In Vaccines We Trust? The Effects of the CIA’s Vaccine Ruse on Immunization in Pakistan

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Vaccine Skepticism & Misconceptions on the Rise

- Vaccines behind some of the largest improvements in human wellbeing
- Vaccine skepticism is on the rise
- Fuelled by anti-vaccine movement and religious extremism (Afghanistan, Pakistan, Nigeria)
- Trust in health providers and vaccines is key for acceptance.
Vaccine Skepticism & Misconceptions on the Rise

- Vaccines behind some of the largest improvements in human wellbeing
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- Trust in health providers and vaccines is key for acceptance.
- How does information discrediting health services affect the vaccination rates?
We Exploit the 2011 CIA Vaccine Ruse

- The CIA got intelligence suggesting Bin Laden was hiding in Pakistan.
- The CIA organized a fake vaccination campaign to get DNA from kids in the compound.
- They recruited a Pakistani physician, who conducted vaccinations in the area.
- Public disclosure: Jul 2011.
- The Pakistani Taliban used this information to discredit vaccines → Anti-Vaccine Propaganda.
Paper In a Nutshell

- We implement a **DiD strategy**:
  - We compare children born **before & after** the disclosure.
  - Across regions with different levels of **Islamist support**.

- **Main Result:** Large **negative effect** on vaccination rates.
  - **12% to 20% decline** in vaccination rates per Standard Deviation in Islamist support.
  - Additional results suggest the channel is **lower demand & trust** in formal medicine
Background
Pakistan’s Political & Administrative Background

- We focus on the 4 provinces of Pakistan (97% of the population)
- Measure of **ideological alignment to the Taliban**:
  Vote share of MMA in 2008
- Alliance of Islamist, ultra-conservative parties with strong connections to the Taliban
- 3% of the votes and seats but substantial variation
Reactions to the CIA Vaccine Ruse in Pakistan

- **Anti-vaccine propaganda intensified** after 2011
  - “Western conspiracy to sterilize Muslim girls”, “vaccines made of pig-fat”, “un-Islamic to take medicines before disease”

- Leverage on the **CIA vaccine ruse** for **credibility**:
  - “Polio agents could be also spies as we have found in the case of Dr. Shakil Afridi has surfaced.”
    (Published in a fatwa, cited in Roul 2014).

- Rumors spread through network of **radicalized mosques** and Islamist newspapers (Roul 2014).

- Extensive anecdotal evidence that **parents granted credibility** to these rumors and became skeptical of vaccines.
Vaccine Delivery in Pakistan

- Vaccines are administered by **Lady Health Workers**.

- Expanded Program in Immunization (EPI) organizes **coordinated vaccination drives**.

- Pakistan follows the official calendar recommended by WHO but not strictly enforced.
Data

- **Pakistan Social and Living Standards Measurement:**
  - Rounds 2010 and 2012
  - 18,000 children in the sample < 2 years old
  - Outcome: indicator for having received 1st dose of vaccine X
    - $= 1$ if vaccine noted in the vaccine card
    - $= 0$ otherwise
Difference-in-Differences Empirical Strategy

1. **Regional variation:**
   - Districts with high support for the Taliban → parents more exposed and persuaded by the anti-vaccine propaganda

2. **Cohort variation:**
   - Fully exposed cohorts → born after July 2011 (disclosure)
   - Not exposed cohorts → born “much earlier” than July 2011
   - Partially exposed cohorts → born shortly before July 2011
     - Early months in their life under the new information scenario

→ Next, we examine the **age profiles** to distinguish partially from not-exposed cohorts.
Age Profile of Vaccines (Pre-Treatment)

Polio Vaccine Age Profile

- Months of Age: 1 to 12
- Share of Vaccinated Children: 0 to 0.8

Graph showing the share of vaccinated children across different months of age.
Age Profile of Vaccines (Pre-Treatment)

Measles Vaccine Age Profile

Share of Vaccinated Children

Months of Age

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Age Profiles. Before & After. By Islamist Support

Polio Vaccine

Low Islamist Support

High Islamist Support
Age Profiles. Before & After. By Islamist Support

Measles Vaccine

Low Islamist Support

High Islamist Support

Share of Vaccinated Children

Months of Age

Pre-Period

Post-Period

DPT
Empirical Strategy

- Flexible Regression Framework

\[ Y_{ikaj} = \sum_k \beta_k D_k I_j + \gamma_k + \gamma_j + \gamma_a + \delta c_i + \epsilon_{ikaj} \]

- \( Y_{ikaj} = 1 \) if child \( i \) got the 1st dose of the vaccine
- \( D_k \) dummy for month of birth \( k \)
- \( I_j \) Islamist Parties (MMA) 2008 vote share in district \( j \)
  (in standard deviations)
- \( \gamma_k, \gamma_j, \gamma_a \): monthly cohort FE, district FE, monthly age FE
- \( c_i \) covariates (month-of-interview & rural indicator)

We plot \( \hat{\beta}_k \) coefficient: treatment effect for each cohort
Cohort-Specific Treatment Effects

Polio Vaccine

Month-Year of Birth

Control Cohorts
Partially Treated Cohorts
Fully Treated Cohorts
Cohort-Specific Treatment Effects

Measles Vaccine

- Control Cohorts
- Partially Treated Cohorts
- Fully Treated Cohorts

Month-Year of Birth


Cohort Specific Treatment Effect

-0.15 -0.1 -0.05 0 0.05 0.1 0.15

With CI  Longer Pre-Trend  Full Immunization  Medium-Run
## Effects of Disclosure of Vaccination Ruse

<table>
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<tr>
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<th>Dependent Variables:</th>
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<tbody>
<tr>
<td></td>
<td>Polio (1)</td>
<td>DPT (2)</td>
<td>Measles (3)</td>
<td>All Vaccines (4)</td>
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<tr>
<td>Mean Dep. Var.</td>
<td>0.420</td>
<td>0.453</td>
<td>0.279</td>
<td>0.250</td>
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<td>-0.056***</td>
<td>-0.055***</td>
<td>-0.058***</td>
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<tr>
<td></td>
<td>(0.020)</td>
<td>(0.018)</td>
<td>(0.016)</td>
<td>(0.016)</td>
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<tr>
<td>Observations</td>
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<td>16,654</td>
<td>12,479</td>
<td>12,479</td>
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<tr>
<td>R-squared</td>
<td>0.262</td>
<td>0.241</td>
<td>0.253</td>
<td>0.259</td>
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<td>Number of Clusters</td>
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### Panel A. 1st Dose of Each Vaccine

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<td>0.279</td>
<td>0.264</td>
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<td>Post × Islamist Support</td>
<td>-0.064***</td>
<td>-0.061***</td>
<td>-0.055***</td>
<td>-0.050***</td>
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<tr>
<td></td>
<td>(0.019)</td>
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<td>(0.016)</td>
<td>(0.015)</td>
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<tr>
<td>Observations</td>
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<td>12,479</td>
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<tr>
<td>R-squared</td>
<td>0.277</td>
<td>0.247</td>
<td>0.253</td>
<td>0.272</td>
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### Notes:
- Standard errors clustered at the district-level in parentheses.
- The unit of observation is the child level.
- The sample consists of children born between July 2010 and July 2012 that are less than 24 months of age at the time of interview. We exclude partially treated children: for the first dose of Polio and DPT, we exclude children born between March and June 2011; for first dose of measles and the first dose of all vaccines, we exclude children born between July 2010 and June 2011. In panel B (with the exception of the results for measles in column 3), we exclude children born between May 2010 and June 2011.
- All regressions include district, monthly cohort, monthly age, and calendar month of interview fixed effects and a dummy for rural regions.
- The dependent variables in Panel A take value 1 if the first dose of each vaccine was received, 0 otherwise. The dependent variables in Panel B take value 1 if a child has received all doses of a given vaccine, 0 otherwise. The outcome for all vaccines takes value 1 if the child has obtained the corresponding dosage of the three vaccines.
Mechanism

- Our proposed mechanism: ↓ **in demand & trust in vaccines**
  - CIA ruse lent credibility to the Taliban’s conspiracy theories
  - The Taliban intensified their anti-vaccine propaganda
  - Parents in regions with higher support for Islamist groups, more exposed to these messages or more persuaded by them. 
  - Higher parental vaccine hesitancy.

- Main **alternative channel**: changes in supply of vaccines
  - Since mid-2012, the Taliban attacked polio vaccine workers.
  - We collected administrative data on vaccination drives.
  - No differential change in frequency of campaigns or in number of targeted children.
  - Results robust to controlling for supply of vaccines.
Evidence Consistent with Demand Channel

1. Lower **Health Seeking** Behavior
   - Less likely to consult medical worker when child gets sick

2. Lower **Trust** in public sector workers
   - Trust measures from South Asia Barometer

3. **Larger negative effect for girls**
   - Some Taliban’s rumors argued that vaccines aimed at sterilizing Muslim girls
Taking Stock & Further Research (I)

- The disclosure of the CIA’s vaccine ruse lead to a substantial decline in immunization rates
- Additional evidence supportive of decline in demand & trust channel
- We estimate persuasion rates of 31-42%. Della Vigna and Gentzkow (2010) rates [0.7% - 29.7%]
- First quantification of the negative effects of using health services as covert for espionage
Taking Stock & Further Research (II)

▶ Can trust be regained? How?
  ▶ Others find trust can be regained Andrabi and Das (2017), Acemoglu, Cheema, Khwaja, Robinson (2018)

▶ Medium-Run Effects

▶ Broader implication of the CIA vaccine ruse: making vaccines vulnerable to future conspiracy theories.
Many thanks!