study Objectives

• **Provide** an objective measure of the quality of care delivered in rural areas

• **Compare** quality of care provided at different tiers of the health system (village, township, county) and with results of a similar study in India

• **Evaluate** the determinants of quality: how to provide quality care? Do resources, physician human capital, incentives matter?

• **Recommend** policy approaches to improve care
Outline for Rest of Presentation

• Measuring Healthcare Quality

• Standardized Patient Methodology

• Pilot Study
  – Sample and Data Collection
  – Results

• Implications and Future Research
Case I: Childhood Dysentery

- 800 million diarrhea episodes annually in China
- Inflammatory disorder of the intestine brought on by infection (viral, bacterial or parasitic)
- Third highest notified communicable disease after TB and HepB
- 2 Types: Amoebic and Bacillary
- Symptoms: severe diarrhea containing blood and mucus in the feces with fever, abdominal pain, feeling of incomplete defecation
- Treatment
  - Dehydration: ORT, IV
  - When no lab for testing: antibiotic
    - Evidence that strains of Shigella becoming resistant in China (Zhang et al 2011)

Healthcare Quality in Rural China
Case II: Unstable Angina

- Cardiovascular disease is #1 cause of death in China, accounting for 41% of deaths annually (3 million per year)
- Irregular chest pains brought on by heart not receiving enough blood flow/oxygen (coronary artery disease)
  - Can evolve into heart attack
- Symptoms
  - Chest pain possibly extending to shoulder, arm, back
  - Tightness/squeezing/burning sensation
  - Shortness of breath
  - Occurs at rest, not brought on by exertion
- Tests: Electrocardiogram
- Treatment
  - Blood thinners/Nitroglycerine during event
  - Asprin
  - *Village doctors should refer to upper level facility
### Table 2: Clinic statistics on diseases used for SP cases

<table>
<thead>
<tr>
<th></th>
<th>Dysentery</th>
<th>Angina</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinic has the necessary equipment to treat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious cases</td>
<td>5.6%</td>
<td>0%</td>
</tr>
<tr>
<td>Moderate cases</td>
<td>88.9%</td>
<td>47.2%</td>
</tr>
<tr>
<td>Does not have the necessary equipment</td>
<td>5.6%</td>
<td>52.8%</td>
</tr>
<tr>
<td>Patients seen in past 2 weeks with condition</td>
<td>1.17 (1.84)</td>
<td>0.83 (1.4)</td>
</tr>
<tr>
<td>(patients)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients referred to other providers in 2012</td>
<td>4.9 (9.4)</td>
<td>2.4 (2.5)</td>
</tr>
<tr>
<td>(patients)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Notes: Provider responses. Source is author survey conducted approximately 6 months before SP visit.*
Method: Case Scripts and Protocols

• Case Scripts
  – Developed with doctors in Xi’an
  – 2 diseases: Dysentery and Unstable Angina
    • No obvious physiological symptoms
    • Low risk of invasive procedures/tests
    • Note: Child dysentery case was proxy (SP was parent of absent child)
  – Detailed history, symptoms
  – Individual background story

• Protocols for avoiding invasive procedures
SP Recruitment and Training

- **Standardized Patient (SP) Recruitment**
  - 4 SPs recruited from northern Shaanxi
  - 2 male patients for Unstable Angina Case and 2 female patients for Childhood Dysentery Case

- **SP Training**
  - Covered:
    - Background on study
    - Basic overview of diseases
    - Memorization of scripts and protocols
    - Rehearsal and test runs near Xi’an
  - SPs wore concealed wire/tape recorder so minimal recall training necessary
Data Collection

• Location/Sample
  – 6 counties in Shaanbei
    • 12 township clinics
    • 36 village clinics
  – x 2 Diseases = 96 interactions total

• Previous Facility Survey in Fall 2012
  – Clinic infrastructure
  – Provider characteristics
  – Community characteristics

• SP visits during Spring Festival 2013 (Feb 9 to 15)
  – Transcripts of interactions (from recordings)
  – Exit Questionnaire: SP Impressions
  – Bought any medicines prescribed
  – Paid any service fee
## Provider Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Township Clinics (n=12)</th>
<th>Village Clinics (n=36)</th>
</tr>
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<tbody>
<tr>
<td><strong>Mean (SD)</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td>43.78 (8.565)</td>
<td>45.85 (10.87)</td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td>83.3%</td>
<td>73.3%</td>
</tr>
<tr>
<td><strong>Experience (years)</strong></td>
<td>20.89 (8.575)</td>
<td>23.33 (9.523)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle school</td>
<td>0%</td>
<td>19.5%</td>
</tr>
<tr>
<td>Vocational middle</td>
<td>41.7%</td>
<td>60.5%</td>
</tr>
<tr>
<td>Vocational high</td>
<td>40.3%</td>
<td>10%</td>
</tr>
<tr>
<td>General high</td>
<td>4.2%</td>
<td>10%</td>
</tr>
<tr>
<td>College</td>
<td>13.9%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Qualification</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>5.6%</td>
<td>0%</td>
</tr>
<tr>
<td>Practicing Physician</td>
<td>66.7%</td>
<td>10%</td>
</tr>
<tr>
<td>Physician assistant</td>
<td>27.8%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Rural Physician</td>
<td>--</td>
<td>84.3%</td>
</tr>
<tr>
<td><strong>Medical Training</strong></td>
<td></td>
<td></td>
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<tr>
<td>None</td>
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<td>25.7%</td>
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<tr>
<td>Informal training at</td>
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<tr>
<td>medical school</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Formal training at</td>
<td>--</td>
<td>49%</td>
</tr>
<tr>
<td>medical school</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td><strong>Hours worked per day</strong></td>
<td>--</td>
<td>9.943 (4.311)</td>
</tr>
<tr>
<td><strong>Base salary (yuan)</strong></td>
<td>--</td>
<td>351.2 (377.7)</td>
</tr>
<tr>
<td><strong>Total income (yuan)</strong></td>
<td>--</td>
<td>1355.2 (1400.7)</td>
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80% of village providers have lower secondary education or less; 41% of township providers

10% PPs in village; 66.7% in township

On average, 74% of income from drug sales/fees ➔ only small share from “base salary” …
Standardized Patient Quality Measures

1. Process Quality (or “checklists”)
   – Transcripts evaluated against “clinical checklist” of recommended questions and tests
   – Checklists for each disease developed with Xi’an doctors, based on national recommended practice

2. Diagnosis
   – Completely correct /or/ partially correct /or/ incorrect

3. Treatment
   – Appropriate drugs?
   – Referral (yes or no?)
# Clinical Checklists

## Dysentery

### QUESTIONS
- Age of child
- Stool type
- Duration of illness
- Stool frequency
- Medicines taken
- Vomiting
- Abdominal Pain
- What child has eaten
- Urination
- Fever
- Stool amount
- Child mood
- Child wellness before this illness
- Drinking water source
- Drug allergies
- Cooking method
- Child drinking fluids
- Family situation
- Environmental Factors

## Unstable Angina

### QUESTIONS
- Pain location
- When started having pain
- Type of pain
- Similar pain previously
- Age
- Pain start time (this episode)
- Pain severity
- Strenuous Activity
- Pain when breathing
- Activity when pain started
- Shortness of breath
- Pain radiation
- Drinking Alcohol
- Smoking
- Nausea
- Diarrhea
- Normal Stool
- Acid reflux
- Sweating
- Constipation
- Stomach pains
- Family History

### EXAMS
- EKG
- Auscultation
- Pulse
- Blood pressure
- Temperature
## Clinical Checklists

### Dysentery

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Evaluating Diagnoses

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<tr>
<th></th>
<th>Dysentery</th>
<th>Unstable Angina</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct</td>
<td>Bacillary dysentery, dysentery, bacteria</td>
<td>Angina, coronary heart disease</td>
</tr>
<tr>
<td>Partially Correct</td>
<td>Enteritis</td>
<td>Heart problem, heart disease</td>
</tr>
<tr>
<td>Incorrect (Diagnosis offered by providers)</td>
<td>Dyspepsia/indigestion, weather, cold, intestinal ulcer, cramps, acidity</td>
<td>Sprain, intercostal neuralgia, Pleurisy, injury/trauma, tendon hemorrhage, pancreatitis, pneumonia, chest congestion</td>
</tr>
</tbody>
</table>
Standardized Patient Quality Measures

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## Evaluating Treatments

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<th><strong>Unstable Angina</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correct</strong></td>
<td>ORS, rehydration, antibiotic</td>
<td>Aspirin, anti-platelet agents, statins, beta blockers, ACE (Angiotensin Converting Enzyme) Inhibitors, referral.</td>
</tr>
<tr>
<td><strong>Incorrect</strong></td>
<td>Albumin tannate powder, norfloxacin capsules, belladonna sulfamethoxazole and trumperhoprim tablets, multienzyme tablets, other medicine for digestion, pediatric oral liquid, loperamide hydrochloride, combined bacillus subtilis and enterococcus faecium, probiotics, smectite Powder</td>
<td>Notoginseng tablets, salvia miltiorrhiza, tongmai particles, wantong, erythromycin ethylsuccinate tablets, coenzyme Q10 capsules, acetylspramycin tablets, isosorbide mononitrate, blood pressure medication, oryzanol, yuan yu anodynes, nimesulide tablets, cephradine capsules, pain killers</td>
</tr>
</tbody>
</table>
Results
Adherence to Checklist: Dysentery

- Age of child*
- Stool type*
- Duration of illness
- Stool frequency*
- Medicines taken
- Vomiting
- Abdominal pain
- What child has eaten
- Urination
- Fever*
- Stool amount
- Child mood
- Child wellness before illness
- Drinking water source
- Drug allergies
- Cooking method
- Child drinking fluids
- Family situation/history
- Environmental factors

Village Clinics
Township Health Centers
Summary: Process Quality

• On average, village clinicians perform **18%** of the recommended checklist items.

• Of “essential” items (those necessary to provide a correct diagnosis and treatment), village clinicians perform **36%**.
  – NO village doctors got all essential items.

• Township doctors do slightly better than village docs on angina case
  – % of checklist items the same for dysentery
Quality of Diagnosis and Care: Dysentery

![Quality of Diagnosis and Care: Dysentery diagram]

- Diagnosis correct
- Diagnosis partially correct
- Diagnosis wrong
- Medications Dispensed
  - Medication correct, if dispensed
  - Medication wrong, if dispensed
- Referral to other provider
  - Referred to county provider, if referred
  - Referred to town provider, if referred
- Treatment correct or partially correct
- Treatment wrong

Healthcare Quality in Rural China
Quality of Diagnosis and Care: Unstable Angina

- Diagnosis correct
- Diagnosis partially correct
- Diagnosis wrong
- Medications Dispensed
- Medication correct, if dispensed
- Medication wrong, if dispensed
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- Treatment correct or partially correct
- Treatment wrong

Village Clinics: Dark gray
Township Health Centers: Light gray

Healthcare Quality in Rural China
Summary: Quality of Diagnoses and Treatment

Diagnosis

• Village doctors get 26% of diagnoses correct
  – Township doctors do better: 52%
  – Mirrors process quality results

• 75% of village doctors dispense medication, but these are correct only 36% of the time

Treatment

• Around 50% of treatments are completely unnecessary ➔ some were determined to be harmful.
Is this good or bad? China vs. India

- Essential Checklist Items (same): China 36%, India 33%
- Diagnosis Correct or Partially Correct: China 59%, India 53%
- Treatment Correct or Partially Correct: China 53%, India 30%
  - Diagnosis and treatment standards different, so difficult to compare
Is this good or bad? China vs. India

- Essential Checklist Items (same): China 36%, India 33%
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  – Diagnosis and treatment standards different, so difficult to compare

Per Capita GDP in 2011: Shaanxi $3,179, Madhya Pradesh $583
How good of a measure is “check-list”? 
Checklist Completion and Correct Diagnoses
Checklist Completion and Correct Diagnoses

India, study 1

India, study 2
Correlates of Quality
## Correlates of Quality in Village Clinics

<table>
<thead>
<tr>
<th></th>
<th>Percent of Recommended Questions and Exams (%)</th>
<th>Diagnosis Correct (0/1)</th>
<th>Correct Treatment (0/1)</th>
<th>Total Fees Charged (yuan)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Provider age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.074</td>
<td>0.027*</td>
<td>0.005</td>
<td>-0.213</td>
</tr>
<tr>
<td></td>
<td>(0.440)</td>
<td>(0.014)</td>
<td>(0.018)</td>
<td>(0.692)</td>
</tr>
<tr>
<td><strong>Male provider</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.370</td>
<td>-0.193</td>
<td>-0.417**</td>
<td>-2.894</td>
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<td>(4.647)</td>
<td>(0.145)</td>
<td>(0.189)</td>
<td>(4.946)</td>
</tr>
<tr>
<td><strong>Provider experience</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.052</td>
<td>-0.028*</td>
<td>-0.009</td>
<td>0.346</td>
</tr>
<tr>
<td></td>
<td>(0.568)</td>
<td>(0.017)</td>
<td>(0.022)</td>
<td>(0.820)</td>
</tr>
<tr>
<td><strong>Provider education, upper secondary or higher</strong></td>
<td>5.069</td>
<td>0.451***</td>
<td>0.295**</td>
<td>1.553</td>
</tr>
<tr>
<td></td>
<td>(3.371)</td>
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</tr>
<tr>
<td><strong>Practicing Physician Certificate</strong></td>
<td>12.294**</td>
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<tr>
<td></td>
<td>(5.483)</td>
<td>(0.168)</td>
<td>(0.225)</td>
<td>(11.930)</td>
</tr>
<tr>
<td><strong>Has base salary (0/1)</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
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</tr>
<tr>
<td><strong>Value of medical instruments (10,000 yuan)</strong></td>
<td>-0.316</td>
<td>0.107**</td>
<td>-0.044</td>
<td>0.097</td>
</tr>
<tr>
<td></td>
<td>(1.342)</td>
<td>(0.049)</td>
<td>(0.047)</td>
<td>(1.100)</td>
</tr>
<tr>
<td><strong>Patient load</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.967</td>
<td>0.024</td>
<td>0.132</td>
<td>-1.437</td>
</tr>
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<td>(1.943)</td>
<td>(0.066)</td>
<td>(0.091)</td>
<td>(2.576)</td>
</tr>
<tr>
<td><strong>Angina</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.188</td>
<td>-0.034</td>
<td>0.130</td>
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<td>0.107**</td>
<td>-0.044</td>
<td>0.097</td>
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<td>(1.342)</td>
<td>(0.049)</td>
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</tr>
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<td>(0.107)</td>
<td>(3.719)</td>
</tr>
</tbody>
</table>
Process Quality and Doctor Qualification in Village Clinics

Marginal effects

- Experience
- Education
- Practicing Physician Qualification
- Base Salary

Healthcare Quality in Rural China
## Correlates of Quality in Village Clinics

<table>
<thead>
<tr>
<th></th>
<th>Percent of Recommended Questions and Exams (%)</th>
<th>Diagnosis Correct (0/1)</th>
<th>Correct Treatment (0/1)</th>
<th>Total Fees Charged (yuan)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Provider age</td>
<td>0.074</td>
<td>0.027*</td>
<td>0.005</td>
<td>-0.213</td>
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<tr>
<td></td>
<td>(0.440)</td>
<td>(0.014)</td>
<td>(0.018)</td>
<td>(0.692)</td>
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<tr>
<td>Male provider</td>
<td>0.370</td>
<td>-0.193</td>
<td>-0.417**</td>
<td>-2.894</td>
</tr>
<tr>
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<td>(4.647)</td>
<td>(0.145)</td>
<td>(0.189)</td>
<td>(4.946)</td>
</tr>
<tr>
<td>Provider experience</td>
<td>-0.052</td>
<td>-0.028*</td>
<td>-0.009</td>
<td>0.346</td>
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<tr>
<td></td>
<td>(0.568)</td>
<td>(0.017)</td>
<td>(0.022)</td>
<td>(0.820)</td>
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<tr>
<td>Provider education, upper secondary or higher</td>
<td>5.069</td>
<td>0.451***</td>
<td>0.295**</td>
<td>1.553</td>
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<tr>
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<td>(3.371)</td>
<td>(0.109)</td>
<td>(0.129)</td>
<td>(4.675)</td>
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<tr>
<td>Practicing Physician Certificate</td>
<td>12.294**</td>
<td>0.433***</td>
<td>0.065</td>
<td>11.177</td>
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<td>(5.483)</td>
<td>(0.168)</td>
<td>(0.225)</td>
<td>(11.930)</td>
</tr>
<tr>
<td>Has base salary (0/1)</td>
<td>3.476</td>
<td>-0.098</td>
<td>0.053</td>
<td>-5.186</td>
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<td>(3.821)</td>
<td>(0.106)</td>
<td>(0.153)</td>
<td>(3.735)</td>
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Process Quality and Doctor Qualification in Village Clinics
Summary: Correlates

• Clinician Competence/Knowledge
  – Better process quality and correct diagnoses strongly correlated with village doctor education and qualifications.

• Clinician Incentives/Effort
  – Suggestive evidence that having base pay reduces costs to patients (but effects on quality less clear).

• BUT
  – Sample is small (we don’t have power to see relationships)
  – Clinician qualifications and pay correlated with many other factors that also influence quality and costs
Going Forward

Improvements to study design
- Incorporate “lessons learned” from pilot study
- Panel of physicians to perfect/develop case scripts and analysis guidelines
- Measure knowledge AND quality by combining vignettes and Standardized Patients

Future Research
- Is this true throughout China’s poor areas?
  - Improve power and representation
  - Improved ability to analyze factors correlated with quality
    (Representative Survey of Providers in the Northwest)
- FIND Solutions
  - Training for Rural Physicians
  - Checklists of recommended questions and exams for specific cases
  - Test effects of provider payment
  - Others
    (Randomized Trials to Test CAUSAL IMPACT of these interventions)

A new case: TB …
Thank you!