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Do public health interventions crowd out private health investments? Malaria control policies in Eritrea☆

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ABSTRACT

Engaging in indoor residual spraying in areas with high coverage of mosquito bed nets may discourage net ownership and use. This paper analyses new data from a randomized control trial conducted in Eritrea, which surprisingly shows the opposite: indoor residual spraying encouraged net acquisition and use. One possible explanation for this finding is that there is imperfect information about the risk of malaria infection. The introduction of indoor residual spraying may have made the problem of malaria more salient, leading to a change in beliefs about its importance and to an increase in private health investments.

1. Introduction

Most public programs induce behavioural responses in their target population. These responses are often perverse, making programs less effective than what was originally intended. This is a central concern in the design of public interventions across a variety of contexts, in rich and poor countries alike. In the particular case of malaria control programs, the introduction of indoor residual spraying[1] (IRS) could have a negative impact on the use of insecticide treated mosquito bed nets (ITN), if the investment in one technology crowds out the investment on the other.

This paper analyses new data from a randomized control trial conducted in Eritrea, which surprisingly shows the opposite: an IRS campaign implemented in the most malarious region of the country led to increases in ITN ownership and use. Under perfect information about the returns to investment in the two technologies, the extent to which private investments crowd out public investments depends on the degree of substitutability between the two (e.g. Lengeler, 2011). If instead individuals perceive IRS and ITNs as complements, we would expect a positive response in private investment when the public

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[1] IRS consists in spraying the interior walls of dwellings with insecticide to kill resting mosquitoes.

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investment is increased, as we observe in the data. However, available data does not allow to identify whether individuals in the sample perceive the technologies as substitutes or complements. In addition, there is no evidence in literature related to the perception of these technologies.[2]

Outside the scope of a perfect information model exist situations where the introduction of a program changes the information set of individuals. For example, by introducing a health program in a community, the public health authorities may be perceived to be especially concerned about that particular health problem. This may indicate to individuals that the issue may be more serious than what they had initially perceived it to be and induce a change in their beliefs about the returns to private health investments. A program could also have an implicit information component even when it does not include an explicit information campaign. In this context, the standard crowding-out intuition breaks down and an increase in public health investments can lead to an increase in private health investments even when the technologies are perceived as substitutes.[3] Our analysis suggests that, in parallel to an increase in private health investments, the introduction of IRS caused a change in beliefs about the importance of the disease in these areas.

An additional channel through which IRS could influence ITN ownership is related to changes in net prices. This could occur if, for example, the intervention not only provides IRS, but also increases the supply of nets. A reduction in net prices and a subsequent increase in ownership could follow. In our setting, no nets were distributed together with the IRS campaign and, therefore, the supply of nets is unlikely to have changed as a result of the intervention.

The data used in the study come from an experimental evaluation of the impact of an IRS program organized by the Government of Eritrea in the most malarious region of Eritrea (Gash Barka). Fifty-eight (58) villages were randomly assigned to treatment and 58 villages were randomly assigned to control. Between June and July 2009, before the start of the malaria season, households in treatment villages were visited by government workers carrying IRS equipment and were offered free IRS[4]. Households in control villages did not receive publicly provided IRS and, at the same time, IRS was not privately provided in this region. A household survey and malaria rapid diagnostic tests (RDT) were administered during the malaria season that followed (October 2009).

Although the prevalence of malaria parasite infections was found to be low in this area, villagers were still actively engaging in different malaria prevention activities. Gash Barka is characterized by environmental features that are favourable, particularly during the rainy season, to mosquito proliferation and that have been relatively constant over the last ten years.[5] In this setting, Keating et al. (2011) focus explicitly on the effect of the IRS campaign on malaria prevalence and on the extensive margin of ITN ownership (i.e. whether households own at least one ITN), documenting no difference between treatment and control group for both indicators. Our aim is instead to quantify the impact of the intervention on individual and household malaria prevention behaviours. Our data shows that the intervention led to higher ownership and use of ITNs on the intensive margin. This means that the extensive margin of ownership does not explain all the increase in the number of nets owned/used that is observed in the treatment group, relative to the control group. In addition, households in treatment villages became more aware of (and concerned with) malaria than those in control villages. Relative to households in control villages, they were more likely to mention mosquitoes as a malaria vector, and to mention children as one of the groups most affected by malaria.

When conducting the analysis, we faced two main challenges. First, even though our data comes from a randomized control trial, we were not able to collect a baseline survey. This means that we were unable to collect pre-program outcomes, and check whether the sample showed balance in these variables. However, we do not expect there to be any imbalance induced by the randomization procedure. We show that the data is balanced across essentially all variables that can be safely assumed to be pre-determined and on indicators of pre-intervention infection risk.[6]

Second, we analyse program impacts on a relatively large number of outcomes. Therefore, it is essential to account for the simultaneous testing of multiple hypotheses. For all the outcomes and for each specification, we implement the stepwise multiple testing procedure suggested by Romano and Wolf (2005), Romano et al. (2008), which adjusts the critical values used for each hypothesis being tested and therefore controls for the family-wise error rate (FWER). We show that our conclusions are robust to multiple hypothesis testing.

A large literature debates the extent to which a variety of public programs discourages (or crowds-out) private investments in those goods or services that are provided by the public sector. Two examples (among many) are Peltzman (1973), who discusses the case of higher education in the US, and Cutler and Gruber (1996), who study health insurance in the US. Examples of the importance of crowding-out effects for health programs in developing countries are much less common in the literature than for developed countries, perhaps because of lack of data. Some examples include Das et al. (2011), who analyse education subsidies in Zambia and India, and Bennett (2012), who studies the negative effect of the provision of piped water on household sanitary behaviour in the Philippines.

The standard presumption in these papers is that there is substitutability between private and public expenditures, and that individuals have perfect information about the returns to their health investments. However, there is increasing evidence that decision-making by the poor is greatly affected by limited information (e.g. Bertrand et al., 2006; Banerjee and Duflo, 2011; Dupas, 2011b). This means that health programs have the potential to simultaneously deliver health services and induce changes in beliefs about the returns to health investments in the populations they serve. This could even lead to a reversal of potential crowding-out effects.

Beyond the literature on crowding-out effects of public programs, it is also important to mention how our study fits into the literature on malaria control programs and on information and health in developing countries. Providing information about the returns from using a

[2] Kleinschmidt et al. (2009) provide evidence that combined use of IRS and ITNs reduces the probability of malaria infection more than their individual use. However, this is not per se evidence of complementarity, which implies that the combined use of the two technologies generates larger impacts than the sum of the impacts of using them individually.

[3] Some public reaction in the US to the recent Ebola outbreak has some similarities with the situation we just described. There is limited public information about Ebola, which means that public perceptions of the disease may be easier to change than in cases where there is a higher level of knowledge. The perception of massive government investments towards the prevention of Ebola in the US (both in the countries where the outbreak originated from and in the US), may have lead some individuals to become very worried about the possibility of an Ebola outbreak in the US. This change in perceptions lead individuals to act accordingly, either through their own health behaviours or by putting pressure on the politicians who represent them.

[4] Teams visiting villages for IRS treatment were comprised of social workers. It is unlikely that IRS teams provided information about malaria to the households living in treatment villages, in addition to offering IRS treatment. Within the National Malaria Control Program, information campaigns are managed by a communication team, which did not participate in the IRS campaign.

[5] The area experienced high levels of malaria infections in the past and a steep reduction over the past decade, mainly explained by an increase in prevention activities. For this intervention, less than 1% in the sample tested positive to malaria on October 2009 (Keating et al., 2011). A detailed discussion of malaria prevalence in the study area is presented in Appendix B.1.

[6] We complement our dataset with pre-intervention geographic and time variation of the area of intervention's Normalized Difference Vegetation Index (NDVI), a vegetation index obtained from the analysis of the colour spectrum of satellite imagery. NDVI generally measures the overall propensity of an area to harbour mosquito populations (Gaudart et al., 2009; Shililu et al., 2004).