Anticipatory cash transfers in climate disaster response

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Climate disasters have large long-run effects on welfare and development.
An anticipatory, rather than reactive, approach to humanitarian aid

- How can we more effectively reduce the immediate impacts of these extreme weather shocks?
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• Limited evidence exists about the timing of cash in response to shocks and the welfare impact of a one-off transfer (Doocy & Tappis 2017; Puri et al. 2017)

• Anticipatory action: Forecasts/triggers + pre-arranged finance + pre-agreed action plan
Why might timing of the cash transfer matter?

- Floods tend to be large and sudden, but predictable, with temporary effects on markets and long-lasting impacts on private assets.

1. An earlier cash transfer widens the choice set of coping strategies.
2. Extreme weather shocks can disrupt markets and access.

• There is a trade-off between maximising timeliness and targeting accuracy.

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- This study: We quantify the impact of a one-off cash transfer delivered ahead of an extreme flood in Bangladesh.
In 2020, Bangladesh experienced the second highest and protracted flood in the past two decades, with 5.5 million people affected.

WFP sent 4,500 Taka ($53) using mobile money to 23,000 households in 131 unions along the Jamuna River in Bangladesh prior to and during the flood.
• We exploit pre-existing lists used to target households where otherwise comparable households were excluded due to not having an active bKash account at the time of verification.

• We collect phone survey data from roughly 9,000 households approximately three months after the intervention.

• We find:
  1. An anticipatory cash transfer has an impact on welfare three months later.
  2. The cash transfer increases the set of pre-emptive actions taken by households.
  3. The speed of delivery matters: an earlier cash transfer is more effective.
A natural experiment to evaluate anticipatory cash transfers

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2. Intervention and sample
Forecast-based triggers and five days of cash transfers

Water level (m) – Bahadurabad gauging station

- Water Flow Observed
- Predicted Waterflow (5-day)

Anticipatory action trigger at 20.35 m
Government danger level at 19.5 m

Cash transfers (Total = 23,434)

10-day lead readiness trigger (4 July)
5-day lead activation trigger (11 July)

Release of traditional humanitarian response plan (4 August)
• Data-driven forecasts triggered the release of anticipatory cash transfers worth approximately two weeks of food expenditure.
Selection of vulnerable households for anticipatory cash transfers

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→ Otherwise comparable households were excluded

→ Some variation in the day when households received cash within the same geographic unit
Treated and control households use technology in similar ways

<table>
<thead>
<tr>
<th>Individual characteristics</th>
<th>Control mean</th>
<th>Treatment mean</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>38.32</td>
<td>38.52</td>
<td>0.186</td>
</tr>
<tr>
<td>Female respondent</td>
<td>0.97</td>
<td>0.97</td>
<td>0.100</td>
</tr>
<tr>
<td>Household head</td>
<td>0.19</td>
<td>0.22</td>
<td>0.866</td>
</tr>
<tr>
<td>Completed primary school</td>
<td>0.30</td>
<td>0.31</td>
<td>0.044</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Household characteristics</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Household size</td>
<td>4.64</td>
<td>4.75</td>
<td>0.338</td>
</tr>
<tr>
<td>Dependency ratio</td>
<td>0.73</td>
<td>0.76</td>
<td>0.929</td>
</tr>
<tr>
<td>Raw material house</td>
<td>0.26</td>
<td>0.27</td>
<td>0.011</td>
</tr>
<tr>
<td>Distance to large water body (m)</td>
<td>1242.05</td>
<td>1283.74</td>
<td>0.106</td>
</tr>
<tr>
<td>Protected mainland</td>
<td>0.45</td>
<td>0.33</td>
<td>0.548</td>
</tr>
<tr>
<td>Unprotected mainland</td>
<td>0.23</td>
<td>0.28</td>
<td>0.061</td>
</tr>
<tr>
<td>Char land</td>
<td>0.32</td>
<td>0.39</td>
<td>0.206</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technology</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Used digital wallet in last six months</td>
<td>0.47</td>
<td>0.48</td>
<td>0.251</td>
</tr>
<tr>
<td>Own mobile</td>
<td>0.83</td>
<td>0.80</td>
<td>0.617</td>
</tr>
<tr>
<td>Uses someone else’s mobile</td>
<td>0.16</td>
<td>0.19</td>
<td>0.869</td>
</tr>
<tr>
<td>Uses mobile at least once a week</td>
<td>0.97</td>
<td>0.96</td>
<td>0.227</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anticipatory action</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Received WFP cash transfer</td>
<td>0.12</td>
<td>0.93</td>
<td>0.000</td>
</tr>
<tr>
<td>Received dignity kit from UNFPA</td>
<td>0.07</td>
<td>0.14</td>
<td>0.003</td>
</tr>
<tr>
<td>Received feed or storage from FAO</td>
<td>0.05</td>
<td>0.07</td>
<td>0.176</td>
</tr>
</tbody>
</table>

Observations: 2235 6803

p-value from test of equivalent means with Union fixed effects
Other data used in the analysis

Second round of phone surveys

- Conducted for a separate evaluation
- 1291 households consistent with selection of treated and control households
- Provides supplementary “cross-section” 20 weeks after the intervention
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- 1291 households consistent with selection of treated and control households
- Provides supplementary “cross-section” 20 weeks after the intervention

Satellite flood data

- With technical assistance from the UN Centre for Humanitarian Data and MapAction
- Validated against external data sources
- Identifies the date of local peak flooding to complement timing analysis

Variation in local flood peak date (days since 6 June, 2020)
2. Results
Empirical strategy

1. To what extent does an early cash transfer help households?

\[ Y_i = \beta_0 + \beta \cdot T_i + \gamma \cdot X_i + \delta + \varepsilon_i \] (1)
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2. Does the timing of the cash transfer matter?

\[ Y_i = \beta_0 + \beta_1 \cdot T_i + \beta_2 \cdot T_i \cdot D_i + \gamma \cdot X_i + \delta + \varepsilon_i \] (2)

• Union fixed effects
• Covariates: Age, gender, education level, household size, dependency ratio, house structure, UNFPA/FAO recipient status, flood exposure (land type), mobile wallet use
• Correction for multiple hypothesis testing: Sharpened q-values (Benjamini et al. 2006)
• Pre-analysis plan: https://www.socialscienceregistry.org/trials/6576
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2.1 Anticipatory cash improves welfare, even three months later

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<thead>
<tr>
<th>Welfare</th>
<th>Control mean</th>
<th>Treatment effect</th>
<th>q-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child food consumption</td>
<td>0.80</td>
<td>+3.8%</td>
<td>0.006</td>
</tr>
<tr>
<td>Adult food consumption index</td>
<td>2.66</td>
<td>+4.1%</td>
<td>0.118</td>
</tr>
<tr>
<td>Protein consumption</td>
<td>39.53</td>
<td>+0.3%</td>
<td></td>
</tr>
<tr>
<td>Food consumption score</td>
<td>2.03</td>
<td>+18.7%</td>
<td>0.001</td>
</tr>
<tr>
<td>Life satisfaction</td>
<td></td>
<td></td>
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Effect size in standard deviations of the control group
2.1 Anticipatory cash improves welfare, even three months later

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<th>Category</th>
<th>Effect Size</th>
<th>Treatment Effect</th>
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<tr>
<td><strong>Pre-emptive actions</strong></td>
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<tr>
<td>Able to replant/no crops lost</td>
<td>0.65</td>
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<td>0.004</td>
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<tr>
<td>Wage hours</td>
<td>9.25</td>
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Control mean | Treatment effect | q-value
---|------------------|---------|
0.96          | +8.3%            | 0.007   |
0.62          | -11.3%           | 0.001   |
1.31          | -5.3%            |         |
15.73         | -12.6%           |         |
8596          | -3.0%            | 0.077   |
4.63          | -5.6%            |         |
0.08          | +12.5%           | 0.12    |

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Results are robust to different model specifications
Cash was mostly spent on food and reduced food insecurity

Most households used the cash transfer to buy food or water

![Spending of cash transfer chart]

Treated households were less likely to go a day without eating during the flood

![Went day without eating during flood chart]
Cash was received at a critical juncture that increased the choice set available to households

<table>
<thead>
<tr>
<th></th>
<th>Pre-emptive actions</th>
<th>Asset loss</th>
<th>Borrowing</th>
<th>Earnings potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any action to prepare (0/1)</td>
<td>ITT 0.053*** (0.013)</td>
<td>0.037*** (0.012)</td>
<td>0.041*** (0.010)</td>
<td>0.030** (0.013)</td>
</tr>
<tr>
<td>Evacuated household (0/1)</td>
<td>0.030** (0.012)</td>
<td>-0.029** (0.012)</td>
<td>-0.036*** (0.013)</td>
<td>0.035*** (0.013)</td>
</tr>
<tr>
<td>Evacuated livestock (0/1)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Purchased food (0/1)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lost small livestock (0/1)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lost poultry (0/1)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Borrowed money (0/1)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Worked for wage (0/1)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Control mean:

- ITT: 0.53
- Evacuated household: 0.30
- Evacuated livestock: 0.17
- Purchased food: 0.38
- Lost small livestock: 0.31
- Lost poultry: 0.61
- Borrowed money: 0.68
- Worked for wage: 0.70

% Δ:

- Evacuated household: 12.5%
- Evacuated livestock: 24.3%
- Purchased food: 7.9%
- Lost small livestock: -9.1%
- Lost poultry: -5.9%
- Borrowed money: 5.1%
- Worked for wage: -4.1%

Controls:

- Checkmark: ✓

Union FE:

- Checkmark: ✓

N:

- 9030

R²:

- 0.10

15/21
2.2 Does the timing of the cash transfer matter?

Does the speed of delivering anticipatory cash matter?

• We compare the date of cash transfers to the timing of the local flood peak using satellite data.

• On average, households received cash 7 days before the local flood peak.

• However, dangerous flood levels persisted for several weeks.
2.2 Does the timing of the cash transfer matter?

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- On average, households received cash 7 days before the local flood peak.
- However, dangerous flood levels persisted for several weeks.
How do small changes in timing matter?

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Child food consumption</td>
<td>Adult food consumption index</td>
<td>Life satisfaction</td>
<td>Pre-emptive actions</td>
<td>Asset loss index</td>
<td>Borrowing index</td>
<td>Remittances</td>
<td>Earning potential index</td>
</tr>
<tr>
<td>ITT</td>
<td>0.084**</td>
<td>0.005</td>
<td>0.183***</td>
<td>0.081***</td>
<td>-0.117***</td>
<td>-0.086**</td>
<td>0.040</td>
<td>0.096***</td>
</tr>
<tr>
<td>(0.033)</td>
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<td>(0.034)</td>
<td>(0.029)</td>
<td></td>
</tr>
<tr>
<td>Transfer × days</td>
<td>0.002</td>
<td>0.005**</td>
<td>-0.001</td>
<td>0.002</td>
<td>0.003</td>
<td>0.006**</td>
<td>-0.001</td>
<td>-0.003</td>
</tr>
<tr>
<td>before flood peak (ITT)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td></td>
</tr>
<tr>
<td>p-value: Transfer × days</td>
<td>0.492</td>
<td>0.033</td>
<td>0.667</td>
<td>0.304</td>
<td>0.192</td>
<td>0.010</td>
<td>0.579</td>
<td>0.126</td>
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<tr>
<td>q-value: Transfer × days</td>
<td>0.623</td>
<td>0.130</td>
<td>0.623</td>
<td>0.508</td>
<td>0.405</td>
<td>0.091</td>
<td>0.623</td>
<td>0.338</td>
</tr>
<tr>
<td>Controls</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
</tr>
<tr>
<td>Union fixed effects</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>N</td>
<td>7416</td>
<td>8797</td>
<td>8786</td>
<td>8793</td>
<td>8796</td>
<td>5941</td>
<td>8796</td>
<td>8790</td>
</tr>
<tr>
<td>R²</td>
<td>0.04</td>
<td>0.09</td>
<td>0.10</td>
<td>0.10</td>
<td>0.13</td>
<td>0.09</td>
<td>0.04</td>
<td>0.11</td>
</tr>
</tbody>
</table>

✓ Results are robust to controlling for transfer date
Timing matters, irrespective of functional form
Welfare effects five months later

- Days without eating during flood
- Child food consumption
- Adult food consumption index
- Protein consumption
- Food consumption score
- Life satisfaction

Effect size in standard deviations of the control group
Conclusion

• Using a natural experiment, we present evidence on the impact of a one-off humanitarian cash transfer in anticipation of an extreme flood.

• A small anticipatory cash transfer improves welfare, even three months later.
  • Children in treated households were 3 percentage points more likely to consume three meals or more a day

• An anticipatory cash transfer enabled households to take more action ahead of the flood.

• Speed of delivery matters.
Open questions for further research

1. What is the value of an early cash transfer relative to a cash transfer received after the shock?
Open questions for further research

1. What is the value of an early cash transfer relative to a cash transfer received after the shock?

2. What is the relative impact of information versus liquidity provided by the cash?
Open questions for further research

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2. What is the relative impact of information versus liquidity provided by the cash?

3. What is the relative impact of a multi-faceted approach relative to a cash transfer?
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4. How large should the cash transfer be?
Open questions for further research

1. What is the value of an early cash transfer relative to a cash transfer received after the shock?

2. What is the relative impact of information versus liquidity provided by the cash?

3. What is the relative impact of a multi-faceted approach relative to a cash transfer?

4. How large should the cash transfer be?

5. How can we target households more effectively in advance of extreme weather events?