Innovations in Sexual and Reproductive Health 4

Who pays and what pays off in sexual and reproductive health? A review of the cost and cost-effectiveness of interventions and implications for future funding and markets

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This Series paper provides a summary of what is known about the funding, cost, and cost-effectiveness of sexual and reproductive health and rights interventions, interrogates the likely impacts of increasing or reducing future sexual and reproductive health and rights funding, and provides recommendations for policy and regulatory changes from an economic perspective. Interventions that target HIV and sexually transmitted infections, contraceptive interventions, and abortion care are among the most cost-effective health interventions worldwide, but their funding is under severe duress. In 2023, approximately US$35 billion was spent on these intervention areas across low-income and middle-income countries—only two-thirds of the $52 billion needed per year. HIV treatment and prevention, as well as contraceptive commodities, rely heavily on donor funding, which has decreased since 2017. The discontinuation of the US Agency for International Development funding in early 2025, in particular, requires that the most impacted countries will have to do more with much less going forward.

Introduction

Funding for sexual and reproductive health and rights (SRHR) services is under severe duress across the globe, even before US cuts to foreign aid for health in early 2025, which had been contributing approximately 26% of all outside assistance to health programmes in low-income and middle-income countries (LMICs). In this Series paper, we summarise what is known about the funding for and the cost and cost-effectiveness of SRHR interventions, based on a review of the literature to identify evidence gaps and factors that improve efficiency and sustainability (for a full definition of the term SRHR see the results of the Guttmacher–*Lancet* Commission).[1] The Guttmacher–*Lancet* Commission[1] recommended an essential package of SRHR services and information that includes contraceptive services, maternal and newborn care, prevention and treatment of HIV, and care for other sexually transmitted infections (STIs), as well as comprehensive sexuality education; safe abortion care; prevention, detection, and counselling for gender-based violence; prevention, detection, and treatment of infertility and cervical cancer; and counselling and care for sexual health and wellbeing.[1] For this Series paper, we conducted a more in-depth review of interventions for HIV and STIs, and a shorter review of other aspects of the essential package of SRHR services, including contraception and abortion care (our analysis excludes maternal and newborn health interventions beyond HIV treatment for the elimination of vertical transmission, as in the past these were often covered by other funding mechanisms). Lastly, we also interrogated the likely impacts of increasing or reducing future funding for these areas and end with recommendations for changes to the policy and regulatory landscape that would render services more efficient, cost-effective, and financially sustainable.

Current funding landscape: global estimates

In order to estimate the combined global funding needed for HIV and STI screening, prevention and management, contraceptive care, and abortion care, we combine global estimates for each of these intervention areas generated using different methods. This provides a rough estimate of approximately US$52 billion needed per year across LMICs in 2023, of which only two thirds (approximately $35 billion) is currently available—the majority of which ($20 billion or 56%) is spent on HIV care (figure 1). The methods behind these estimates are explained in more detail below.

Funding for HIV care

In early 2025, the US President's Emergency Plan for AIDS Relief (PEPFAR), which provided more than 26% of global HIV funding in 2022, had both its budget[2] (which was already in decline for the last 3 years[3]) and its reach curtailed through the current US administration's dismantling of the US Agency for International Development, which had been responsible for implementing 60% of PEPFAR programmes.[4] This defunding follows a continuous decrease in HIV funding from a high of $24 billion (costs from 2019) in 2017.[3] Before the reduction of the PEPFAR budget, global HIV funding in 2023 was nearly $20 billion, already a 17% decrease from the peak in 2017, and approximately a third off the projected $29 billion required for the global HIV response—a shortage that is set to increase in the following years.[3] Although approximately 60% of resources in 2023 were funded from the domestic budgets of LMICs with high HIV prevalence, these countries' fiscal space continues to be constrained by the aftermath of the COVID-19 pandemic, debt servicing, and conflict and other humanitarian crises.[3] Concurrently, the mobilisation of donor funding for HIV prevention, care, and treatment specifically and SRHR more generally has become increasingly difficult.

Funding for STI care

Current funding for STI prevention, care, and treatment is not tracked as well as the funding for HIV care, as nearly all is funded from countries' own health budgets.[5] A 2017 analysis of WHO's 2022–30 global health sector strategies on HIV, viral hepatitis, and STIs included an estimation of the cost of STI care, including human papillomavirus (HPV) vaccination, across 118 LMICs.[5] The analysis estimated that annual costs would increase from \$3·4 billion in 2023 to \$6·3 billion by 2026 when fully scaled up, but could decline thereafter owing to unspecified efficiency gains.[5] This includes \$344 million by 2030 for primary prevention, and \$1·9 billion for outreach, screening, and management of treatment failures and antibiotic resistance.[5]

Funding for contraception and abortion care

Providing current levels of contraceptive care in LMICs costs an estimated \$9·0 billion annually, which is considerably below the estimated \$13·6 billion required to provide all women wanting to avoid pregnancy with modern methods (adjusting to 2023 US dollars, based on cost and coverage estimates for 2024).[6] Although domestic government funding for contraception services has remained stable since 2019, at approximately \$1·7 billion, there have been notable declines in donor expenditures over that same period, similar to funding for HIV prevention, care, and treatment.[8] The most recent estimates show a 10% decline from 2021 to 2022,[2] and current cuts to overseas direct assistance budgets across Europe indicate this trend is unlikely to reverse in the coming years.

Additionally, an estimated 19·7 million women in LMICs currently require post-abortion care annually due to unsafe abortions, resulting in 20 824 maternal deaths from unsafe abortions and contributing to \$2·3 billion for post-abortion care services (costs adjusted to 2023 US dollars; see the first paper[7] in this series).[6] The costs of safe abortion and post-abortion care are estimated to be \$3·0 billion annually, although if all abortions were provided safely, this would drop to \$1·6 billion annually, resulting in cost-savings of \$1·5 billion per year (figure 1).[6]

Future funding landscape

Funding for HIV prevention, care, and treatment

Donor funding and country-level investments in SRHR services are under severe threat. Although domestic funding remains the main contributor, countries will potentially need to do more with less going forward as contributions from global donors, such as PEPFAR and The Global Fund to Fight AIDS, Tuberculosis and Malaria, have plummeted.

A number of analyses have been published estimating the impact of the complete or partial cessation of PEPFAR support for global health. Each uses one or more established health–state transition models parameterised with local epidemiological, cost, and financing data. Across analyses, the main sources of uncertainty were the size and duration of future funding reductions, the translation of decreases in funding into decreases in intervention coverage, and the amount and quality of mitigation of these impacts through domestic resource mobilisation or gains in programmatic efficiency. Stover and colleagues[9] combined results from eight models and three additional analyses to estimate the impact across the areas of HIV, tuberculosis, family planning, and maternal and child health for up to 80 countries from 2025 to 2040. A complete cessation of US foreign assistance for global health would result in 15·2 (uncertainty range, 9·3–20·8) million additional AIDS-related deaths, 2·2 (1·5–1·9) million additional tuberculosis deaths, 7·9 million additional child deaths from other causes, 40–55 million additional unplanned pregnancies, and 12–16 million unsafe abortions.[9] If made permanent, these cuts to US funding would reverse decades of progress in global health and return deaths and new cases to levels last seen in the 1990s.[9] Focusing on the impact on HIV alone, Ten Brink and colleagues[10] analysed the effect of reductions in US and European foreign health funding by 2030 in 26 high-prevalence countries, estimating an additional 0·8–2·9 million deaths in this period, as well as 4·4–10·8 million new HIV infections.

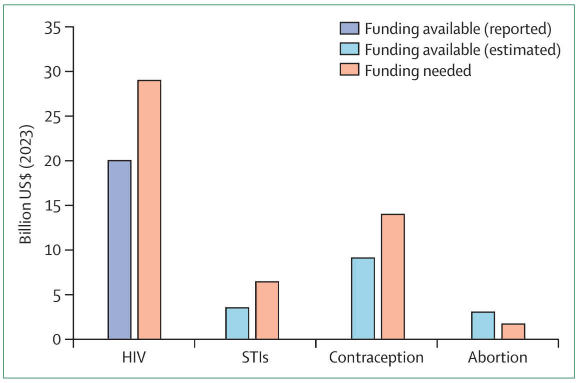

Figure 1: **Indicative annual funding levels for HIV care, STI care, contraception, and abortion care**

Funding levels are indicative only and were generated using different methods and assumptions. For STI care, contraception, and abortion, the bars represent estimated current expenditure based on assumed current coverage multiplied by assumed costs. For abortion, the funding needed category includes the cost-saving impact of providing abortions safely. STI=sexually transmitted infection.

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Funding for STI prevention, care, and treatment

The funding landscape for the control of STIs remains chronically insufficient. Global health initiatives, as well as national public health programmes, often prioritise HIV rather than a specific focus on comprehensive funding for STI care. This underfunding hampers the capacity for effective prevention, treatment, and research, including innovations, such as new diagnostic tools, vaccines, and behavioural interventions.[11] The absence of robust financial commitment also undermines efforts to integrate STI services into broader sexual and reproductive health programmes and other related services.

Funding for contraception and abortion care

The Adding It Up report by the Guttmacher Institute (included in Stover and colleagues[9]) models the impacts of current care and declining funding for contraception, in addition to the total costs necessary to meet all contraceptive needs for LMICs.[6] Providing contraceptive care to 714 million current users in LMICs is estimated to prevent 311 288 unintended pregnancies and 133 635 maternal deaths. Every $100 million decrease in funding for contraception is estimated to result in 8·1 million more unintended pregnancies and 2173 maternal deaths.[12] Given the current termination of all US grants for family planning (a total of $607·5 million), the Guttmacher Institute estimates that this will result in 47·6 million women and couples denied contraceptive care in LMICs in 2025, resulting in 17·1 million unintended pregnancies, including 5·2 million unsafe abortions, which will result in an estimated 34 000 deaths.[13]

If funding for contraception was scaled up to meet all expressed needs in LMICs, annual cost would have to increase from $1·38 to $2·09 per capita. An estimated 41% of contraceptive care expenditures were funded by international donors as of 2022,[8] and were heavily dependent on three countries: the USA (43% of all donor expenditures as of 2022), the Netherlands (16% of all donor expenditures as of 2022), and the UK (13% of all donor expenditures as of 2022), all of which have reduced overseas direct assistance funding[2] or, in the case of the USA, terminated all programmes supported by that funding. In the context of a large and growing financing gap, domestic financing for contraception and financing innovations that promote scale-up is crucial.

See Online for appendix

Finally, if safe abortion care services were scaled up to meet all needs on a global scale, such that all people having abortions in LMICs have access to safe abortion care, the costs of safe abortion care would increase from $774 million to $1·3 billion annually (when adjusted to 2023 US dollars).[6] However, by scaling up safe abortion services, the resulting decrease in complications—and therefore costs associated with post-abortion care—would result in a drop in annual unsafe abortion-related maternal deaths from 21 138 globally to as few as 1145.[6]

The economic impact of defunding SRHR

Even before the change in US policy regarding foreign aid, the economic consequences of missing the 95–95–95 targets by 2030 had been estimated to be $14 billion globally between 2021 and 2050, using a full-income approach (ie, combining economic gains from improved productivity or economic growth plus health gains).[14] However, if targets were met, the return on investment would be $11–14 for every dollar spent, with the highest returns in low-income countries.[14] The impact of scaling up STI services to achieve a 90% reduction in curable STIs has been estimated as part of the analysis of WHO's global STI strategy,[5] which noted potential returns on the $18 million investment in terms of health-care cost-savings and productivity gains, in particular from a reduction in cervical cancer by 70%. Additionally, the authors projected reductions in health-care costs and productivity losses from STIs and morbidity and mortality owing to infertility, pregnancy and congenital complications, and psychosocial impacts. However, the total value of these economic gains was not estimated.[5]

What do we know about the cost-effectiveness of SRHR interventions?

In order to summarise what is known about the funding, cost, and cost-effectiveness of SRHR interventions (see panel 1 for definitions), we conducted a review of the literature on cost analyses and economic evaluations of HIV and STI interventions and contraception and abortion care between January, 2009, and September, 2024, using PubMed as well as additional publications, reports, and grey literature recommended by coauthors who are experts in their respective fields.[15] We extracted the main findings of existing systematic and non-systematic literature reviews and added publications not yet included in other reviews. We summarise the main findings by disease and intervention area. Results and thresholds values are given as reported in the papers (ie, unadjusted over time; more detailed findings are summarised in the appendix pp 11–36). The detailed search strategy can be found in the appendix (p 3), and a short overview of evidence gaps can also be found in the appendix (p 7).

Comparisons of SHRH interventions

Few economic analyses have compared interventions across the entire spectrum of SRHR interventions incorporated here. In addition to interventions reviewed in detail below, a scoping review of SRHR interventions found the following interventions to be cost-effective under a variety of thresholds: school-based and internet-based sexuality and sexual health education programmes for adolescents; community mobilisation programmes; an intervention combining microfinance with gender and HIV training for the prevention of intimate partner violence and violence against female sex workers; a parenting programme for preventing abuse of adolescents by their caregivers; cervical cancer treatment including lesion removal, radiotherapy, chemotherapy, and radical hysterectomy with pelvic lymph node dissection; clinical examination for early detection as well as lumpectomy, radiotherapy, mastectomy, and adjuvant treatment with oophorectomy and tamoxifen after mastectomy; and population-based screening for prostate cancer.[16] The following interventions were found not to be cost-effective: infertility services including intrauterine insemination and in vitro fertilisation and neoadjuvant chemotherapy for advanced ovarian cancer. Interventions such as mammography screening and different chemotherapy regimens for breast cancer had variable results.[16] Although there are crucial gaps in economic analyses of many domains of SRHR interventions, there is clear evidence that a large set of SRHR services are indeed cost-effective interventions.[16]

One meta-regression compared the cost-effectiveness of select interventions for HIV, malaria, syphilis, and tuberculosis in 128 countries based on 144 existing analyses that reported cost per disability-adjusted life-year (DALY) averted.[17] The analysis predicted incremental cost-effectiveness ratios (ICERs) for antenatal syphilis screening, antiretroviral therapy (ART) for children and adults, and pre-exposure prophylaxis (PrEP) for men who have sex with men (MSM) and female sex workers, in addition to several tuberculosis and malaria interventions. The study found that antenatal syphilis screening was the most cost-effective of these interventions across regions, whereas PrEP for MSM was the least cost-effective.[17] Within HIV, multiple allocative efficiency modelling exercises have compared a wide range of interventions in different settings, including the HIV Investment Case that is run annually for South Africa to optimise the allocation of financial resources for HIV.[18] Across 11 annual iterations of this Investment Case, the most cost-effective and the only cost-saving intervention was increasing condom provision and uptake, as it averts treatment costs far outweighing the costs of condom provision itself. Additionally, further expansions of testing coverage across different populations and of ART eligibility, uptake, and retention were shown to be cost-effective and affordable under the relevant HIV budget in each iteration.[19]

HIV

ART

13 systematic and 11 non-systematic reviews summarised 353 individual papers on ART (there was some overlap between the papers included in each review, which this metric does not account for). The results suggested that scaling up ART was cost-effective under a 1×gross domestic product per capita per DALY averted threshold.[20] ART provision cost was reduced, and its cost-effectiveness improved, by improving service efficiency through differentiated service delivery (DSD) based on clients' need (ie, DSD models),[21] including community-based delivery and home-based care[22,23] and task shifting from doctors to nurses.[24–26] Notably, community ART delivery was found to be no more expensive than facility-based ART delivery, as the costs of home visits tended to be offset by savings from reduced health service use.[27] DSD decreased costs for both the patient and the provider, despite increased start-up costs.[28] In addition, economic strengthening interventions in DSD,[29] newer first-line treatment options,[30] interventions for improving adherence using peer health workers,[31] SMS or smartphone-based interventions,[32,33] and promoting water, sanitation, and hygiene interventions to prevent water-borne diseases in people on ART[34] were all found to be cost-effective, albeit under different thresholds.

Panel 1: What does cost-effectiveness measure?

Traditionally, economic evaluations, including modelled cost-effectiveness analyses, are used to inform health intervention prioritisation under resource constraints, with clinical guidelines, targets, and budgets developed once a decision to introduce an intervention has been made. Cost-effectiveness analyses compare the outcome of an intervention—such as additional survival, infections averted, or couple-years protected from pregnancy—to its cost. An incremental cost-effectiveness ratio (ICER) is calculated by dividing the difference in total costs by the difference in the chosen health outcome or effect. This ICER is then compared with a cost-effectiveness threshold defined by different methods, including a country's productivity (eg, gross domestic product per capita) per disability-adjusted life-year averted; the historic relationship between health expenditure and increases in life expectancy (opportunity cost approach); and another approximation of a funder's willingness to pay, or the ICER of an existing, already funded intervention.

The cost of health interventions is driven by factors such as disease prevalence and incidence, the size and type of subpopulations, the ease with which subpopulations can be identified and reached, the success of risk targeting, the model of care and staff cadre used in its implementation, whether the intervention is feasible and acceptable to scale up, and whether implementation happens in a disease-specific silo or is integrated into other care (figure 1). As a result, many of the results summarised in this paper will likely change due to the defunding of HIV and other sexual and reproductive health programmes. Additionally, effectiveness—and cost-effectiveness—depends on an intervention's ability to control or eliminate a disease, with ICERs increasing as elimination requires service provision to harder to reach populations (appendix p 1). Of central importance in the process of economic evaluation is how cost-effectiveness is defined and how outcomes are calculated (appendix p 2).

In addition, 63 papers not included in the reviews confirmed the aforementioned findings, with analyses showing the cost-saving aspect of task shifting and DSD.[35–39] DSD exhibited excellent outcomes at a similar cost in Uganda,[40] was costlier in Zambia (partly explained by increased resource use from increased retention),[41] and was cost-effective in high-prevalence settings in South Africa.[42] Further, in both facility-based and DSD models, cost-savings could be generated by initiating treatment earlier in adults and children[43–46] (as early as the same day that a positive HIV test result is received[47]) and by dispensing several months of ART at a single client visit.[37,48] Immediate ART initiation compared with later ART initiation was found to be cost-effective over the long term with modest budget impact in Cote d'Ivoire,[49] and HIV-related inpatient care was cheaper in those already on ART than those untreated in South Africa and Malawi.[50,51] However, earlier treatment initiation might increase the cost of retention interventions across sub-Saharan African settings.[52] In 2016, reaching the UNAIDS 90–90–90 targets was found to be cost-effective as it cost 42% of gross domestic product per capita per life-year saved.[53] Individual analyses found cost-savings associated with specific regimen changes in children[54,55] and adults on first-line or second-line treatment.[56,57] In the only cost–benefit analysis reviewed, ART provision by a South African mining company was cost-saving from the company perspective due to reductions in health-care costs, absenteeism, and staff turnover, including benefit payments.[58] Additional cost-effective models of care included combination prevention including ART (in addition to home-based testing and linkage to care, voluntary medical male circumcision [VMMC], and condoms distribution),[59] comprehensive community-based social support for adolescents[60] and adults[61] on ART, mobile ART delivery,[62] active surveillance pharmacovigilance instead of spontaneous reporting of side-effects,[63] and private sector provision.[64] Directly administered ART (ie, treatment administered directly by a health-care worker) was found to not be cost-effective in sub-Saharan Africa.[65] Integration of maternal and paediatric HIV care into general maternal and child health was found to be cost-effective for South Africa,[66] and in Kenya, maternal and child health clinic costs were found to remain constant, but had fallen substantially for the ART clinic group.[67] Finally, a modelled analysis of potential future long-acting injectable ART formulations found that they could be cost-effective in adolescents and young adults in Kenya if they cost less than twice as much as oral ART.[68]

HIV testing

12 systematic and non-systematic reviews, summarising 686 papers, indicated that despite variability in cost per person tested and cost per person diagnosed across different HIV testing modalities,[69–71] HIV testing strategies are more cost-effective when analyses include linkage to treatment, especially in sub-Saharan Africa and other LMICs[72] where unit costs vary widely.[73] Costs were driven by testing approach,[74] scale of implementation,[73] integration with other health services,[75] and target population.[72,76,77] HIV testing approaches, such as social network-based approaches,[69] index testing services,[74,78] and venue-based testing,[69] were more costly due to additional efforts in reaching specific populations, higher personnel, and logistical costs. Increasing scale—either through integration with other health services, or via stand-alone large-scale community-based testing—was associated with lower cost per test, ranging from \$4·97 to \$72·35[75] in Africa (with higher values observed during the early phase of HIV testing in South Africa) and from \$2·61 to \$9·76[75] in Asia. Across settings, provider-initiated testing and counselling was found to cost less than half as much as client-initiated testing and counselling.[73,75] Point-of-care testing has proven to be a cost-effective option for HIV-exposed infants.[79] HIV self-testing (see the third paper[80] in this Series)—whether conducted at facilities, through secondary or index distribution, or home-based testing—exhibits lower costs per person tested (ranging from \$1·09 to \$155) than standard HIV testing;[74,81] however, sensitisation and promotion can raise costs in some settings.[74] Additionally, HIV self-testing has higher per-client costs once linkage to care is included, as a positive self-test result requires follow-up services.[81] HIV self-testing costs also vary widely by population. Caregiver-assisted HIV self-testing for infants was more costly than standard testing,[71] whereas targeted HIV self-testing for young adults was generally cost-effective in high-prevalence countries, with variations owing to kit costs, health-care infrastructure, training, and distribution.[72] For MSM and female sex workers, HIV self-testing incurred higher costs owing to targeting but can remain cost-effective when kit prices are competitive and detection rates are optimised by prioritising high-yield settings such as STI clinics or testing partners of index cases.[77]

Studies not included in the reviews confirmed that HIV self-testing reduces the client's economic burden, although costs vary widely across countries and distribution channels, and are higher than facility-based testing when considering cost per positive individual identified.[82–84] The secondary distribution of HIV self-testing kits to partners of ART patients had the largest impact in terms of life-years saved, but was one of the least cost-effective strategies.[85] Civil society organisation-led HIV self-testing kit provision to key populations including MSM, female sex workers, and people who inject drugs showed relatively high costs due to contextual challenges, including safety concerns; scaling up services was estimated to reduce average costs by 26–60%.[86] HIV self-testing distribution costs were reduced through community-led approaches,[87,88] peer networks including key population distribution,[89–92] optimised distribution channels,[76,85,91] reduced personnel and facility costs,[93] integration within existing facilities[94–96] and with other testing modalities such as home-based testing,[93] secondary distribution to absent people during home visits[97] and to partners of pregnant women,[93,98,99] and focusing on areas with undiagnosed HIV prevalence above 3%.[100] Facility-based HIV testing costs also varied across settings. Mobile clinics were more expensive per test due to higher operational and logistical expenses.[101] Home-based testing with lower infrastructure requirements and high uptake among hard-to-reach groups was cost-effective for reaching rural and underserved populations in high-prevalence settings, although costs can grow with large-scale coverage.[59,102–107] Facility-based and provider-initiated testing benefits from economies of scale, especially in densely populated or high-prevalence areas, making it a cost-effective approach to meet universal testing goals.[108–112] One multicountry study showed that average costs per client tested or diagnosed for testing in antenatal clinics varied with positivity rates and staff costs.[113] The cost of HIV testing in incarcerated populations in South Africa and Zambia[114] was higher than facility-based HIV testing because of the additional security required and there being no integration with other services. Early infant diagnosis at birth and at age 6 weeks[115,116] and maternal ART initiation[117] were found to be cost-effective if using specific point-of-care early infant diagnosis platforms, substantially lowering testing costs compared with central laboratory-based early infant diagnosis.[118]

HIV prevention

Six systematic or scoping reviews explored the cost and value for money of biomedical, non-surgical prevention interventions, which spanned 463 papers, some of which were themselves systematic reviews.[119–122] Additionally, we identified 32 individual papers that were not discussed in the reviews. Most papers focused on oral PrEP, with a minority covering injectable PrEP and other products. The evidence base is largely from southern and eastern Africa.

Targeted delivery of oral PrEP to key populations including MSM, female sex workers, and young men and women at high risk is likely to be cost-effective across settings,[119,123–125] as is delivery in concentrated epidemics.[126,127] However, the additional costs of accessing these vulnerable populations at risk of HIV can be considerable.[128,129] Evidence suggests that age-targeted delivery of oral PrEP and the dapivirine ring is also likely to be cost-effective.[72,130–132] Although long-acting injectables, such as cabotegravir and lenacapavir, have the potential to be very effective, their value for money will largely depend on their ultimate price.[133–136] Vaccines and broadly neutralising antibody-based prevention, once available, are potentially cost-effective, although considerable uncertainty surrounds these estimates due to a scarcity of data on both cost and effectiveness.[119,137,138] The delivery of oral PrEP through community-based and integrated delivery strategies (eg, incorporating PrEP and ART delivery strategies and joint HIV and tuberculosis interventions) was considered cost-effective in multiple settings.[139–143] Increasing client volume could facilitate economies of scale, driving down unit costs.[123,144,145] Task shifting (eg, in nurse-led PrEP provision) could also reduce costs and accelerate PrEP delivery expansion.[144]

Three systematic and non-systematic reviews of VMMC, covering a total of 206 papers, as well as 31 individual papers not yet included in other reviews, confirmed that scaling up VMMC could dramatically reduce HIV infections, especially among males aged 15–29 years.[146,147] High costs in mobile models were driven by personnel and consumables.[148–152] Delivering VMMC at scale and task shifting reduced costs in sub-Saharan African countries with high HIV prevalence, whereas hospital-based delivery, greater recruitment of older men (aged ≥30 years), and inclusion of outreach services increased costs.[148,149,153–155] VMMC was cost-effective in 68% of sub-Saharan African model settings, and cost-saving in countries such as South Africa and Malawi over a 50-year period; however, its impact could vary based on a variety of factors including HIV incidence, VMMC programme implementation, individual risk factors, and the presence of other co-interventions.[156]

STIs

The ten systematic and non-systematic reviews included, along with an earlier systematic review from 2006,[157] and an unpublished review,[158] collectively summarised 104 papers. Most reviews focused on STI screening and treatment, with few addressing prevention interventions and antimicrobial resistance. Two reviews on STI prevention noted that many HIV prevention interventions also target STIs; however, due to the greater and more widely recognised health and economic burden of HIV, the STI-related benefits of these interventions are often under-reported or overlooked in evaluations.[159,160] Integrating STI and HIV prevention interventions, especially among groups such as female sex workers,[159] could enhance the cost-effectiveness of STI control programmes by leveraging HIV prevention benefits.[160] Antimicrobial resistance considerations could substantially alter cost-effectiveness estimates and influence treatment recommendations for gonorrhoea and other STIs.[161] However, robust antimicrobial resistance costing data and a standardised methodology for economic evaluations that incorporate antimicrobial resistance effects are scarce.

STI prevention, screening, and management

A modelling study of 81 countries found that increasing male condom use was a cost-effective intervention for preventing HIV, STIs, and unintended pregnancies.[162]

Syphilis screening in pregnancy was consistently cost-effective compared with no screening,[160,163–165] and rapid point-of-care testing in the clinic was found to be more cost-effective than off-site laboratory testing, particularly in high-incidence settings with minimal laboratory access.[163,164] Additionally, a meta-regression across 128 countries ranked antenatal syphilis screening as having the lowest median ICER among interventions for HIV, malaria, and tuberculosis in 81 (63%) of these countries, with ICERs ranging from $3 (IQR $2–4) per DALY averted in Equatorial Guinea to $3473 (2244–5222) in Ukraine.[17]

The cost-effectiveness of causation versus syndromic management for other curable STIs was less substantiated in the literature. Several reviews on STI point-of-care testing highlighted prohibitive costs of the currently available instruments and assays, limiting LMIC uptake.[166–168] Experts convened during a STAR STI Clinical Trial Group programmatic meeting arrived at a consensus target price of $1 per test for low-resource settings, well below current technology costs.[167] There was little evidence of the cost-effectiveness of point-of-care causation testing versus off-site testing beyond one paper suggesting off-site testing is currently more cost-effective for curable STIs.[166]

A 2006 review estimated the median cost per treated curable STI case at $17·80 (cost from 2004).[157] An update of that review reported a lower median cost of $4·15 per diagnosed and treated curable STI case (cost from 2015).[158] Both reviews highlighted incomplete data from many studies, which might explain the variation in cost estimates. Additionally, the reviews found that the service delivery mode impacted costs, with clinics incurring lower costs than outreach services; however, cost-effectiveness would highly depend on the STI prevalence in groups targeted.

Individual studies not included in the reviews supported several findings from the reviews and provided additional insights. The cost-effectiveness of antenatal syphilis screening compared with no screening was confirmed, especially in contexts of high prevalence,[169] high incidence,[170] and strong adherence, implying low loss to follow-up and high treatment completion,[171] resulting in lower costs and ICERs. Interventions targeting key populations, such as behavioural programmes promoting safe sex among female sex workers[172] and screening for people who are incarcerated,[173] were found to be more cost-effective than current syndromic management practices. In contrast, among MSM and female sex workers in Papua New Guinea, syndromic management, condom distribution, and contact tracing were found to be more cost-effective than screening; however, costs for all interventions were below $0·50 per infection averted.[174] Additionally, among MSM in Zimbabwe, self-testing for syphilis showed lower costs per person tested compared with facility-based testing; however, no evidence was provided on acceptable price points for broader adoption.[175]

Several strategies have been identified to reduce costs per case for *Neisseria gonorrhoea* and *Chlamydia trachomatis* causation testing, including using in-house PCR testing rather than commercial tests,[176] using a pooling of samples for women,[177] performing GeneXpert testing in a centralised laboratory instead of point-of-care,[178] and targeting screening based on risk factors.[179] In Botswana, a mixed approach (ie, a hub-and-spoke approach that offers point-of-care testing at high-volume sites that act as centralised laboratory hubs for lower-volume sites [known as spokes] in their region) using GeneXpert testing among pregnant women resulted in lower costs per case averted compared with centralised or point-of-care testing and syndromic management.[180] A new rapid point-of-care genital inflammation test in women, combined with syndromic management, was the most cost-effective strategy for screening in South Africa, outperforming combinations of genital inflammation test with on-site GeneXpert or off-site PCR testing, regardless of variations in lost to follow-up rates.[181]

HPV and hepatitis B virus screening and vaccination

The cost-effectiveness of HPV vaccination and screening in LMICs were found to depend on delivery costs, number of doses, type of delivery strategy, coverage levels, and types of outcomes included—specifically whether analyses considered HPV-related cancers and genital warts. Although delivery costs varied widely, with procurement and human resources as key contributors,[182] vaccination remained highly cost-effective for young girls (typically aged 9–13 years).[183,184] In contrast, evidence on the cost-effectiveness of HPV vaccination for boys in LMICs is insufficient and inconclusive, with fewer than three studies identified across all reviews that have examined this question.[184,185] Combining vaccination with cost-effective screening methods, such as visual inspection of the cervix with acetic acid or HPV testing, offered greater impact, particularly with self-collection of samples by the patient, as an alternative to clinician-collected samples, achieving more than 50% coverage.[184,186,187] Competitive vaccine pricing and donor support are crucial for maximising cost-effectiveness in high-burden LMICs.[185]

Universal infant hepatitis B virus vaccination was cost-effective or cost-saving compared with no vaccination.[188] For adults in LMICs, screening combined with treatment, or with catch-up vaccination for younger adults, was found to be cost-effective compared with having no screening programme.[189] Antiviral therapies were highly cost-effective, and expanding treatment eligibility reduced late-stage liver disease and simplified diagnosis.[190] A reasonably priced hepatitis B virus cure could also be cost-effective, especially in LMICs.[191]

Contraception and safe abortion

Cost-effectiveness for contraception is typically measured through unintended pregnancies averted, the resulting short-term cost-savings to the health system, and longer term social and economic impacts.[8] Well-established return on investment analyses in family planning

Panel 2: Examples of integration making interventions cost-saving or more cost-effective

Health economics differentiate whether an intervention is cost-saving (ie, it reduces overall costs for the payer, be it the provider, the patient, or society) or cost-effective (ie, more costly but also more effective than what it is compared with; predefined thresholds set by local or international decision makers are then used to determine whether the additional benefit is worth the additional cost).

Integration of the following interventions was found to be cost-saving:
- Maternal and paediatric HIV care into general maternal and child health care in Kenya[67]
- HIV testing with other health services in African and Asian countries[73,75]
- HIV self-test distribution in existing primary health-care facilities in Malawi, South Africa, Zambia, and Zimbabwe[94–96]
- HIV self-test distribution with home-based testing in South Africa[93]
- Dual rapid diagnostic testing for HIV and syphilis at antenatal clinic visits in Kenya, South Africa, and Colombia[165]

Integration of the following interventions was found to be cost-effective under different thresholds:
- Maternal and paediatric HIV care into general maternal and child health care in South Africa[6]
- Sexually transmitted infection (STI) and HIV prevention,[160] especially in female sex workers,[159] in different countries
- Contraception and HIV services[193]
- Contraception and STI management in a mobile clinic in South Africa[194]
- HIV testing into HIV treatment in Zambia and South Africa[59,96] (community-based rapid HIV testing and referral to treatment at a government facility with additional support and provider-initiated testing by trained community health workers)
- HIV prevention[138]
- STI prevention[195] (integration of human papillomavirus and *Chlamydia trachomatis* prevention through condom distribution and human papillomavirus vaccination)
- Contraception and STI management into human papillomavirus services[194] (HIV counselling and testing, syndromic management of STIs with onward referral, breast examinations, provision of condoms, contraceptives, and general health education into mobile human papillomavirus screening vans)
- STI with other services in sub-Saharan Africa[187,196,197] (human papillomavirus self-sampling, cervical cancer screening, and HIV testing with family planning or antenatal clinic services)

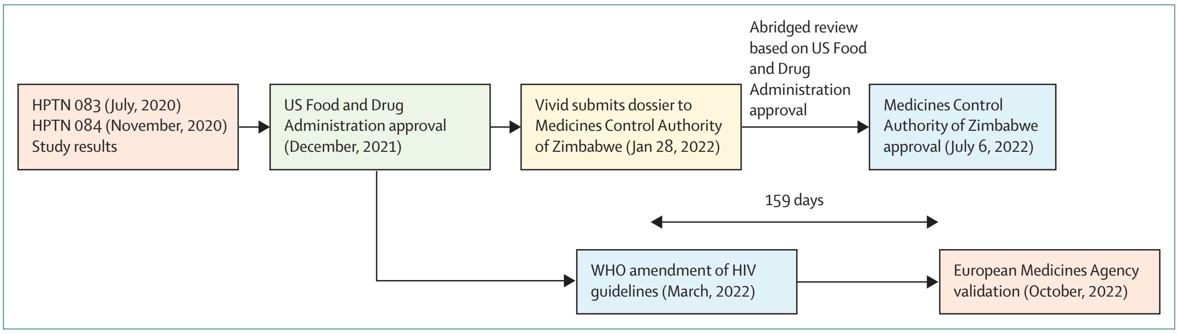

Figure 2: **Accelerated approval pathway for long-acting cabotegravir in Zimbabwe**
Reproduced from Murombedzi and colleagues.[200]

suggest that for every $1 invested in contraceptive care in LMICs, the health system saves $2·48–3·21,[12] whereas the longer term annual benefits through reduced maternal and infant mortality and economic growth have been independently estimated to be $120 per dollar spent[192] (appendix p 3). One systematic review found that it is cost-effective to scale up family planning interventions, and that cost-effectiveness was driven by increasing coverage in high HIV prevalence settings, and by improving integration with HIV services.[193]

In addition, safe abortion care is a key cost-effective investment; the scoping review on SRHR found seven country-based studies that consistently showed safe abortion was cost-effective, particularly for the use of manual vacuum aspiration and misoprostol for abortion in the first trimester.[16]

Summary of findings

Cost drivers

Our literature review identified key factors increasing intervention costs from the provider perspective (ie, cost drivers), based on the reported results of sensitivity analyses. Across interventions and contexts, the most often identified cost driver was staff time, followed by drug and laboratory monitoring costs for ART, diagnostic and supply costs (in particular the cost of HIV and STI self-test kits), and supplies and outreach activities for HIV prevention.

Factors improving cost-effectiveness

Our review identified factors that increase the cost-effectiveness of services (panel 2), including expanding the number of eligible population groups; expanding

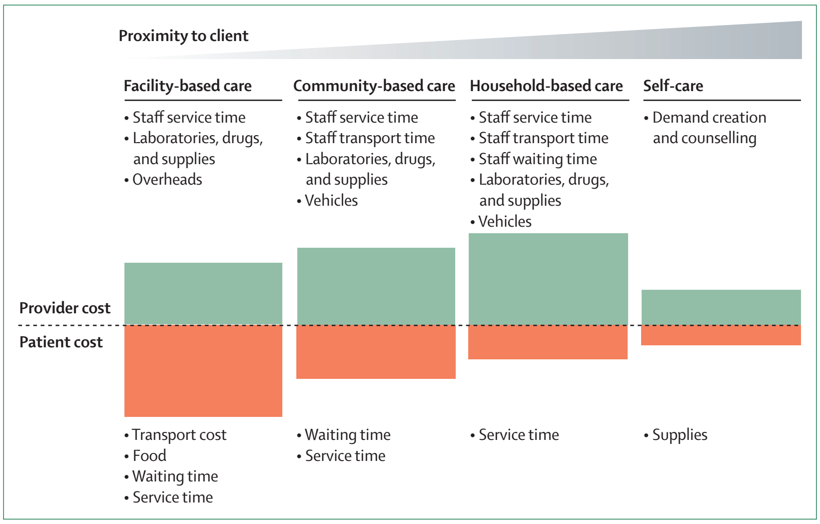

Figure 3: **Cost accruing to different payers along the care spectrum**
The size of the coloured boxes represents the tentative size of costs accruing to each payer.

***Panel 3:* The economic case for integration**

Integration of sexual and reproductive health and rights services and systems into countries' existing primary health-care platforms is often suggested as a solution to funding declines across all areas of sexual and reproductive health and rights and the ensuing need for increased country ownership and domestic funding. In economic theory, providing intervention A together with intervention B should reduce the cost of this integrated intervention AB below the combined cost of interventions A and B, owing to economies of scope (ie, fixed resources, such as staff and space, can be shared and thus reduced; figure 4A). Integration also reduces costs for patients who only have to travel once to obtain two or more services. However, knowledge gaps on the economics of integration remain. A review of the economic evidence on HIV integration found that, although integration generally led to lower unit costs and tended to be cost-effective, the pathways of integration are not well understood and are likely to be highly context-specific.[207] Case studies suggest that although integration tended to decrease indirect unit costs, there was considerable uncertainty around the effect on above-service delivery and above-facility level costs and other shared resources,[207] potentially annulling the cost-saving effects of integration (figure 4B, C). Importantly, integration of new interventions needs to be carefully monitored in order to not overwhelm existing services and health-care providers and, as a result, reduce the quality of both services. See the appendix (pp 8–9) for other aspects of integration with primary health care and universal health coverage.

coverage, uptake, and demand, including through community provision; improving retention in care[139,172,198,199] and earlier care initiation;[49,115–117] and integrated programming (panel 2). Offering services in high-prevalence settings also generally results in improved cost-effectiveness.

Key recommendations for future SRHR policy, funding, and markets

Policy and regulation imperatives

The provision of cost-effective interventions requires a stable and committed policy environment allowing for flexible, rapid regulatory approvals of novel products and interventions. Both the COVID-19 pandemic (in regard to fast-tracking approvals of products, such as vaccines and novel drugs) and the accelerated approval for injectable long-acting cabotegravir for PrEP can serve as lessons learned. In 2022, Zimbabwe became the first African country to approve long-acting cabotegravir, as its Medicines Control Authority was able to register it within 159 days instead of its median time of 1673 days (figure 2).[200] The following factors and those in the appendix (p 7) are imperative for rapid regulatory approval: first, shorten timelines to regulatory approval, guideline development, and implementation to allow rapid enough scale-up for prevention products to yield the cost-effectiveness estimated in the studies presented here. Second, close all policy gaps. Expanding contraceptive and abortion care in particular requires addressing gaps in financing and policy that restrict access to crucial services, such as safe abortion care and access for marginalised populations, including adolescents. Third, coordinate approval regionally. Policy makers in high HIV prevalence settings should enable in-country or coordinated regional regulatory approval to be sought as soon as trial results are finalised, and health technology assessment, budgeting, tendering, and supply-chain management processes should be prepared alongside and initiated immediately after approval.[201,202]

Programming imperatives

The cost-effectiveness of interventions centrally depends on sufficient uptake and demand, calling for health systems and programmes that are nimbler and more responsive to users' needs than what is currently the case. Several aspects will need to be implemented (appendix p 7). First, deliver services outside of facilities. Our literature review suggests that most HIV, STI, contraceptive, and abortion interventions can be safely and effectively delivered by lower-level cadres in health facilities or in the community, through community health-care workers, mobile outreach, or in community pharmacies, potentially improving health outcomes and cost-effectiveness.[142] Second, foster user engagement in self-care. Self-care allows further decentralisation and democratisation of health, for example through provision of self-testing and health education via mobile phones.[203] New SRHR self-care technologies include HIV self-testing, STI self-swabbing, self-injectable contraceptives (see the second paper[204] in this Series), and self-managed abortion.[205] Although this self-care can reduce transportation costs and other barriers, some new costs, such as those of supplies or internet connectivity, will now accrue to the patient as will the costs of linkage to care and potential onward treatment for those with positive results. (figure 3). Third, build prevention systems, not single interventions. The future product landscape will increasingly change to one of several available options, allowing for a degree of user choice. Health systems, and economic analyses, need to consider complex dynamic prevention systems, taking into account baskets of interventions and switching between technologies according to individuals' evolving needs, preferences, and risk, if funding allows.[206] Fourth, create demand for a plethora of options. Prevention systems allow patients to choose from a wide selection of HIV prevention options. These systems would require tailored messaging and demand creation for the pipeline overall instead of for individual products, allowing users to immediately switch to new options as they enter individual countries' markets. Fifth, integrate programmes. Although integrating SRHR interventions into other programmes might reduce provider costs (panel 3), other important benefits, including those to individual health and health systems outcomes, have been systematically documented.[208] Demand and ease of access will be served by integrating SRHR interventions with each other, but also with services such as maternal and child health.

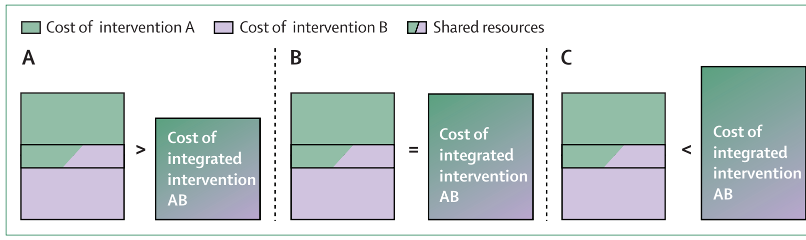

Figure 4: **Potential economies of scope in integration**
Current evidence (panel 2) suggests that although integration might reduce costs below the sum of the cost of the individual services, due to the sharing of fixed resources (A), the cost of the combined service might also stay the same (B) or increase (C), especially once above-facility costs are included.

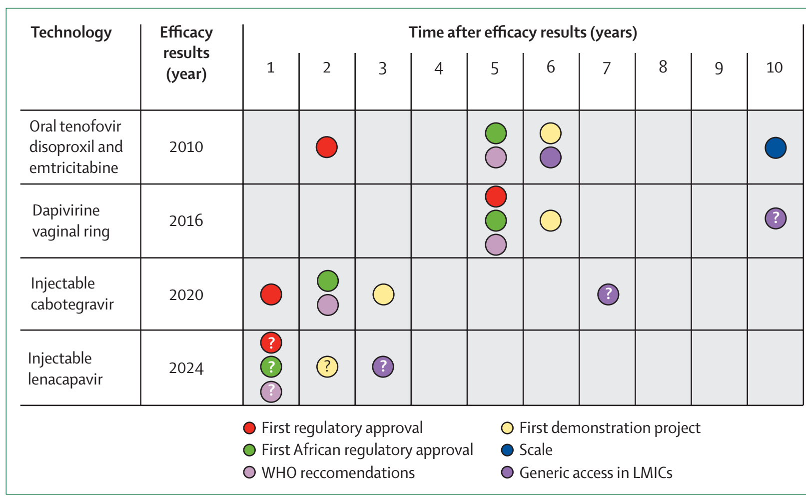

Figure 5: **Accelerating product introduction for HIV prevention**
Reproduced from AVAC.[202] Question marks denote the timing of anticipated but still uncertain milestones. LMICs=low-income and middle-income countries.

Market imperatives: how to shape markets for SRHR services

If cost-effective interventions are to be delivered at scale, a number of market factors will need to be aligned with this goal. Market factors, such as generic and local manufacturing and voluntary licences, can be brought to bear towards that goal across the following intervention areas: first, STI services. Currently, demand for services, diagnostics, and treatments for STIs outstrips production by far. Shortages of antimicrobials for STI treatment are increasing worldwide due to manufacturing challenges, quality control issues, and market pressures, all of which negatively impact patient outcomes and escalate health-care costs.[209] Given the global STI burden, large-scale manufacturing offers the potential for economies of scale to reduce unit costs, and targeting interventions alleviates short-term production constraints. Other potential solutions include onshoring production, building strategic stockpiles, and offering incentives to manufacturers to secure a stable supply of essential antimicrobials, and voluntary licensing agreements, in particular between patent holders of STI diagnostics and local manufacturers.[168,210] Second, contraceptive care. The UN Population Fund Supplies Match Fund for contraceptive supplies launched by the UN Population Fund Supplies Partnership allows the UN Population Fund to match domestic contributions to quality-assured commodity procurement. A total of 44 countries have signed on, and 15 have thus far contributed at a level where they could access the match fund, unlocking an additional \$10·5 million across the 15 countries.[211] Third, HIV care. Both WHO guidelines and national regulatory approvals happened far more quickly with long-acting cabotegravir than with oral PrEP (figure 5). However, minimal supplies from the originator company, delays in voluntary licences for generic manufacturers, and the focus on small-scale implementation studies (to the detriment of large-scale roll-out) have reduced the likelihood of an injectable PrEP option making an impact on public health.[212] Injectable lenacapavir, which is as effective as long-acting cabotegravir, but requires an injection only every 6 months as opposed to every 2 months,[213,214] demands even greater speed, scale, and equity in planning for its introduction. This initiation can only happen with strategic actions coordinated among all stakeholders.[202]

Conclusions

In the context of constrained funding for HIV and STI care, contraception implementation, and abortion care, it is imperative to implement and scale up cost-effective approaches to service delivery, including integrated delivery, task-sharing, and self-care interventions. Under reduced funding, prioritising health in domestic budgets and political leadership is essential, alongside inter-sectoral and intra-sectoral collaboration. Past evidence has shown that SRHR services are among the most cost-effective services in global health, and that efficiency has increased over the past decades; however, additional funding from outside donors will continue to be needed.[215] As resource constraints increase, the global community will need to ensure that it does not lose hard-won ground towards improving health, safeguarding human rights, and controlling the spread of infectious diseases. Defunding services now merely moves funding needs into the future, and increases the amount required eventually—all while the number of deaths and suffering are likely to increase sharply.

Contributors

GM-R and LJ wrote the first draft of the manuscript. LJ, KSn, EM, and EAS conducted the literature review and summarised its results. JJO, JC, MW, VW, and KSt added sections on aspects of the funding landscape and key recommendations. JH substantially edited the manuscript and assisted with figure development. All authors reviewed several versions of the manuscript and suggested additional literature where relevant.

Declaration of interests

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