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The age pattern of increases in mortality affected by HIV: Bayesian fit of the Heligman-Pollard Model to data from the

Agincourt HDSS field site in rural northeast South Africa

By [David Sharrow](#), [Samuel J. Clark](#), [Mark Collinson](#), [Kathleen Kahn](#), [Stephen Tollman](#)

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Abstract

Background: We investigate the sex-age-specific changes in the mortality of a prospectively monitored rural population in South Africa. We quantify changes in the age pattern of mortality efficiently by estimating the eight parameters of the Heligman-Pollard (HP) model of age-specific mortality. In its traditional form this model is difficult to fit and does not account for uncertainty.

Objective: (1) To quantify changes in the sex-age pattern of mortality experienced by a population with endemic HIV. 2. To develop and demonstrate a robust Bayesian estimation method for the HP model that accounts for uncertainty.

Methods: Bayesian estimation methods are adapted to work with the HP model. Temporal changes in parameter values are related to changes in HIV prevalence.

Results: Over the period when the HIV epidemic in South Africa was growing, mortality in the population described by our data increased profoundly with losses of life expectancy of ~15 years for both males and females. The temporal changes in the HP parameters reflect in a parsimonious way the changes in the age pattern of mortality. We develop a robust Bayesian method to estimate the eight parameters of the HP model and thoroughly demonstrate it.

Conclusions: Changes in mortality in South Africa over the past fifteen years have been profound. The HP model can be fit well using Bayesian methods, and the results can be useful in developing a parsimonious description of changes in the age pattern of mortality.

Comments: The motivating aim of this work is to develop new methods that can be useful in applying the HP eight-parameter model of age-specific mortality. We have done this and chosen an interesting application to demonstrate the new methods.

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