



**Economic and Health Consequences of Pesticide Use in Developing Country  
Agriculture: Discussion**

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# Economic and Health Consequences of Pesticide Use in Developing Country Agriculture: Discussion

Maureen L. Cropper

The policy question that all three papers in this session raise is: Should we regulate pesticide use in developing countries, and if so, what form should the regulation take? The purpose of these comments is to raise questions that must be answered before the health effects of pesticides can be regulated efficiently.

## Can Averting Behavior Be Used to Control the Health Effects of Pesticide Use?

A distinctive feature of pesticide use—as opposed to other forms of pollution—is that the magnitude of the health effects associated with pesticide use can often be reduced by averting behavior; wearing protective clothing, such as gloves or a jacket, can often reduce exposures by 80 or 90%. Encouraging the use of protective clothing and other practices that would reduce exposure, e.g., fixing leaky backpack sprayers, is therefore a form of regulation that seems worth pursuing. What is not clear from the studies reported here is whether attempts to encourage the safe application of pesticides are likely to be successful.

We know, for example, that applicators in the communities studied rarely wear protective clothing, and that in the Philippines, when applicators attempt to reduce inhalation exposure by wearing a cloth over the nose and mouth, this appears to increase their exposure. What we do not know is why effective protection is not undertaken. There are at least three possible explanations, each with different policy implications.

The first is that applicators do not understand

the health consequences of exposure to the pesticides they are using. Although Crissman and Cole report that 70% of the population of Carchi, Ecuador, perceives pesticides to pose a serious health threat, we do not know if applicators perceive this to be true, nor what specific health effects they associate with pesticides. It would be interesting to allow applicators to describe what they believe the health consequences of pesticide use to be, in their own words, and then to ask them about health effects that they do not describe voluntarily. While applicators are almost surely aware of acute poisoning, they may not appreciate the chronic effects of pesticide use.

A second possible explanation for the lack of averting behavior is failure to appreciate the efficacy of certain types of protective clothing. Mixers and applicators may not realize that most exposure occurs through the skin—and that wearing gloves and covering the forearms can significantly reduce exposure. Or, they may fail to appreciate the fact that health risk is proportional to dose received. In a survey of lay persons in the United States, Kraus, Malmfors, and Slovic found that 45% of respondents without a college degree believed the negative side effects of exposure to pesticides to be unrelated to the size of the dose received. Such a belief would, of course, imply that averting behavior is useless.

The third explanation for failure to wear protective clothing is that such clothing may be inconvenient, especially in tropical climates, or may reduce productivity. To see if this is so, it would be interesting to ask applicators if they would wear gloves and jackets if they were provided free of charge, and if not, why. If applicators would wear protective clothing, it would be of interest to know what they would pay for it. This would not necessarily measure the true health benefits of reducing exposure

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to pesticides, but if this value were compared to applicators' willingness to pay for a safe pesticide (a pesticide with no adverse health effects), it would indicate in dollar terms the inconvenience of wearing protective clothing.

As noted above, these three explanations for failure to apply pesticides in a safer manner have very different policy implications. If the disutility associated with protective clothing is high, then it may not be optimal to engage in this form of averting behavior.<sup>1</sup> If the problem is that workers fail to appreciate the health consequences of pesticide use, or do not understand how to reduce exposure, then education is the obvious approach. While Antle and Capalbo, and Pingali and Marquez are pessimistic about the possibilities of education, the studies they cite do not deal explicitly with education about averting behavior, so its success would seem to remain an open question.

### Should Pesticide Use Be Restricted to Limit Adverse Health Effects?

If averting behavior is infeasible as a method of controlling the health risks associated with pesticides, then measures to restrict the use of dangerous pesticides must be considered. These would include taxes on pesticides, outright bans, and investment to develop safer pesticides. To set a tax equal to marginal social damage or to decide whether the benefits of pesticide use outweigh the social costs requires placing a value on the adverse health effects associated with pesticide use.

Contrary to remarks by Antle and Capalbo, methods of valuing the health effects of pesticide use need not assume that applicators understand the link between pesticides and health. Instead, one can rely on dose-response functions, such as the ones estimated by Pingali and Marquez, to map out the relationship between pesticide exposure and health, and use various techniques to value the health effects themselves.

Pingali and Marquez have done a great service by computing the health cost of pesticide use, using a cost-of-illness approach. The latter measures health costs as the sum of medical expenditures plus time spent recuperating from

illness. While this yields only a lower bound to health costs, it is an important starting point. Furthermore, if these costs exceed the benefits of pesticide use, then the decision is clear: a ban on the use of the pesticide is optimal.

Pingali and Marquez, however, acknowledge that the cost of illness approach is only a starting point. Ideally, one would like to know what people would pay to avoid becoming ill, a figure that should include not only the cost of illness, as defined above, but the value of the pain and inconvenience of being ill. Studies that ask people how much they would pay to avoid an adverse health outcome have been conducted both in the United States and in developing countries.<sup>2</sup> Such studies must handle three problems. First, they must carefully define the health outcome being valued, e.g., chronic skin lesions. Or even better, they must allow the respondent to characterize the severity of the health outcome himself. Second, they must make sure that the respondent is aware of the consequences of the health outcome, including the time that would be lost from work and the medical expenses incurred. Third, they must make sure that the respondent carefully considers the budgetary implications of his willingness to pay response. While difficult, these components of a careful survey are not impossible to achieve, assuming that resources are available to develop a survey instrument at the study site.

Little work has been done thus far in estimating the value of avoiding illness in developing countries. What work has been done using data from developing countries themselves has largely been limited to cost of illness estimates. This is understandable. Any policy for which the health benefits (measured by the cost of illness) exceed the costs of the policy is, by definition, a "win-win" policy; it does not require society to trade off GDP against improved quality of life. Policies whose benefits include the psychic value of improved health are more controversial.

The utility of avoiding illness is, however, a legitimate component of health benefits. In valuing it, it seems only appropriate that we rely on the preferences of the people who will be affected by the policy—in this case, pesticide mixers and applicators in developing countries—rather than transferring benefit esti-

<sup>1</sup> It may, however, be appropriate to encourage mixers to mix pesticides with sticks instead of their hands, or to require that pesticides that must be mixed with water be sold in water-soluble bags.

<sup>2</sup> Studies in the United States are summarized in Cropper and Freeman. The author has recently completed a study of willingness to pay to avoid an episode of respiratory illness using subjects in Taipei, Taiwan.

mates from developed countries to the developing country context.

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