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The value of models in maternal and child health research

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With fairy lights and Christmas trees screaming for attention in every shopping mall it is hard to ignore that the new year will soon be upon us. Besides another edition of the Rugby World Cup, 2015 signifies the deadline for the Millennium Development Goals (MDGs). These ambitious targets, defined by the United Nations in 2000, include reduction of the under-five mortality rate by two-thirds, reduction of the maternal mortality ratio by three quarters (both relative to the 1990 figures), and universal access to reproductive health.

Recent analyses indicate that we are still very far from reaching the MDGs, although important progress has been made – mostly over the last decade (1,2). Two challenges that are particularly pertinent to sub-Saharan Africa are the ongoing, fast population growth in large parts of the sub-continent and the widening health disparities between the richest and poorest households (3).

Bringing health care services closer to those who need them most is an emerging top priority in the quest for improved coverage of health services and interventions (4), and ultimately for reduced inequalities in maternal and child health (5). There is a growing interest in new, innovative interventions, including so-called mHealth solutions, to positively influence health care seeking behaviours (6,7). While such novel approaches undoubtedly deserve rigorous research efforts to assess their impact on maternal and child health, a recent consultation of researchers, health care providers, programme managers and donor representatives indicates that most priority research questions still revolve around the evaluation of implementation and delivery of existing interventions (8). Indeed, existing programmes and interventions are not receiving the monitoring and evaluation efforts they deserve. As a result, policy makers are lacking the evidence required to make informed decisions on which interventions that are already being implemented should be prioritised, scaled-up, modified or abandoned.

In light of these knowledge gaps, how should we interpret the astonishing level of precision and detail of the recent model-based development of a new Global Investment Framework for increased investments in women's and children's health for the

advancement of global social and economic development (9)? Focusing on the validity of the actual numeric model output, it is easy to criticise this model for being overly ambitious and deceptively precise. However, if instead we focus on the qualitative conclusions, we must recognise the value of this model for its ability to reinvigorated further debate and empirical investigations.

This issue of the SACEMA Quarterly focuses on various aspects of maternal and child health, and the role of statistical and mathematical modelling techniques in this area of research. Michael Schomaker discusses how advanced statistical modelling techniques have been used to draw causal inferences from observational data on the effect of immediate versus deferred ART initiation on mortality in 2-5 year-old HIV-positive children in South Africa, Zimbabwe, and Malawi. Specifically, his analysis suggests that there is no increased risk in mortality, for up to three years of follow-up, when deferring therapy until CD4 drops below 750 cells/mm³ or 25% compared to when starting ART immediately, as recommended by the World Health Organization since 2013.

Ngianga-Bakwin Kandala presents the results of a spatial modelling analysis investigating geographical disparities in modern contraception use among women in the Democratic Republic of Congo (DRC). Contraceptive use is generally low in the DRC, but large variation in contraceptive use exists across provinces. These trends may be explained by lack of investment in physical and human health infrastructure, decades of protracted conflict (particularly in the eastern part of the country), poor governance and economic mismanagement, and the uneven distribution of health services infrastructure.

Joseph Murage describes how the new M&E approach “Performance Monitoring and Accountability 2020” provides rich and timely information to decision makers by measuring family planning indicators through a mobile-assisted data and dissemination system using mobile devices. All indicators of family planning measured in the PMA2020 survey improved compared to the 2008 Kenyan Demographic and Health Survey. Staying in Kenya, Vernon Mochache reports on a secondary

analysis from the MOMI project (Missed Opportunities in Maternal and Infant health) funded by the European Union. Comparing selected health service delivery indicators between primary care facilities that reported adverse maternal and perinatal outcomes (early neonatal deaths, stillbirths, maternal deaths) and those that did not, it becomes clear that the disparity between availability and coverage of health services in Matuga, Kwale County is associated with the reporting of adverse maternal and perinatal outcomes.

Roxanne Beauclair presents findings from a retrospective cohort analysis that aimed to determine if the timing of the first antenatal care (ANC) visit influences the risk of having a stillbirth in a full-term, singleton pregnancy for a population of South African women. While her analysis does not provide evidence that the risk of stillbirth is associated with the timing of the first ANC visit, it remains plausible that timing matters, but needs to be taken in conjunction with the number of ANC visits and the content and quality of care. Lastly, Alex Welte describes the process, benefits, and challenges of developing a modelling framework that could be used to estimate the magnitude of negative consequences of adult HIV infection for the health and well-being of children.

Together, these articles and short items showcase the important role that statistical and mathematical modelling can play in maternal and child health research. The obvious, primary function of the models is that of internally consistent estimation tools. In particular, the models presented here enabled researchers to estimate time trends and geographical differences of indicators of maternal and child health, and to estimate the effects of (targeted) interventions or harmful exposures. Perhaps less obvious, but at least as important, is that the formulation of a model (or the unsuccessful attempt thereto) makes explicit to researchers and their audience which elements of the problem under study are already well documented, and for which elements data is lacking which forced the modellers to make assumptions. We hope this issue of the Quarterly provides useful perspectives and inspiration on ways to approach some ongoing challenges to childhood development, the importance of which can hardly be overstated.

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