Deworming improves lives across generations

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Data tracking children in Kenya since they received deworming treatment over twenty years ago reveals that the benefits of deworming extend into the next generation

The persistence of poor health and poverty across generations is a particularly intractable global policy issue. Researchers have long explored how factors that affect children may impact their outcomes later in life — even into the next generation. Longitudinal data, or datasets that track individuals over several decades, is a foundational element of this kind of research.

For instance, research using the Indonesia Family Life Study (IFLS), a longitudinal survey administered in Indonesia since 1993, has supported dozens of studies covering a wide range of topics, including rural vs urban labour productivity gaps (e.g. Hamory et al. 2021, summarised here), intergenerational correlations in health (e.g. Kim et al. 2015), and long-term effects from in-utero exposures during pregnancy (e.g. Majid 2015).

However, these kinds of data sources are uncommon in low- and middle-income countries (LMIC), where intergenerational poverty is particularly entrenched, and many datasets also lack experimental or quasi-experimental variation needed for causal inference. This makes estimating intergenerational effects especially challenging in LMICs.

Recent work using the Kenya Life Panel Survey (KLPS), a longitudinal dataset that has tracked over 6,500 participants in a school-based deworming programme, provides a striking example of the benefits of these types of data collection efforts. In Walker et al. (2023), we (along with a team of co-authors) make use of unique features of the KLPS to causally estimate intergenerational effects on child mortality from the deworming programme. Despite substantial progress over the last several decades, child mortality rates in numerous LMICs remain elevated, and research has documented geographic persistence (Burstein et al. 2019) and intergenerational persistence in child mortality (Lu and Vogl 2023, summarised here).

The Primary School Deworming Programme (PSDP)

In 1998, a non-governmental organisation launched the PSDP in 75 schools in Busia county, enrolling over 32,000 pupils in an effort to combat high rates of intestinal helminth infection (above 90%). Schools were randomly assigned into one of three treatment groups, with 25 schools assigned to each. The programme was phased in across groups: Group one schools began treatment in 1998; group two schools in 1999; and group three schools in 2001 (for more details, see Miguel and Kremer 2004). As a result of this design, children in groups one and two received, on average, 2.41 additional years of deworming treatment and serve as the treatment group in this analysis, while group three serves as the control group (as in other papers studying the long-run effects of the programme, such as Baird et al. 2016 and Hamory et al. 2021). Take-up of the deworming drugs was high: around 75% for the treatment group and under 5% for the control (Miguel and Kremer 2004).

The Kenya Life Panel Survey (KLPS)

In 2003, the Kenya Life Panel Survey (KLPS) began to track a representative sample of approximately 7,500 students enrolled in grades 2 to 7 in the PSDP schools at baseline. It is largely representative of primary school students in the study area in 1998. Four rounds of KLPS surveys have been collected from 1998-2021, as respondents have aged from 8-15 years old to 28-36 years old. A notable feature of the KLPS is its commitment to tracking all respondents selected at baseline regardless of their current location, resulting in high overall effective tracking rates of 86.5% across all rounds.

Each KLPS round has collected information on fertility and child health, and we have used self-reported survey data on births and survival status to construct child and infant mortality measures consistent with Demographic and Health Surveys. We look at two main outcomes: under-5 (child) mortality, and under-1 (infant) mortality, for births by female respondents and the partners of male respondents.

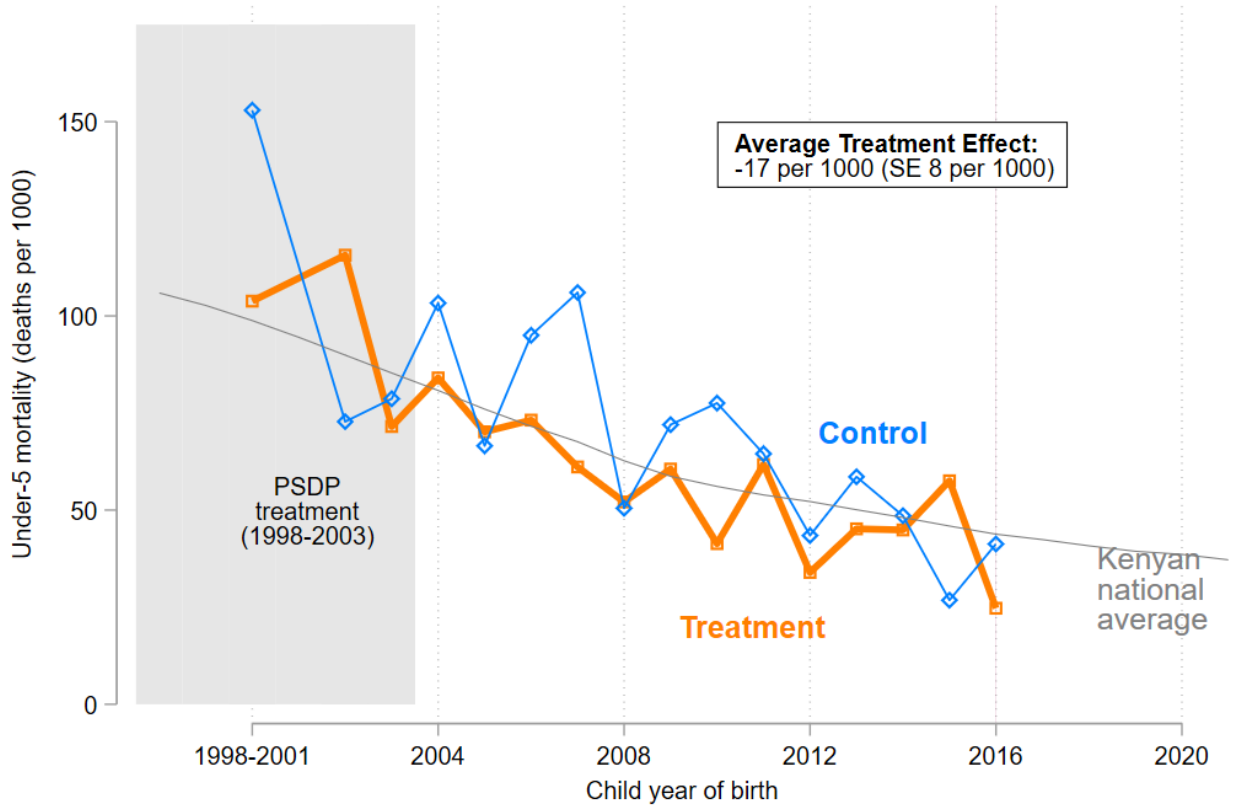
Results

Previous KLPS survey rounds informed evaluations that found that deworming reduced school absenteeism by 25%, including a spillover effect on control schools, and increased consumption expenditure, hourly earnings, and the likelihood of living in urban areas (a proxy for better quality of life). As assessed in our 2021 paper, these benefits, when considered with the low cost of the intervention distributed at scale (less than $0.50 per child per year), suggest that the earnings gains from deworming have an annualised, social, internal rate of return estimated at 37% — a notably high number.

These gains experienced by the parents raise the question of whether their children may also benefit. Figure 1 presents the under-5 child mortality data, by year of birth. Rates are declining for both the treatment and control group (which is roughly in line with the Kenyan national average), with rates for the treatment group often below those of the control group.

When we estimate impacts in a regression framework, we find that the deworming intervention decreased the under-5 mortality rate for the children of beneficiaries by 17 deaths per 1000 births, a reduction of 22% relative to the control mean of 76 deaths per 1000 births. We also estimate a reduction of 15% in the infant (under age 1) mortality rate, though this result is not statistically significant at traditional confidence levels.

Figure 1: Under-5 mortality by child year of birth

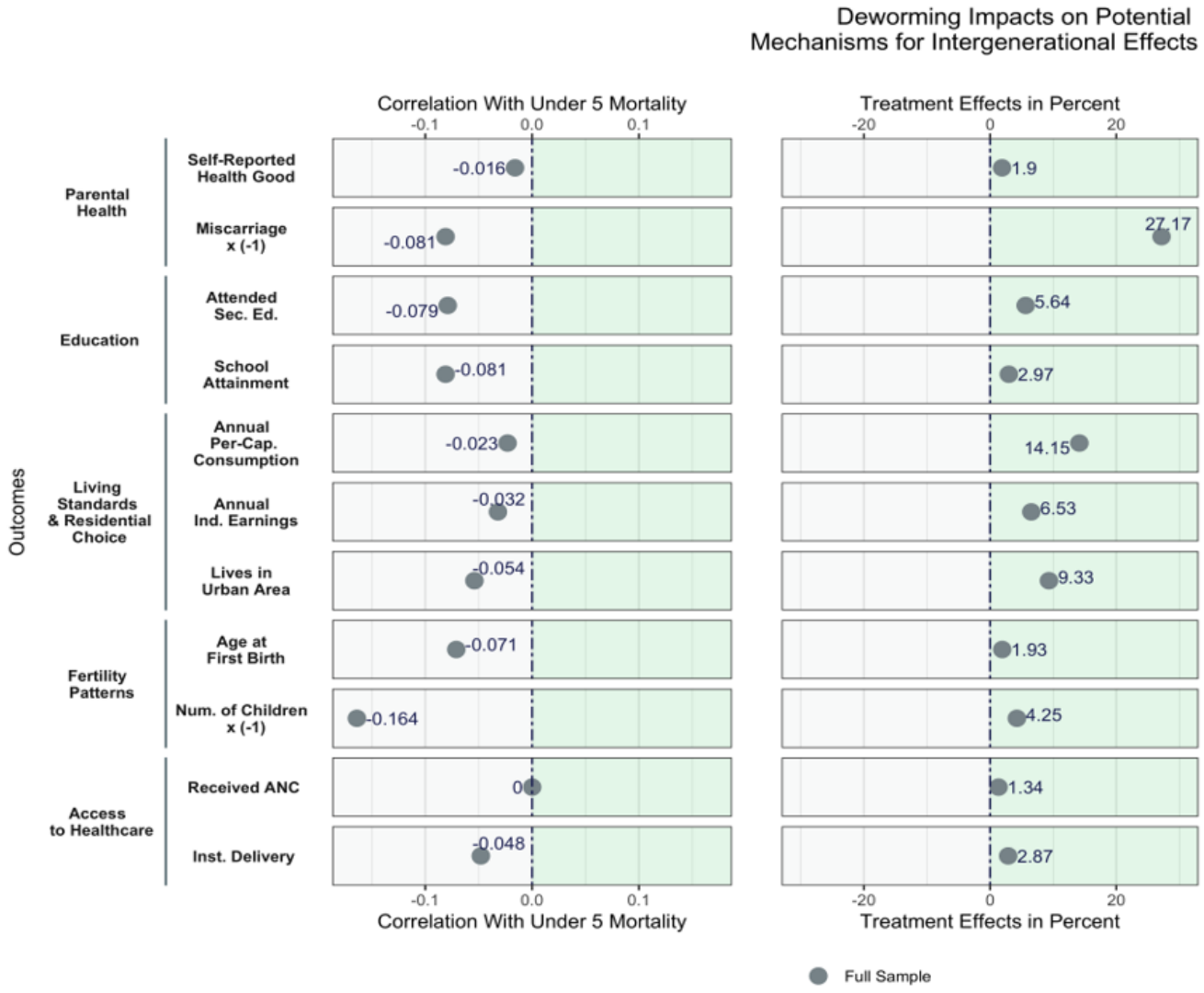


Notes: In Figure 1, the Kenyan national average for under-five mortality over time is shown in gray. As in many LMICs, this rate has fallen by almost half since the start of KLPS. The blue line shows the under-five mortality rate for the control group by year of child birth. The deworming treatment group is plotted in orange. Across child year of birth, under-five mortality is lower among the children of the treated group in most years.

Teasing out the mechanisms at play here is more difficult. Five main channels are prominent in existing research and were collected as part of the KLPS surveys: parental health, education, living standards and setting of residence, fertility patterns, and use of health care. To explore the plausibility of these as potential mechanisms of the decrease, we calculated correlations between these outcomes and child mortality and estimated deworming treatment effects on these outcomes. This is presented visually in figure two.

Though the magnitude and statistical significance of effects may vary, we find that all these factors are associated with declines in under-five mortality (the right panel), and that deworming generates positive point estimates on these outcomes (the left panel), suggesting several potential contributors to intergenerational child health formation. Improved health and education, particularly among female parents, improved living standards and residence, slightly older parent age of first birth, and increased access to health care may all serve as pathways to reducing the subsequent generation's child mortality risk. Though the experimental variation in deworming is unable to causally identify separate impacts, the analysis does confirm the combined effect of several factors on intergenerational child survival.

Figure 2: Mechanisms: Correlations and deworming impacts



Notes: This figure presents results on potential mechanisms behind the child mortality reductions by reporting (a) correlations with under 5 mortality (left panel) and (b) point estimates of treatment effects in percent terms (right panel), across outcomes related to five potential types of mechanisms: (i) parental health, (ii) education, (iii) living standards and residential choice, (iv) fertility patterns, and (v) access to healthcare.

Conclusion

In general, rigorous evaluations of the long-term and intergenerational impacts of childhood health investments are rare in LMICs due to both a lack of longitudinal data that tracks adults and their children, and the well-known difficulties inherent in designing credible strategies to address omitted variables and confounding variables. Yet, as this and other studies have shown, they carry significant value. This study leverages the unusual combination of experimental evidence and a long-term longitudinal survey among the original respondents and their children, in the process generating insights into the drivers of intergenerational health.

These findings suggest that deworming treatment has implications not only for reducing infection rates and improving living standards among the current generation, but also potentially far-reaching implications on improving child survival (and possibly other outcomes) of the subsequent generation. Taken together, the results provide causal evidence that there is meaningful intergenerational transmission of health outcomes, and widen the range of assumptions under which subsidies for child health investments would be justified.

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Kenya Deworming Intergenerational health