Public Policy for the Poor? A Randomized Evaluation of the Mexican Universal Health Insurance Program

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Joint work with Emmanuela Gakidou, Kosuke Imai, Jason Lakin, Ryan T. Moore, Clayon Nall, Nirmala Ravishankar, Manett Vargas, Martha María Téllez-Rojo, Juan Eugenio Hernández Ávila, Mauricio Hernández Ávila, Héctor Hernández Llamas

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The Essential Role of Pair Matching in Cluster-Randomized Experiments, with Application to the Mexican Universal Health Insurance Evaluation *Statistical Science* (2009)

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Seguro Popular: A Massive Reform

Medical services, preventive care, pharmaceuticals, and financial health protection beneficiaries: 50M Mexicans (half of the population) with no regular access to health care, particularly those with low incomes.

Mexican Health Policy: centralized ⇝ decentralized ⇝ stewardship

Cost in 2005: $795.5 million in new money

Cost when fully implemented: additional 1% of GDP

One of the largest health reforms of any country in last 2 decades

Most visible accomplishment of the Fox administration

Major issue in the 2006 presidential campaign

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- Financial Protection (money for the poor rarely makes it there)
- Out-of-pocket expenditure
- Catastrophic expenditure (8.4% of households, & 10% of the poor, spend >30% of annual disposable income on health)
- Impoverishment due to health care payments

Health System Effective Coverage

Health Care Facilities
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Frenk and Fox asked: How can one democratically elected government “tie the hands” of their successors?

Commission an independent evaluation

(They are true believers in SP)

Like in science: make themselves vulnerable to being proven wrong

If we show SP is a success: elimination would be difficult

If SP is a failure: who cares about extending it

The largest randomized health policy experiment in history

One of the largest policy experiments to date

First cohort: 148 geographic areas, 1,380 localities, \(\approx 118,569\) households, and \(\approx 534,457\) people
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Most large scale public policy experiments fail. Many failures are political.

Politicians: need to pursue short term goals.
Citizens: you plan to randomly assign me? All perfectly legitimate; a natural consequence in a democracy.

E.g., Oportunidades program: Some governors “miraculously” found money for control groups to participate too (numerous similar examples worldwide).

Previous evaluation designs ignored democratic politics. We developed a new research design & new methods for Mexico: includes fail-safe components for when politics intervenes. Uses data far more efficiently to find effects and save money.
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1. Complete Randomization (used in Oportunidades evaluation)
   - Flip coin to assign program to each area
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2. Matched-Pair Randomization (used in Seguro Popular evaluation)
   - Match areas in pairs on background characteristics
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- More efficient: up to 38 times!
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Define 12,284 "health clusters" that tile Mexico's 31 states; each includes a health clinic and catchment area.

Persuaded 13 of 31 states to participate (7,078 clusters).

Match clusters in pairs on background characteristics.

Select 74 pairs (based on necessary political criteria, closeness of the match, likelihood of compliance).

Randomly assign one in each pair to receive encouragement to affiliate, better health facilities, drugs, and doctors.

Conduct baseline survey of each cluster's health facility.

Survey \approx 32,000 random households in 50 of the 74 treated and control unit pairs (chosen based on likelihood of compliance with encouragement and similarity of the clusters within pair).

Repeat surveys in 10 months to measure outcome.
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Remaining in study: 148 clusters (74 pairs) in 7 states
Clusters are Representative On Measured Variables

- Prop earning <2 min wages
- Mean Years Education
- Prop aged 0–4 years old
- Prop Employed
- Prop Female−headed HH
- Prop w/o Soc Sec Rights

Gary King (Harvard)
Public Policy for the Poor?
10 / 27
Matched Pairs, Guerrero

Guerrero

1 rural pair
6 urban pairs

- Treatment Rural
- Control Rural
- Treatment Urban
- Control Urban
Matched Pairs, Jalisco

Jalisco

1 urban pair

- Treatment Rural
- Control Rural
- Treatment Urban
- Control Urban
Matched Pairs, Estado de México

Gary King (Harvard)
Matched Pairs, Morelos

Morelos

12 rural pairs
9 urban pairs

- Treatment Rural
- Control Rural
- Treatment Urban
- Control Urban
Matched Pairs, Oaxaca

3 rural pairs
1 urban pair

Gary King (Harvard)
Matched Pairs, San Luis Potosí

San Luis Potosí

2 rural pairs

- Treatment Rural
- Control Rural
- Treatment Urban
- Control Urban
Matched Pairs, Sonora

Sonora

2 rural pairs
1 urban pair

- Treatment Rural
- Control Rural
- Treatment Urban
- Control Urban
Design and Analysis Strategy is Triply Robust

Design has three parts:

1. Matching pairs on observed covariates
2. Randomization of treatment within pairs
3. If necessary statistically adjust for differences

Triple Robustness
If matching or randomization or statistical analysis is right, but the other two are wrong, results are still unbiased.

Two Additional Checks if Triple Robustness Fails

1. If one of the three works, then “effect of SP” on time 0 outcomes (measured in baseline survey) must be zero
2. If we lose pairs, we check for selection bias by rerunning this check.
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ITT on Outcome Measures at Baseline, for all families (left) and poor families, in Oportunidades (right)
Effect of Encouragement on Seguro Popular Affiliation

Horizontal axes: per-capita asset ownership deciles of areas (poorer to the left). Vertical axes: percentage point causal effect of encouragement to affiliate on Seguro Popular affiliation.

Poor areas, not poor households, are affiliated the most.
Effect on % of Households with Catastrophic Health Expenditures

<table>
<thead>
<tr>
<th></th>
<th>All Study Participants</th>
<th>Experimental Compliers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average (Control)</td>
<td>ITT</td>
</tr>
<tr>
<td>All</td>
<td>8.4</td>
<td>1.9*</td>
</tr>
<tr>
<td>Low Asset</td>
<td>9.9</td>
<td>3.0*</td>
</tr>
<tr>
<td>High Asset</td>
<td>7.1</td>
<td>0.9</td>
</tr>
<tr>
<td>Female-Headed</td>
<td>8.5</td>
<td>1.4</td>
</tr>
</tbody>
</table>

“Catastrophic expenditures”: out-of-pocket health expenses > 30% of post-subsistence income
<table>
<thead>
<tr>
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<th>Experimental Compliers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average (Control) ITT</td>
<td>SE ($\text{\textdollar}175$)</td>
<td>Average (Control) CACE</td>
<td>SE ($\text{\textdollar}453$)</td>
</tr>
<tr>
<td>Overall:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>$1631.3$</td>
<td>$258.0$</td>
<td>$1712.7$</td>
<td>$689.7$</td>
</tr>
<tr>
<td>Low Asset</td>
<td>$1360.2$</td>
<td>$425.6^*$</td>
<td>$1502.6$</td>
<td>$915.3^*$</td>
</tr>
<tr>
<td>High Asset</td>
<td>$1867.9$</td>
<td>$128.4$</td>
<td>$1933.2$</td>
<td>$428.2$</td>
</tr>
<tr>
<td>Female-Headed</td>
<td>$1509.1$</td>
<td>$156.5$</td>
<td>$1689.9$</td>
<td>$428.6$</td>
</tr>
<tr>
<td><strong>Inpatient Care:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>$532.5$</td>
<td>$96.9^*$</td>
<td>$557.1$</td>
<td>$259.1^*$</td>
</tr>
<tr>
<td>Low Asset</td>
<td>$527.1$</td>
<td>$188.2^*$</td>
<td>$579.0$</td>
<td>$404.8^*$</td>
</tr>
<tr>
<td>High Asset</td>
<td>$537.2$</td>
<td>$31.1$</td>
<td>$536.2$</td>
<td>$103.6$</td>
</tr>
<tr>
<td>Female-Headed</td>
<td>$452.5$</td>
<td>$115.1^*$</td>
<td>$510.0$</td>
<td>$315.2^*$</td>
</tr>
<tr>
<td><strong>Outpatient Care:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>$448.3$</td>
<td>$116.7^*$</td>
<td>$499.1$</td>
<td>$312.0^*$</td>
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<tr>
<td>Low Asset</td>
<td>$412.3$</td>
<td>$176.7^*$</td>
<td>$466.3$</td>
<td>$380.0^*$</td>
</tr>
<tr>
<td>High Asset</td>
<td>$479.7$</td>
<td>$81.9$</td>
<td>$533.0$</td>
<td>$272.9$</td>
</tr>
<tr>
<td>Female-Headed</td>
<td>$416.3$</td>
<td>$110.4$</td>
<td>$496.8$</td>
<td>$302.4$</td>
</tr>
<tr>
<td></td>
<td>All Study Participants</td>
<td>Experimental Compliers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------</td>
<td>------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average (Control)</td>
<td>ITT SE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Devices:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>521.1</td>
<td>20.0 (41)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Asset</td>
<td>427.3</td>
<td>17.8 (46)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Asset</td>
<td>603.0</td>
<td>29.4 (47)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female-Headed</td>
<td>625.6</td>
<td>53.6 (55)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Devices:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>139.7</td>
<td>−8.8 (23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Asset</td>
<td>72.0</td>
<td>−0.2 (20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Asset</td>
<td>198.8</td>
<td>−16.5 (29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female-Headed</td>
<td>155.5</td>
<td>10.9 (34)</td>
<td></td>
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</tbody>
</table>
# Self-Assessment: Overall

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>Average (Control)</td>
<td>ITT SE</td>
</tr>
<tr>
<td>Overall Health</td>
<td>55.7</td>
<td>4.2* (2.0)</td>
</tr>
<tr>
<td>Mobility</td>
<td>86.7</td>
<td>1.0 (1.0)</td>
</tr>
<tr>
<td>Vigorous Activity</td>
<td>69.2</td>
<td>4.6* (2.7)</td>
</tr>
<tr>
<td>Self-Care</td>
<td>95.3</td>
<td>0.4 (0.6)</td>
</tr>
<tr>
<td>Soreness</td>
<td>80.3</td>
<td>2.6* (1.5)</td>
</tr>
<tr>
<td>Pain</td>
<td>82.4</td>
<td>2.4* (1.4)</td>
</tr>
<tr>
<td>Sleeping</td>
<td>85.1</td>
<td>2.7* (1.3)</td>
</tr>
<tr>
<td>Depression</td>
<td>77.3</td>
<td>6.4* (3.7)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>85.9</td>
<td>3.1 (2.0)</td>
</tr>
</tbody>
</table>
### Self-Assessment, Controlling for Baseline Levels

<table>
<thead>
<tr>
<th></th>
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<th>CACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Health</td>
<td>0.6</td>
<td>1.7</td>
</tr>
<tr>
<td>Mobility</td>
<td>0.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Vigorous Activity</td>
<td>3.3</td>
<td>8.9</td>
</tr>
<tr>
<td>Self-Care</td>
<td>−0.2</td>
<td>−0.5</td>
</tr>
<tr>
<td>Soreness</td>
<td>1.0</td>
<td>2.6</td>
</tr>
<tr>
<td>Pain</td>
<td>1.1</td>
<td>3.0</td>
</tr>
<tr>
<td>Sleeping</td>
<td>1.0</td>
<td>2.6</td>
</tr>
<tr>
<td>Depression</td>
<td>0.6</td>
<td>1.5</td>
</tr>
<tr>
<td>Anxiety</td>
<td>0.8</td>
<td>2.1</td>
</tr>
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</table>

A **difference-in-difference test**: The causal effect of Seguro Popular on the change from baseline to followup in the difference between treated and control groups on health self-assessment variables.
Conclusions

Positive effects detected now:
- Catastrophic expenditures slashed
- In-patient out-of-pocket expenditures drastically reduced
- Out-patient out-of-pocket expenditures drastically reduced

Positive effects not yet seen:
- Expenditures on medicines
- Utilization (preventative and procedures)
- Risk factors

Other findings:
- Only 66% of automatically affiliated Oportunidades respondents were aware they were affiliated!
- More encouragement to affiliate might be devoted to finding the poor hidden within relatively "wealthier" clusters
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GaryKing.org