Institution: The University of Oxford

Unit of Assessment: 1

Title of case study:

KNOWLEDGE IS POWER: INFORMING NATIONAL GOVERNMENTS IN THE GLOBAL FIGHT AGAINST MALARIA

Summary of the impact:

In spite of recent reductions in transmission, malaria continues to kill over half a million people annually. To assist in fighting the global burden of malaria, Kenya-based Oxford research team, the Malaria Public Health Department (MPHD) has spent the past decade analysing malaria risk, interventions, and control methods, to better define and target malaria. This research has been used to inform local governments, the World Health Organization (WHO), and international funding organisations about malaria risk, interventions and control methods to better define and target malaria.

Underpinning research:

Following the rapid decline of malaria transmission among African nations at the turn of the century, it became clear that updated intelligence based on sound epidemiological data would play a major role in the continued success of the global fight against malaria. Responding to this need, Kenya-based University of Oxford Professor Bob Snow established the Malaria Public Health Department (MPHD) to undertake the following tasks:

Geographic analysis of the global burden of malaria

MPHD published its first pivotal paper in 2005, which showed there was an estimated 515 million episodes of clinical *P. falciparum* malaria worldwide in 2002 – higher than that reported by the World Health Organization (WHO)[1]. It also showed Africa as the dominant contributor to the global burden of malaria, while highlighting a hidden burden in Asia[1]. In a subsequent paper, MPHD assessed the global spatial distribution of *P. falciparum* malaria. It showed that of the 1.38 billion people exposed to stable *P. falciparum* malaria risk worldwide in 2007, 759 million (approximately 55%) lived in conditions of very low endemicity with the potential for malaria to be eliminated altogether. It also identified that a much more aggressive control strategy was required for the 345 million people living in areas of high risk[2]. The quality of the geographical data presented in these papers led the University of Oxford to establish the Malaria Atlas Project, a continuously updated open access online mapping resource, which describes the distribution of malaria in every country around the world.

Provision of evidence-based data on malaria intervention coverage

Between 2004 and 2006 MPHD undertook a cohort study of 3,700 children aged 0-4 years in four districts of Kenya (Bondo, Greater Kisii, Kwale, and Makueni) to assess the uptake of insecticide treated nets (ITNs), funded by the Wellcome Trust and the UK Government's Department for International Development. Following the introduction of free ITNs, the prevalence of usage rose from 7.1% to 67.3% demonstrating that rapid protection of Africa's poorest rural children can be achieved through free mass ITN distribution campaigns[3].

Gauge malaria transmission risk among African nations

Since the establishment of the Malaria Atlas Project, MPHD have used maps to visually represent their data in key studies on malaria risk among African nations. Such national studies include their work on the spatial prediction of *P. falciparum* prevalence and malaria risk in Somalia and Kenya[4, 5].

Guiding global resource allocations for malaria

In an analysis of the equity and adequacy of international donor assistance for global malaria control, MPHD found that the US$4.9 billion spent on malaria control worldwide in 2010 was 60% lower than it needed to be for comprehensive control. They also found that while some of the countries receiving overseas development assistance were able to fund malaria control from domestic resources, other countries with the least development assistance remained some of the poorest countries in Africa[6].

References to the research:

1. Snow, R. W., Guerra, C. A., Noor, A. M., Myint, H. Y. & Hay, S. I. The global distribution of clinical episodes of *P. falciparum* malaria. *Nature* **434**, 214–217 (2005). ***Primary paper outlining global burden of malaria.***

2. Hay, S. I. *et al*. A world malaria map: *P. falciparum* endemicity in 2007. *PLoS Med*. **6**, e1000048 (2009). doi: 10.1371/journal.pmed.1000048. ***Paper outlining transmission risk of malaria worldwide.***

3. Noor, A. M., Amin, A. A., Akhwale, W. S. & Snow, R. W. Increasing coverage and decreasing inequity in insecticide-treated bed net use among rural Kenyan children. *PLoS Med*. **4**, e255 (2007). ***Paper reporting the effect of free provision of ITNs in Kenya.***

4. Noor, A. M. *et al.* Spatial prediction of *P. falciparum* prevalence in Somalia. *Malar. J.* **7**, 159 (2008). doi: 10.1186/1475-2875-7-159. ***Study showing geographical and epidemiological distribution of malaria in Somalia.***

5. Noor, A. M. *et al.* The risks of malaria infection in Kenya in 2009. *BMC Infect. Dis.* **9**, 180 (2009). doi: 10.1186/1471-2334-9-180. ***Study showing geographical and epidemiological distribution of malaria infection in Kenya.***

6. Snow, R. W., Okiro, E. A., Gething, P. W., Atun, R. & Hay, S. I. Equity and adequacy of international donor assistance for global malaria control: an analysis of populations at risk and external funding commitments. *Lancet* **376**, 1409–1416 (2010). doi: 10.1016/S0140-6736(10)61340-2. ***Paper showing the need for donor assistance in malaria affected areas.***

This research was funded by the Wellcome Trust.

Details of the impact:

By providing key data to the World Health Organization, national governments, world leaders, and the general public, the University of Oxford's MPHD has made a significant contribution to the global fight against malaria. MPHD's research has led to:

The Malaria Atlas Project

The Malaria Atlas Project is an interactive and globally accessible online mapping tool, which publishes MPHD's epidemiological, geographic and demographic data. The Malaria Atlas Project receives an average of 70,000 hits from around 216 nations every year (including all malaria endemic countries in the world). MPHD work in collaboration with national governments in Africa to develop Malaria Atlas Project maps specific to the needs of each nation. A recent Malaria Programme Review conducted in Namibia relied on the Malaria Atlas Project's "Malaria Risk in Namibia, 2009" map[7] to provide updated data on transmission risk in Namibia[8]. Malaria Atlas Project maps[4,5] have also been used by African nations to seek funding for malaria aid and interventions, including Kenya and Somalia's successful proposals to the Global Fund in August 2010[9,10].

Changes in WHO Policy and Practice

The research on the distribution of impregnated nets carried out by MPHD in Kenya[3] led directly to changes in WHO policy. Following new guidance released in 2007, the WHO now recommends that insecticidal nets be distributed free, or highly subsidised, to all members of affected communities[11]. In a press release distributed by the WHO, Arata Kochi, head of the WHO's Global Malaria Programme made the following statement regarding MPHD's research: *"This data from Kenya ends the debate about how to deliver long-lasting insecticidal nets. No longer should the safety and well-being of your family be based upon whether you are rich or poor. When insecticide treated mosquito nets are easily available for every person, young or old, malaria is reduced"*[11].

This policy change, leading to the scaled-up delivery of insecticide treated bed nets, has significantly reduced malaria-related child mortality among African communities[12]. A study from the World Health Organization, published in 2011, showed that the rapid increase in the use of ITNs in Zanzibar led to a reduction in mortality of 75% within 5 years of scaled-up intervention[12]. This paper showed that intensified malaria control (as recommended by MPHD) has, and will, significantly contribute to the success of the WHO's *Millennium Development Goal 4* target, to reduce mortality in children under the age of five by two-thirds between 1990 and 2015[12].

Improved Global Resource Allocation and Funding

By providing new estimates showing the global burden of malaria, research undertaken by MPHD has been critical for funding and international planning of resources required for malaria control. MPHD's epidemiological studies and maps have been used by the UK Department for International Development[13], the World Bank[14], and the WHO Roll Back Malaria Partnership[15]. The following statement from Alastair Robb, the UK Department for International Development's Senior Health Adviser and Regional Malaria Adviser for Africa, encapsulates the broad impact of MPHD's work on funding, national planning, policy and risk reduction in Africa[13]: *"The work of Snow and the Malaria Public Health and Epidemiology Group has been very influential. It has had an impact on decisions of donors, national programmes and other researchers. They have highlighted the importance of knowing more about malaria epidemiology, so that national policies are based on evidence. Their work is already being used to help target money so that it will achieve maximal benefit. This is coming at an important time in malaria control. DFID has been influenced by the approach taken by Snow and his team. Recent conversations with WHO, RBM, US PMI, Gates, CDC and Swiss Tropical Institute have all referenced the work of Snow's team in helping them refine their thinking from a blue print approach to malaria to a more nuanced approach"*[13].

Resources provided by the WHO's Roll Back Malaria Partnership have also been guided by MPHD's data. The following 'Letter Of Recommendation' from Dr Thomas Teuscher, Executive Director for the WHO Roll Back Malaria Partnership, emphasises the importance of MPHD's research in this field[15]. *"The KEMRI-University of Oxford-Wellcome Trust Collaborative Program under your leadership has been one of the principal providers of scientific evidence that operationally guides the malaria control community. Your recent work has supported the targeting of international aid in support of malaria control to regions where level of endemicity, population at risk and domestic income produce maximum value for money. Your continued work on the epidemiology of malaria provides partners like RBM with essential guidance on global resource allocation for malaria control"*[15].

Sources to corroborate the impact:

7. Namibia – Malaria risk. *Malaria Atlas Project* at http://www.map.ox.ac.uk/explore/countries/nam/ (Accessed 2013). ***Malaria Atlas Project (MAP) website.***

8. Republic of Namibia Ministry of Health and Social Services. Namibia Malaria Program Performance Review. Draft report. National Vector-Borne Diseases Control Program. Directorate of Special Programs Ministry of Health and Social Services, July 2010 (available on request). ***Namibia Malaria Program Performance Review including Malaria Atlas Project map of Namibia from 2009.***

9. The Global Fund. Proposal Form – Round 10 Single Country Applicant Sections 1-2. Kenya, 20 August 2010 (available on request). ***Kenya Global Fund Application including Malaria Atlas Project maps and MPHEG data.***

10. The Global Fund. Proposal Form – Round 10 Single Country Applicant Sections 1-2. Somalia, 20 August 2010 (available on request). ***Somalia Global Fund Application including Malaria Atlas Project maps and MPHD data.***

11. WHO releases new guidance on insecticide-treated mosquito nets. *World Health Organization* at http://www.who.int/mediacentre/news/releases/2007/pr43/en/index.html (Accessed 2013). ***Press release from the World Health Organisation outlining changes to policy directly resulting from MPHD's research in Kenya.***

12. Aregawi, M. W. *et al*. Reductions in malaria and anaemia case and death burden at hospitals following scale-up of malaria control in Zanzibar, 1999-2008. *Malar. J.* **10**, 46 (2011). doi: 10.1186/1475-2875-10-46. ***WHO study reporting the reduction in child mortality over a five year period in Zanzibar hospitals due to scaled-up interventions.***

13. Department for International Development. Senior Health Adviser, Regional Malaria Adviser for Africa. Statement supporting MPHD work in Africa (available on request). ***Email correspondence from Alastair Robb outlining the Department for International Development's support for the research carried out by MPHD.***

14. World Development Report 2009: Reshaping Economic Geography. Washington D.C.: The World Bank: 117. (2009) http://www.map.ox.ac.uk/client_media/publications/Hay_et_al_2009a.pdf (Accessed 2013). ***World Development Report from The World Bank, using mapping data from the Malaria Atlas Project.***

15. World Health Organization. Executive Director for the WHO Roll Back Malaria Partnership. Letter of recommendation (available on request). ***A letter of support from Thomas Teuscher, Roll Back Malaria (WHO).***