Disparities in HIV/AIDS Progression among Children
A Case of Uganda

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Rationale: HIV causes chronic infection that requires life-long treatment once one starts the therapy. With HIV/AIDS care and treatment or antiretroviral therapy, HIV-related mortality and morbidity are reduced, and the general quality of life of People Living with HIV/AIDS (PLWH) is improved (USAID, 2010; Schneider et al., 2005). However, how much this differ by individuals' socio-demographic factors along the lifecourse of HIV-AIDS, and the estimates of how many will develop AIDS and when is barely unknown (CDC, 2006).
In addition, while studies have reported on rapid HIV progression without Antiretroviral (ARV) treatment (Abrams et al., 2003), hardly a study has examined this scenario in the face of HIV care or ARV-treatment. Many a times, people of lesser socioeconomic status are highly vulnerable to deaths from certain causes such as malnutrition, yet they are preventable. Indeed, studies in the United States (US) have revealed higher burden of disease in minority population groups (AHRQ, 2001). However, there is dearth of information on how socioeconomic inequalities as factors documented for differences in cause-specific mortality (Bos et al., 2004) may affect HIV/AIDS transition rates among children.

Furthermore, there is considerable evidence of disparities in life expectancy, morbidity, risk factors, and quality of life among segments of the population, defined by, sex, education, income, location, among other aspects (AHRQ, 2001; CDC, 2011). Thus, with incessant HIV/AIDS care and treatment among PLWH, there is need to examine how different, a cohort features along the HIV/AIDS lifecourse. Certainly, we cannot claim overall progress in the fight against HIV/AIDS morbidity if there are certain populations that are disadvantaged along the course of treatment. While some studies have found rapid HIV virus progression among infants (Newell et al., 2004), there is need to establish the transition rate of these CLWH from one stage of HIV to another. Furthermore, understanding population-health issues require a multidisciplinary approach that examines health determinants, disease and intervention at each stage of health transition, with critical emphasis on morbidity and mortality (Niessen, 2002).

Objective: The main objective of this study therefore, is to examine the HIV/AIDS progression among children and associated factors following WHO (2007a) immunological staging of established HIV infection (Table 1). In other words, the study set out to describe the HIV/AIDS lifecourse and the factors associated with HIV/AIDS progression among children on HIV/AIDS care and Treatment.
Therefore, this study provides an input in assessing the contribution of HIV/AIDS care and treatment towards improving lives of HIV seropositive persons by estimating survival rates at each stage of HIV progression. That is, the gains of the life-prolonging effect of HIV care and treatment or antiretroviral therapy in improving child health (averting morbidity and mortality). This is a direct contribution to how HIV/AIDS care and treatment programs effort towards attaining the fourth UN millennium development goal (MDG) of reducing under five mortality. Furthermore, results from this study will help to focus treatment guarding against ARV treatment discontinuation. This is essential in maintaining the health benefits of the therapy and in averting viral resistance to drugs and other adverse side effects. In addition, provide information for policy intervention to enhance equity or equal access and health benefit of ART to those who are disadvantaged because of their demographic and socioeconomic traits.

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Theory: This study adopts the Lifecourse Theory, which examines how chronological demographic and socioeconomic factors shape people's lives from birth to death (Hutchison, 2007). This framework is relevant in studying the causal effects of chronic disease and infectious disease (Ben-Shlomo & Kuh, 2002; Hall et al., 2002). The lifecourse theory enables the understanding of individuals by construction of an event history (series of different events and transitions) from birth to death and examines how people transit through different life periods.

In addition, the lifecourse perspective reflects how society and social institutions shape the pattern of a person's life (Elder 1985). With lifecourse perspective, the interplay of human lives and historical time provide an understanding of how people in a given cohort feature differently with their life experience (Elder, 1998). There is wealth of evidence that early experiences affect later morbidity and mortality (Halfon et al., 2005) especially with chronic diseases.

Therefore, while studying differences in HIV/AIDS progression in children, the factors that influence HIV infection progression embeds within the key principles of the lifecourse perspective. In addition, the study models some parental background characteristics such as survival status, education attainment to measure their effect on child survival. The four stages of HIV/AIDS lifecourse are immunologically, clinically determined depending on certain health symptoms a PLWH attains (CDC, 1994; NIH, 2010; WHO, 2007a), and Death is the definitive stage. The model thus, indicates that PLWH can stay or progress from the initial stage or state (N) to the next health state (A, B, C) or may die (D).

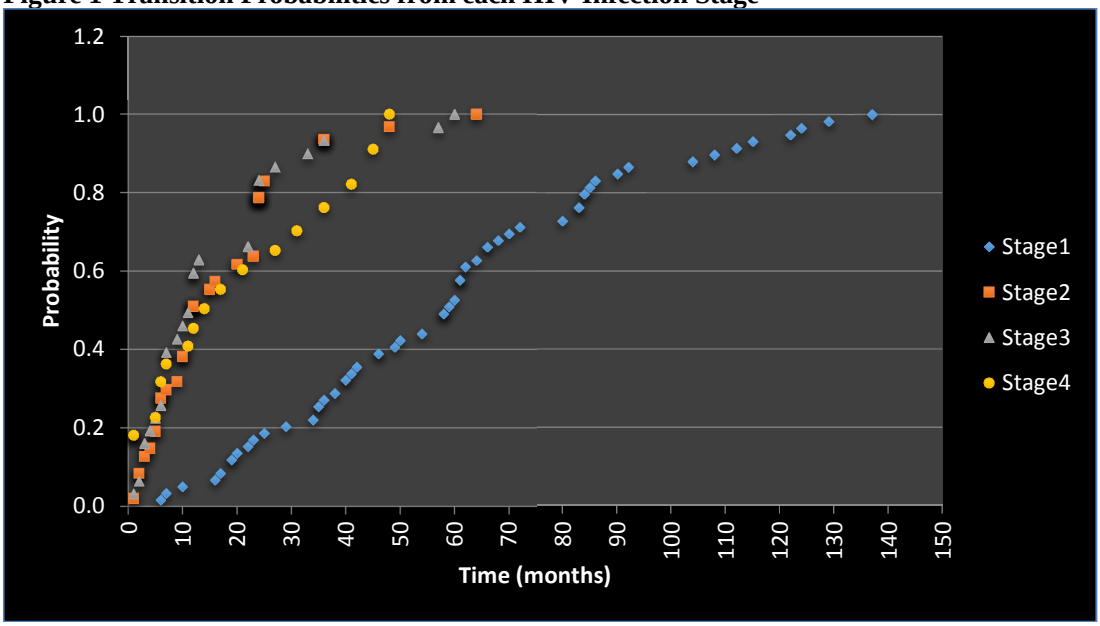
Methods: The study takes on a retrospective cohort design, using quantitative statistical measures to estimate and describe the expectation of life in each HIV stage and establish the demographic and socioeconomic factors that contribute to differences in transition rates from one stage to another. The study utilizes event-history analysis procedures: Kaplan Meier and the Cox proportional hazard model to estimate exposure time, transition probabilities and the relative risk to event respectively.

The study comprised of children under age 15 years on HIV/AIDS care and treatment at Mildmay Uganda obtaining data from a "cohort" of children of known HIV/AIDS status within an age range of 0- 14 years. The data enabled examining their HIV/AIDS disease life history from the time of identification to age 15 years or death. The year 2000 was the base year for recruiting the study subjects. Henceforth, the study followed the HIV/AIDS life history of these children in a retrospective manner between the periods January 2000 to December 2010. The study employed two techniques of data analysis: Kaplan Meier Event History analysis procedures and the Cox proportional hazard model to estimate and describe transition, exposure time, expectation and influencing cofactors. The study dropped the earlier proposal to use Multistate Life Table (MSLT) to classify and describe HIV/AIDS transition lifecourse at a given distinct stage due to data limitations.

The study specified Kaplan Meier survival functions to describe event failure against event time/ age that is, the survival function and the hazard. In addition, the study specified Cox proportional hazard models to analyze multiple covariates for their effect on survival in a given state. As input into the Cox regression model, the framework posits that demographic and socioeconomic factors as embedded in the five theme of the life course theory influence the rate of HIV/AIDS progression. The study considers; age, sex, education attainment, among others (covariates) as demographic and socioeconomic proxy indicators that influence HIV infection progression. Thus, the differences in demographic and socioeconomic factors constitute disparities in HIV/AIDS state transitions in CLWH.

Results: Children contributed 5,108 person months on HIV infection lifecourse of which 55% is lived with asymptomatic stage. The duration of exposure to HIV infection contributed in each stage decreases with progressive amplification in the infection. There is increasingly short expectation of life and great probability of HIV infection progression once a child progresses from asymptomatic stage. Figure 1 summarizes the transition probabilities of the four HIV infection stages for the period of 140 months of observation window. It can be seen that the transition probabilities in Asymptomatic HIV infection (Stage I) are markedly distinct from the other three stages. That is, the probabilities for children living with HIV infection stage I to progress to a higher HIV infection stage are lower at all times than those of higher HIV infection stages. For example, at a duration of 60 months, the transition probability for HIV infection stage I is half that of stage II and III. In addition, there is no distinct pattern in transition probabilities in stages II (mildly asymptomatic) and stage III (moderately asymptomatic).

Figure 1 Transition Probabilities from each HIV Infection Stage



The duration of exposure to each distinct HIV infection stage differs from stage to stage and about three quarters of the lifetime lived with HIV infection is spent with asymptomatic HIV infection stage. Moreover, the progressive and amplification of the HIV viral infection undermines the duration of exposure time in each additional higher stage of HIV infection. The transition probability with Asymptomatic HIV infection stage is lower than that of higher infection stages at all time yet; there is an increasingly great probability of HIV infection progression once a child progresses from asymptomatic stage. HIV infection progression is independent of sex of a child, however, age at starting care and treatment greatly affects exposure time at each stage of HIV infection. Certainly, later ages at initiation of HIV/AIDS care and treatment are associated with high risk of infection progression. Grandparents offer ample care to HIV infected children than other persons, and the role of region in offering social support is evident yet, paternal survival impinge on the of an HIV positive child.

Henceforth, to optimize survival time on HIV infection lifecourse, HIV/AIDS care and treatment (ART) should target to control and maintain HIV infection within asymptomatic levels yet initiating care on the earliest time possible. Adequate monitoring and management of the infection should prioritize early diagnosis through PMTCT and routine medical reviews.