Worms at Work:
Long-run Impacts of Child Health Gains

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Child health and adult income

- **Do child health investments increase adult living standards?**

  -- This question is of great interest to J-PAL researchers, and of major policy importance for governments and aid donors – but solid answers remain elusive

  -- Why? There are many methodological challenges to studying this question, including non-random child health investments (i.e., sick children may have other disadvantages, such as poverty), and the near lack of panel datasets tracking children into adulthood

Child health and adult income

- **I will focus on the problem of worm infections in rural Kenya**

  -- 1 in 4 people are infected by intestinal worms around the globe, with massive disease burden (due to anemia, fatigue, growth stunting, lethargy), especially among children in Africa

  -- There is also evidence that deworming treatment can reduce the likelihood of Malaria infection.

  -- *The case of deworming in Kenya illustrates the power of the analytical methods used by J-PAL researchers, and their potential to improve public policy choices in less developed countries*

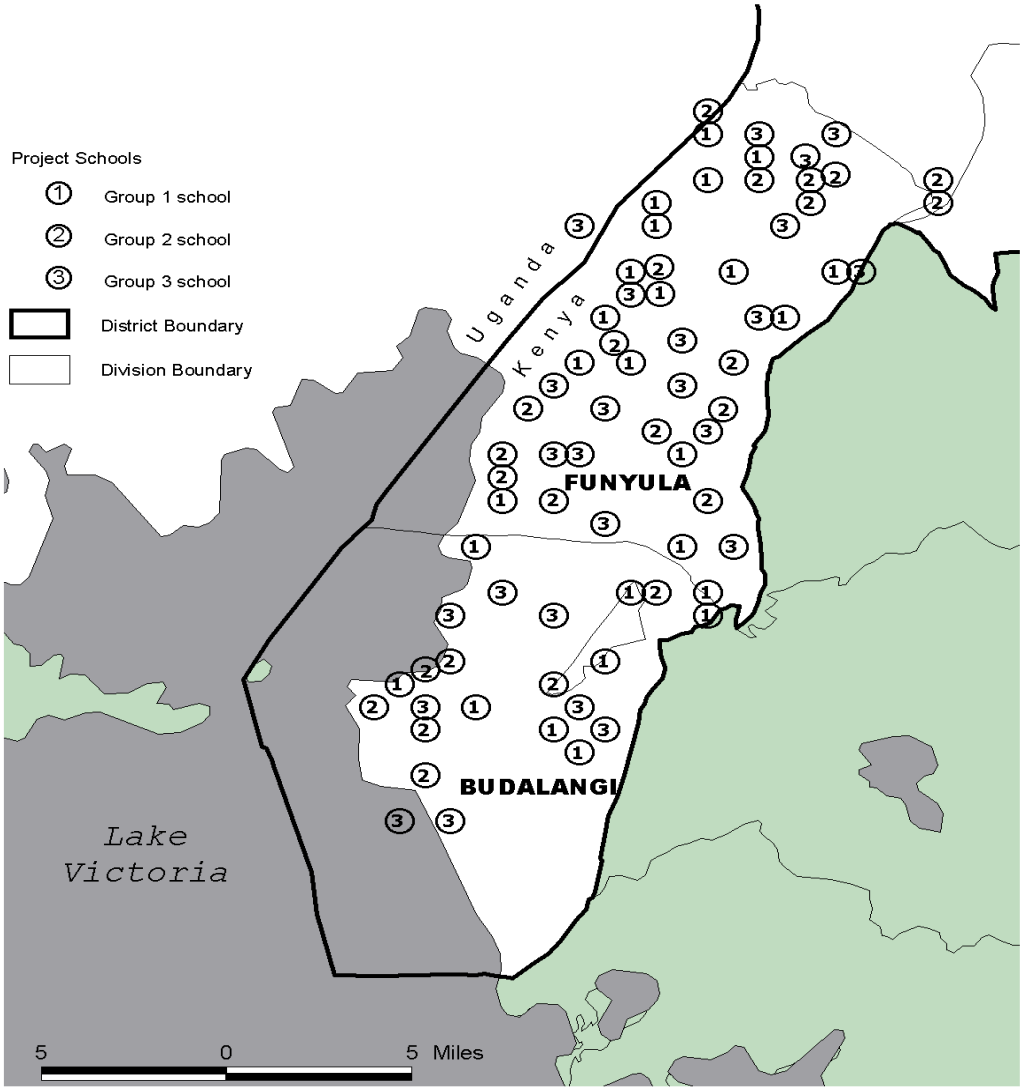
Deworming and schooling in Kenya

- **The Primary School Deworming Project in Kenya (1998-2002)**

  -- 75 primary schools (30,000 children aged 6-18), with deworming treatment phased in over three years in 25 schools at a time.

  -- We used randomized evaluation methods, where schools are gradually "phased in" to deworming in a randomized order. This is a practical real-world approach since real-world financial constraints often lead to staggered phase-in.

  -- As in a medical trial, randomization provides a plausible method for estimating program impacts, since on average the "treatment" and "control" groups are similar in all ways but one: the intervention.


Project Schools
Group 1 school
Group 2 school
Group 3 school
District Boundary
Division Boundary
Uganda
Kenya
FUNYULA
BUDALANGI
Lake Victoria
5 0 5 Miles

Deworming and schooling in Kenya

- **Deworming led to large schooling gains – at low cost.**

  -- We worked in a rural district with 90 percent worm infection rates at baseline. Treatment with albendazole and praziquantel twice per year costs less than 0.50 USD per child.

  -- Rates of serious worm infections fell by half, from 52% to 25%. There were also significant gains in self-reported health and height.

  -- There were large gains in rates of school participation in the first two years of the project, with absenteeism falling by one quarter, or 7.5 percentage points.

Deworming and schooling in Kenya

- **Deworming had broader community-wide benefits.**

  -- Deworming reduced re-infection among other community members, including among untreated children in treatment schools (70% of the effect on the treated) and those living within 6 km. There were also positive “spillovers” in school attendance.

  -- Taking these positive spillovers into account, deworming increased school participation by one year at a cost of only 3.50 USD. Miguel and Kremer (2004) argue this finding provides a strong rationale for subsidized deworming treatment.

Translating Evidence into Action

- **The findings of this study, together with others, have contributed to large-scale policy change in Kenya.**

  -- Ted Miguel and Michael Kremer disseminated these findings in seminars at the Ministry of Education and World Bank offices in Nairobi, at the WHO, USAID, and health policy conferences, through meetings with policymakers in Kenya, and through popular news articles and books.

  -- Together with the efforts of other colleagues, NGOs, and advocates within Kenya, this helped generate growing interest in a mass school deworming campaign in Kenya.

  -- With technical advice from Deworm the World (an NGO), the Kenya Ministry of Education carried out a national school-based deworming program in 2009 that treated over 3.6 million children!

Assessing long-run impacts on income

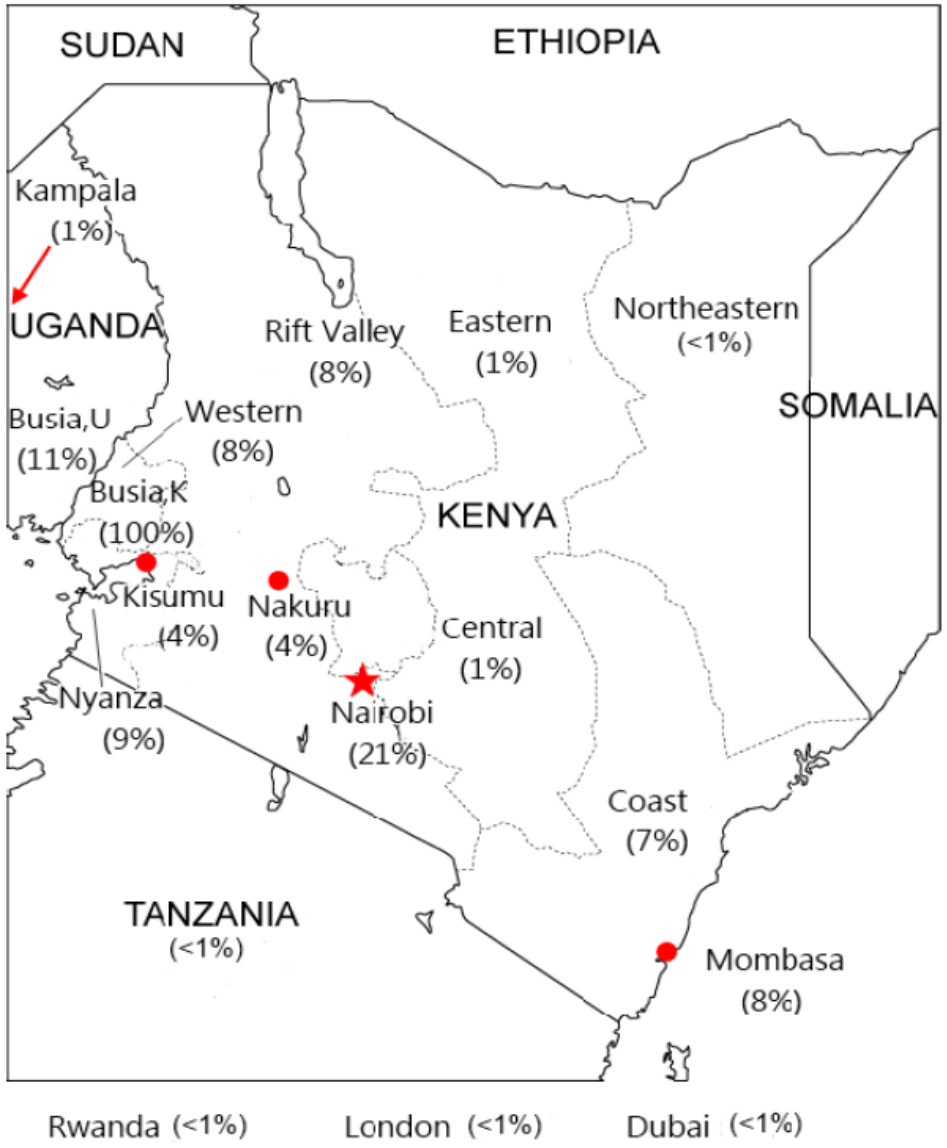
- **The Kenya Life Panel Survey (1998-2009) data project**

  -- A representative sample of 7,530 of the roughly 33,000 individuals in the baseline deworming sample were tracked over time. By the 2007-2009 survey round, most were 20-26 years old.

  -- KLPS individuals were “tracked” as they moved throughout Kenya, Uganda, Tanzania – and even to London in one case! The team regularly updated contact information, often using cell phones.

  -- This intensive fieldwork allowed us to track down and survey 85% of the sample (among those still alive), a remarkably high rate for a young adult population over a decade (Baird, Hamory-Hicks, Kremer and Miguel 2010).

Figure 2: Migration residential location map



Notes: Percentages add up to greater than one, since they capture residential location at any point during 1998-2009

Deworming impacts on living standards

- **The additional 2 to 3 years of deworming pills received by the treatment group led to large labor market benefits in 2007-2009**

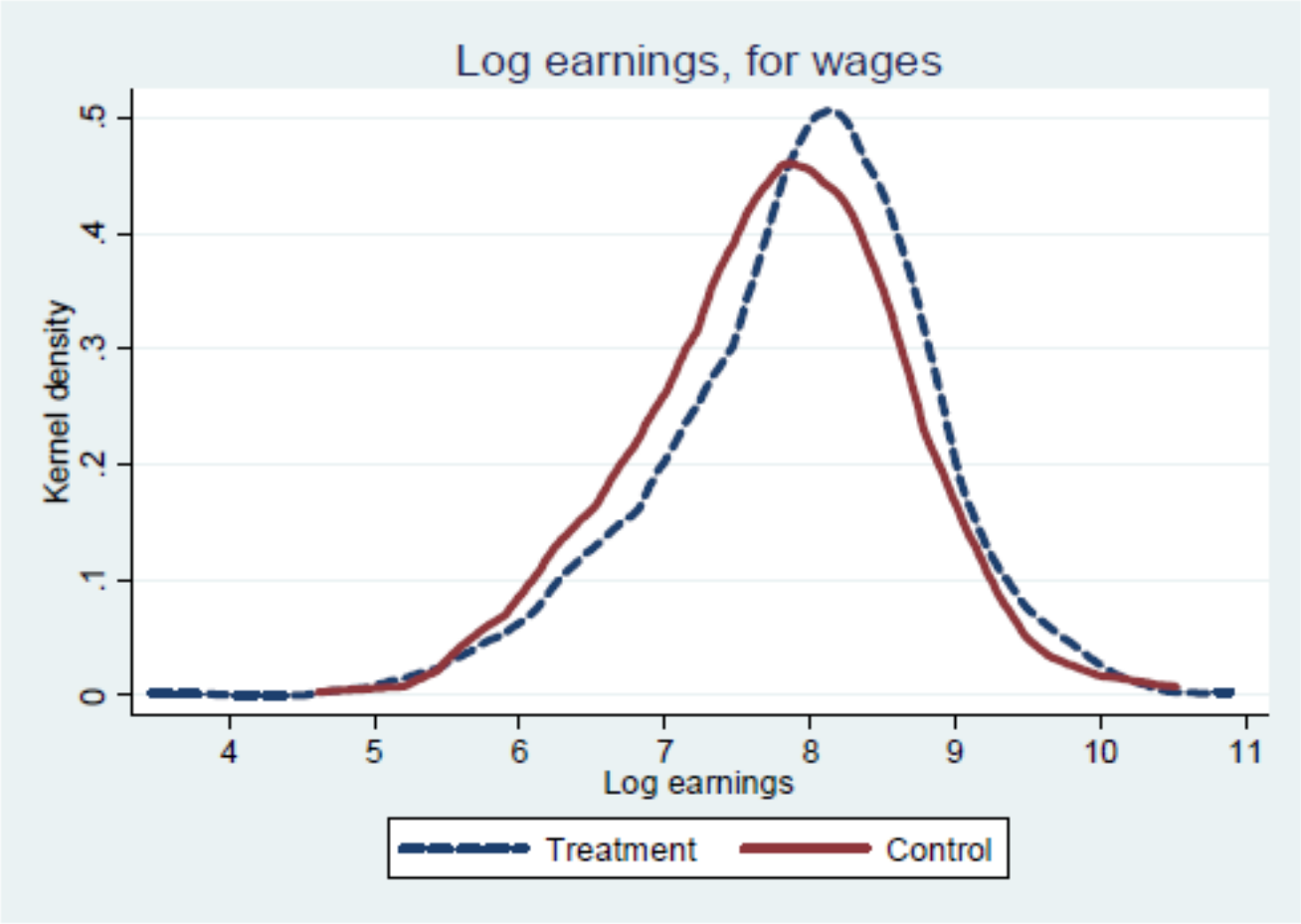
  -- Among wage earners, income rose 20-27% in the treatment group (sig at 99% confidence), with similar gains for both females and males.

  -- Deworming beneficiaries appear to have greater capacity to work longer hours: hours worked rose substantially, by 12%.

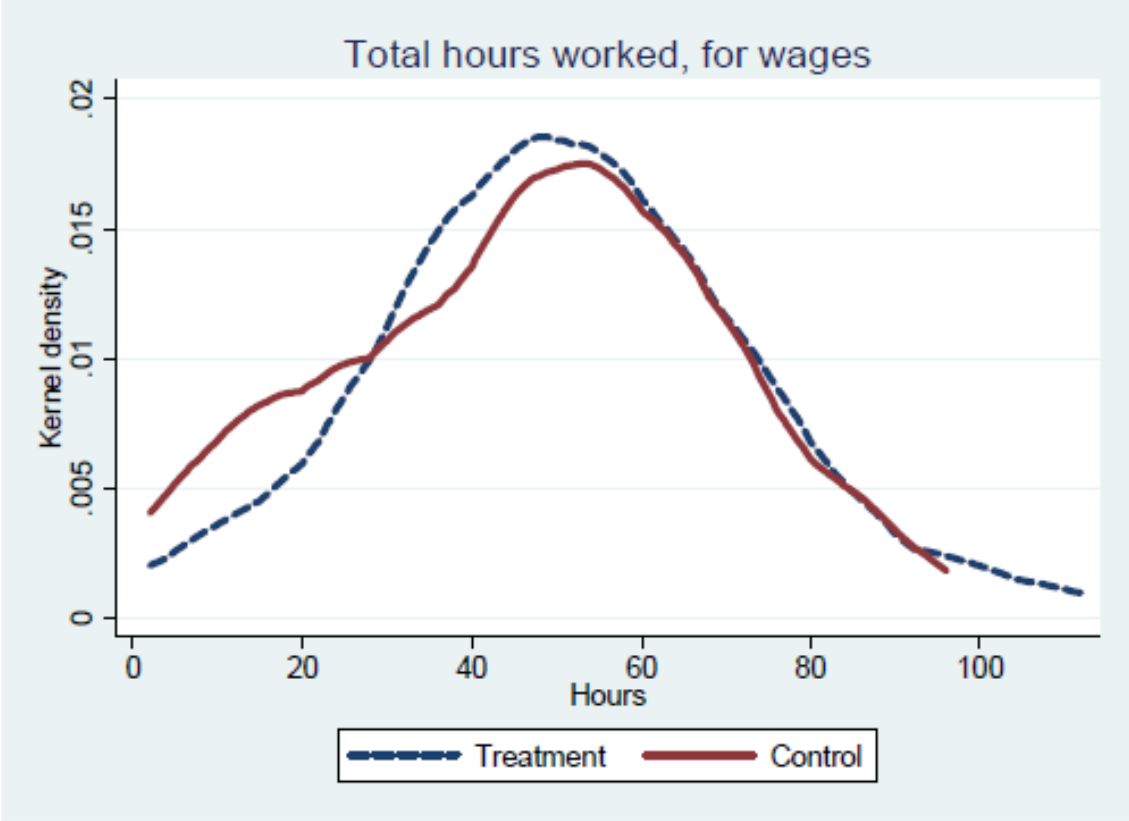
  -- There is a large shift in employment sector, with a tripling of employment in well-paid manufacturing jobs (for men), and much less casual labor and work in domestic services (for women).

Figure 3:

Panel A: The distribution of log labor earnings in the last month, deworming treatment versus control (among those with positive labor earnings)



Panel B: The distribution of hours worked in the last week, deworming treatment versus control (among those working for wages)



Notes: The sample used here includes all individuals who were surveyed in KLPS-2 and reported working for wages or in-kind in the last month. All observations are weighted to maintain initial population proportions.

Deworming impacts on living standards

- **Why the labor market gains? Deworming also led to improved measures of health and education.**

  -- On average, the total time enrolled in school between 1998 and 2008 rose by more than 0.3 years in the deworming treatment group, and test scores also improved.

  -- Self-reported health status is significantly higher, as are total health expenditures.

  --Using 1999 data, we find that self reported malaria was 3.2pp lower in the last week, a reduction of 14%

  -- Another indication of higher living standards: the number of meals eaten in the previous day increased significantly.

Deworming as a human capital investment

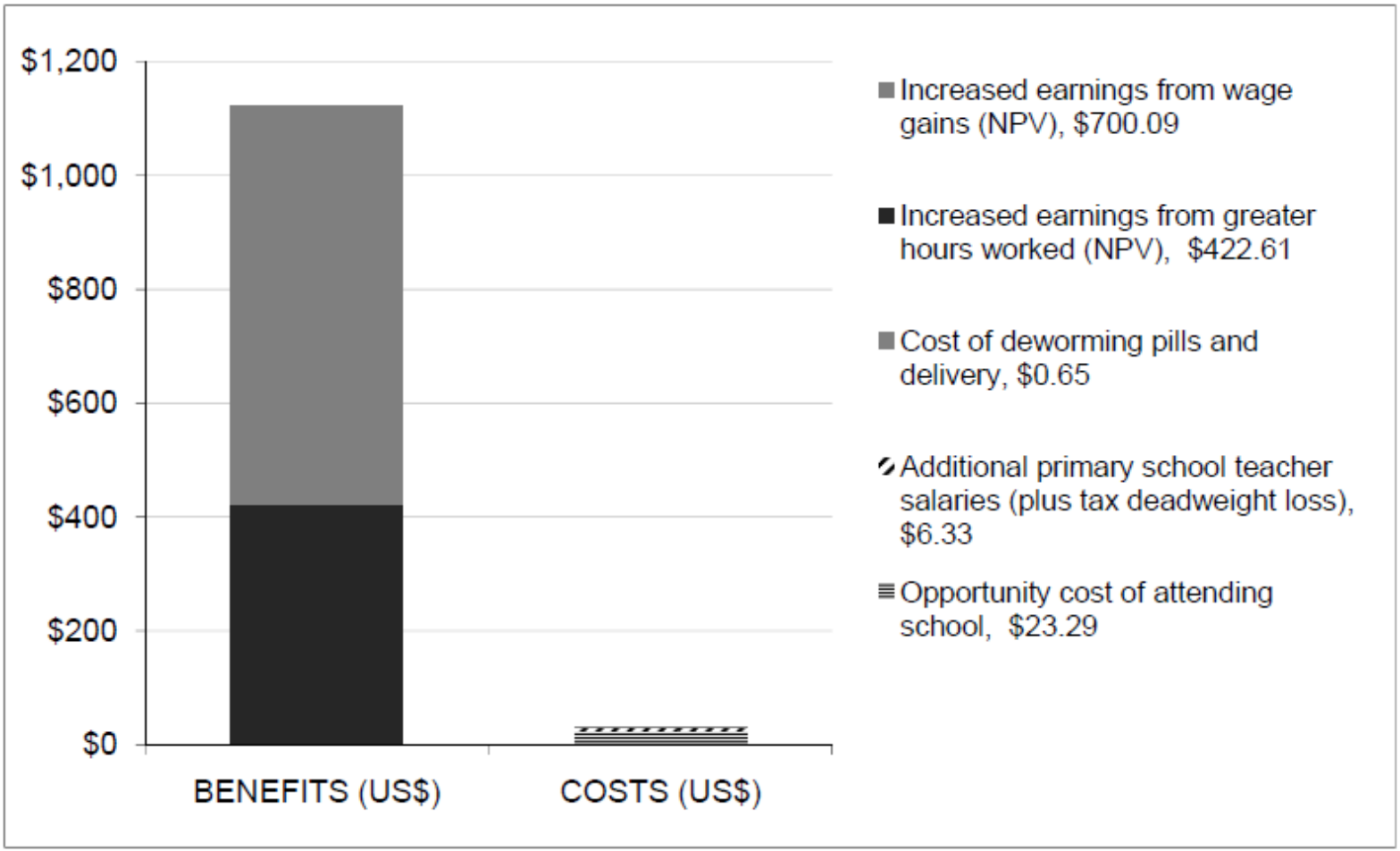
- **The return on deworming investments is extraordinarily high, even under conservative assumptions.**

  -- The benefits side: higher labor market earnings and wages in the deworming treatment group.

  -- The cost side: (i) deworming pills and delivery; (ii) the opportunity cost of time spent in school and not working (especially for teenagers); and (iii) the cost of additional teacher salaries to maintain class sizes at pre-deworming levels

  -- The social benefit-cost ratio is 37:1. Considering externalities (which we ignore) would increase earnings gains by over 50%. The internal rate of return is 21% per annum.

Figure 4: Labor market returns of childhood deworming treatment



Notes: These are the undiscounted sum of benefits and costs over the schooling years and 40 year working life of sample individuals.

Investing in the future: school health programs

- **The bottom line: childhood deworming in Kenya not only improved school participation in the short-run, but also led to much higher labor market earnings a full decade later.**

  -- Health investments for older children above age 0-3 can still have large impacts on future living standards.

  -- While the income gains from treating worms cannot begin to eliminate the gap between Kenya and rich countries like the U.S., the gains are meaningful for people living near subsistence

  -- The national primary school deworming program Kenya launched in 2009 will likely have large future social benefits.

Next steps: building human capital in Kenyan youth

- **Ongoing research projects seek to build a fuller understanding of the most promising human capital investments in Kenya**

  -- A randomized evaluation is underway to estimate the benefits of *vouchers for vocational education* – a promising approach to skills upgrading among out-of-school youth.

  -- The long-run survey tracking (2001-2011) of earlier beneficiaries of a *girls merit scholarship program* is planned for next year.

  -- We hope the knowledge gained from these and other rigorous evaluations by JPAL faculty, staff and Ph.D. students will help inform policymakers in Kenya – and other African countries – about the most effective education and health reforms.