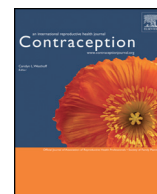




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Is contraceptive self-injection cost-effective compared to contraceptive injections from facility-based health workers? Evidence from Uganda ☆☆☆

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ABSTRACT

Objective: To assess the cost-effectiveness of self-injected subcutaneous depot medroxyprogesterone acetate (DMPA-SC) compared to health-worker-administered intramuscular DMPA (DMPA-IM) in Uganda.

Study design: We developed a decision-tree model with a 12-month time horizon for a hypothetical cohort of approximately 1 million injectable contraceptive users in Uganda to estimate the incremental costs per pregnancy averted and per disability-adjusted life year (DALY) averted. The study design derived model inputs from DMPA-SC self-injection continuation and costing research studies and peer-reviewed literature. We calculated incremental cost-effectiveness ratios from societal and health system perspectives and conducted one-way and probabilistic sensitivity analyses to test the robustness of results.

Results: Self-injected DMPA-SC could prevent 10,827 additional unintended pregnancies and 1620 maternal DALYs per year for this hypothetical cohort compared to DMPA-IM administered by facility-based health workers. Due to savings in women's time and travel costs, under a societal perspective, self-injection could save approximately US\$1 million or \$84,000 per year, depending on the self-injection training aid used. From a health system perspective, self-injection would avert more pregnancies but incur additional costs. A training approach using a one-page client instruction sheet would make self-injection cost-effective compared to DMPA-IM, with incremental costs per pregnancy averted of \$15 and per maternal DALY averted of \$98. Sensitivity analysis showed that the estimates were robust. The one-way and probabilistic sensitivity analyses showed that the costs of the first visit for self-injection (which include training costs) were an important variable impacting the cost-effectiveness estimates.

Conclusions: Under a societal perspective, self-injected DMPA-SC averted more pregnancies and cost less compared to health-worker-administered DMPA-IM. Under a health system perspective, self-injected DMPA-SC can be cost-effective relative to DMPA-IM when a lower-cost visual aid for client training is used.

Implications: Self-injection has economic benefits for women through savings in time and travel costs, and it averts additional pregnancies and maternal disability-adjusted life years compared to health-worker-administered injectable DMPA-IM. Implementing lower-cost approaches to client training can help ensure that self-injection is also cost-effective from a health system perspective.

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1. Introduction

Investments in satisfying unmet need for contraception—thereby preventing unintended pregnancies, unplanned births and induced abortions—reduce maternal morbidity and mortality. Investing in contraceptive services in addition to maternal and newborn services in low- and middle-income countries could save nearly US\$7 billion compared with investing in maternal and newborn services alone [1].

Previous analyses have shown that any modern contraceptive is cost-saving compared to no contraception [2–4]. However, the

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literature on the relative cost-effectiveness of different modern contraceptive methods in low-resource settings is less conclusive. Most analyses have been conducted in high-income countries [2–9], while evidence from developing countries remains scarce [10,11]. Not surprisingly, perhaps, most analyses indicate that sterilization and long-acting reversible contraceptive methods (e.g., copper T intrauterine device, intrauterine system, contraceptive implant) are the most cost-effective family planning alternatives [12]; however, these are not always women's preferred methods [10,11], and they depend on availability of skilled health workers, which can be limited in low-resource settings.

Among women using contraception in Uganda, where overall unmet need remains high, the most common method is the injectable [13]. Subcutaneous depot medroxyprogesterone acetate (DMPA-SC) is a novel injectable contraceptive that can be self-administered by women after training with a health worker [14]. Self-injection eliminates the need for quarterly visits to the clinic, which has the potential to reduce a common reason for discontinuation of injectables: being late for injection [15]. Previous studies demonstrate that self-injection with DMPA-SC is feasible and highly acceptable [16,17]. In addition, newly published research in Uganda, Malawi, and the United States demonstrates that women who self-injected DMPA-SC had higher 12-month continuation rates than women who received DMPA from health workers [18–20]. However, the cost-effectiveness of self-injection compared to health-worker-administered injections has not been evaluated. This study aims to fill this research gap by exploring cost-effectiveness of self-injected DMPA-SC compared to health-worker-administered DMPA-IM in Uganda.

The Uganda continuation study referenced above [18] provided a unique opportunity to assess the cost-effectiveness of self-injection. The study used a prospective cohort design, where women self-injecting DMPA-SC and women receiving DMPA-IM from a facility-based health worker were interviewed and followed every 3 months to estimate continuation rates at 12 months (81% among self-injectors and 65% among DMPA-IM users). We conducted the continuation study alongside a costing study that collected primary costing data to estimate the health system costs of delivering the injectables [21]. Study staff obtained data on women's time and travel costs from interviews with the women included in the continuation studies.

Information on the economic costs and corresponding benefits of various contraceptive options and delivery strategies can help decision-makers, implementers, civil society groups and advocates make evidence-based decisions about family planning policy and programs. The objective of this study was to assess the cost-effectiveness of self-injected DMPA-SC compared to health-worker-administered DMPA-IM and provide evidence on whether the benefits of self-injection (as demonstrated by longer continuation rates and hence fewer unintended pregnancies) are worth any additional costs compared to health-worker-administered DMPA-IM in Uganda.

2. Methods

2.1. Comparison of DMPA delivery strategies

We compared self-injection of DMPA-SC (delivered within the context of the research study conducted in Uganda [18]) to facility-based health worker administration of DMPA-IM. Under the research study, women opting to receive an injectable contraceptive at a health facility chose to either self-inject DMPA-SC or receive DMPA-IM from a facility-based health worker. Women who chose DMPA-IM had the injection administered by the health worker, and study staff asked them to return to the facility every 3 months for their next injection. Study nurses used water-filled devices to train clients who chose self-injection and gave each woman a calendar to assist with reinjection dates and an instruction booklet as a client training aid. Clients self-injected for the first time at the health facility under the supervision of the health worker. Those deemed proficient took three doses home for independent self-

injection and were advised to dispose of used injection devices in a latrine. Researchers followed up with clients to measure continuation rates (the measure of "effectiveness" employed in the cost-effectiveness analysis) at 12 months (after four injections) for the two delivery strategies.

To adapt the research intervention to better reflect the current standard of practice for self-injection in Uganda, we substituted the training booklet for a one-page instruction sheet and considered that women were given a disposal container for storing used injection units until they could be returned to a health facility or health worker. The one-page (two-sided) instruction sheet currently used in programmatic implementation contains the same information as the booklet used in the research study. We assumed that staff provided the impermeable, low-cost disposal containers for storing used injection units free of charge to women. The cost analysis reflects the implications of both adaptations (i.e., reduced cost for the client training aid and small additive cost for the impermeable containers); we did not expect either adaptation to change women's ability to self-inject correctly or impact continuation.

2.2. Overview of the cost-effectiveness model

We used a decision-tree model to evaluate the outcomes of continuation and discontinuation of either DMPA-SC or DMPA-IM (Fig. 1) for a hypothetical cohort of approximately 1 million Ugandan women using injectable contraceptives. The cohort size reflects the estimated number of women of reproductive age in Uganda who used injectable contraceptives in 2015 [22,23]. We then allocated this number equally between self-injection of DMPA-SC and receipt of DMPA-IM from a health worker. As described in Fig. 1, after self-injecting DMPA-SC or receiving DMPA-IM from a health worker, each woman could choose to either continue using the injectable or discontinue. Women who continue or discontinue would then either become pregnant or not. Each pregnancy would result in a delivery or pregnancy termination (miscarriage or abortion). We modeled a 1-year time horizon to reflect the injectable continuation duration used in the study and assumed that any woman who discontinued the method did so at 6 months. In the event of discontinuation, we assumed that women discontinued using contraception altogether or switched to another contraceptive method (modern or traditional) or no method. We used the average contraceptive method (ACM) approach to model the effectiveness and the costs of the method to which they switched [7]. The ACM approach weighted the average contraceptive costs and effectiveness according to each injectable group's switching behavior. The proportions of women switching to each contraceptive method or no method differed by injectable group, and we based these on data from the self-injection research study [18]. Women who discontinued self-injection could also choose to receive DMPA-SC injections from a health worker. We based the costs of these DMPA-SC injections on the costs of DMPA-IM administered at health facilities, adjusted for the slightly higher commodity price of DMPA-SC.

2.3. Model data inputs

We ran the analysis from both the health system and societal perspectives. The health system perspective accounted for the direct costs of providing injectable contraceptives: for contraceptive commodities, health worker time for service delivery, supplies and tests, drugs used to treat side effects and health facility waste disposal. We derived data on the costs of contraceptive service delivery from a microcosting study (Table 1) [21]. We included additional costs for self-injection training supplies and health worker time to provide training for DMPA-SC users. Under a societal perspective, we added women's travel and time costs to receive contraception (DMPA-SC, DMPA-IM or the contraceptives to which they switched in the case of injectable discontinuation) (Table 1). Since the analysis had a 1-year time horizon,

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