**Title of the Presentation**

# Access to Water Estates and Food Security Outcome: Evidence from Coastal Bangladesh

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# Access to Water Estates and Food Security Outcome: Evidence from Coastal Bangladesh

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## Background:

- The world's poor and malnourished rely more heavily on fresh water fisheries as compared to marine or aquaculture sources
- In recent years, policy reforms have led to a transition from open-access to right-based fishing access regimes
- Contributions of small-scale fisheries towards poverty alleviation and food security is poorly quantified
- There is a lack of precise information on the role of fisheries on food security at the individual and household level (Béné et. al 2016)
- The overall status of food security in Bangladesh is low. Addressing food security is one of the top priorities for the government

## Bangladesh & Water Estates

- Bangladesh has joined the bandwagon of rights-based fishing access regime for about 120, 000 water estates (*jalmahals* in the Bangla language) that are owned by the state.
- Through the Jalmahal Management Policy 2009 (amended in 2012), access rights to these water estates are assigned to registered fishers' association for a period of one to three years, through negotiation with local leasing committees formed at the district and upaliza levels.
- There are concerns that lease to water estates usually go to the local elites who acquire exclusive rights to fishing access by using their social power
- From a policy perspective, an access regime that helps raise the lower tail of the macro and micro-nutrient intake distribution is often more appreciated than one that raises perhaps the median or higher tail of the distribution

## Objectives

- Quantify the mean effect of fishing access to water estates, under a rights-based access regime, on **calorie**, **protein**, **iron** and **zinc** intake by households from four villages that surround two water estates in southern Bangladesh.
- Quantify the effect of access to water estates on the *entire unconditional distribution* of household **calorie**, **protein**, **iron** and **zinc** intake distribution.

## Model

The household wants to maximize utility:

$$U_i = f(c_{i,j}, X_i) \quad (1),$$

$$\text{s.t: } p_c c_{ij} + X_i = j(e_i + m - f) + (1-j)(e_i)$$

where $c_{i,j}$ is the consumption of calories by household *i*; *j = 1* if the household has access to water estate, and *j=0* otherwise; *X* is the consumption of all other goods whose price has been normalized to *1*. We assume that each household is endowed with a non-water-estate income of $e_i$. If the household wants access to water estate it must pay a fee of *f*. Access to water estate may generate some income *m*. The Marshallian demand for calorie consumption is:

$$c_{i,j} = \gamma(j(e_i + m - f) + (1-j)(e_i), p_c) \quad (2).$$

## Data

- The water estates were selected using purposive sampling
- Barguna and Patuakhali district was selected from a total of nineteen coastal districts. For the Barguna district, the Candra water estate was selected; and for the Patualhali district, the Keshobpur water estate selected. Two adjacent villages located within four kilometers of each water estate was selected.
- Households were selected using systematic random sample using probability weights based on village population.
- Food consumption was measured using the last three days recall method. The raw ingredients were matched to items listed in the Food Composition Table developed by Shaheen et al. 2013. The net edible portion of each food item was then converted to calories, protein, iron and zinc content. Individual intakes were then determined by distributing total calories/protein/iron/zinc among members in the household using adult male equivalent (AME) household size.

## Empirical Framework

We employ a reduced form specification:

$$c_i = \mu + \delta D_i + \beta X_i + \gamma_i + v_i \quad (3),$$

where $c_i$ is calorie consumption by household *i*, $\mu$ is the intercept term, *D* is a binary indicator taking a value of "*1*" if the household has access to water estate and "*0*" otherwise, with $\delta$ being the parameter of interest. β is a vector of parameters associated control variables *X*. $\gamma_i$ is the household specific effect and $v_i$ is the idiosyncratic error. It is likely that unobserved household specific characteristics ($\gamma_i$), such as social network or political influence, is correlated with Access ($D_i$). To address the issue of endogeneity we employ a 2SLS regression.

**Choosing an Instrument:**
The proximity of the household to the specified water estate, distance measured in *km*, is used as an instrument. Villagers living near the water estate are more likely to cooperate with each other when it comes to accessing the water estate. Whereas, people who live far away from the water estate may face social exclusion or too high of a transaction cost. Proximity of the household to the water estate is unlikely to have an independent effect on calorie consumption but only indirectly though access.

**Unconditional Endogenous Quantile Treatment Effect :**

- Unconditional quantile regression (UQR) estimates the effect of a change in the unconditional distribution of a covariate on the unconditional distribution of the outcome variable.
- We implement an unconditional instrumental quantile estimation technique (IVQTE) to assess the distributional effect of access to water estate on food security outcome (Frolich and Melly 2010; Frölich and Melly 2013).

## Regression Results

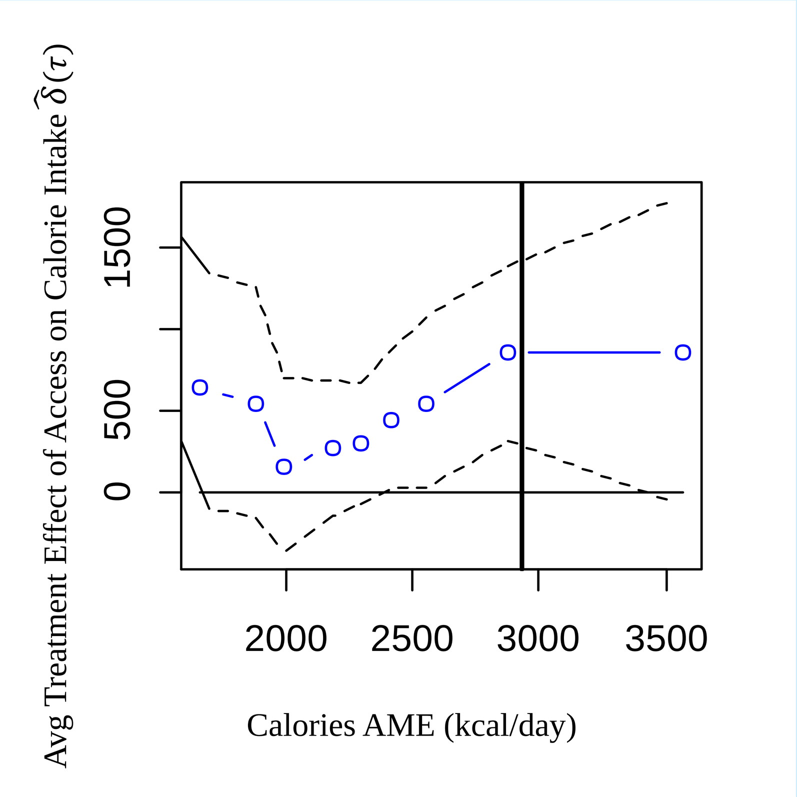
Note: control variables include household level price index, total income, acres of land owned, value to total household assets, time needed to travel to the nearest market, household size, average education of household members and age composition of household members. We also have indicator variables that denote weather the household participates in any cultural or political association, the household head is a fisher, the household lived in the area for more than 21 years, the household engages in home-gardening, the household is female headed, and the household has a female wage earner. Water estate specific indicator variable is also a regressor.

**IV-2SLS**

| | (1) Calories AME (kcal/day) | (2) Protein AME (g/day) | (3) Iron AME (mg/day) | (4) Zinc AME (mg/day) |
|---|---|---|---|---|
| Access ($\hat{\delta}$) | 797.68*** | 42.48** | 6.62** | 6.41** |
| | (301.95) | (16.87) | (3.32) | (2.74) |

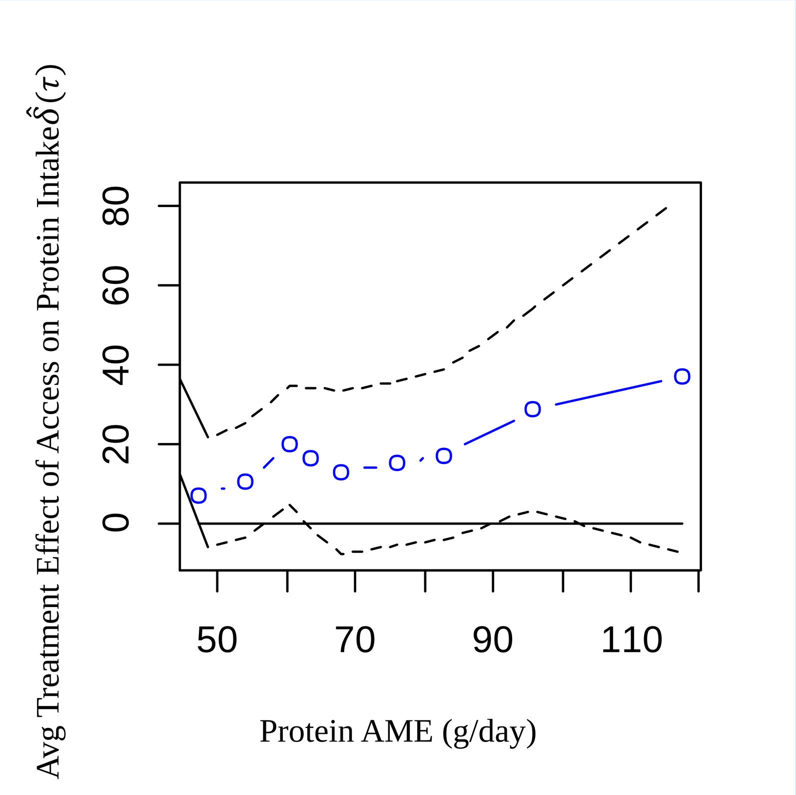
**Unconditional Instrumental Quantile Treatment Effect (IVQTE) :**

- broken lines denote 95% confidence interval from 3000 bootstrap replications
- unfilled blue circles denote estimates of quantile treatment effect
- $\tau$ denotes percentile



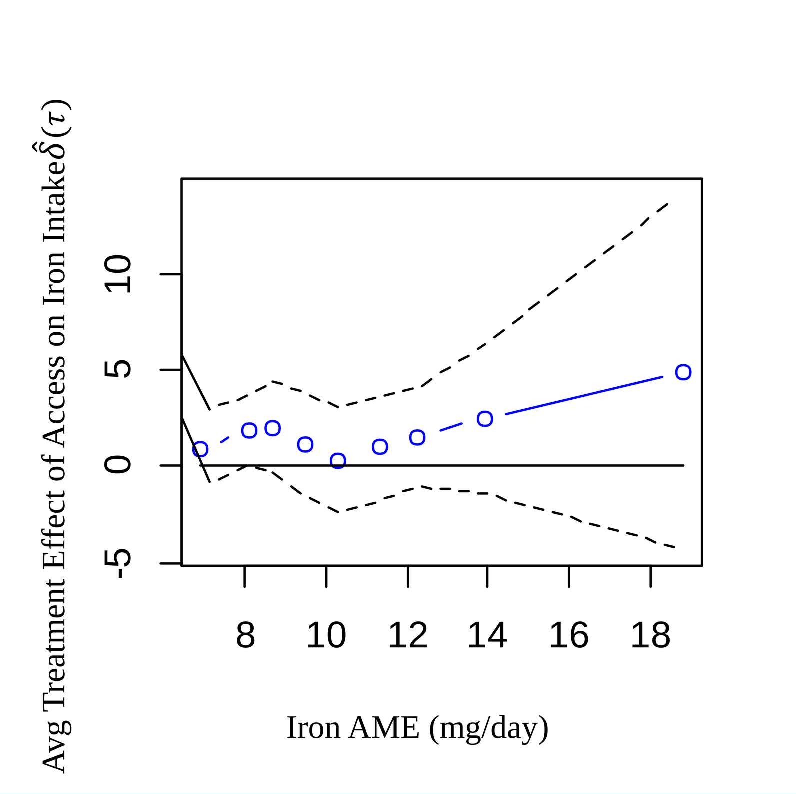

### Calories

- Daily recommended calorie intake is 2933 kcal/ day, as represented by the vertical black line
- Access to water estates has statistically significant and positive effect on the 6th, 7th and 8th deciles of the calorie distribution



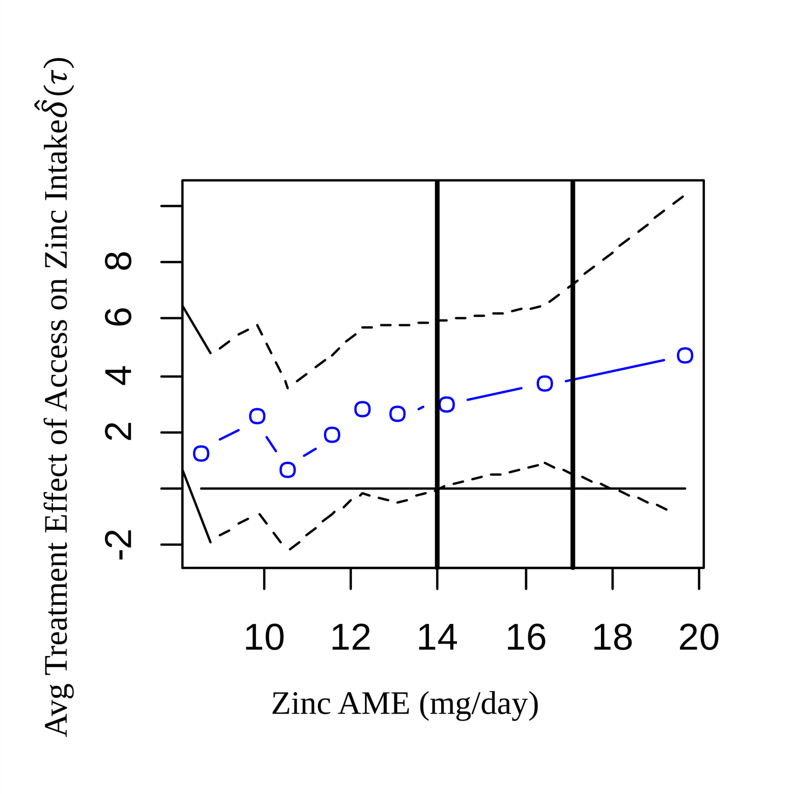

### Protein

- Daily recommended protein intake is 33 - 66 g/ day
- 1.9% households had protein intake below the daily recommendation.
- Access to water estates has statistically significant and positive effect on the 3rd and 8th deciles of the protein distribution




### Iron

- Daily recommended iron intake is 27.4 - 37.6 mg/ day
- 3.3% households had iron intake above the daily recommendation.
- Access to water estates has statistically significant and positive effect on the 2nd decile of the iron distribution




### Zinc

- Daily recommended Zinc intake is 14 - 17.1 mg/ day, as represented by the two vertical black lines
- Access to water estates has statistically significant and positive effect on the 7th and 8th decile of the zinc distribution

## Conclusion

- Access to water estates has a positive and statistically significant mean effect on for food security outcome (as measured by intake of calories, protein, iron and zinc AME).
- Access to water estates improve calorie intake for those already close to the recommended daily value. But has statistically zero effect for those at the lowest deciles (10th -40th)
- Access improves protein intake for those at 30th and 80th deciles of the protein distribution.
- Access improves iron intake for those at 2nd decile of the iron distribution
- Access improves zinc intake for those 7th and 8th deciles of the zinc distribution

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