Specific Aims

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Recent efforts to control and eliminate tuberculosis (TB), the leading infectious cause of death worldwide, have highlighted the importance not only of improving access to diagnosis and treatment, but also of ensuring that care is of high quality.[1] Globally, low-quality TB care in high-burden settings contributes to slow annual declines in incidence (2%) and mortality (3%) and the large fraction of incident cases that are missed (30-40%).[1,2] Enhancing health systems' capacity to collect and utilize accurate data is a priority in high-burden settings like Uganda, where studies have identified specific gaps in the TB care cascade, but less is known about the reasons for these gaps or how to measure them quickly and reliably.[3–6] Despite a substantial investment in diagnostic and laboratory infrastructure for TB by rolling out Xpert MTB/RIF in health facilities nationwide, the 2015 prevalence survey[7] and 2019 WHO TB reports[8] continue to show high TB prevalence and low treatment coverage. A deeper understanding of the determinants of high-quality TB care and the accuracy of routine data is critical to inform effective quality improvement (QI) strategies in Uganda and similar settings.

Care cascades describe patient progress and drop out through each step of guideline-based TB screening, diagnosis, and treatment.[9] However, the inability to operationalize cascades for TB control is a critical barrier to QI. To address this need, we will perform a detailed analysis of the quality of TB care in Uganda using routine TB surveillance data reported to the Ministry of Health (MOH) via its District Health Information System 2 (DHIS2) platform. We will use this data to construct quality indicators derived from the TB and TB-HIV care cascades.[9,10] Previous national TB care cascades, including those developed for India[11] and South Africa,[12] measure gaps in care but do not meet needs for real-time, sub-national data to improve quality management. Recent digitalization of Uganda's routine data opens the possibility of operationalizing care cascades as a real-time QI tool. The first step is to validate methods for producing accurate measures of the care cascade from aggregate data. Then, we will assess the value of this data and framework for measuring the impact of past and future interventions. One intervention of interest is Xpert molecular testing, a highly sensitive diagnostic introduced to improve the accuracy of diagnosis and the timeliness of treatment initiation. We will also use the cascade to model other simple, low-cost strategies that could enhance quality TB care in Uganda. Care cascade analyses have been used extensively in HIV, and increasingly in TB, to characterize the success of treatment programs, identify public health priorities, and assess impact of interventions.[10,13–21] Our approach will allow us to identify methods to produce these estimates directly from routine data, ultimately making timely, actionable quality indicators available to program decision-makers. Our specific aims are:

Aim 1: To evaluate the accuracy of routine surveillance data in Uganda for measuring the quality of TB care. We will construct and compare TB quality indicators – proportions diagnosed who initiate treatment, complete treatment, are tested for HIV, and, if positive, are on ART – using data for 24 health facilities in 2017. We will use two different methods: aggregate, routine surveillance data reported to the DHIS2 system and individual-level data from a prior study of TB diagnosis.[22] *We hypothesize that the proportions measured with aggregate data will be within 10% of those measured with individual-level research data.*

[Usually there will be 2-3 related but independent aims. Same format as above.]

Findings of the proposed work will extend the application of TB care cascades to produce actionable quality indicators and impact estimates directly from surveillance data. In addition, this project will further my training and experience so I can become an independent researcher in infectious disease epidemiology.

Hook. Name the disease or problem to be studied; grab the reader's attention.

Known information. Concisely describe burden of disease, scope of problem, known associations, etc. Key points only; elaborate in Significance section.

Gap in knowledge. What is not yet known about this topic.

Critical need. Information that will be generated by the proposed work to advance public health knowledge or population health outcomes. The critical need usually appears at the end of paragraph 1, or possibly (as in this example) at the beginning of paragraph 2.

Overarching objective of this proposal. Cutting across all aims, what is the objective?

Specific objectives and Rationale. What will you do to address the critical need, and what is the justification for your approach and/or hypothesis? If relevant, concisely name population, data source, general approach. Can briefly mention previous research or preliminary data to support your proposal.

Payoff. What will be the contribution of this work?

Aim title. Short, bolded title that clearly describes the objective of the specific aim.

Approach. Very briefly describe approach, including (as relevant): study design, population, setting, time period, data source, model, exposure, outcome.

Hypothesis. Be specific; can italicize for emphasis.

Impact. How this proposal will contribute to the field; for training grants (F30/31), how this proposal will contribute to your scientific training.