**HOME**

I am a postdoctoral research associate and consultant at Imperial College London working at the interface between disease modelling and global health policy.

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**ABOUT**

In my present position with the HIV Modelling Consortium at Imperial College London, I specialise in using mathematical modelling to inform global health policy.

I am interested in understanding how global health policy should respond to shifting donor priorities and evolving epidemics as the world moves toward ambitious development goals for 2030. Recently I have supported the 2017 Global Fund replenishment campaign, made a case for continued U.S. investment in the global AIDS response in the face of a changing political climate, and evaluated on-the-ground HIV prevention programmes in sub-Saharan Africa.

Prior to joining Imperial, I earned a DPhil in mathematical biology from Oxford University. In my thesis, titled *Mathematical Modelling of Metabolism and Acidity in Cancer*, I developed spatial models of altered metabolism and nutrient supply in growing tumours. I also have a masters in computational biology and undergraduate degrees in biology and statistics from Carnegie Mellon University.

I am currently based in New York.

**CURRENT PROJECTS**

**Consequences of a changing U.S. strategy in the global AIDS response**

Recent political changes have brought the United States’ investment in global health into heightened focus. Preliminary budget proposals released by the Trump White House have hinted at a commitment to the President's Emergency Plan for AIDS Relief (PEPFAR) and the Global Fund, though this may be limited and full details are not yet known. Editorials have discussed the importance of U.S. funding from the perspectives of human rights, global relations, and national security, but the conversation has been missing estimates of the potential impact on the epidemic of changes in U.S. funding.

At the request of the American Foundation for AIDS Research (amfAR) and Friends of the Global Fight, I have used a model of HIV in Africa to analyse a range of plausible strategies for how the new U.S. government might contribute to, or withdraw from, international response efforts going forward. My findings suggest that budget cuts or even a deviation in programmatic focus would dramatically hinder efforts to reach UNAIDS targets.

This work has been submitted for publication, incorporated into policy briefs, and is being shared with PEPFAR, the Global Fund, and members of the 115th US Congress for use in their budget deliberations.

**Supporting the 2017 Global Fund replenishment**

The Global Fund is the world's largest catalyst of the fight against HIV, tuberculosis, and malaria. Operating as a financing institution, it raises and manages multilateral funds, leverages public-private partnerships, and invests to support treatment, prevention, and care services in countries in need. The Fund operates on three-year cycles and must appeal to donor countries for financial replenishment at the beginning of each cycle.

At the request of the Fund's division of strategic information, I carried out consulting work to inform and strengthen the 2017 replenishment campaign. Together with Avenir Health and malaria modellers at Imperial, I explored the potential impact that a fully-funded Global Fund could have on each epidemic, as well as the losses that could be seen under incomplete funding or ineffective spending.

Following the successful replenishment, I aggregated modelling results across HIV, tuberculosis, and malaria to identify indicators for impact and service delivery that will guide the Global Fund's board-approved strategy over the new funding period.

**Evaluation of HIV prevention programmes in Zambia and Zimbabwe**

Zimbabwe and Zambia have lately been scaling up voluntary medical male circumcision, a proven intervention that reduces the risk of HIV acquisition by up to 60%. In collaboration with Avenir Health, the Institute for Disease Research, and Weill Cornell Medicine, I am using modelling to provide interim evaluations of the ongoing circumcision programmes.

In a completed first phase, my collaborators and I found that both countries will need to ramp up circumcision rates in order to meet their targets, but that the circumcisions already performed have had an impact on the local epidemics. We presented these findings to stakeholders and in-country programme coordinators at workshops in Harare and Lusaka, and will update our conclusions as new data come available.

**How to optimally reduce HIV incidence across sub-Saharan Africa**

Advances in HIV prevention methods offer promise to accelerate declines in incidence, but it has been unclear how these can be deployed to best effect in the complex setting of sub-Saharan Africa.

I hypothesised that tailoring prevention to local epidemic patterns could enhance the impact of HIV investments on a large scale. To test this, I developed a mathematical model of HIV transmission at subnational resolution in 18 sub-Saharan African countries. The model was calibrated to local historical data on HIV prevalence, sexual behaviours, treatment scale-up, and demographics. I then evaluated a series of different strategies for distributing prevention funding over 2016–2030.

According to the model, shifting from the current to optimal funding pattern would rebalance resources toward more cost-effective interventions and emerging epidemics, and would enable a much greater impact than current spending. This suggests that if domestic and international funders were to align strategically to build an aggregate funding pattern guided by epidemiology, more cost-effective and impactful HIV investments could be achieved across sub-Saharan Africa. This work has been published in the *Lancet HIV*.

I am now beginning to examine the impact of real-world constraints on the optimal funding pattern—for example, geopolitics of funding decisions, health system capacity, and the socioeconomic context in which people seek care or prevention.

**The role of PrEP and voluntary medical male circumcision in optimal HIV prevention**

New guidelines from the World Health Organisation recommend offering pre-exposure prophylaxis (PrEP) to people who are at substantial risk of HIV infection. But where PrEP should be prioritised, and for which population groups, remains an open question—and, for sub-Saharan Africa, a complex one.

I used modelling to examine what role PrEP should play in the heterogeneous and resource-limited landscape of sub-Saharan Africa. I found that using a fixed incidence benchmark to guide the allocation of PrEP would incur a loss in impact compared to an approach that uses PrEP more flexibly in light of prevailing budget conditions. This work has been published in the *Journal of the International AIDS Society*.

In contrast, a similar analysis of voluntary medical male circumcision (VMMC) in optimal prevention has shown that VMMC should be offered in most places even if the overall budget is small. This study serves as a reminder that VMMC remains a highly cost-effective prevention tool and should not be overlooked even as the field moves toward innovations such as longer-acting PrEP or a vaccine.

**CV** (embedded PDF)

**CONTACT**

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