Cost Benefit Analysis

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Taylor Brown, Matt Menezes, Jordan Minot

Study Objectives

The study outlined the costs of using pesticide-impregnated bednets over ordinary bed nets and the health and community outcomes of adopting the National Insecticide-impregnated Bednet Program (NIBP). They investigated costs to producers of manufacturing and distributing nets, as well as costs to communities of maintaining the nets. 86% of costs were recurring, mostly having to do with re-dipping the nets to keep the insecticides potent. The metrics for evaluating benefit were mainly savings from reduced infection rates, included discounted life years, reduced treatment costs to government and families, and mitigation of losses in productivity and income. The objective of the study was to evaluate whether the costs of producing, distributing, and implementing impregnated bednets were offset by the positive consequences to the country of the NIBP.

Study Overview

The two main undertakings of the study included implementing an educational awareness campaign and evaluating the effects of distributing the impregnated bednets. However, the study did not allow for any meaningful assessment of the educational campaign's effectiveness. In assessing the outcomes of the impregnated bednets campaign, the study identified three broad criteria. First, it sought to determine any changes in mortality and morbidity rates in the chosen communities. Improvements in these rates were measured against past levels. At the end of the study, there were an estimated 40.56 deaths and 707.8 illnesses averted. This led the study to conclude that an estimated 605 discounted life-years were saved. The morbidity rates per year fell to under .5 percent. Second, the study sought to determine the effect on school attendance of the impregnated bednet program. However, it was found that there was no statistically significant effect on absenteeism. The idea had been that children who became ill less often would attend school more often. This does not seem to bear out. Finally, the study sought to determine the effect on resource savings within the health care sector and households from deaths prevented through the program. One large impact was found in the reduction of costs for treatment and hospitalization for the local health care sector. Additionally, households benefitted from this reduction in treatment and care costs. Households also accrued time-savings and the benefits of funeral postponements from the program. Overall, it appears that the effect on lowered mortality rates and resource savings provided the most benefits.

Strengths and Weaknesses of the Study

The analysis is particularly strong in the authors' ability to collect comprehensive cost and benefit statistics given the limited information available. The authors made use of questionnaires, for instance, to measure the effects of the program on school absenteeism. They also were able to account not only for the benefit in reduced treatment costs to the government but also the reduced costs to households for treatment and funeral expenses. A a result the authors were able to combine these benefits with the

discounted life-years gained and compare those benefits to the costs of the program to produce a convincing estimate of the cost per life--or life-year-- gained from the program.

While the study effectively accounts for the costs of the program as it exists, it fails to justify the benefits of particular aspects of the program. Most notably, the authors focus almost exclusively on the insecticide treatment aspect of the program and make little mention of the education aspect of the program. The reader is informed that the "sensitivity and awareness campaign" comprises 35% of the capital costs of the project and is an integral second part of the program aimed at making the bednet treatment operations more effective. Yet the authors do little to analyze the costs versus the benefits of this half of the program. They attribute no particular benefits to this education aspect nor make any claims as to the effectiveness of this aspect of the program, opting instead to discuss the overall benefits and costs. However, a separate analysis of the sensitivity and awareness campaign would be very useful in determining if those capital costs are a worthwhile expenditure in the effort to save lives.

Another issue with the analysis is the authors lack of accounting for the possible negative health effects due to the chemicals. According to the U.S. Environmental Protection Agency fact sheet on permethrin (the insecticide used to treat the bednets), the chemical is "Likely to be Carcinogenic to Humans," especially when ingested orally and admits that there may be further health effects that have yet to be determined by studies. The authors make no discussion of the possibility of these risks imposing future costs as dippers of the nets or the end users could potentially suffer adverse effects from the insecticide. Though these costs of shortened life may be less than the benefits of a life saved now due to discounting of future life years, the effect should be considered to provide a more complete perspective on the efficacy of the bednet treatment regime.

Information for Further Study

The study only accounted for some of the more apparent costs and consequences of the impregnated bednet program. The study accounted for the capital costs of production and distribution, but did little to discuss the education program training civilians in proper bednet use. Malaria is a highly contagious disease, so I would expect broader bednet coverage to have exponential returns in reducing rates of infection. This will only work if the public is properly educated, though, and a campaign to do so will incur additional costs. I would like to see a cost-effectiveness assessment of the education program as well. The cost of educating each additional person may exceed diminishing returns to infection prevention, and understanding the optimal investment in bednet training will be important to evaluating effectiveness.

The study seems to compare impregnated bednets to non-impregnated ones as the baseline, as opposed to no bednets. This makes sense, since, according to the study, about 85% of the population uses the nets. However, for the study to be pertinent to other African countries, especially ones where bednet use is less prevalent, we would benefit from knowing the effectiveness of bednets vs no bednets. The costs of producing bednets were not accounted for in the initial cost-effectiveness study, but when they were incorporated they increased costs substantially. It would be useful, in making the study relevant to other cases, to know the gains in effectiveness from no bednets to bednets, as well as from bednets to impregnated bednets. The benefits associated with each of these interventions would also be useful, how much does widespread bednet use reduce infection over no use? How much more does the impregnation abate infection? Furthermore, the insecticides have the potential to cause cancer from prolonged

exposure, and understanding this element of the impregnated nets may change the cost-benefit calculus. The study investigated the extent to which impregnated bednets are a cost-effective way of reducing malaria, but for the study to be relevant to countries just getting their net programs off the ground, additional info on the value of bednets would be useful.

Finally, the study looked in depth at the costs of children getting infected, looking at missed school days, bereavement from dead children, and weighting the deaths of children more heavily in Discounted Life Years. However, nowhere did the study discuss differences in rates of infection between children and adults, which would have been very helpful for deciding how best to allocate resources. The study clearly weighted the loss of children more heavily than adults, which leads us to conclude that the program could be made more cost-effective by targeting children as the first recipients of impregnated nets. Gambia could base the ratio of distribution on the likelihood of children to become infected, but the study made no mention of infection rates. Knowing the comparative differences between children and adults could, especially in terms of weighted costs as set forth in this study, increase cost effectiveness and save lives.

Conclusion

The study shows that the distribution of impregnated bednets in The Gambia reduces malaria infection at an overall greater benefit than the cost of the program, but we should account for additional costs before we accept this conclusion. The study, though, fails to address many important costs and benefits of the program, such as the cost-effectiveness of the education campaign, the relative costs and benefits of impregnated bednets vs bednets vs no bednets, and the potential of the insecticides to cause cancer. The potential for insecticides to cause cancer could offset many of the savings in treatment and bereavement, and may end up being more expensive than malaria. We can also conclude that children ought to be the main beneficiaries of a bednet campaign, since the savings from infection reduction are greatest when children avoid malaria. We should not conclude that Gambian findings on impregnated net cost-effectiveness are generalizable to other African populations, given the high percentage of Gambians already using bednets. This study provides useful insights into the mechanics of impregnated bednet programs for malaria treatment, but its failure to address certain important costs makes its findings difficult to use to inform policy.