Socioeconomic indicators as determinants for water access in rural areas of developing countries: A panel data approach

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Motivation

Water is a basic resource, essential to all environmental, human and social processes, however:

- 663 million lack access to safe water in 2015
- Rural areas access to piped sources is 28% in DC and 3% in LDC
- Inadequate WASH is estimated to cause 842.000 diarrheal disease deaths/ year in LMC

Extensive efforts are being put by numerous organizations to improve this situation:

- July 2010 UN recognized the basic human right for water and sanitation
- 2000 the MDG's were stablished: captured the goal to reduce by 1/2 the proportion of people without sustainable WASH by 2015
- 2015 the SGD's were stablished with 2030 as target date: captured the aim to achieve universal and equitable access to safe and affordable drinking water for all.

The national characteristics of countries may intensify or obstruct this aimed progress.

Percentage of population with piped on premises water access in rural areas

| 100% | 90% | 75% | 50% | 25% | 0% |
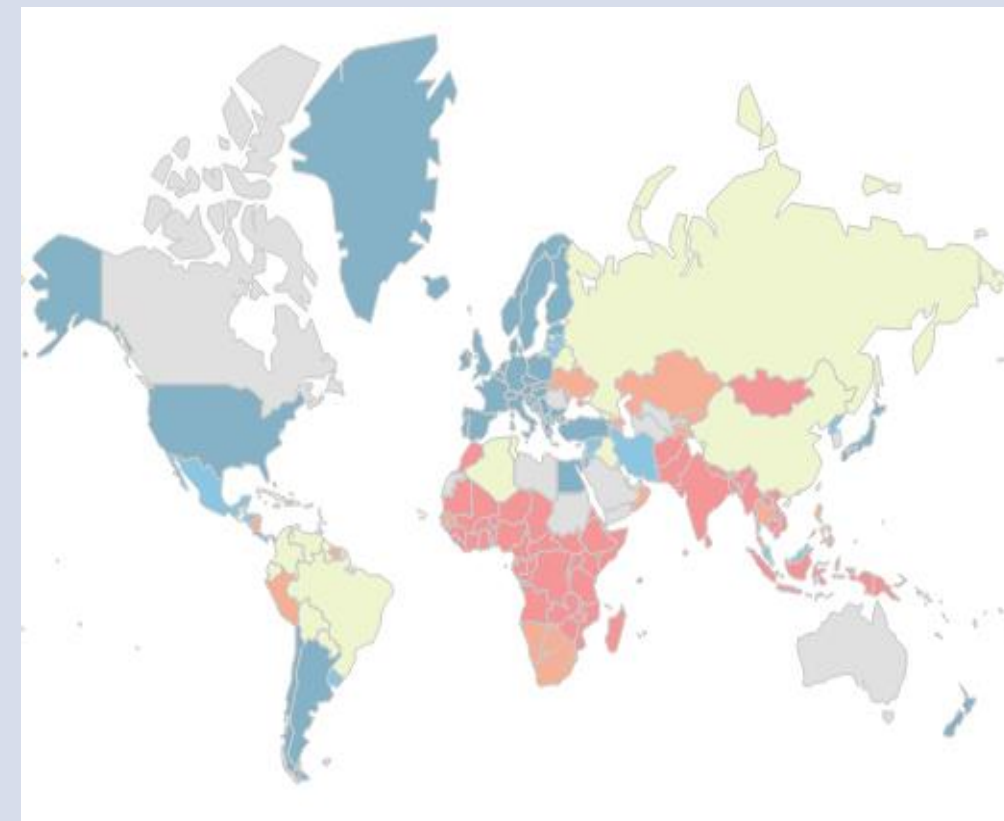
Source: WHO and UNICEF Joint Monitory Program

Objectives

- Provide response to the question of what are **socio and economic indicators** of countries that may **act as the determinants for water access**
- If possible, identify possible **causality relations**

Considering:
- Rural areas
- Improved and piped on premises sources of water
- in developing and LD countries
- Panel Data Approach

Literature

Luha, J. & Bartrama, J. 2015. Drinking water and sanitation: progress in 73 countries in relation to socioeconomic indicators. WHO Bulletin
No relation was found between indicators used and water access

Methodology

- **Observations for years 1990-2015**
- **Databases:**
  - World Bank
  - OECD
  - WHO and UNICEF JMP
- **Countries selected for the analysis (135)**
  - Low income
  - Middle-low income
  - Middle high income

As classified by the World Bank

- **Dependent variables (% rural population)**
  - **Total improved water sources**
    - **Piped on premises sources**
      - piped household connection in dwelling, plot or yard
    - **Other improved sources**
      - Public taps or standpipes
      - Tube wells or boreholes
      - Protected wells and springs
      - Rainwater collection stored in tanks and cisterns

- **Independent variables (national socioeconomic indicators)**
  - **GNI per capita**
  - **Primary completion rate, female**
  - **Agriculture (% GDP)**
  - **Official level of development assistance**
  - **Rural population growth**
  - Governance indicators
    - **Political Stability and Absence of Violence**
    - **Control of Corruption**

Results

Econometric model

- Two dimensional cross-sectional times-series data
- Panel Data Regression Analysis
- Linear Fixed Effects Model
  - assumption that different between countries are constant rather than random
- Model is expressed as follows:

$$Y_{it} = v_i + \eta_t + \beta_1 X_{1it} + \cdots + e_{it}$$

Where v_i and η_t represent a dichotomic variable vector for each country and year that control for heterogeneity

- Problems of autocorrelation and heteroskedasticity were tested for, found and consequently, solved

All countries	Total improved	Piped on premises	Other improved
GNI	3.0439 (0.000)***	16.9992 (0.000)***	-12.5991 (0.000)***
Primary completion rate, fem	0.1537 (0.000)***	0.0856 (0.000)***	0.0964 (0.002)***
Agriculture (% GDP)	-0.3748 (0.000)***	-0.1950 (0.000)***	-0.1248 (0.031)**
Development/GDP	2.8392 (0.286)	-4.8092 (0.128)	6.3457 (0.128)
Growth, rural population	0.5491 (0.100)*	1.3907 (0.003)***	-1.2946 (0.008)**
Weak Political Stability	-0.9560 (0.023)**	0.5392 (0.284)	-2.0417 (0.001)***
Very weak political stability	0.3259 (0.619)	1.1744 (0.176)	-15648 (0.110)
Weak control of corruption	-0.1629 (0.748)	0.1349 (0.897)	0.6266 (0.523)
Very weak control of corruption	0.1124 (0.876)	-2.7296 (0.042)*	3.380 (0.009)**

Source: Own elaboration

- **GNI**
  - + relation piped on premises sources
  - - relation other improved sources
- **Primary Completion rate, female**
  - + relation for all sources
- **Agriculture**
  - - relation for all sources
- **Growth rural population**
  - + relation piped on premises sources
  - - relation other improved sources
- **Weak political stability**
  - -relation total and other improved sources
- **Very weak control of corruption**
  - - relation piped on premises sources
  - + relation other improved sources
- **Development assistance/GDP**
  - No relation for any of the sources

Conclusions

Many of the socioeconomic indicators studied **presented a significant relation with water access**, **contrasting with results of previous studies**.

- Due to panel data model used
- Significant variables should be considered when evaluating water access improvement in a country
- These associations should allow policy makers to better understand drivers for water access and make better decisions in the future.

Limitations & Further study

- Difficulty to find observations
- Many interesting variable had to be eliminated
- Governance indicators presented correlation
- Further research could include exploratory methods:
  - Factor or principal components analysis
  - Clustering by country characteristics