

Effects of Adult Health Interventions at Scale on Children's Schooling: Evidence from Antiretroviral Therapy in Zambia

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Motivation

- Educational attainment creates a foundation for later life outcomes
- But poor health can impede this attainment
 - Own lack of health and nutrition (summarized in Glewwe 2005)
 - Health of other household members – caregiving duties, labor substitution, household stress, and money available for schooling expenses, etc. (e.g. Pitt and Rosensweig 1990, Yamano and Jayne 2005, and Evans and Miguel 2007)
- In the southern cone of sub-Saharan Africa 10 percent of prime aged adults are HIV+
 - In Zambia 1 in 7 adults is HIV+ and 1 in 5 children live with an HIV+ household head, mother, or father
- Without treatment HIV/AIDS *infects* one generation and *affects* the next

Motivation

- Adult HIV/AIDS has contemporaneous intergenerational effects
 - e.g. Yamano and Jayne (2005); Evans and Miguel (2007); Fortson (2011); Akbulut-Yuksel and Turan (2013);
- Since 2003, rapid increase in the availability of antiretroviral (ARV) drugs in sub-Saharan Africa
- Evidence from small, clinic based studies that ART
 - Increases children's school attendance and anthropometrics (Graff Zivin et al. 2009)
 - Increases adult health and labor market participation (Thimuruthy et al. 2008)
 - Decreases worker absenteeism (Habyarimana et al. 2010)

Motivation

- Evidence that ART at scale
 - Increases children's and women anthropometrics (Lucas and Wilson 2013 and 2016)
 - Increases labor force participation (McLaren 2010)
 - Reduces all-cause adult mortality (Bendavid et al. 2011)
 - Increases savings and human capital investment regardless of HIV status (Baranov and Kohler 2014)
 - Improves mental health and labor supply of HIV negative households (Baranov, Bennett, and Kohler 2012)
- Does ART at scale affect educational outcomes of children of likely HIV+ individuals?

Our Approach

- We use the (mostly) US funded scale-up of subsidized adult ARV distribution in Zambia as a quasi experiment
- Causal effects from a difference-in-difference-in-differences
 - Temporal variation – scale-up happened gradually from 2004 to beyond 2007
 - Spatial variation – we calculate a 10 km catchment area for each ARV clinic (clinics in place prior to ARV)
 - Targeted population variation – HIV status of adults
- Our estimates will be the reduced form sum of many potential indirect effects operating through improved caregiver (mental and physical) health

Our Contribution

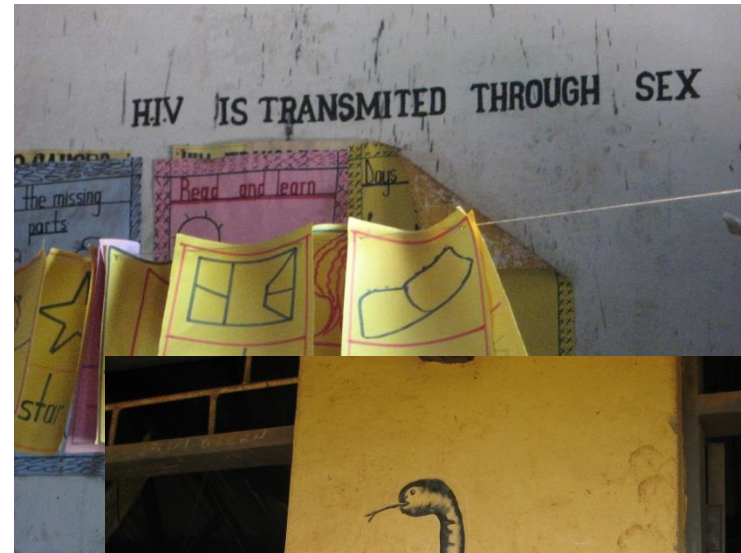
1. First estimates based on national data of the effect of the scale-up of an adult ARV program on children's schooling
2. We are not relying on people who seek or adhere to treatment
3. Realistic estimates of effects for countries with similar scale-up models
4. Effect of a positive adult health shock on children's schooling

Findings: Availability of subsidized ART increases likelihood of children being age for grade

- Children more likely to start school on time, could also operate through increased attendance or focus while in class
- Mechanisms: children are healthier with fewer episodes of illness (not extensive margin of adult labor supply, household wealth, or bed net use)

HIV/AIDS

- HIV/AIDS
 - 13% prime age prevalence in Zambia – 7th highest in the world
 - Centerpiece of international treatment response is subsidized antiretroviral therapy (ART)
- PEPFAR - US President's Emergency Plan For AIDS Relief
 - Approved 2003 as “the largest international health initiative in history initiated by one nation to address a single disease” (PEPFAR 2005)
 - Initial PEPFAR funding did not seek to strengthen health sectors



The Intervention

- Scale-up of subsidized adult antiretroviral therapy
 - Starting serving existing clinics in 2004
 - Within 10km of 46% of households by 2007
 - In empirical strategy will control for time varying, regional specific attributes



The Mechanisms

- Improved adult physical and mental health →
 1. fewer opportunistic infections in household (Robson 2007)
 2. children not kept home to care for an ill family member (Robson 2007)
 3. children less likely to be substitutes for adult labor in employment, household production, or child care (Dillon 2013)
 4. increase in income (decrease in expenditures) could provide for school expenses
 5. increase in income (decrease in expenditures) could improve nutritional intake and thus school attendance and outcomes
 6. improved mental health/mental capacity (Baranov et al. 2012)
- Other program effects →
 1. reduction in HIV stigma
 2. increased number of clinic touches

Empirical Strategy

- Triple Difference Specification – temporal, spatial, and HIV status

$$- y_{ijt} = \alpha + \beta(HIV_{ijt} * ART_j * post_t) + \gamma_1 HIV_{ijt} + \gamma_2 ART_j + \gamma_3 post_t + \gamma_4(HIV_{ijt} * ART_j) + \gamma_5(HIV_{ijt} * post_t) + \gamma_6(ART_j *$$

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Data

- ART availability – collected by Wilson (2012), exact clinic location and initial date of ART availability – temporal and spatial variation
- National household survey – two rounds of the Zambia DHS
 - 2001 (pre, virtually no ART access) and 2007 (post, ART access for about 46% of households)
 - HIV status: Household Head, Mother, Father
 - province – urban/rural – age group – gender cells
 - School enrollment and current grade
 - Additional controls – female, urban, adult age group, adult age group*post, child age, year of survey, month of survey, district, district*post. Robustness: other HIV services, TeacherHIV*ART*post
 - Mechanisms: limited adult labor supply information, health of younger siblings

Effect on Children's Schooling

- Three schooling outcomes
 1. Attending school
 2. Grade for age
 3. Timely entry
- Sample limited to primary school children (grades 1-7)

Table 3: Effect of Adult ART on Children's Schooling

	Attended School		
	During Current School Year	Grade for Age	Timely Entry
	(1)	(2)	(3)
HIV+ X ART Ever X Post	0.178 (0.150)	0.518*** (0.156)	0.763** (0.388)
HIV+	0.138* (0.079)	0.209** (0.085)	0.391** (0.186)
ART Ever	0.065* (0.035)	0.115*** (0.041)	0.090 (0.060)
Post	0.138*** (0.051)	0.178*** (0.060)	0.304* (0.180)
HIV+ X ART Ever	-0.115 (0.092)	-0.251** (0.117)	-0.352 (0.227)
HIV+ X Post	-0.205 (0.127)	-0.292** (0.143)	-0.528 (0.338)
ART Ever X Post	-0.070 (0.047)	-0.146** (0.057)	-0.169* (0.101)
Observations	12,128	12,128	1,933
Rsquared	0.19	0.22	0.24

Notes : * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors clustered at the cluster level appear in parenthesis. The sample is limited to children in expected grades 1-7 with a valid HIV approximation for their household head. All columns are linear probability models and include child age, household head age group, district, year of survey, month of survey, urban, and female dummy variables and household head age group times post and district dummy variables times post.

Effect on Children's Schooling

- Adult ART availability for HIV+ household heads
 - Did not change the likelihood of attending at least some school (extensive margin)
 - Increased the likelihood of being grade for age – a measure that includes elements of age at entry and timely progression
 - 0 to 1: 51.8 percentage points
 - 10th to 90th percentile: 20 percentage points
 - 0 to median: 8 percentage points
 - Increased likelihood of starting school on time
 - 0 to median: 12 percentage points
 - Point values are (insignificantly) larger for boys
- Mechanisms?




Mechanisms

- Do adults supply more labor on extensive margin?
- Are households wealthier?
- Changes in other clinic inputs in health production?
- Lower incidence of other illnesses?

- Are young children healthier?
- Are adults healthier?

- Mental benefits in addition to physical?
- Child labor?
- Child caretaking duties?

Mechanisms

- Do adults supply more labor on extensive margin? **X**
- Are households wealthier? **X**
- Changes in other clinic inputs in health production? **X**
- Lower incidence of other illnesses? 
- Are young children healthier?  (Lucas and Wilson 2013)
- Are adults healthier?  (Lucas and Wilson 2016)
- Mental benefits in addition to physical? **?**
- Child labor? **?**
- Child caretaking duties? **?**

What about other adults in the household?

- Presence of a mother or father could be endogenous to ART availability, but everyone has a household head
- Education results similar for head/mother/father
- Illness results stronger for mother/father (selection or closeness?)
 - But not correspondingly stronger education results

Robust!

- Dropping social cash transfer (SCT) districts
- Additional HIV services (VCT, PMTCT)
- Approximate teacher HIV status
- Orphan status
- Average regional HIV status
- Limit sample to households with 10km of a health facility
- Bed net ownership

Conclusions

- Antiretroviral therapy at scale
 - Increased the timely educational progression and on time entry of the children in households of the targeted
 - Did not increase likelihood of school enrollment beyond first two years
 - Concentrated in households within 10km of clinic
- Mechanisms
 - Health of young children increased
 - No increase in extensive margin of labor supply
- Policy Implications
 - Positive externalities of health interventions
 - Supply side education interventions might not be sufficient