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542: Nutrition smoothing: Does access to towns and cities protect children against poor health conditions at birth?

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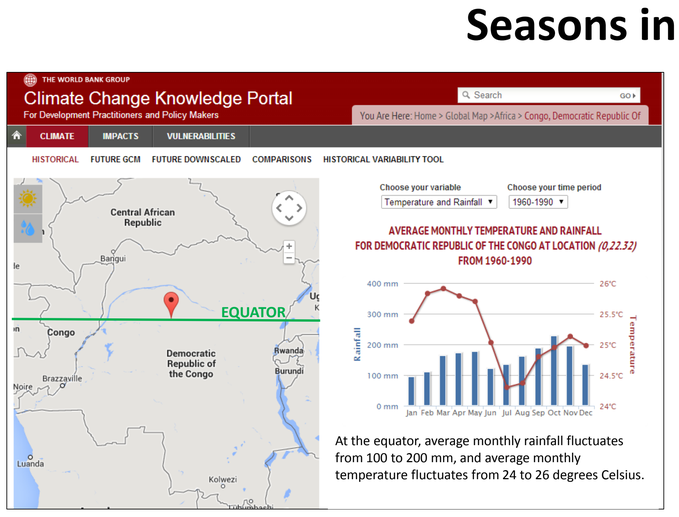
Introduction

- Motivation
  - Weather shocks are linked to health outcomes, especially at birth
  - Seasonal fluctuations are predictable, but associated with outcomes
  - Could access to markets and services help people smooth shocks?
- Context
  - The Democratic Republic of Congo (DRC) has extremes of:
    - deprivation, with severe and widespread growth faltering
    - spatial diversity, often long roadless distance to towns
    - seasonality, with no seasons at equator but dry winters in N&S
- Identification
  - Random birth timing determines exposure to seasonality
  - Latitude determines whether there is seasonal variation at all
  - Location determines distance to the nearest town or city
- Potential significance
  - Identifying the worst times and places can guide prevention
  - Transport infrastructure itself may be a powerful remedy
  - Natural experiments like seasonality can reveal mechanisms

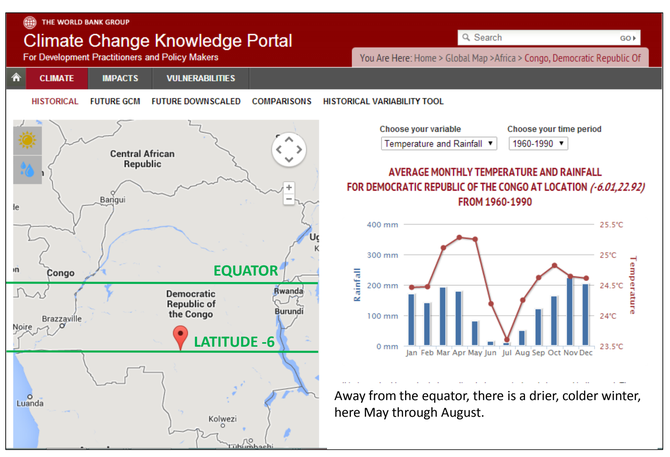
Seasons in the DRC



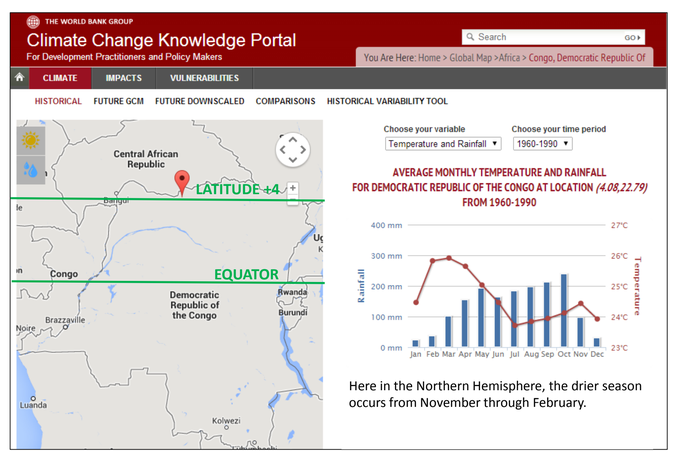
At the equator, average monthly rainfall fluctuates from 100 to 200 mm, and average monthly temperature fluctuates from 24 to 26 degrees Celsius.

Maps displaying the identification strategy: Screenshots are from the *Climate Change Knowledge Portal* (World Bank 2014).

Even though the DRC spans the equator where climate and weather are relatively constant throughout the year, there are measurable seasons. Rainfall and temperature vary throughout the year. This variation is more pronounced as you travel farther away from the equator.



Away from the equator, there is a drier, colder winter, here May through August.



Here in the Northern Hemisphere, the drier season occurs from November through February.

Methods

We designed a natural experiment using the quasi-random component of birth timing to identify exposure to seasonal risk.

- ***Data:***
  - 2007 and 2013 Demographic and Health Surveys for the DRC; maps of towns and roads from AFRICOVER (FAO 2013); Climate data to identify regions with & without seasonal fluctuations (World Bank 2013).
- ***Analysis:***
  - Triple difference-in-differences analytical strategy;
  - Aggregated observations into dichotomous categories;
  - Incorporated maternal and community fixed effects;
  - Conducted various robustness checks, including falsification tests.

Analytical design and hypothesized effects over triple d-in-d (region x birth timing x market access)								
Region has a distinct rainy season? (= farther from the equator)	Yes				No			
Child born in or after rainy season? (=Jan-Jun if lat.<0, Jul-Dec otherwise)	Yes*		No		Yes		No	
Household is closer to town? (=distance to town in km)	Yes	No**	Yes	No	Yes	No	Yes	No
Hypothesized status:	***Vulnerable to seasonal variation***				***Not vulnerable to seasonal variation***			
	****Protected***	*****Affected***	***Unexposed***		***No effect***			

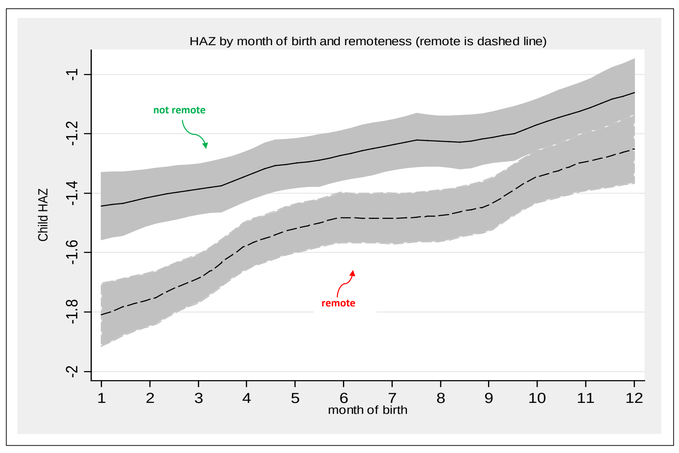
Note: Asterisks indicate hypothesis of significantly worse child nutrition relative to other groups in the same row. For *, the identifying assumption is that birth timing occurs randomly between seasons (tested). For **, the identifying assumption is that seasonal risk factors would have been similar in the absence of towns (untestable).

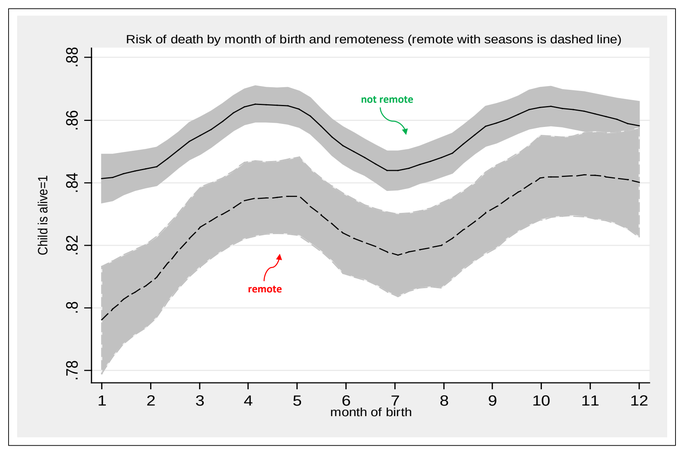
Results

Average treatment effect (ATE)/Difference-in-differences regression estimates

variable	*units/type*	Alive Seasons	Alive No Seasons	HAZ Seasons	HAZ No Seasons
Male	*Binary*	-0.117***	-0.126***	0.029	-0.293***
Jan.-June	*Binary*	-0.127**	0.079	-0.097	0.063
Jan.-June*Remote	*Interaction*	**0.128***	-0.025	**-0.329****	-0.188
Observations	*N*	17,217	17,297	4,224	4,211

Age controls and other controls suppressed. Errors clustered by DHS-cluster (v001). * p<.10, ** p<.05, *** p<.01. Mortality regressions include maternal fixed-effects. HAZ regressions include survey cluster fixed effects.





Month of birth 1-12 corresponds to Jan-Dec. Charts are the kernel-weighted local polynomial smoothing regressions of height-for-age z scores and child survival against child age in months and month of birth. The charts are drawn separated between remote households in areas with seasons versus the rest of the sample. The households in remote areas with seasons are expected to be the worst group in terms of child outcomes, because the children are exposed to seasons and not protected by a close proximity to town.

Discussion:

- Our spatial difference-in-difference approach uses underlying variation in latitude, distance to towns, and distribution of birth timing.
- Controlling for mother and community fixed effects and a variety of robustness tests, we find that rural children who live closer to towns have less impact of their birth timing on their subsequent heights and risk of death.
- The protective effect of market access could involve a variety of mechanisms including both consumption smoothing and access to health services or other assistance.
- Health interventions can act on our findings to target services on more remote children born in the less healthy season
- Results also reinforce the importance of rural infrastructure and rural-urban linkages

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References: Food and Agriculture Organization of the United Nations (FAO), 2014, GEONETWORK. Multipurpose Africover Databases on Environmental Resources (MADE) (GeoLayer). 2013; ICF International and Measure DHS. The Demographic and Health Surveys: The Democratic Republic of the Congo (2007) and (2013). 2014; World Bank. Climate Change Knowledge Portal. http://sdwebx.worldbank.org/climateportal/ (accessed April 2014).