

**Project Title:** Lenses for HIV testing and treatment programme success: linking population and clinical surveillance perspectives on the HIV care cascade in rural KwaZulu-Natal

This project is suitable for (please put an X next to the appropriate group):

MSc in Epidemiology students:	X
MPH (Health Services and Systems stream) students:	
MPH (Global Health stream) students:	

**Background**

Global HIV policy objectives, and especially in the most affected settings in sub-Saharan Africa, are intensely focused on supporting all HIV positive persons to be tested for and diagnosed for HIV, initiated and retained on antiretroviral treatment (ART), and to achieve HIV viral suppression to prevent HIV morbidity and mortality, and to interrupt ongoing HIV transmission. These goals are encompassed by the UNAIDS '90-90-90' targets, which stipulate that, by 2020, at least 90% of all people living with HIV (PLHIV) should know their HIV status, 90% of those should be on ART, and 90% of those should be virally suppressed.

Monitoring progress towards these targets and ensuring sustained viral suppression is essential to determine the success of HIV programs and identify gaps where additional resources are needed. Accurate and precise measurement of HIV indicators is challenging, however, due to limited and incomplete data. The most readily available data in local settings are programmatic health system records about HIV testing, care and treatment, and clinical diagnostics, including HIV viral load measurements. Interpreting these data both at the individual and population level is challenging due to the complex pathways through which individuals navigate HIV care and treatment as well as the inconsistency and variable validity of programmatic data collection. For example, disengagement and re-entry into care at each stage of the HIV care cascade, and incomplete adherence to monitoring guidelines result in missing outcome data for a large proportion of patients who are likely systematically different from those who are observed.

By contrast, population-wide surveillance through regional or national household surveys provide population representative snapshots of the HIV care cascade, which can also demonstrate programme successes and challenges. However, such surveys are infrequent, costly, cumbersome to conduct, and do not provide sufficiently timely or granular feedback to guide programmatic management and improvement.

The Africa Health Research Institute (AHRI; <https://www.ahri.org/>) is a multidisciplinary population, clinical, and laboratory research institute situated in rural KwaZulu-Natal, South Africa where adult HIV prevalence is over 30%. AHRI has conducted both community-based, population-wide demographic and HIV surveillance since 2003 and clinical programmatic HIV data since 2008. Vukuzazi, is a new initiative in the AHRI study population, which builds upon these activities with collection of biospecimens for a wide array of laboratory analyses including cross-sectional measures of HIV seroprevalence and viral load testing. This combination of population-based and clinical data allows a unique opportunity to triangulate different sources of HIV indicator data to determine the optimal methods of tracking the HIV cascade of care, and determine if and what limitations arise from standard measurement approaches.

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### Aims

The aim of this project is to leverage the detailed clinical, population, and laboratory data from the AHRI population cohort and new Vukuzazi study data to compare and triangulate different approaches to estimating levels of HIV testing, treatment, and viral load suppression from cross-sectional population and longitudinal clinical data sources.

The ultimate objective of the project is to develop and validate approaches to assessing HIV testing and treatment programme outcomes from clinical surveillance data in typical settings that do not have detailed population data available.

Specifically, the project will use linked population and clinical surveillance data to investigate:

- Levels of HIV testing and diagnosis, and re-testing and engagement in care.
- Retention on ART among clinical cohorts compared to cross-sectional ART coverage.
- Population wide VLS amongst persons on ART compared to levels of VLS recorded via routine clinical monitoring of viral load.

### Proposed methods

The project will involve (1) statistical analysis of linked general population and clinical surveillance data, and (2) simple compartmental mathematical modelling to reconcile longitudinal and cross-sectional observations of HIV testing and treatment outcomes.

### Data collection and access

<b>Type of data</b>		
Secondary data analysis	<b>Access to data currently established</b>	
	No	
Secondary data analysis (abroad)	<b>Ethics Approval currently in place</b>	
	No	
Primary data collection	<b>Ethics Approval currently in place</b>	
	N/A	

**If you have said No to any of the above, please explain plans for gaining access to data or ethics approval, including timelines? Please also include alternative data set or research question that the student will work on should data or ethics approval not be in place by June 2019.**

Anonymised data from the AHRI population and clinical surveillance are publicly available upon request through the AHRI data repository:  
<https://data.africacentre.ac.za/index.php/home>

Interim analytical data from the Vukuzazi study will be available in April 2019. Should there be delays in availability of data from the Vukuzazi study, analysis will proceed using already available data from existing linked population and clinical surveillance.

Ethical approval for the AHRI population cohort and Vukuzazi have been reviewed granted by the University of KwaZulu-Natal and University College London institutional review

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boards. Approval for secondary analysis of deidentified anonymised study data will be submitted to the Imperial College Research Ethics Committee in February 2019.

### Skills required

- Data manipulation and statistical analysis in R or Stata
- Experience with mathematical modelling
- Knowledge of HIV epidemiology in sub-Saharan Africa
- Interest in population health and surveillance

### Outcomes

Students will gain knowledge and experience in:

- Management and analysis of complex longitudinal and cross-sectional data sources typical of applied epidemiology and public health settings.
- Understanding of HIV epidemiology, dynamics, and care and treatment interventions.
- Statistical analysis.
- Basic mathematical modelling.
- Collaborating with a high-profile international and multidisciplinary research team in the context of a major overseas research programme.
- Production, submission, and publication of peer-reviewed manuscripts

### Supervisor:

Dr Jeff Eaton

### Co-supervisor:

Dr Mark Siedner (Africa Health Research Institute & Harvard Medical School)

Dr Leigh Johnson (University of Cape Town)

**Please detail any costs (up to £500) to be incurred and the amount you plan to claim from the School of Public Health: None.**

Description	Costs	Funds required

**Note:** Please also refer to the 'Application for fieldwork funding' document, if applicable. Funding from the School of Public Health is not available for conference attendance or cost related to the project but not specific to the student's activities.