Technical appendix

Appendix 1

It was necessary to determine a randomly assigned time that each individual in the model would spend on each class-stage. However the Kaplan-Meier Estimator (KME) only provides estimates for the probability of survival up to the latest time period in the database. We needed to find a function that fit the KME and allowed for an estimation of time on class-stage both for time periods which the KME provide data for and for time periods beyond this. The function chosen was of the form

$$f = e^{at^b}.$$

This form was chosen because f tends to zero as t tends to infinity and is monotonically decreasing.

A random walk optimisation was used to find values of a and b that produced f that was closest to the KME. This equation can be inverted to the form

$$t = \sqrt[b]{\frac{-\ln(f)}{a}}.$$

By choosing at random an f uniformly between 0 and 1, a time t is generated which represents a random individuals' time on that particular class-stage in days. Repeatedly sampling f between 0 and 1 will result in a distribution sample of time until class-stage conclusion which is an approximation to the distribution of the original AHOD class-stage change data.

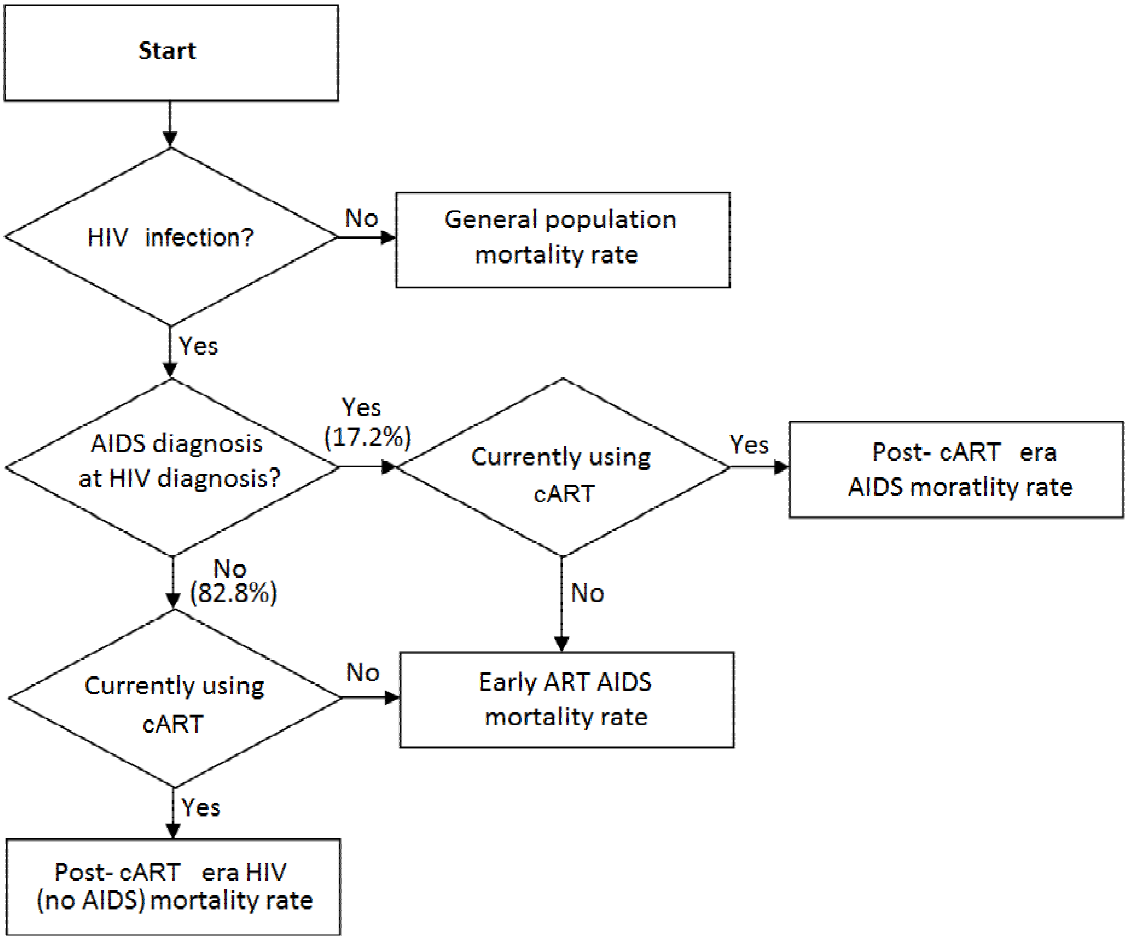
Below are the optimized values for a and b in the equation used to estimate the distribution of time until the end of each class-stage.

Class-Stage	a	b	Median class-stage time

1	1.9337×10^{-3}	0.74646	7.2
2	2.2361×10^{-6}	1.46672	15.2
3	1.1790×10^{-5}	1.45644	5.2

Appendix 2

The following diagram shows how the model decides what mortality rate to use based on the circumstances of the individual in the model.



Age	Median standardised mortality rate used in calculations (range of values used for uncertainty analysis)		
	Currently using treatment (no AIDS diagnosis)	Currently using treatment (with AIDS diagnosis at HIV diagnosis)	All currently available therapy exhausted
0 - 24	3.79 (2.39 - 6.01)	19.95 (11.05 - 36.02)	78.18 (39.09 - 117.27)
25 - 34	2.69 (2.35 - 3.07)	14.11 (12.3 - 16.19)	59.9 (29.95 - 89.85)
35 - 44	2.16 (1.96 - 2.38)	8.12 (7.43 - 8.87)	46.01 (23.01 - 69.02)
45 - 54	1.56 (1.39 - 1.76)	4.25 (3.81 - 4.47)	41.13 (20.56 - 61.70)
55 - 64	1.05 (0.89 - 1.24)	2.43 (2.08 - 2.84)	9.25 (4.63 - 13.88)
65 - 100	0.68 (0.54 - 0.84)	1.19 (0.94 - 1.5)	4.44 (2.22 - 6.66)

Appendix 3

The following is a description of the methodology used in simulating a scenario in which cART is not available to PLHIV. In the scenario in which cART is not available, the progression of disease to AIDS occurs regularly in people living with HIV. To simulate the era before cART, data was loaded from the Australian HIV Surveillance Database. Records were selected that were similar in age to the 20 year-old and 40 year-old scenarios (+/- 10 years for both). CD4 count at diagnosis of relevant records was used to form a vector that was resampled with replacement to produce a distribution of CD4s at diagnosis. The CD4 counts were used to determine rates at which AIDS would develop according to Mellors et al. [24]. Prior to AIDS development in each individual, the rate of mortality was based on mortality rates of those infected with HIV but yet to develop AIDS described in Nakhaee et al [10]. Following AIDS development in each individual, the rate of mortality in the model was based on the rate of mortality of those with AIDS in the pre-HAART era described in Nakhaee et al.