Where are the deficiencies in care? (another viewpoint)

***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, starting from the baseline ‘leaky’ cascade and making each stage in turn ‘perfect’ while keeping all others at baseline values to visualise the impact on DALYs and mortality.*

**Method:**

1. *Calculate the number of DALYs accrued between 2010 and 2030 along with mortality in the baseline leaky cascade scenario.*
2. *In the absence of interventions, test the contribution of each “stage” of care, on DALYs accrued and mortality, while keeping all remaining parameters are baseline values. For example, for testing pre-ART retention: set pre-ART retention to be perfect but keep upstream and downstream care at baseline levels.*
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: test the impact of the pre-ART outreach intervention on reducing DALYs accrued and mortality while keeping all other parameters at baseline levels (this is identical to running an intervention as we have done in the paper).*

# Results

***“Baseline Care”***

Baseline= 36.6m DALYs accrued between 2010 and 2030.

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

Starting with our baseline care scenario, I split care into 5 discrete stages:

***1. HIV-Testing***

***2. Linkage***

***3. Pre-ART Retention***

***4. ART Retention***

***5. ART Adherence***

**Impact on DALYs averted**

Here we look at the flip-side to the previous document. What if care is at normal “baseline” levels throughout and we then make each stage “perfect” in turn while keeping all upstream and downstream settings at baseline levels.

*The definitions for “perfect” in each stage are below:*

***Perfect HIV-Testing*** *–* HIV-testing rates are set to baseline levels but everyone attends an HIV clinic for testing the day they acquire HIV (if time >2004 else attend a clinic on 1st Jan 2004). All other parameters are at baseline levels.

***Perfect Linkage*** *–* Linkage is perfect, but all other parameters are at baseline levels.

***Perfect Pre-ART Retention*** *–* Pre-ART retention levels are perfect, but all other parameters are at baseline levels.

***Perfect ART Retention*** *–* No ART dropout occurs, but all other parameters are at baseline levels.

***Perfect ART Adherence*** *–* Adherence to ART is 100%, but all other parameters are at baseline levels.

Looking at figure 1, if we consider HIV-testing we see that more DALYs are averted by the HBCT (max possible) intervention than “perfect care”. This is because in addition to impacting HIV-testing the HBCT intervention also impacts linkage, and links all patients identified to care immediately.

The HBCT POC CD4 intervention also exceeds the “perfect linkage” (2nd black bar) as HBCT impacts HIV-testing by bringing more people into care, then POC CD4 ensures that they are linked immediately, so the impact is greater than perfect linkage alone, where fewer individuals are entering care in total.

If pre-ART retention were perfect (with all upstream / downstream care at baseline levels) we see >4.5m DALYs would be averted over the 20 year period. This is due to the fact that interventions only come into play from 2010 onwards. The “perfect” scenarios for ART Retention and ART Adherence are not particularly impactful as due to upstream weaknesses in care, very few individuals ever initiate ART (<25% initiate ART prior to an HIV-related death between 2010 and 2030).

**Impact on mortality**

Figure 2 illustrates the distribution of care among HIV-related deaths between 2010 and 2030.

The first bar is for the “perfect care” scenario with perfect HIV-testing, linkage, pre-ART retention, ART retention and adherence.

The second bar illustates the “baseline” scenario distribution of HIV-related deaths.

Subsequent bars follow the pattern of figure 1 with the “perfect” scenario for each stage of care followed by relevant interventions. No interventions, or stages of care is able to approach the low levels of HIV-related deaths seen in the “perfect care” across the board scenario.

Interestingly, the VCT POC CD4 intervention produces fewer HIV-related deaths than perfect linkage. This is due to the VCT POC CD4 intervention providing immediate CD4 test results enabling sick individuals to initiate ART quickly while, perfect linkage still involves lab-based CD4 testing so the time to initiation is longer. This explains why the proportion of HIV-related deaths among individuals “tested but never initiated ART” is less in the VCT POC CD4 intervention than the “perfect linkage” scenario.

The HBCT and HBCT POC CD4 interventions produce fewer HIV-related deaths than their respective “perfect” scenarios as these interventions impact more than one aspect of care at any one time (as explained above).

jjo11:cascade:CareCascadeV2:2015:January:7th:LeaksReverse:plots:mortalityDistribution.pdfjjo11:cascade:CareCascadeV2:2015:January:7th:LeaksReverse:plots:dalysAvertedComparedToPerfectCare.pdf

Figure 2.

Figure 1.