EDITOR'S CHOICE

Costs and efficiency of integrating HIV/AIDS services with other health services: a systematic review of evidence and experience

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ABSTRACT

Objectives To review the literature on the potential efficiency gains of integrating HIV services with other health services.

Design Systematic literature review. Search of electronic databases, manual searching and snowball sampling. Studies that presented results on cost, efficiency or cost-effectiveness of integrated HIV services were included, focusing on low- and middle-income countries. Evidence was analysed and synthesised through a narrative approach and the quality of studies assessed.

Results Of 666 citations retrieved, 46 were included (35 peer reviewed and 11 from grey literature). A range of integrated HIV services were found to be cost-effective compared with 'do-nothing' alternatives, including HIV services integrated into sexual and reproductive health services, integrated tuberculosis/HIV services and HIV services integrated into primary healthcare. The cost of integrated HIV counselling and testing is likely to be lower than that of stand-alone counselling and testing provision; however, evidence is limited on the comparative costs of other services, particularly HIV care and treatment. There is also little known about the most efficient model of integration, the efficiency gain from integration beyond the service level and any economic benefit to HIV service users.

Conclusions In the context of increasing political commitment and previous reviews suggesting a strong public health argument for the integration of HIV services, the authors found the evidence on efficiency broadly supports further efforts to integrate HIV services. However, key evidence gaps remain, and there is an urgent need for further research in this area.

INTRODUCTION

Integration is a growing priority in the context of the AIDS response. HIV/AIDS is intrinsically linked to many other health problems. Integration has the potential to improve the quality and continuity of care for those living with HIV or bring HIV services to those who would otherwise not have access to them.[1 2] For some interventions, such as prevention of mother-to-child transmission of HIV (PMTCT) or prevention and treatment of tuberculosis (TB) co-infection, integration is clinically essential. The integration of HIV services is supported by a wide range of evidence on its clinical and public health benefit.[3–7] These highlight its benefits to patients with co-morbidities, benefits in terms of continuity of care and increased access to HIV services. It has therefore been called for in a number of global policies and high-level position papers, most recently in the 2011 UN Declaration on HIV/AIDS.[8] It is also commonly assumed that integration can improve programme efficiency.[2 9 10] This is of particular interest in the current economic climate, as many countries are seeking to rationalise their health-related expenditure. However, to date, the evidence base to support this assertion remains unclear, despite the numerous reviews that focus on HIV integration more generally.[9–18] This paper therefore summarises the current evidence on the impact of integration of HIV services on the efficiency of health services, focusing on low- and middle-income countries.

Integration has been approached differently in a wide variety of settings, making the concept of integration difficult to tie down. Although there has been some consensus recently in the field of sexual and reproductive health (SRH) on terminology,[19] there remain several differing discourses on integration.[12 20–23] The most common understanding relates to horizontal integration or integration at the point of service delivery; this can range from structured referrals to physical incorporation providing a one-stop approach.[21] Integration can also be seen as part of a wider system of co-ordination at the policy and planning, human resources and financing levels, sometimes referred as linkages.[19] For the purposes of this review, we use the UNAIDS definition of programme integration: 'joining together different kinds of services or operational programmes in order to maximize outcomes, e.g. by organizing referrals from one service to another or offering one-stop comprehensive and integrated services'.[W1] This includes services from a singular provider and from separate providers (within one site) where there is a clearly functional referral system.

Economic theory suggests several potential efficiency advantages at various levels of a health system arising from the integration of HIV and other health services.[15 24] Integration has the potential to improve both technical efficiency (providing services or producing outputs at the lowest cost) and allocative efficiency (achieving health outcomes at a low cost). Technical efficiency focuses on using the right mix of resources to produce health services and can be assessed by measuring the unit cost of HIV services. Allocative efficiency is also concerned with whether the right

mix of health services are provided and is commonly assessed using measures of cost-effectiveness.

Integration has the potential to improve technical efficiency through economies of scope and scale. Economies of scope, or reductions in HIV service costs from combining services, may be found through shared use of a common infrastructure, overheads and certain 'indivisible' operational resources. Economies of scale, or reductions in HIV service costs associated with increased scale of service provision, may be found where integration enables expansion of service coverage to clients who have not previously accessed them.

Beyond this, as stated above, HIV service integration may be clinically essential for the provision of cost-effective services for those with HIV (eg, the integration of HIV counselling and testing (CT) into antenatal care (ANC) services is clinically required for the provision of PMTCT). Integration can thus also contribute to an overall improvement of the allocative efficiency of HIV services. Moreover, integration may enable further efficiency gains beyond the service level. Box 1 further describes the potential effect of integration at each level of a health system, loosely based on the framework to describe integration developed by Atun *et al*.[25]

Economic evidence on integration from other sectors suggests that integration is likely to produce efficiency gains when '(1) goods/services are complementary, (2) there is a low marginal cost of added service, (3) consumers value all services and (4) there is a low correlation in demand for different services'.[15] The integration of HIV and other health services potentially meets most of these requirements. First, HIV and TB/SRH/maternal and child health services are complementary services as they address co-infections, are provided at similar health services levels and may affect the same persons.[26] Second, there is a potentially low marginal cost of integrated services where clinic space exists and staff already have much of the essential knowledge and skills.[15] Third, HIV services may be valued by clients seeking general services, and people living with HIV may have a wide range of other unmet health needs.[27–30] Fourth, there may be a low correlation in existing demand where groups of clients seeking other health services may not seek HIV-related services independently.[15]

Box 1 Potential efficiency gains from integration

1. Integration at the *governance level* (such as co-ordination of strategic and operation planning and performance level) may improve technical efficiency by sharing scarce resources, such as skilled planners and managers. Joint or co-ordinated planning and management, monitoring and evaluation, and reporting may also improve allocative efficiency, as (or if) planners allocate their scarce resources across interventions taking into account the relative cost-effectiveness of services.
2. At the *financing level*, integration may improve technical efficiency by merging the costs of separate financing systems. Co-ordinated financing systems may also reduce perverse incentives that may be created by competing programmes and thus impact allocative efficiency.
3. At the *health management systems* level, integration can facilitate improvements in technical efficiency through reductions in management systems costs. This can include joint procurement, sharing of middle managers, joint training and supervision, sharing of information, education and communication materials, and joint management information systems.
4. At the *facility level*, integration can contribute to reductions in facility costs resulting from joint utilisation of fixed factors of production.
5. For *patients*, integration may lead to less fragmented services, higher levels of continuity of care, better referral systems and possibly reductions in patient/community-level costs resulting from fewer visits to facilities, greater proximity of services and reduced delays in accessing treatment.

METHODOLOGY

We conducted a systematic review of published and grey literature to identify studies presenting the costs and cost-effectiveness of integrated HIV services. Searches were conducted on EconLit, Global Health, Eldis and PubMed databases. Database searches were restricted to studies written in English, potentially introducing some bias to our findings. We put no date restriction on our search but found no studies published before 1990 fit our inclusion criteria. We used two different search strings to identify studies in PubMed, as listed in box W1 in the online appendix. In order to minimise the effect of publication bias,[W2] we also conducted manual searches of websites of key organisations involved in HIV-related research or cost-effectiveness studies.[i] We found additional references through a 'snowball sampling' process.

Inclusion criteria were designed to retain all studies, which examined the costs or efficiency consequences of integration. We focused on studies set in low- or middle-income countries as defined by the World Bank.[W3] We found only one article examining integration for services targeted at populations at a higher risk of exposure to HIV; so we expanded our search to include high-income countries for this topic as we felt that it is important to include evidence on integration relevant for concentrated epidemic settings. Study inclusion/exclusion was not blinded. Cases where there was uncertainty or disagreement about the inclusion of a study were discussed between the authors and a consensus reached.

Data extraction was divided between two authors, with uniform tables filled for all included studies. We evaluated the quality of included studies using 'Drummond's checklist' to evaluate the quality of economic articles.[W4] Criteria for quality analysis also included alternatives compared, whether all relevant costs were included, source of cost and effectiveness estimates and the inclusion and type of sensitivity analysis conducted. We expanded Drummond's criteria on cost measurement to include study scale. Studies determined to be of poor quality were not excluded from the review, as we wanted to present the full range of studies, including a comment on overall quality of work in this area. However, study quality was taken into account when reporting the strength of the evidence to date and interpreting our findings. Due to the complexity of integration and differences in measures, we did not attempt to quantitatively synthesise the evidence. Instead we took a narrative approach in data synthesis, as has been recommended for reviews of health systems/organisational interventions where findings are too heterogeneous for meta-analysis.[W5] This paper is adapted from a full review report that can be found on (http://www.integrainitiative.org/). In addition, a full list of references and several additional tables and

[i]Organisations include Abt Associates, Population Services International, Family Health International, Health and Life Sciences Partnership, Management Sciences for Health, PATH, Center for Strategic and International Studies, Population Services International, Research for Development, John Snow International, International Planned Parenthood Foundation, Population Council and Options.

figures can be found on (http://sti.bmj.com/content/88/2.toc); these are prefixed with a 'W' in this paper.

RESULTS

Study overview

Database searches returned a total of 588 results. Manual searches and snowballing retrieved an additional 78 articles, totalling 666 citations in full. Fifty-one duplicates and 451 clearly irrelevant titles were excluded in the first round of title/abstract review. Reasons for exclusion included high-income setting, had nothing to do with HIV/AIDS, commentary or review paper and intervention was clearly not integrated. One hundred and sixty-four abstracts were evaluated, and full text was read and reviewed for 55 citations in total. A total of 46 studies were retained after review of the full text. A flow chart of this review selection process is contained in the online appendix (figure W1).

Of 46 studies retained, 35 were peer-reviewed and 11 were grey literature. Studies included cost analyses, cost-effectiveness analyses and least-cost analyses. Most studies included all relevant costs in their analysis, though costing methods varied. Studies either evaluated an integrated intervention against a 'do-nothing' comparator in which no treatment or intervention was offered or compared alternative integrated intervention strategies (such as comparative evaluations of isoniazid preventive therapy (IPT) with and without TB screening). Nine studies conducted a direct comparison of integrated and stand-alone services providing the same set of interventions. Studies used a wide variety of service output and outcome measures for cost and cost-effectiveness. For example, cost-effectiveness was measured used the cost per TB case averted, HIV infection averted and disability-adjusted life year averted. Disability-adjusted life years are calculated as the sum of years of life lost and years of life lived in a state of less than full health. Study quality is summarised in table W1.

We divided studies into five major topic headings. First is HIV CT integrated into other health services. This includes both voluntary and provider-initiated CT for HIV, integrated into primary healthcare (PHC), SRH, home-based care, MCH and TB services. Second is TB services integrated into HIV care and treatment, including IPT, intensified case finding and TB treatment. These services often used CT as an access point for TB services, although several studies also included referral from any TB unit to the CT unit, indicating two-way collaboration. Third is HIV care and treatment integrated into general health services and community-based care (including palliative care, cotrimoxazole preventive therapy, PMTCT and antiretroviral therapy (ART)). The fourth examined the integration of family planning (FP) into services for HIV-positive individuals, including PMTCT and HIV care and treatment. Finally, the last topic examined HIV care and treatment and preventive outreach services integrated into other health services for populations at higher risk of HIV exposure, who may have different needs/interactions with the healthcare system from the general public.

HIV CT integrated into other health services

We identified 17 studies which evaluated the costs and/or cost-effectiveness of the integration of CT into other health services (table 1), 10 of which were peer-reviewed and seven of which were grey literature. Five of the studies[W6–10] compared the cost of integrated services with those of stand-alone services, enabling an assessment of technical efficiency gains. The remaining 12 studies[W11–22] provide cost estimates for different models of integrated CT or contribute to the evidence base on the cost-effectiveness of an integrated service package.

Of the five studies which present a non-integrated comparator, three were conducted in Kenya, one in Uganda and one in India. The three Kenyan studies examined introducing CT into FP/PHC settings. The Ugandan study[W10] compared different CT strategies including stand-alone, hospital-based and facility-based home outreach. Finally, the Indian study[W8] examined the economic consequences of merging existing SRH and HIV services. All five studies found that unit costs were consistently lower for integrated services than stand-alone services, with savings between 31% and 79% of stand-alone costs. However, they were all conducted at a relatively small scale. Generally, the studies that examined CT as part of integrated service packages (ANC/PMTCT and TB/HIV) found these services to be cost-effective compared with a 'do-nothing' alternative. In addition, one study[W22] reported significant potential future cost savings in ART and PMTCT services from integrating CT in ANC compared with a do-nothing alternative.

TB services integrated into HIV care

We found two models[W23 W24] and seven empirically based studies (some involving limited modelling)[W17 W19 W25–29] examining the costs and/or cost-effectiveness of integrating TB and HIV services (table 2). All nine studies were peer-reviewed. Studies largely evaluated elements of the '3 I's' strategy, an integrated approach to reduce the burden of TB on HIV-positive clients through intensified TB case finding, IPT and infection control for TB, as recommended by WHO (2008).[W30] Intervention elements included IPT (in some cases targeted with a tuberculin skin test), intensified case finding and cotrimoxazole preventive therapy, integrated with CT or HIV care and treatment services. CT was commonly used as an access point for TB services, although in some cases (eg, ProTEST), the collaboration was bi-directional (including referral from TB to HIV and vice versa). None of the studies compared a stand-alone versus integrated option, as integration is clinically required to deliver the full range of TB/HIV services to co-infected patients. Five of the seven empirical studies focused on establishing the incremental cost-effectiveness of integrated TB/HIV services compared with 'do nothing'. All studies were set in the context of generalised epidemics in sub-Saharan Africa, with the exception of one from Cambodia.[W29]

The majority of studies found that integrated TB/HIV care was highly cost-effective. Five studies included the estimated TB treatment cost savings from preventive therapy; three of these found the intervention to be cost saving. None of the studies presented a before and after evaluation of changes in average costs of services as a consequence of integration or examined different models of integration, so no conclusions on technical efficiency can be drawn.

HIV care and treatment integrated into general health services

We found 18 studies[W16 W17 W21 W31–45] evaluating the costs and/or cost-effectiveness of HIV care and treatment integrated into general health services, community-based care or PHC (table 3). Sixteen studies were peer-reviewed and two were grey literature. Only one study (Rosen *et al*)[W39] considered a non-integrated alternative. Of the remaining studies, 11 specified the model of integrated service delivery in use and six specified provision in conjunction with PHC but gave few details of service delivery organisation.

All of the 11 studies that specify integrated service delivery examine HIV care and treatment in a one-stop-shop setting, except Kitajima *et al*[W38] (which evaluated referral to different providers within the same facility). Generally, the studies were

Table 1 CT studies

Citation	Author	Date	Country	HIV prevalence (%)	Target population	Integration detail	Study scale	Costing methods	Intervention unit costs	Comparator units costs	Unit
Studies with a non-integrated comparator											
W6	Twarir	1996	Kenya	10.50	MCH/FP clients	Referral Different structures	Pilot 2 clinics	Financial Incremental costs Health services perspective	$12.77	$18.42	Client accessing all services
W7	Forsythe	2002	Kenya	7.90	General population	One stop Same structure	Pilot 3 PHC clinics	Economic Incremental costs Health services perspective	$11—$21	$18—$35*	Person tested
W8	Das	2007	India	0.40	SRH clients	One stop Same structure	Pilot 1 clinic	Financial Full costs Health services perspective	$3.51	$5.24	Client accessing RH and CT services
W9	Liambila	2008	Kenya	6.70	FP clients Hospitals and health centres	(1) Referral Same or Different structures (2) One stop Same structure	(1) Pilot 14 sites (2) Pilot 9 sites	Financial Incremental costs Health services perspective	(1) NA (2) (a) $7.21 (b) $11.86 (c) $12.27	34.77*	(1) NA (2) (a) Person tested (hospital) (b) Person tested (health centre) (c) Person tested (dispensary)
W10	Menzies	2009	Uganda	6.50	(1) Hospital clients (2) Families of HIV-positive clients/ facility-based home outreach (3) General population/ facility-based home outreach	(1) One stop Same structure (2) One stop Same structure (3) One stop Same structure	(1) Pilot 1 hospital (2) Pilot 1 outreach site (3) Pilot 1 outreach site	Economic Full costs (assumed) Health services perspective	(1) (a) $12.43 (b) $15.68 (c) $45.87 (2) (a) $14.74 (b) $15.47 (c) $246.53 (3) (a) $8.82 (b) $9.80 (c) $174.46	(a) $20.50 (b) $31.61 (c) $107.05	(a) HCT client (b) New CT client (c) HIV-positive individual identified
CT integrated into PHC/SRH											
W11	Thielman	2006	Tanzania	6	General population Community level	(1) One stop (free) Same structure (2) One stop (fee based) Same structure	Pilot 1 scheme	Incremental Economic costs Health services perspective	(1) (a) $8.80 (b) $5.40 (2) (a) $14.22 (b) $8.72		(a) Person tested (b) DALY averted
W12	Chee	2006	Zambia	13.8	Antenatal clients Community and clinic level	One stop Same structure	Pilot	Full Financial costs Health service perspective	(a) $3.24 (b) $427		(a) Beneficiary (b) New CT acceptor
W13	Homan	2006	South Africa	18.10	General population FP clinics	One stop and referral Same structure	Pilot 18 clinics	Incremental Financial costs Health services perspective	(a) $5679—$7950 (b) $1817		(a) Staff training (per clinic) (b) Annual supplies (per clinic)
W14	Reynolds	2006	Kenya	6.60	CT clients Clinic/Hospital	One stop Same structure	Pilot 14 sites	Incremental Economic costs Health service perspective	$399		Person trained annually

Continued

Table 1 Continued

Citation	Author	Date	Country	HIV prevalence (%)	Target population	Integration detail	Study scale	Costing methods	Intervention unit costs	Comparator units costs	Unit
W15	Mullick	2008	South Africa	29.10	Family planning clients Clinic/hospital	(1) One stop Same structure (2) Referral Different structures	Pilot 18 sites	Incremental Economic costs Health service perspective	(1) $7724 (2) $5452		Additional investment required
W16	Bratt	2011	Zambia	13.50	(1) Hospital (2) Hospital (3) Clinic (4) Hospital (5) Health centre (6) Health centre (7) District hospital (8) Clinic (9) Health centre (10) District hospital (11) Mission hospital (12) Central clinic	One stop Same structure	At scale 12 facilities costed 219 facilities existing	Full Economic costs Health service perspective	(1) $9.23 (2) $9.89 (3) $24.54 (4) $14.18 (5) NA (6) $19.24 (7) $21.83 (8) $26.04 (9) $30.25 (10) NA (11) $20.29 (12) $14.69		Visit
CT integrated into TB											
W17	Hausler	2006	South Africa	17	(1) CT, ANC, TB and STI clients Community health centre (2) CT, ANC, TB and STI clients PHC clinics	One stop and referral Same structure	Pilot 3 sites costed 12 facilities existing	Full Economic costs Health service perspective	(1) (a) $29 (b) $113 (c) $216 (2) (a) $38 (b) $136 (c) $260		(a) Person accessing ProTest (b) HIV infection averted by CT (c) TB case prevented by CT
W18	Uhler	2010	India	0.3	Patients with active TB National model	(1) Selective referral Different structures (2) Targeted referral Different structures (3) Universal routine referral Different structures	Model	Full Costing not clear Cost perspective not clear	(1) $103 (2) $114 (3) $124		Person lifetime
W19	Vassall	2010	Ethiopia	4.40	TB/HIV patients Hospitals	One stop and referral Same structure	Pilot 3 hospitals costed 9 facilities existing	Full Economic costs Patent perspective	(1) $147 (2) $326 (3) $193		(a) Patient (TB only) (b) Patient (HIV only) (c) Patient (TB/HIV)

Continued

Table 1 Continued

Citation	Author	Date	Country	HIV prevalence (%)	Target population	Integration detail	Study scale	Costing methods	Intervention unit costs	Comparator units costs	Unit
CT as an entry point for PMTCT											
W20	Kumar	2006	India	0.40	(1) ANC clients (universal) (2) ANC clients (targeted)	One stop Same structure	Model	Incremental Economic costs Health service and societal costs	(1) (a) $663.93 (b) $49.82 (2) (a) $543.02 (b) $23.35		(a) HIV infection prevented (b) Year reduction on PYLLs
W21	Sweat	2004	(1) Botswana (2) Cote d'Ivoire (3) Kenya (4) Rwanda (5) Tanzania (6) Uganda (7) Zambia (8) Zimbabwe	(1) 25.8 (2) 5.3 (3) 7.1 (4) 3.2 (5) 6.4 (6) 6.4 (7) 14 (8) 19.8	ANC clients	One stop Same structure	Pilot	Incremental Costing not clear Health services perspective	(1) (a) $2329 (b) $75 (2) (a) $11 924 (b) 399$ (3) (a) $5528 (b) $180 (4) (a) $2406 (b) $85 (5) (a) $2942 (b) $99 (6) (a) $6255 (b) $216 (7) (a) $3305 (b) $111 (8) (a) $4602 (b) $148		(a) Perinatal HIV infection averted (b) DALY averted
W22	Perchal	2006	(1) Ethiopia (2) Ukraine	(1) 14—16 (2) 1.1	ANC clients	One stop Same structure	Pilot	Incremental Economic costs Health services perspective	(1) (a) $25.74 (b) $6.92 (2) (a) $8.72 (b) $6.25		(a) User in the first year (b) User in subsequent years

*Previously published cost estimate.
Costs adjusted to 2010 USD.
ANC, antenatal care; CT, counselling and testing; DALY, disability-adjusted life year; FP, family planning; MCH, maternal and child health; PHC, primary healthcare; PMTCT, prevention of mother-to-child transmission; SRH, sexual and reproductive health; STI, sexually transmitted infection; TB, tuberculosis; RH, reproductive health; PYLL, potential years of life lost.

Table 2 TB studies

Citation	Author	Date	Country	HIV prevalence (%)	Target population	Integration detail	Scale	Costing methods	Unit costs and cost-effectiveness	Unit
Models										
W23	Masobe	1995	South Africa	6.10	HIV-positive individuals	Integration not clear	Model Scale not clear	Costing not clear Full costs (assumed) Health services perspective	(1) $42 980 118 (2) $24 006 909	(1) Do nothing cost over 8 years (2) Intervention cost over 8 years
W24	Bell	1999	Uganda	7.30	HIV-positive individuals w/ pos TST	Integration not clear (1) IPT (INH for 6 months) (2) IPT (INH+RIF for 3 months) (3) RIF+PZA for 2 months	Model Scale not clear	Costing not clear Incremental costs Health services perspective	(1) $156 (2) $376 (3) $356	QALY saved over do-nothing
			Uganda	7.30	HIV-positive individuals w/ pos TST	Integration not clear (1) IPT (INH for 6 months) (2) IPT (INH+RIF for 3 months) (3) RIF+PZA for 2 months	Model Scale not clear	Costing not clear Incremental costs (assumed) Societal perspective	(1) $17.40 (2) $6.95 (3) $5.98	Savings per person in therapy
Empirical studies										
W25	Foster	1997	Zambia	14.50	Individuals presenting for CT	(1) Referral from CT centre (2) Referral from CT centre (3) Referral from STD clinic (4) Occupational therapy (5) Occupational therapy (6) Referral from CT centre	Model Scale not clear	Costing not clear Incremental costs Health services and patient wages	(1) −$25 to $34 (2) −$53 to −$39 (3) −$19 to $54 (4) −$30 to $23 (5) −$55 to −$44 (6) $2−$100	TB case prevented
W26	Shrestha	2006	Uganda	6.30	Newly diagnosed HIV-positive patients (1) IPT with TST, 6-month regimen (2) IPT with TST, 9-month regimen (3) IPT without TST, 6-month regimen (4) IPT without TST, 9-month regimen	One stop Same structure	Pilot 1 clinic	Financial Incremental costs Health services perspective	(1) $23.62 (2) $61.19 (3) $19.68 (4) $46.16	HIV-positive patient
W17	Hausler	2006	South Africa	17	CT, ANC, TB and STI clients (1) Community health centre (2) PHC clinic	One stop Same structure	Pilot 3 facilities costed 12 facilities existing	Economic Full costs Health services perspective	(1) (a) $29 (b) $805 (c) $1166 (2) (a) $38 (b) $391 (c) $586	(a) Person accessing Pro TEST (b) TB case prevented by ICF (c) TB case prevented by IPT
W27	Shrestha	2007	Uganda	6.30	Newly diagnosed HIV-positive patients (1) IPT with TST (2) IPT without TST	One stop Same structure	Pilot 2 clinics	Financial Incremental costs Health services perspective	(1) (a) $121.18 (b) $102 (2) (a) $159.34 (b) $105	(a) Client (b) QALY gained over control

Continued

Table 2 Continued

Citation	Author	Date	Country	HIV prevalence (%)	Target population	Integration detail	Scale	Costing methods	Unit costs and cost-effectiveness	Unit
W28	Terris-Prestholt	2008	Zambia	13.60	Newly diagnosed HIV-positive patients	One stop Same structure	Pilot 1 clinic, 1 hospital	Economic Full costs Health services perspective (assumed)	(1) (a) $14 (b) $31 (c) $56 (2) (a) $35 (b) $40 (c) $56	(a) Person pre-test counselled for CT (b) Person completing IPT (c) Annually per client
W29	Sutton	2009	Cambodia	0.50	HIV-positive individuals	One stop Same structure	Pilot 4 hospitals	Economic Full costs Health services perspective	(a) $99.72 (b) $27.64 (c) $398.84 (d) $1049.47	(a) TB case detected by ICF (b) Person completing IPT (c) TB case prevented by ICF (d) TB case prevented by IPT
W19	Vassall	2010	Ethiopia	4.40	TB/HIV patients	One stop Same structure	Pilot 3 hospitals costed 9 sites existing	Economic Full costs Patient perspective	(a) $147/patient (b) $326/patient (c) $193	(a) Patient (TB only) (b) Patient (HIV only) (c) Patient (TB/HIV)

All costs adjusted to 2010 USD.

ANC, antenatal care; CT, counselling and testing; ICF, intensified case finding; IPT, isoniazid preventive therapy; STD; sexually transmitted disease; STI, sexually transmitted infection; TB, tuberculosis; TST, tuberculin skin test; w/pos TST, with positive tuberculin skin test; INH, isoniazid; PZA, pyrazinamide; RIF, rifampin.

set in the context of generalised epidemics in sub-Saharan Africa, although two studies consider concentrated epidemics: one in Mexico[W42] and one in Thailand.[W38] The majority of studies conclude that integrated HIV treatment and care services are feasible and cost-effective.

The one comparative study by Rosen *et al*[W39] found that stand-alone sites were more expensive per patient treated than some integrated models (hospital and general practitioner based) but less expensive than an integrated PHC model. When costs per patient in care and 'responding to treatment' were compared, the results for the stand-alone and integrated PHC models were equivocal and the general practitioner model was found to be more expensive. However, as this study includes only four sites (each with differing methods, financing sources and settings), no firm conclusions on whether integration or stand-alone provision of HIV care and treatment is more efficient can be drawn.

FP for HIV-positive individuals

Four studies estimated the potential cost savings from provision of FP to HIV-positive individuals through integrating FP services within PMTCT[W46–48] or HIV care and treatment[W49] programmes, two of which were peer-reviewed (table 4). All studies modelled costs at the national level in the context of generalised epidemics; we found no studies that empirically evaluated models of integrating FP with ART services or comprehensive care centres, despite the widespread existence of such programmes.

All studies found the provision of FP to HIV-positive individuals to be highly cost-effective or cost saving. Most studies estimate substantial savings through prevention of the costs incurred from PMTCT interventions, treatment of perinatal HIV infections, care and support for orphans and vulnerable children, and maternal deaths. No studies compared the unit costs of integrated versus stand-alone FP or HIV care and treatment services or examined the comparative costs of different models of integration.

HIV services integrated with other health services for populations at a higher risk of HIV exposure

We found three studies evaluating the integration of HIV services into other health services for key populations at higher risk of HIV exposure[W50–52] (table 5). All three studies were peer-reviewed. Studies examined the impact of integration on services targeted towards female sex workers, people who inject drugs, and those with mental health disorders. Two studies, set in the USA,[W50 W51] evaluated integration of mental health and/or substance abuse services into HIV care and treatment, while one set in Tanzania[W52] evaluated four different approaches to provision of HIV/sexually transmitted disease prevention services for sex workers at truck stops. All three studies were conducted on a small scale. Two studies[W51 W52] report lower unit costs per patient for integrated services, although in one, the difference was insignificant. The third study found that costs for integrated care were higher at the majority of sites and often not reimbursable by a third-party payer.

DISCUSSION

Our results show that a wide range of integrated services are cost-effective and that integration may reduce the costs of delivering some key HIV services. The best quality economic evidence focuses on the cost-effectiveness of HIV services, which require integration from a clinical perspective. This includes offering HIV CT in ANC services as part of the provision of PMTCT, providing TB services to HIV-positive clients and HIV

Table 3 HIV care and treatment studies

Citation	Author	Date	Country	HIV prevalence	Target population/setting	Integration detail	Intervention scale	Costing methods	Unit costs and cost-effectiveness	Unit
HIV palliative care										
W31	Hansen	1998	Zimbabwe	26.30	Facility-based home outreach	One stop Same structure	At Scale 4 schemes costed 67 schemes existing	Economic Full costs Health services perspective	(1) $191 (2) $465.9 (3) $509.7 (4) $271.3	(1) Home visit (urban) (2) Home visit (rural) (3) Home visit (rural) (4) Home visit (urban)
			Zimbabwe	26.30	Facility-based home outreach	One stop Same structure	At scale 4 schemes costed 67 schemes existing	Economic Full costs Household costs	$825.7—$1249	3 months
W32	Chandler	2004	Rwanda	3.20	(1) Facility-based home outreach (2) Facility-based home outreach (3) Facility-based home outreach (4) Community-based home outreach (5) Community-based home outreach (6) Community-based home outreach (7) Community-based home outreach (8) Community-based home outreach	One stop Same structure	At scale (assumed) 8 schemes costed	Full costs Economic Health service perspective	(1) $39.08 (2) $37.21 (3) $43.01 (4) $29.26 (5) $16.15 (6) $28.49 (7) $16.21 (8) $15.21	Client per month
W33	Bikilla	2009	Ethiopia	Unknown	HIV patients HIV clinic within district hospital	One stop Same structure	At scale 1 facility costed 272 sites existing	Economic (assumed) Full costs District hospital perspective	(a) $35 (b) $92	(a) Patient annually (outpatient) (b) Patient annually (inpatient)
W34	Uys	2002	South Africa	17.70	Community-based home outreach, clinic and hospital care	Not clear	Pilot 7 sites	Economic Incremental costs Health services perspective	$1209	Patient annually
Cotrimoxazole preventive therapy										
W17	Hausler	2006	South Africa	17	CT, ANC TB and STI clients (1) Community health centre (2) PHC clinic	One stop Same structure	Pilot 3 facilities costed 12 facilities existing	Economic Full costs Health services perspective	(1) (a) $10 (b) $53 (2) (a) $7 (b) $24	(1) (a) Person per 6 months of treatment (b) Person completing treatment
W35	Pitter	2007	Uganda	6.30	(1) All HIV-positive individuals (2) WHO stages ≥2 (3) CD4<500 (4) WHO stages ≥2 or CD4<500 facility-based home outreach/hospital	One stop Same structure	Pilot 1 scheme	Economic Incremental costs Health services perspective	(1) $54.45 (2) $59.05 (3) $77.03 (4) $59.15 Do nothing: $57.37	Patient annually

Continued

Table 3 Continued

Citation	Author	Date	Country	HIV prevalence	Target population/setting	Integration detail	Intervention scale	Costing methods	Unit costs and cost-effectiveness	Unit
W36	Yazdanpanah	2005	Cote D'Ivoire	4.80	University hospital and community clinics (1) WHO stage ≥3 (2) WHO stage ≥2 (3) CD4≤50 (4) CD4≤200 (5) CD4≤500 (6) All HIV positive	Not clear	Model Scale not clear	Costing not clear Incremental costs Health service perspective	(1) $1661 (2) $1700 (3) $1752 (4) $1752 (5) $1790 (6) $1700	Person lifetime
			Cote D'Ivoire	4.80	University hospital and community clinics (1) WHO stages ≥3 (2) WHO stages ≥2 (3) CD4≤50 (4) CD4≤200 (5) CD4≤500 (6) All HIV positive	Not clear	Model Scale not clear	Costing not clear Incremental costs Health service perspective	(1) $142 (2) $258 (3) Dominated (4) Dominated (5) Dominated (6) $193	Life year saved over do-nothing
PMTCT										
W37	Stringer	2000	Sub-Saharan Africa	15% assumed	(1) (a) ANC clients (targeted therapy) (b) ANC clients (mass therapy) (2) (a) Labour/ delivery clients (infant only) (b) Labour/ delivery clients (mass therapy)	One stop Same structure	Model Scale not clear	Costing not clear Full costs (assumed) Third-party payer perspective	(1) (a) $153 886 (b) $175 493 (2) (a) $114 415 (b) $155 850 Do nothing: $139 240	10 000 women
W21	Sweat	2004	(1) Botswana (2) Cote d'Ivoire (3) Kenya (4) Rwanda (5) Tanzania (6) Uganda (7) Zambia (8) Zimbabwe	(1) 25.8 (2) 5.3 (3) 7.1 (4) 3.2 (5) 6.4 (6) 6.4 (7) 14 (8) 19.8	ANC clients	One stop Same structure	Model National	Costing not clear Incremental costs Health services Perspective	(1) $2329 (2) $11 924 (3) $5528 (4) $2406 (5) $2942 (6) $6255 (7) $3305 (8) $4602	Perinatal HIV infection averted
			(1) Botswana (2) Cote d'Ivoire (3) Kenya (4) Rwanda (5) Tanzania (6) Uganda (7) Zambia (8) Zimbabwe	(1) 25.8 (2) 5.3 (3) 7.1 (4) 3.2 (5) 6.4 (6) 6.4 (7) 14 (8) 19.8	ANC clients	One stop Same structure	Model National	Costing not clear Incremental costs Health services Perspective	(1) $75 (2) $399 (3) $180 (4) $85 (5) $99 (6) $216 (7) $111 (8) $148	DALY averted

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Table 3 Continued

Citation	Author	Date	Country	HIV prevalence	Target population/setting	Integration detail	Intervention scale	Costing methods	Unit costs and cost-effectiveness	Unit
W16	Bratt	2011	Zambia	13.50	(1) Arthur Davison Children's Hospital (2) Ndola Central Hospital (3) Chipokota Mayamba Clinic (4) Kabwe General Hospital (5) Mahatma Gandhi Health Center (6) Kasanda Health Center (7) Kabompo District Hospital (8) St. Kalemba Clinic (9) Mufumbwa Health Center (10) Kawambwa District Hospital (11) Mbereshi Mission Hospital (12) Kawambwa Central Clinic	One stop Same structure	At scale 12 facilities costed 219 facilities existing	Economic Full costs Health services Perspective	(1) NA (2) $28—$50 (3) $20—$51 (4) NA (5) NA (6) $20 (7) $38—$62 (8) $73 (9) $58 (10) NA (11) $31—$62 (12) NA	PMTCT visit
ART										
W38	Kitajima	2003	Thailand	1.50	HIV clinics within regional hospitals	Referral Same structure	Pilot 2 hospitals	Financial (assumed) Full costs Third-party payer perspective	(a) $354 (b) $420.6	(a) Outpatient visit (b) Inpatient visit
W39	Rosen	2008	South Africa	17.90	(1) ART patients (hospital) (2) ART patients (private ART programme) (3) ART patients (stand-alone HIV clinic) (4) ART patients (PHC clinic)	One stop Same structure	At scale 4 facilities costed	Economic Full costs Health services Perspective	(1) $831 (2) $984 (3) $1024 (4) $1237	Patient annually
W33	Bikilla	2009	Ethiopia	Unknown	HIV patients HIV clinic within district hospital	One stop Same structure	At scale 1 facility costed 272 sites existing	Economic (assumed) Full costs District hospital perspective	(a) $267 (b) $33	(a) Patient annually (outpatient) (b) Patient annually (inpatient)
W40	Marseille	2009	Uganda	6.50	HIV patients Facility-based home outreach	One stop Same structure	Pilot 1 HBC scheme	Economic (assumed) Incremental costs Health service perspective	$696	Incremental DALY averted over CPT only
W41	Renaud	2009	Burundi	3.30	ART patients PHC clinic for HIV positive	One stop Same structure	Pilot 1 facility	Financial (assumed) Incremental costs Health services perspective	(a) $1389 (b) $1177 (c) $1020 (d) $842 (e) $805 (f) $783	(a) Patient in 2003 (b) Patient in 2004 (c) Patient in 2005 (d) Patient in 2006 (e) Patient in 2007 (f) Patient in 2008

Continued

Table 3 Continued

Citation	Author	Date	Country	HIV prevalence	Target population/setting	Integration detail	Intervention scale	Costing methods	Unit costs and cost-effectiveness	Unit
			Burundi	3.30	ART patients PHC clinic for HIV positive	One stop Same structure	Pilot 1 facility	Financial (assumed) Incremental costs Health service perspective	$275	Incremental DALY averted over 'do nothing'
W16	Bratt	2011	Zambia	13.50	(1) Arthur Davison Children's Hospital (2) Ndola Central Hospital (3) Chipokota Mayamba Clinic (4) Kabwe General Hospital (5) Mahatma Gandhi Health Center (6) Kasanda Health Center (7) Kabompo District Hospital (8) St. Kalemba Clinic (9) Mufumbwa District Hospital (10) Kawambwa District Hospital (11) Mbereshi Mission Hospital (12) Kawambwa Central Clinic	One stop Same structure	At scale 12 facilities costed 219 facilities existing	Economic Full costs Health services Perspective	(1) $31 (2) $18—$30 (3) $17—$27 (4) $27—$30 (5) $NA (6) $23—$33 (7) $35—$39 (8) NA (9) $39—$43 (10) $33—$37 (11) $25—$34 (12) NA	ART visit
W42	Bautista	2003	Mexico	0.30	Hospitals and AIDS clinics	Not clear	At scale 11 health facilities costed	Financial (assumed) Full costs Third-party payer perspective	(a) $997 (b) $881 (c) $1336 (d) $4748 (e) $3674 (f) $3686	(a) 3 years pre-ART (b) 2 years pre-ART (c) 1 year pre-ART (d) 1 year post-ART (e) 2 years post-ART (f) 3 years post-ART
W43	Cleary	2006	South Africa	18.10	ART clinics within PHC clinics	Not clear	Pilot 3 ART clinics	Economic Full costs Health services Perspective	(a) $23.05 (b) $11 253 (c) $1175 (d) $1314	(a) Clinic visit (b) Patient lifetime (c) Life year gained over do-nothing (d) QALY gained over do-nothing
W44	Quentin	2008	Rwanda	2.90	PHC clinics	Not clear	Model National	Financial Full costs Third-party payer perspective	$554.10 $100.30	(a) ART patient per year (b) Non-ART patient per year
W45	Babigumira	2009	Uganda	6.50	(1) Unspecified mobile clinic care (2) Unspecified HBC (3) Facility-based care	Not clear	Model Scale not clear	Financial Full costs Health services perspective	(1) $4948 (2) $7277 (3) $3323	Patient annually

All costs adjusted to 2010 USD.
ANC, antenatal care; ART, antiretroviral therapy; CT, counselling and testing; DALY, disability-adjusted life year; HBC, home-based care; PHC, primary healthcare; PMTCT, prevention of mother-to-child transmission; STI, sexually transmitted infection; TB, tuberculosis; CPT, cotrimoxazole preventive therapy.

Table 4 FP studies

Citation	Author	Date	Country	HIV prevalence	Integration detail	Costing methods	Cost savings and cost-effectiveness	Unit
W46	Halperin	2009	(1) 14 high-prevalence countries (subset) (2) 139 countries	Varies	National model Service details not clear	Costing methods not clear Health services perspective	(1) (a) $562 (b) $371 (c) $63 (2) (a) $714 (b) $384 (c) $65	(a) Infant infection averted by perinatal prevention (b) Infant infection averted by pregnancy averted (c) Unintended pregnancy prevented to HIV positive
W47	Reynolds	2008	(1) Botswana (2) Mozambique (3) Namibia (4) South Africa (5) Zambia (6) Ethiopia (7) Kenya (8) Rwanda (9) Tanzania (10) Uganda (11) Cote d'Ivorie (12) Nigeria (13) Guyana (14) Haiti (15) Vietnam	(1) 24.1 (2) 16.1 (3) 19.6 (4) 18.8 (5) 17.0 (6) 1.4 (7) 6.1 (8) 3.1 (9) 6.5 (10) 6.7 (11) 4.7 (12) 3.9 (13) 2.4 (14) 2.2 (15) 0.5	National model Service details not clear	Costing methods not clear Health services perspective	(1) $425 695 (2) $1 294 921 (3) $307 759 (4) $9 036 245 (5) $2 527 589 (6) $1 984 179 (7) $2 890 267 (8) $427 605 (9) $1 659 623 (10) $2 701 425 (11) $592 230 (12) $2 119 550 (13) NA (14) $221 298 (15) $76 562	Saved over current practice in the first year
W48	Stover	2003	14 PEPFAR countries	Varies	National model One stop Same structure	Financial (assumed) Incremental costs Health services perspective (assumed)	(a) $1383 (b) $2767 (c) $702 (d) $383 (e) $138 (f) $2767	(a) Child HIV infection averted by PMTCT only (b) Child death averted by PMTCT only (c) Unintended HIV-positive birth averted by PMTCT+FP (d) Child death averted by PMTCT+FP (e) Unintended orphaned child averted by PMTCT+FP (f) Mother's life saved by PMTCT+FP
W49	Stover	2006	(1) Botswana (2) Cote d'Ivorie (3) Ethiopia (4) Guyana (5) Haiti (6) Kenya (7) Mozambique (8) Namibia (9) Nigeria (10) Rwanda (11) South Africa (12) Tanzania (13) Uganda (14) Zambia	(1) 25.3 (2) 4.4 (3) Unknown (4) 1.1 (5) 2.1 (6) 6.6 (7) 11.3 (8) 15 (9) 3.6 (10) 3 (11) 18.1 (12) 6 (13) 6.3 (14) 13.8	National model Service details not clear	Costing methods not clear Health services perspective (assumed)	(1) $7 300 000 (2) $3 400 000 (3) $3 600 000 (4) $48 000 (5) $4 900 000 (6) $4 400 000 (7) $2 400 000 (8) $1 100 000 (9) $3 700 000 (10) $1 500 000 (11) $14 000 000 (12) $1 000 000 (13) $18 000 000 (14) $2 900 000	Annual net savings

All costs adjusted to 2010 USD.
FP, family planning; PMTCT, prevention of mother-to-child transmission.

services to those with TB, and making FP services available to HIV-positive clients. There are number of studies that demonstrate the cost-effectiveness and cost savings of these service packages, strongly supporting further scale-up from an economic perspective. However, the cost-effectiveness of these integrated services has generally been demonstrated through models or at the pilot level, and in some areas, there is little empirical evidence to demonstrate efficiency at scale in different contexts. Additionally, none of the studies compare the relative efficiency of different models of delivery, such as one-stop versus structured referrals. None of the studies found examine whether the provision of these services may also result reductions in the unit costs of services through economies of scale or scope, and only a few examine reductions in costs to the patient. The exclusion of these factors is likely to result in an underestimation of the cost-effectiveness of these integrated services.

The integration of both CT and HIV care and treatment into general health services is feasible, and in the case of CT, the evidence consistently demonstrates that integrated CT services are likely to improve technical efficiency. It should be noted, however, that economic concerns may need to be weighed against issues such as stigma and confidentiality. Where reported, lower CT costs were primarily driven by the improved use of human resources. This suggests that the expansion of CT through existing services may place less of a burden on scarce human resources for health than expansion through stand-alone facilities (although any expansion may still require additional resourcing of staff).

Although there were several studies demonstrating the costs and feasibility of integrated HIV care and treatment, there were no high-quality studies comparing the costs of integrated services with those of stand-alone alternatives. The one study that compared costs across integrated and non-integrated sites was of an insufficient sample size. Due to the variety in services examined and methods used to measure costs, it was also hard to examine whether the costs of integrated HIV care and treatment are higher or lower than those found in other studies costing stand-alone services. Therefore, at present, no firm conclusions can be drawn on the economic benefits of integrating HIV care and treatment.

Table 5 Other health services studies

Citation	Author	Date	Country	HIV prevalence (%)	Intervention	Scale	Integration detail	Costing methods	Findings summary
W50	Schackman	2011	USA	0.6	Substance abuse treatment	Pilot 10 clinics	One stop Same structure or same clinician	Economic Incremental costs Societal perspective	Median range difference between costs for integrated care and non-integrated care was $14 ($67—$76). Costs for integrated care are higher at 7 sites. At the remaining 2 sites with comparison groups, costs were lower for integrated care due to fewer encounters with physicians.
W51	Weaver	2009	USA	0.6	Treatment for mental health and substance abuse disorders in triply diagnosed patients	RCT 4 hospitals	One stop Same structure	Economic Full costs Health service perspective	Total average monthly cost of health services for the intervention group decreased from $3235 to $3052 and for the control group decreased from $3556 to $3271, but the decreases were not significant. There is not enough evidence to either limit continued exploration of integration of care for triply diagnosed patients or adopt policies to encourage it.
W52	Nyamuryekung'e	1997	Tanzania	7.9	STD component integrated into HIV prevention programmes at truck stops	Pilot	(1) One stop; in PHC building at special times (2) One stop; integrated into PHC (3) One stop; mobile outreach	Costing not clear Incremental costs Health service perspective	(1) Special times: $18.35 per client (2) Integrated into PHC: $17 per client (3) Mobile outreach: $17.58 per client

All costs adjusted to 2010 USD.
PHC, primary healthcare; STD; sexually transmitted disease; RCT, randomized controlled trial.

Broadly, we found that the evidence base is weak on assessing any technical efficiency gains from integration, assessing any efficiency impact beyond the service delivery level and assessing any gains from the patient perspective (box 1). Furthermore, the evidence found provides little insight into the most efficient model to employ in different contexts. None of the studies found used traditional econometric methods to estimate economies of scale or scope; where other methods were used, such as before and after comparisons, study quality tended to be poor. This is likely to reflect the fact that these methods require large sample sizes, and there is a scarcity of HIV service cost data from low- and middle-income countries. The application of data envelopment analysis, a non-parametric technique for evaluating efficiency, is beginning to be used in other sectors and could provide a solution where sample sizes are small. Even where broad analytical techniques are available, integration is complex and challenging to represent in quantitative terms. It can be best described as a continuum, progressing from linkages and service co-ordination to full integration of resources and services.[21 25] New techniques, such as developing indices for integration, may provide a way forward. A recent study[21] developed a scale of integration to enable cross-country comparisons of performance. Likewise, work is in progress on the Integra Initiative[ii] to develop an index of integration. However, to date, no studies have yet explored how these scales and indices relate to cost.

This review paper has several limitations. This review only includes accessible published and grey literature and is not necessarily an accurate representation of the full range of cost data available from HIV programmes. Moreover, we were not able to account for the potential impact of political or economic context on study findings. Finally, there was a lack of consistency in cost and efficiency measures (and description of methods) across different studies, again limiting the extent that we were able to interpret and validate study results.

Our results broadly support current recommendations in international policy for integration in HIV services. Studies evaluating WHO collaborative TB/HIV treatment guidelines and 'Three I's' strategy[W30] to reduce the impact of TB on those living with HIV found these interventions to be cost-effective and potentially cost saving. Studies evaluating integration of CT largely support the current WHO policy to expand provider-initiated CT for HIV in PHC settings.[W53] Finally, although there is little empirical evidence available, strong modelling evidence indicates that the steps already taken by a number of countries to integrate FP into services for HIV-positive individuals are likely to be economically beneficial.

Given the significant policy interest in scaling up integration, research on how to implement and expand integrated services is now required. In particular, there is an urgent need to assess the potential for efficiency gains from integrating HIV treatment and care into general health services, requiring large-scale costing studies. There is also almost nothing known about the impact of integration on service provision and efficiency for populations at higher risk of exposure to HIV, a key concern in concentrated epidemic settings. Moreover, for areas where cost-effectiveness is established, we recommend further operational and country-level research to support programme and facility managers. This should focus on identifying which models of integration are most appropriate in different settings, balancing efficiency with other service delivery objectives. Researchers should be

[ii]A project researching HIV/SRH integration funded by the Bill and Melinda Gates Foundation, implemented by the International Planned Parenthood Foundation, London School of Hygiene and Tropical Medicine and Population Council.

Key messages

- The evidence to date largely supports current global policy and further efforts to integrate.
- A number of integrated HIV services have been shown to be cost-effective, though little is known about the comparative efficiency of differing integration models.
- Evidence gaps remain on economic impact of integration for HIV care and treatment and services for populations at higher risk of HIV exposure.
- Further research is necessary to identify efficiency gains from integration beyond the service level and economic gains to HIV service users.

challenged not just to assess the extent of gains to be made but also investigate the implications of different models in different settings. Research is also required on the most effective ways for programme managers to implement and promote integration at the facility level. Unfortunately, there is currently insufficient evidence to draw any lessons on the most efficient process of integration, although there are some promising examples of research in this area.[W28] Finally, none of the studies reviewed included efficiency gains at the systems and few at the patient level. The potential in this area may be significant (box 1); it is therefore highly recommended that future studies include these aspects in their assessment of integration.

In summary, given the existing evidence that largely supports HIV integration from a public health and clinical perspective, the findings of this review support further efforts to integrate. However, significant evidence gaps remain. Unfortunately, few of the studies found adequately address the central questions currently concerning many programme managers at this moment in time: not whether to integrate, but when to, how to and which model is most efficient in which setting? Investment in country-based operational research and larger costing studies across a variety of settings is therefore urgently required to support future development of policy and programming in this area.

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