Integrated multi-month dispensing for HIV and hypertension in South Africa: a model of epidemiological impact and cost-effectiveness

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BACKGROUND

In the current era of universal antiretroviral treatment (ART), health systems face the dual challenge of a growing number of people living with HIV and on ART who are also receiving chronic, life-long treatment for non-communicable diseases. **We examined the theoretical cost-effectiveness of integrated multi-month drug dispensing (MMD) for people living with HIV and hypertension (HTN).** We hypothesized that this intervention would improve health system service quality by allowing more time to provide care to high-risk patients, thus reducing loss to follow-up (LTFU) and mortality rates of all unstable and stable patients in care compared to conventional care.

METHODS

- Age and sex-specific Markov state-transition model
- Constructed a 100,000-person simulated population cohort who may develop HIV and HTN and initiate treatment at clinics in South Africa over a 10-year time horizon.
- Assessed the incremental costs and effectiveness of integrated MMD versus conventional care from a health system perspective under different conditions of care seeking, eligibility, and uptake of MMD for clinically stable patients.
- MMD = integrated 6-month dispensing of HIV and HTN medications; conventional care = 3-month dispensing without integration.
- Model inputs were sourced from the literature
  - ART cost = $13/patient/month, hypertension medications $42/month, outpatient visits $11/visit, and startup costs $820,000/10 clinics.
  - Population HIV prevalence 14%; HIV/HTN prevalence 3% (=20% of those with HIV).

Integrated 6-month dispensing for people living with HIV with and without hypertension can be highly cost-effective at ≤$50 per DALY averted.

RESULTS

- Integrated MMD for HIV and HTN in South Africa averts 0.7-0.9 DALYs per HIV patient (with and without HTN) per year and increases health systems costs $18-$38 per HIV patient per year (Table 1)
- HIV prevalence, care-seeking level, and mortality rate were key drivers in DALYs averted; HTN management, HIV prevalence, and outpatient care per visit were key drivers in health systems costs.
- Health benefits were 2.5 times greater for integrated MMD compared to MMD alone.

Table 1. Health outcome and health systems cost per 100,000 general population over 10 years (2022-2031) (USD)

Base case Care seeking: 60% for HIV; 50% for HIVHTN % well-controlled patients: 70% for HIV 50% for HIVHTN	Number of patients		Health outcome		Total cost ($,000)	Incremental health outcome			Incremental costs ($,000)	Cost per controlled patient	Cost per death averted	Cost per DALY averted
	Total patients in care	Total patients controlled	Total deaths	Total DALYs		Increased stable patients	Deaths averted	DALY averted				
Status quo without MMD	225,899	189,289	78,563	370,062	61,998	Ref	Ref	Ref	Ref	Ref	Ref	Ref
MMD for HIV only	237,476	201,270	70,362	328,903	61,731	11,981	8,200	41,158 (11%)	-$267 (-0.4%)	-$22	-$33	-$6
MMD for HIV+HIVHTN	237,476	201,270	70,362	328,903	60,629	11,981	8,200	41,158 (11%)	-$1,370 (-0.4%)	-$114	-$167	-$33
Integrated MMD for HIV+HIVHTN	256,343	221,016	57,116	261,425	65,449	31,727	21,446	108,637 (29%)	$3,451 (5.6%)	$109	$161	$32

Fig 3. ICERs (Cost per DALY averted) for three-way sensitivity analyses

Care seeking: low, Being stable after 6 months: low

1.5	-23	-174	410	166	125
1.25	-2	-88	654	168	122
1	15	-37	Inf	170	118
0.75	29	-2	-326	174	114
LTFU x0.5	41	22	-82	182	109
Mortality x0.5	0.75	1	1.25	1.5	

Care seeking: low, Being stable after 6 months: high

1.5	-58	-287	463	191	139
1.25	-29	-151	759	197	137
1	-7	-78	Inf	206	135
0.75	11	-32	-427	221	132
LTFU x0.5	26	0	-131	251	127
Mortality x0.5	0.75	1	1.25	1.5	

Care seeking: high, Being stable after 6 months: low

1.5	-27	-209	396	173	131
1.25	-4	-101	629	177	129
1	15	-41	Inf	182	127
0.75	30	-3	-309	193	123
LTFU x0.5	43	23	-76	215	119
Mortality x0.5	0.75	1	1.25	1.5	

Care seeking: high, Being stable after 6 months: low

1.5	-66	-342	448	197	145
1.25	-33	-168	730	205	144
1	-8	-83	Inf	217	142
0.75	12	-32	-401	240	140
LTFU x0.5	27	2	-119	291	137
Mortality x0.5	0.75	1	1.25	1.5	

Less cost and less DALY averted
Cost saving
Cost effective

- Regardless of care-seeking level (low or high), integrated MMD with a greater proportion of well-controlled patients in care led to greater cost savings or better (lower) ICER values.
- When mortality with integrated MMD is greater than status quo values, most conditions result in lower costs and fewer DALYs averted.
- When mortality rates with integrated MMD are the same as or below status quo values, most conditions result in cost-saving or highly cost-effective ICERs (≤$50 per DALY averted).
- The overall results indicate that despite a wide range of LTFU factor variation (-/+50%), integrated MMD can achieve cost savings or is highly cost-effective as long as it maintains or reduces mortality similar to the status quo.

CONCLUSIONS Despite the high initial start-up and implementation costs, integrated MMD can be highly cost-effective at ≤$50 per DALY averted under various care-seeking scenarios and proportions of patients in care. Scale-up of MMD strategies may be more effective when multiple conditions are addressed simultaneously.

Fig 1. Markov state model and transition parameters

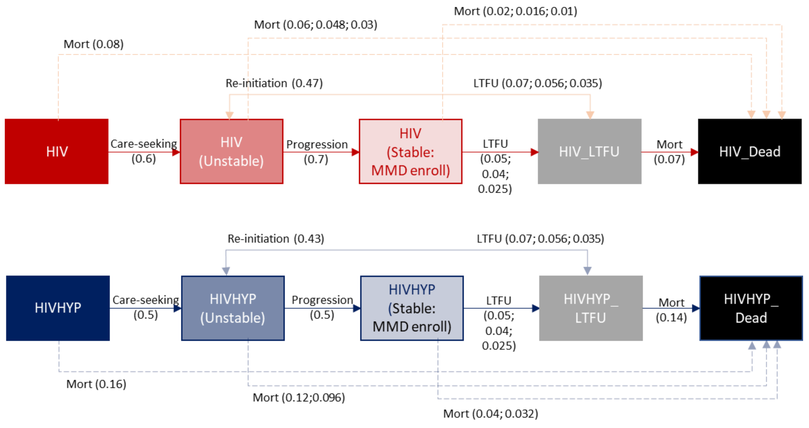
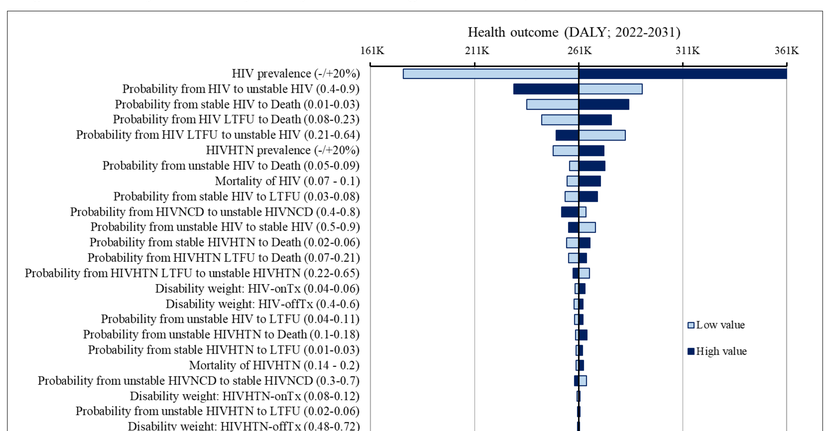
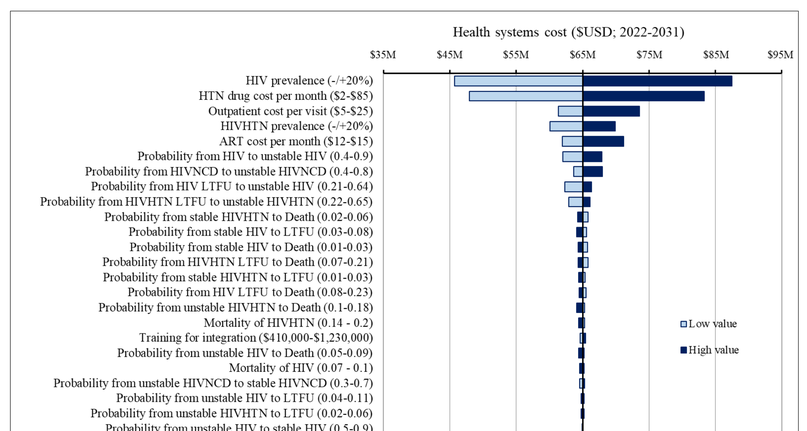


Fig 2. One way sensitivity analyses of integrated MMD, compared with the status quo





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