KNOW YOUR TARGETS: HOW OPTIMAL RESOURCE ALLOCATIONS VARY WITH DIFFERENT OBJECTIVES

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Introduction

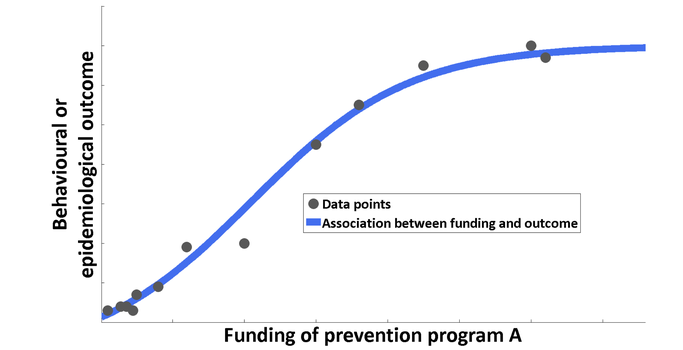
Allocating resources to achieve desirable outcomes can be a complex problem. Here we investigate:

- How resources can be distributed most efficiently to achieve epidemiological and economic outcomes.
- How altering the choice of desirable outcome can yield conflicting messages for resource allocation.

This allocative efficiency study was carried out in the context of the Indonesian HIV epidemic.

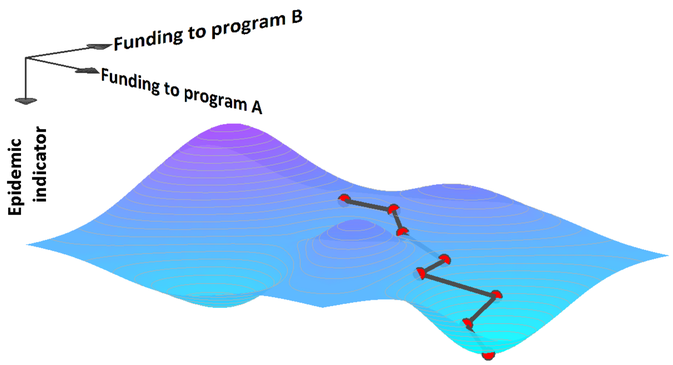
Methods

To investigate the impact of program funding, associations between spending and outcomes were identified for all modelled prevention and treatment programs. Via these associations, the expected result of varying investments across combinations of programs can be estimated.



An optimisation procedure was conducted across the modelled programs to determine the optimal allocation that:

- Minimises a predefined epidemic indicator, given a fixed pool of funding. The following indicators were used for this study:
  - **Cumulative AIDS-related deaths** (2013-2020)
  - **Cumulative incidence** (2013-2020)
  - **Cumulative DALYs** (2013-2020)
  - **Future HIV costs*** (2013-2020)
- Minimises the total pool of funding required to achieve a set of epidemiological targets.

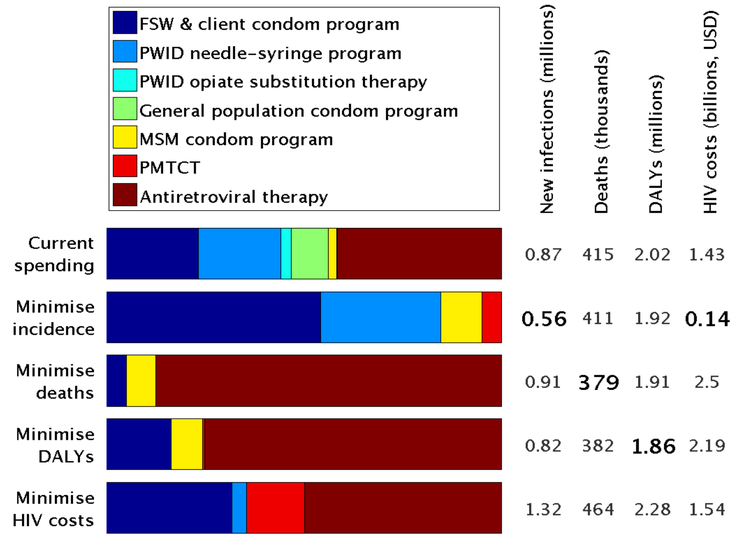


** Subject to ART, PMTCT and testing constraints*

Results

Relative to a baseline of current resource allocation when compared over a 10 year period, it was estimated that by efficiently allocating resources we could:

- **Save 36,000 lives** by optimising for AIDS-related deaths.
- **Avert 310,000 new infections** by optimising for incidence.
- **Avert 160,000 DALYs** by optimising for DALYs.



However, **many caveats** exist with the proposed optimal allocations:

- The optimal allocation for AIDS-related deaths is estimated to cause an **additional 40,000 new infections** and generate **over 1 billion USD in future HIV costs**.
- The optimal allocation for incidence requires a **complete defunding of treatment programs** *(see figure below)*.
- Under conservative constraints, the optimal allocation for minimising future HIV costs is **inferior to the baseline** across **all epidemic indicators**.

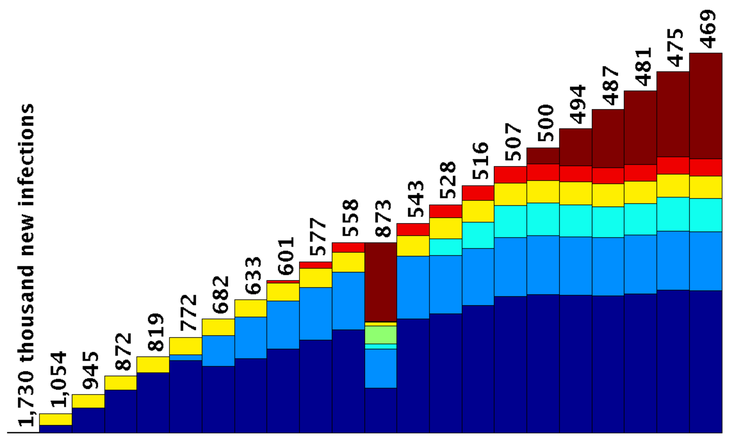
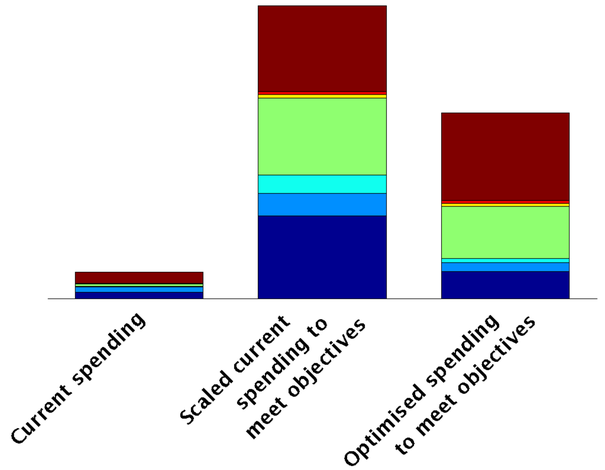


Figure: *Allocations to minimise incidence with varying budgets. Treatment programs are only incorporated when high levels of funding are available.*

By instead compiling a set of epidemiological targets that incorporated:

- 50% reductions in sexual and injecting incidence.
- 50% reductions in AIDS-related deaths.
- Targets relating the vertical transmission.

it was found that the **minimal amount of funding** required (assuming allocative efficiency) to achieve the targets was a **7-fold increase** on the current national budget.



The funding pool required to achieve the same targets should the current distribution of resources be kept constant is even greater, at **11 times** the national budget.

Conclusions

- Outcomes can be substantially improved by reallocating resources across programs more effectively.
- However, mathematically-optimal allocations may not sufficiently cover ethical and moral considerations, thus care should be taken when interpreting results.
- These analyses support the notion that the most efficient distribution of resources is highly dependent on the choice of desired objectives.
- These contrasting messages of how to spend money most effectively make it imperative for policy makers to know the objectives that they wish to achieve.
- The optimal distribution of resources also varies according to:
  - The characteristics of a country's epidemic.
  - The amount of funding available.
  - The timeframes associated with the desired outcomes.
- By setting constraints on the reduction of funding to certain programs, the improvement of outcomes through allocative efficiency can diminish and potentially disappear altogether.

Acknowledgements

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