

## **Three Essays on Health and Development**

### ***Chapter 1: Do Informed Consumers Reduce the Price and Prevalence of Counterfeit Drugs? Evidence from the Antimalarial Market (job market paper)***

Asymmetric information between patients and providers is a defining characteristic of healthcare markets. Although patients expect healthcare providers to advise treatments to maximize patient well-being, providers may instead use this information advantage to increase profits. Healthcare providers may strategically use this information advantage to maximize their own payoff. As a result, providers may increase prices (“overcharge”), advise unnecessary services, or substitute lower quality products or services for unsuspecting customers.

In this paper, I design and implement an audit study using study team confederates (covert shoppers) to test how providers adjust price and quality when customers demonstrate relatively more information about healthcare product choices. Shoppers purchase antimalarial drugs according to randomized scripts. The scripts experimentally vary information about the patient's diagnosis (malaria) and/or information about appropriate treatment (artemether-lumefantrine). I then compare outcomes across transactions when shoppers were randomly assigned to signal different levels of information. I then test the purchased drugs to determine whether they are counterfeit or substandard, in order to have an objective measure of quality.

Shoppers who present information about either the diagnosis or recommended treatment pay approximately \$0.18 (5 percent) less. Counter-intuitively, I find that customers who present information about either the diagnosis or the recommended treatment are 3.4 percentage points *more* likely to be sold a substandard drug. However, overall drug quality is high. I interpret results through a framework in which providers trade off the current benefits to strategic behavior against potential future profit losses if strategic behavior was detected. There are lower expected profit losses because more informed consumers are less likely to be repeat customers, and overall pay lower prices. I provide additional survey data from both providers and real customers to support this interpretation. I conclude that while customers who show more information may pay lower prices, providers also lower quality in order to maximize profits. Thus, more informed shoppers are not necessarily better off.

### ***Chapter 2: Correlates of Low Quality Drugs in Uganda (with Esther Atukunda)***

According to recent studies, as many as one-third of antimalarial drugs throughout sub-Saharan Africa are counterfeit, or of low quality. However, estimates are typically based upon non-random and small samples. As a result, the true prevalence of counterfeit, or low-quality medicines, is uncertain. Without knowing the empirical average, it is difficult to estimate the consequences of low quality medicine on individual and public health. Absent data on the vendor and outlet correlates of low quality drugs, it is difficult to target policy interventions.

In the largest study of antimalarial drug quality to date, we purchase nearly 1000 antimalarial drugs from 438 randomly selected outlets in 45 parishes (over 100 villages). All tablets were tested for quality using a handheld spectrometer, and drug quality data were then linked to surveys of the same drug vendors and real customers at the same outlets. We find a substantially lower counterfeit rate than found in other studies; we estimate approximately 17 percent of samples are counterfeit. We further distinguish between counterfeit yet effective medicines and counterfeit, substandard medicines. We estimate that only 3.4 percent of purchased drugs are substandard.

An outstanding question in the literature is whether providers are complicit in the sale of low-quality medicines. One practical concern is that simply asking vendors whether they sell low-quality drugs may result in an under-reporting to avoid potential penalties. To address this question, we conduct a “list randomization” exercise that estimates the percentage of the sample that has knowingly engaged in low quality drug sales. We randomly divide respondents into two groups. The Control group is shown a list of 5 non-sensitive activities; the Treatment group is shown the same list, plus one additional activity (knowingly selling a low quality drug). Although there were implementation issues with the procedure, results indicate that as many as half of respondents have knowingly engaged in low quality drug sales. We view that as an upper bound on the true complicity in low quality drug sales.

We will present results that indicate the problem of counterfeit drugs appears to be a combination of brand counterfeiting and lax manufacturing standards resulting in highly variable formulations. We show that price is uncorrelated with drug quality, and thus customers are likely unable to judge drug quality at the point of sale. However, vendor characteristics associated with regulation and expected penalties from low-quality drug sales are correlated with drug quality. We conclude with a discussion of potential policy interventions that could further lower counterfeit drug rates.

***Chapter 3: The Spillover Effects of Health Insurance to Families: Experimental Evidence from Nicaragua (with Rebecca Thornton)***

Using two rounds of existing data among 2608 uninsured adult informal-sector workers in Nicaragua, we report the causal effects of having health insurance on the health care utilization among children who were covered as dependents. We utilize the fact that at the baseline, some adult respondents were randomly given six months of free insurance, which allows for us to empirically identify causal effects. We then examine differential effects among children who were part of an insured household, but ineligible for health insurance themselves due to an age restriction. Our results indicate that the health insurance significantly increases access to higher-quality providers and altered the entire family’s health demands. Children of insured parents were reported to have an average increase of 0.5 visits to covered providers one year later; the total number of visits increased by one full visit. We find that there were spillovers in utilization onto children excluded from insurance coverage due to age restrictions. We find mixed evidence of the effect of health insurance on health; health insurance increases the reported number of times sick among insured children, but decreases the reported number of times sick among uninsured children. We investigate possible reasons for this trend, including reporting biases. We caution that these results may be due to the short-term nature of the intervention and may not reflect long-term benefits of health insurance. We find no changes in parents health expenditures on insured children, and reductions among uninsured children.