Where are the deficiencies in care?

***Aim:***

*What is the contribution of each stage of care on overall DALYs / mortality?*

*The interventions we have designed to intervene along HIV care may have an attentuated impact due to upstream / downstream weaknesses in care. For example, we have a powerful ART Outreach intervention that brings back 100% of people lost from care, yet it doesn’t have a huge impact on DALYs averted in the model, this is due to the small proportion of individuals that ever initiate ART due to upstream leaks in care at baseline. I want to understand how important each “stage” of care is, by making care “perfect” and then systematically walking through each stage and “weakening” it (using the baseline values from AMPATH), while keeping all other aspects of care perfect to visualise the impact on DALYs and mortality.*

**Method:**

1. *Create a “perfect care” scenario, in which everyone, upon getting infected, immediately gets tested, linked, retained in pre-ART care and initiates ART as soon as they become eligible, all adhere to ART and there is zero dropout.*
2. *In the absence of interventions, test the contribution of each “stage” of care on DALYs accrued and mortality. For example, for testing pre-ART retention: set pre-ART retention parameters to “baseline” levels, allow care upstream and downstream to be perfect.*
3. *Test the impact of our interventions on each “stage” of care on DALYs accrued and mortality. For example, again for testing pre-ART retention: with pre-ART retention parameters at “baseline” levels (care upstream and downtream perfect), test the impact of the pre-ART outreach intervention on reducing DALYs accrued and mortality.*

# Results

***“Perfect Care”***

22.8m DALYs accrued between 2010 and 2030.

*This scenario was created by doing the following:*

* Individuals get an HIV-test the very day they become infected (if time >= 2004, when testing starts)
* The mean times to seeking care through VCT / PICT are set to baseline levels, so people seek care normally (but everyone seeks care once, as soon as they become infected).
* All tested individuals are linked to care.
* Once linked, all individuals receive a CD4 test, none are lost from care
* Receive the CD4 test result the very next day (on average).
* If not eligible, the follow-up test is the next day. (PICT / VCT rates are competing here so everyone is seeking care all the time).
* If eligible, start ART the next day.
* 100% adherence to ART
* 0% dropout from ART.

This scenario was created in an attempt to understand “if HIV care is perfect, no leaks, immediate testing and treatment, whats the cost in terms of DALYs accrued and mortality?”

**Contribution of each stage of care to DALYs accrued and mortality**

Starting with our “perfect care” scenario, I split care into 5 discrete stages:

***Normal HIV-Testing*** *–* all care downstream is perfect but HIV-testing rates are set to baseline levels.

***Normal Linkage*** *–* HIV-testing is perfect, linkage is set to baseline levels and all care downstream is perfect

***Normal Pre-ART Retention*** *–* HIV-testing and linkage is perfect, pre-ART retention levels are set to baseline with ART retention and adherence perfect

***Normal ART Retention*** *–* HIV-testing, linkage and pre-ART retention are perfect, ART adherence is perfect too but patients can dropout of ART care.

***Normal ART Adherence*** *–* HIV-testing, linkage, pre-ART and ART retention are perfect but adherence to ART is set to baseline levels.

I first look at impact in terms of DALYs, by subtracting the DALYs that accrue between 2010 and 2030 in the “perfect care” scenario from the DALYs that accrue when I test each of the 5 stages, I arrive at the “additional DALYs that accrue due to imperfect care between 2010 and 2030” for each stage. The results are shown in the black bars on figure 1. The longer the bar, the more detrimental the impact a particular stage has on care.

In contrast to the previous figures produced when I set the time to seeking care through VCT/PICT to 1 day, we see very few additional DALYs brought about by baseline HIV-testing (1st black bar of figure 1). This is due to baseline testing using the same rates of seeking care through VCT/PICT as the “perfect care” scenario with the exception that in “perfect care”, patients attend the clinic immediately upon becoming infected with HIV (if HIV testing is available, i.e. time >= 2004). This is crucial as it explains the negative result seen in the bars for HBCT. What is being shown is that the HBCT intervention with perfect care upstream results in the accumulation of fewer DALYs than the “perfect care” scenario, as the HBCT intervention is powerful enough to draw in 90% of the population in an active year.

The limitation here is that the “perfect care” scenario only schedules a VCT test immediately if the time an individual becomes infected is >2004. Thus, many individuals who are infected prior to 2004, will not immediately enter care and will seek care at baseline rates. So, an HBCT intervention that covers 90% of the population in an active year in addition to the baseline rates of seeking care through VCT/PICT will be more powerful than the baseline rates of seeking care through VCT/PICT alone.

The remaining interventions follow the similar pattern as before with the “baseline” scenario causing the most additional DALYs compared to “perfect care”, followed by the *realistic* intervention and the the *best possible* intervention.

Interestingly, the scenarios looking at ART Retention and ART Adherence produce less additional DALYs at basline than in the previous version of this document. This is due to the levels of seeking care in the “perfect care” scenario being at baseline levels and as such the “perfect care” scenario accumulates significantly more DALYs over the 20 year period than the previous perfect care scenario with care seeking times being 1 day (22.8m to 1.9m, respectively).

Compared to “perfect care” HIV-related mortality is higher in all cases except the HBCT and HBCT POC CD4 interventions which are able to capture more individuals into care and therefore, avert fewer DALYs and reduce mortality.

jjo11:cascade:CareCascadeV2:2015:January:6th:Leaks:plots:additionalDalysDueToImperfectCare.pdfjjo11:cascade:CareCascadeV2:2015:January:6th:Leaks:plots:mortalityDueToImperfectCare.pdf

Figure 2.

Figure 1.