Major Problems Facing Two Billion Farmers in Low and Lower Middle-income Countries

• Inadequate funding: people lack access to basic health services because of shortage of providers, low salary, inadequate health manpower, lack of drugs and supplies, and unaffordable fees.
• Government failures in public provisions: Inefficiency, low quality of services, unable to manage basic health care at the village level where people demand.
• Misallocation of resource: Lack of adequate prevention and public health.
• Lack of adequate insurance protection: People face impoverishment when serious illness strikes.
• Emerging new communicable diseases: HIV/AIDS, SARS, Avian Flu
<table>
<thead>
<tr>
<th>Category</th>
<th>BOD (DALY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total BOD</td>
<td>200,134,562</td>
</tr>
<tr>
<td>(1) Communicable</td>
<td>36,944,372</td>
</tr>
<tr>
<td>HIV/AIDS, TB &amp; Malaria</td>
<td>5,698,015</td>
</tr>
<tr>
<td>(2) Respiratory infection</td>
<td>6,030,661</td>
</tr>
<tr>
<td>(3) Perinatal</td>
<td>11,273,423</td>
</tr>
<tr>
<td>(4) Diarrhoeal</td>
<td>5,005,434</td>
</tr>
<tr>
<td>Sub-total [2+3+4]</td>
<td>22,309,518</td>
</tr>
</tbody>
</table>
Social Experiments Designed to Answer Twelve Questions

- Is the RMHC model viable?
- Is the RMHC replicable?
- How much are poor farmers willing to pay and enroll when they are subsidized with $2.50/person/year?
- How much adverse selection in voluntary schemes?
- **HOW MUCH DID RMHC IMPACT ACCESS?**
- **WHAT ARE THE EQUITY CONSEQUENCES?**
- **HOW MUCH DID RMHC AFFECT HEALTH STATUS?**
- How can RMHC enhance and integrate prevention?
- **HOW MUCH DID RMHC REDUCE MEDICAL IMPOVERISHMENT?**
- How much efficiency gains can RMHC produce?
- How much quality gains can RMHC produce?
- How satisfied are the people?
Rural Mutual Health Care

Joint Financing (Gov't / Farmers)
Self Governance by Farmers
Reform Prevention & basic healthcare delivery
Cover basic care & provide Insurance

The Four Pillars of RMHC
Rural Mutual Healthcare In China

- Voluntary payment and enrollment.
- Project pays $2.50/person/year, farmers select one of three packages and prepay $1.50 to $2.20/person/year, depending on the package. Very poor fully subsidized.
- Cover prevention, primary care, drugs and hospitalization with patients still have to pay 50%-60% of cost when seek services.
- Reform the delivery system at village level, select and contracted village doctors, central purchase/distribution of drugs, quality assurance of services and payment for hospitalization.
- Partial self-governance by farmers through village committees and town board; government supervise, regulate and monitor performance.
Site Selection and Sites

- **RMHC Intervention sites:**
  - One town in Guizhou province: $220 avg income p.c.
  - Two towns in Shaanxi province: $180 avg income p.c.
  - Together: 60,000 farmers and family members.
  - Began enrollment in Dec 2003 and started operation immediately

- **Control sites:** 2 sites, matched to intervention site based on socioeconomic conditions, demographic characteristics, availability of health care facilities.

- **One Catastrophic insurance intervention site**

- **Longitudinal household/individual surveys:**
  - Baseline: Nov/Dec 2002
Evaluation I and II

- What is the impact of RMHC on health care utilization?
- What is the impact of RMHC on health status?
- How do the impacts vary by:
  - Household income?
  - Those with and without chronic conditions?
Evaluations III

- What is the impact of RMHC on improving financial risk protection?
- Following van Doorslaer and Wagstaff’s approach:
  - Catastrophic expenditure is defined by out-of-pocket health expenditure exceeding a certain threshold of “ability to pay”—household income less food consumption expenditure
  - Medical impoverishment is measured by:
    - Headcount: Probability of being pushed below the poverty line due to medical expenditures (USD 1 per day)
    - Poverty gap: The amount of short fall among those below the poverty line.
Data Used in the Evaluation in this Presentation

- Baseline and 2005 follow up
- Sample size: RMHC (4271); Control site (1340); Catastrophic insurance only site (1220)
- Follow up rate (household, individual): RMHC (85%, 80%); Control site (88%, 84%); Catastrophic insurance only site (72%, 56%)
- We use 2005 because 2004 was only one year after the intervention and responses may not have been stable yet.
Estimation Method

• Difference-in-difference to remove:
  – time-invariant person-specific, and site-specific, unobservable factors and
  – trends that are similar between experiment and control site

• Propensity score matching to remove heterogeneity between “treatment” and control group: where “treatment” are those who enrolled in the experiment.

• Matching algorithm
  – Nearest 4 neighbor
  – Kernel weights
Estimation

\[ Y_{ikt} = \beta_0 + \beta_1 \text{RMHC}_{kt} + \beta_2 X_{ikt} + \alpha_i + \theta_k + \nu_t + \varepsilon_{it} \]

\[ \Delta Y_{ik} = \beta_1 \text{RMHC}_k + \beta_2 \Delta X_{ik} + \Delta \nu + \Delta \varepsilon_i \]
Heckman’s Difference-in-Differences Matching Estimator

\[
ATT = \frac{1}{n_1} \sum_{i \in I_1 \cap S_p} \{(Y_{1t_i} - Y_{1t_i}) - \sum_{j \in I_0 \cap S_p} W(i, j)(Y_{0t_j} - Y_{0t_j})\}
\]

Enrolled in the set of common-support.

Multiple individuals in the control group who are in the set of common-support.
Heckman’s Difference-in-Differences Matching Estimator

1. Kernel matching:

\[ W(i, j) = \frac{G\left( \frac{P_j - P_i}{\alpha_n} \right)}{\sum_{k \in I_0} G\left( \frac{P_k - P_i}{\alpha_n} \right)} \]

where \( G(.) \) is a kernel function and \( \alpha_n \) is a bandwidth parameter.
## Impact on Access (Utilization)

<table>
<thead>
<tr>
<th>Impact on Access</th>
<th>Baseline</th>
<th>Diff-in-Diff</th>
<th>DD+ Nearest 4 neighbor</th>
<th>DD+ Kernel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visit an outpatient provider in the last 2 weeks? (1/0)</td>
<td>0.173</td>
<td>0.036** (0.010)</td>
<td>0.121** (0.026)</td>
<td>0.120** (0.018)</td>
</tr>
<tr>
<td>Number of outpatient visit in the last 2 weeks</td>
<td>0.352</td>
<td>0.007 (0.033)</td>
<td>0.155** (0.052)</td>
<td>0.148** (0.040)</td>
</tr>
<tr>
<td>Self-treat in the last 2 weeks? (1/0)</td>
<td>0.056</td>
<td>-0.045** (0.009)</td>
<td>-0.032** (0.015)</td>
<td>-0.039** (0.013)</td>
</tr>
<tr>
<td>Hospitalized in the last year? (1/0)</td>
<td>0.033</td>
<td>0.010 (0.009)</td>
<td>-0.023 (0.012)</td>
<td>-0.011 (0.011)</td>
</tr>
</tbody>
</table>
### Impact Estimates of RMHC on Outpatient/Inpatient Utilization and Self-Medication

<table>
<thead>
<tr>
<th></th>
<th>Baseline (N = 4175)</th>
<th>DD (univariate) (N = 4175)</th>
<th>DD (multivariate)† (N = 4175)</th>
<th>Nearest 4 neighbor† (N = 4066)</th>
<th>Kernel† (N = 4147)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td>s.e.</td>
<td>β</td>
<td>s.e.</td>
<td>β</td>
</tr>
<tr>
<td>Patient Visit (0/1)</td>
<td>0.173</td>
<td>0.022 (0.016)</td>
<td>0.036</td>
<td>(0.010)**</td>
<td>0.121</td>
</tr>
<tr>
<td>Visit to Village Clinic</td>
<td>0.141</td>
<td>0.023 (0.014)</td>
<td>0.033</td>
<td>(0.011)**</td>
<td>0.108</td>
</tr>
<tr>
<td>Visit to Township Health Center</td>
<td>0.022</td>
<td>0.013 (0.007)</td>
<td>0.016</td>
<td>(0.007)*</td>
<td>0.018</td>
</tr>
<tr>
<td>Visit to County Hospital and above</td>
<td>0.010</td>
<td>-0.014 (0.006)*</td>
<td>-0.013</td>
<td>(0.006)*</td>
<td>-0.005</td>
</tr>
<tr>
<td>Outpatient Visits</td>
<td>0.352</td>
<td>-0.018 (0.040)</td>
<td>0.007</td>
<td>(0.033)</td>
<td>0.155</td>
</tr>
<tr>
<td>f-Medication</td>
<td>0.056</td>
<td>-0.052 (0.010)**</td>
<td>-0.045</td>
<td>(0.009)**</td>
<td>-0.032</td>
</tr>
<tr>
<td>Patient Visit</td>
<td>0.033</td>
<td>0.006 (0.009)</td>
<td>0.01</td>
<td>(0.009)</td>
<td>-0.023</td>
</tr>
<tr>
<td>Visit to Township Health Center</td>
<td>0.012</td>
<td>0.001 (0.005)</td>
<td>0.001</td>
<td>(0.005)</td>
<td>-0.018</td>
</tr>
<tr>
<td>Visit to County Hospital and above</td>
<td>0.021</td>
<td>0.005 (0.007)</td>
<td>0.009</td>
<td>(0.007)</td>
<td>-0.005</td>
</tr>
</tbody>
</table>

* Significant at 5%  ** Significant at 1%
Impact on Utilization by Household Income and Chronic Condition

- **Household income:**
  - Lowest 25%: increase OP visit by 100%
  - Middle 50%: increase OP visit by 62%
  - Highest 25%: increase OP visit by 90%

- **With chronic condition:**
  - Increase OP visit by 100%

- **Without chronic condition:**
  - Increase OP visit by 70%
## Impact on Health Status—EQ-5D

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Baseline</th>
<th>DD+ Nearest 4 neighbor</th>
<th>DD+ Kernel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility (1=problem, 0=no problem)</td>
<td>0.08</td>
<td>-0.030** (0.015)</td>
<td>-0.022 (0.014)</td>
</tr>
<tr>
<td>Self-care</td>
<td>0.05</td>
<td>-0.004 (0.012)</td>
<td>0.001 (0.012)</td>
</tr>
<tr>
<td>Usual activity</td>
<td>0.11</td>
<td>-0.031 (0.017)</td>
<td>-0.018 (0.015)</td>
</tr>
<tr>
<td>Pain/Discomfort</td>
<td>0.31</td>
<td>-0.121** (0.027)</td>
<td>-0.117** (0.023)</td>
</tr>
<tr>
<td>Anxiety/depression</td>
<td>0.40</td>
<td>-0.220** (0.028)</td>
<td>-0.217** (0.026)</td>
</tr>
<tr>
<td>Any of the 5 dimension with problem</td>
<td>0.49</td>
<td>-0.246** (0.028)</td>
<td>-0.238** (0.026)</td>
</tr>
</tbody>
</table>
Impact on health status by...

- Income: lowest income experienced the greatest health improvement
- Those who were “ill” in the baseline experienced a greater reduction in reporting “any problem” in EQ-5D
- Those above 55 years old benefit most in terms of improved mobility and usual activities.
## Impact on Catastrophic Expenditure

<table>
<thead>
<tr>
<th>Out-of-pocket health expenditure</th>
<th>Baseline</th>
<th>Diff-in-Diff</th>
<th>DD+ Nearest 4 neighbor</th>
<th>DD+ Kernel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out-of-pocket health expenditure $&gt; 10%$ income net of food expenditure</td>
<td>0.285</td>
<td>-0.069** (0.019)</td>
<td>-0.122** (0.036)</td>
<td>-0.091** (0.028)</td>
</tr>
<tr>
<td>$&gt; 20%$</td>
<td>0.197</td>
<td>-0.062** (0.017)</td>
<td>-0.075** (0.032)</td>
<td>-0.054* (0.025)</td>
</tr>
<tr>
<td>$&gt; 30%$</td>
<td>0.153</td>
<td>-0.056** (0.016)</td>
<td>-0.072** (0.028)</td>
<td>-0.062** (0.022)</td>
</tr>
</tbody>
</table>
Impact on Catastrophic Expenditure (30% of income) by income classes

<table>
<thead>
<tr>
<th>Income Class</th>
<th>Baseline</th>
<th>Diff-in-Diff</th>
<th>DD+ Nearest 4 neighbor</th>
<th>DD+ Kernel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest 25% income</td>
<td>0.128</td>
<td>-0.098**</td>
<td>-0.125*</td>
<td>-0.116**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.034)</td>
<td>(0.056)</td>
<td>(0.043)</td>
</tr>
<tr>
<td>Middle 50%</td>
<td>0.138</td>
<td>-0.035</td>
<td>-0.009</td>
<td>-0.009</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.023)</td>
<td>(0.029)</td>
<td>(0.028)</td>
</tr>
<tr>
<td>Highest 25%</td>
<td>0.201</td>
<td>-0.075**</td>
<td>0.011</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.030)</td>
<td>(0.055)</td>
<td>(0.049)</td>
</tr>
</tbody>
</table>
## Impact on Impoverishment

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Diff-in-Diff</th>
<th>DD+ Nearest 4 neighbor</th>
<th>DD+ Kernel</th>
</tr>
</thead>
<tbody>
<tr>
<td>% below $1/day: full sample</td>
<td>0.201</td>
<td>-0.028*</td>
<td>-0.021 (0.027)</td>
<td>-0.023 (0.020)</td>
</tr>
<tr>
<td>% below $1/day: lowest 25% income sample</td>
<td>0.621</td>
<td>-0.107** (0.027)</td>
<td>-0.093* (0.042)</td>
<td>-0.099* (0.046)</td>
</tr>
<tr>
<td>Poverty gap (RMB): full sample</td>
<td>59</td>
<td>-8.02 (6.16)</td>
<td>-1.2 (9.66)</td>
<td>0.82 (8.96)</td>
</tr>
<tr>
<td>Poverty gap (RMB): lowest 25% income sample</td>
<td>157</td>
<td>-25.5 (17.5)</td>
<td>-65.9* (32.9)</td>
<td>-72.0** (30.04)</td>
</tr>
</tbody>
</table>

*Statistically significant at the 5% level. **Statistically significant at the 1% level.
Catastrophic + Saving Accounts

- Benefit package:
  - Outpatient: 8 RMB saving accounts
  - Inpatient: high deductible, high ceiling (copayment)

- Continue with public provision
  - FFS
  - Earns profit from selling drugs

Rural Mutual Health Care (RMHC)

- Benefit package:
  - Covers both outpatient and inpatient, no deductible, but ceilings

- Insurance fund acts as purchaser:
  - Use competition to select village doctor
  - Pay village doctor salary
  - Use bulk purchasing for drug
Conclusions on Access and Utilization

• RMHC
  – Enrolled benefits by increasing outpatient utilization by 70%
  – Most benefits are at village level
  – Highest and lowest income group’s increase mostly at village level, the middle income group’s increase at township level.
  – Increase greater for those with chronic conditions
  – No statistically significant effect on inpatient use

• Catastrophic + MSA
  – No overall statistically significant effect.
Overall Summary

- Willingness to pay—70%+ would voluntarily enroll and prepay average of $1.50 if subsidized $2.50.
- Adverse selection—Serious (increased average cost of premium by more than 10%)
- Prevention, basic health services and essential drugs made available at the village level.
- Access and use—significantly improved
- Equity—improved
- Risk protection—reduced impoverishment by 30%-50%, depending on measurement used.
- Efficiency Improvements—At least 30%.
- Quality Improvements—Significant at village level.
- Public Satisfaction—More than 90%.
Replication (go to scale)

• GUIYANG MUNCIPAL GOVERNMENT REPLICATED RMHC TO COVER 1.7 MILLION FARMERS
• SHAANXI PROVINCIAL GOVERNMENT PLANS TO REPLICATE TO COVER 300,000 FARMERS IN A COUNTY AS AN INTERMEDIATE STEP TO GO TO SCALE PROVINCIAL WIDE.
Key Elements of Rural Mutual Healthcare Found Their Way Into Chinese Policy

• Joint Government and Household financing.
• Shift coverage from MSA/Cat to coverage of prevention, primary care and catastrophic.
• Encourage community governance.
Team Work

The Research Team:

- William Hsiao—Harvard
- Winnie Yip—Harvard
- Hong Wang—Yale
- Lusheng Wang—China Health Economics Institute
- Licheng Zhang—Beijing University
- Jianmin Gao—Xian JiaTong University
- Graduate and undergraduate students from Harvard, Yale, Stanford, Beijing, JiaTong and Yanyming universities