

Driving time delays treatment initiation for tuberculosis in Uganda

We investigated the association between distance to health care facilities and delay in treatment initiation for patients with tuberculosis in Kampala, Uganda. We used a theoretical construct known as appraisal delay, which is the approximate time in days that a patient takes to consider a symptom as not only noticeable, but a sign of illness necessitating treatment. Delay of this type is best captured using an interval construction that spans and records symptom chronology over time before effective medical treatment that alleviates symptoms is administered.

Our characterization of this delay type can be described as follows: the greatest number of days reported by the patient for any symptom served as the upper limit of the interval, whereas the shortest number of days indicated the appearance of the most recent symptom that triggered subsequent medical intervention (Fig. 1). For example, reporting a cough for 150 days and weight loss for 12 days generates an interval of [12, 150]. The appraisal delay may be 138 days (the exact difference between the upper and lower limits associated with patient reports of symptoms) or fall somewhere else within the interval based on a patient's propensity to monitor, seek and improve self-care.

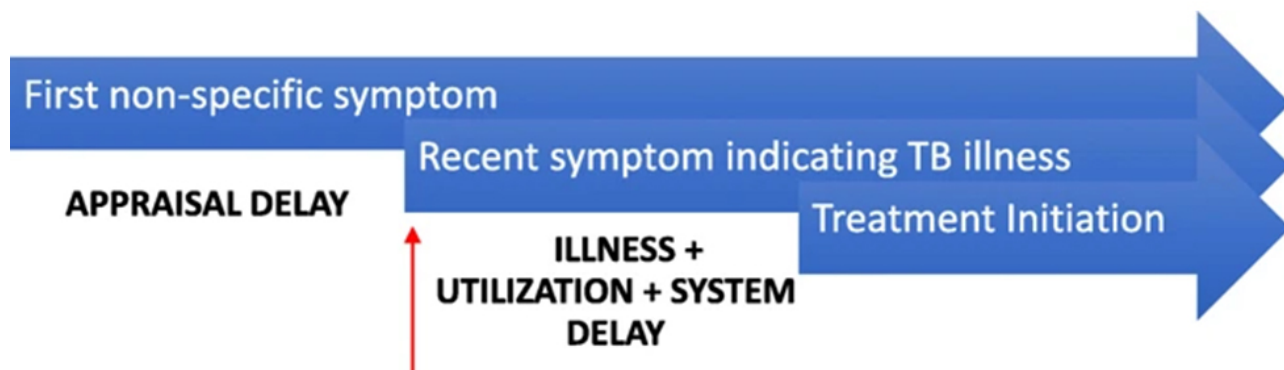


Fig. 1. Appraisal delay is the time a person takes to evaluate a symptom as a sign of illness. Illness delay is the time the person takes from the first sign of illness until deciding to seek professional medical care. Utilization delay is the time from the decision to seek care until the consult at a health facility. System delay is the time from the first consultation to initiation of treatment. The red arrow indicates the appraisal date, at which time the patient recognizes possible tuberculosis (TB) as the explanation for his or her symptoms.

Because tuberculosis symptoms are often non-specific and may be temporarily alleviated with alternative interventions, this interval serves as a proxy of the length of contagion risk. Hence,

assessing appraisal delay is important to understanding the dynamics and consequences for community and household transmission of tuberculosis. Few studies have queried this aspect of delay using the patient perspective in relation to symptom type, duration and accumulation. We sought to explore whether driving distance to health care facilities was associated with this appraisal delay. To investigate this relationship, we used a comprehensive set of variables based on the Andersen health care utilization framework, including predisposing characters (e.g., age, sex, marital status), perceived needs (e.g., total symptoms reported and whether other household members were previously treated for tuberculosis), evaluated needs (e.g., physical examination, Karnofsky performance score, comorbidities), and personal health practices (e.g., smoking, alcohol consumption).

Our methodology constituted the use of geospatial techniques and interval regression models. Spatial mapping of households was critical in determining the true distance to the clinic using exact addresses. Interval regression model is the requisite analytical tool to determine the association between an outcome with interval censoring and a predictive variable set. Importantly, the interval design allowed us to capture the effects of distance for patients with uneven duration and timing of delay. Our models also predicted the variability in the interval outcome to assess how these boundaries changed in relation to the mean delay and other factors like distance. Our methodology used techniques to find the estimate(s) of the parameter(s) that maximized the probability of observing the data we have.

Our multivariable results revealed that among 798 patients, driving time significantly predicted increased delay: each minute of driving time was associated with 0.25 days' delay. At median values, this represented 12 days' delay in addition to the mean delay of 40 days. Notably, these results were sensitive to controlling for the extent of patient disease. The findings suggest that living in urban, congested areas with dense traffic may be an important contributor to appraisal delay. We conclude that distance exerts its impact on healthcare access for tuberculosis through both time and space dimensions.

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Publication

[Impact of geographic distance on appraisal delay for active TB treatment seeking in Uganda: a network analysis of the Kawempe Community Health Cohort Study.](#)

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