

Robyn M. Stuart^{1*}, Jamie A. Cohen¹, Romesh G. Abeysuriya², Paula Sanz-Leon³, Cliff C. Kerr¹, Darcy Rao¹, Daniel Klein¹
¹ Bill & Melinda Gates Foundation, USA; ² Burnet Institute, Australia; ³ QIMR Berghofer Medical Research Institute, Australia;

- Human papillomavirus (HPV) is a very common sexually transmitted infection
- HPV has been implicated as the causative agent in >90% of cervical cancers
- Estimated global burden of cervical cancer: 600,000 new cases and 342,000 deaths in 2020.
- Timeline from HPV -> cervical cancer takes decades & is unobserved
 - Incident infections peak soon after sexual debut
 - Precancerous lesions peak ~10-15 years later
 - Invasive cancers peak ??? years after that



- Objective: determine whether the differences in the age distribution of cervical cancers across countries in Sub-Saharan Africa (SSA) can be explained without varying natural history parameters
- Study design: simulation study using **HPVsim (hpvsim.org)**, open source software for creating agent-based models of HPV transmission and progression
- Setting: 30 most populous countries in SSA

- Using HPVsim, we created models for each of the 30 countries over the period 1960–2020 with customized demographics and sexual networks
- We then performed three calibrations:
 - POOLED: each model assumes the same natural history parameters
 - UNCONSTRAINED: natural history parameters for each country are calibrated separately
 - IMMUNO-VARYING: one “immunocompromise” parameter varies, remainder are fixed

- Cannot achieve a good fit if we fix all the natural history parameters to be the same for all countries but we can with the addition of a single immunocompetence parameter for each country
- From this we derive multi-country estimates of probabilities of HPV clearance & cancer over time

