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Cost-effectiveness analysis of an intimate partner violence prevention intervention targeting men, women and couples in rural Ethiopia: Evidence from Unite for a Better Life

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Abstract

Objectives: Experience of intimate partner violence (IPV) is associated with adverse health and psychosocial outcomes for women. However, rigorous economic evaluations of interventions targeting the prevention of IPV are rare. The objective of this paper is to analyze the cost-effectiveness of Unite for a Better Life (UBL), a gender-transformative, participatory intervention designed to prevent IPV and HIV risk behaviors among men, women and couples.

Design: We utilize an economic evaluation nested within a large-scale cluster randomized controlled trial, analyzing financial and economic costs tracked contemporaneously. A range of sensitivity analyses are also conducted.

Setting: Unite for a Better Life was implemented in rural southern Ethiopia between 2013 and 2015.

Participants: The randomized controlled trial included 6,770 households in 64 villages.

Interventions: Unite for a Better Life is an intervention delivered within the context of the Ethiopian coffee ceremony, a culturally established forum for community discussion, and designed to assist participants to build skills for healthy, non-violent, equitable relationships.

Primary and secondary outcome measures: This paper reports on the unit cost and cost-effectiveness of the interventions implemented.

Results: The estimated annualized cost of developing and implementing Unite for a Better Life was 2015 US$296,772, or approximately 2015 US$74 per individual directly participating in the intervention and 2015 US$5 per person annually for each community-level beneficiary (woman of reproductive age in intervention communities). The estimated cost per case of past-year physical and/or sexual intimate partner violence averted was 2015 US$2726 for the sample of direct beneficiaries, and 2015 US$194 for the sample of all community-level beneficiaries.

Conclusions: Unite for a Better Life is an effective and cost-effective intervention for the prevention of IPV in a developing country setting. Further research should explore strategies to quantify the positive effects of the intervention across a range of other domains.

Trial registration: The trial was registered at Clinicaltrials.gov (NCT02311699).

Article summary: Strengths and limitations of this study

-Intimate partner violence has serious health consequences for women experiencing violence as well as for their families and communities.

-An increasing body of literature suggests that strategies targeting community-based norms transformation can be effective in preventing IPV, but less is known about the cost-effectiveness of these strategies.

-Unite for a Better Life effectively reduces intimate partner violence among both direct and indirect beneficiaries, and the cost per case of intimate partner violence averted compares favorably to cost estimates drawn from existing interventions.

-A key strength of this study is that it draws on high-quality, contemporaneously collected cost and outcome data from a large-scale randomized controlled trial, and thus generates accurate cost-effectiveness estimates that are relatively robust to different costing assumptions.

-However, one important limitation is that cost-effectiveness can be evaluated only with respect to cases of IPV averted, not with respect to other outcomes.

Introduction

Globally, 30% of women experience physical and/or sexual violence by an intimate partner (IPV) in their lifetime.[1] IPV has both immediate and long-term adverse health and social consequences for women and their families.[2-6] Physical effects of IPV include traumatic injuries, chronic illness, and death, and adverse mental health effects include depression and suicide.[1-4] In addition, intimate partner violence has substantial economic costs.[7,8] Evidence suggests rates of IPV are particularly high in sub-Saharan Africa; in Ethiopia, the site of this study, over 70% of women reported lifetime physical/and or sexual IPV in the 2005 WHO Multi-country Study on Women's Health and Domestic Violence.[9]

A growing literature has explored the effectiveness of interventions designed to prevent and reduce IPV in low-income contexts, and thus the body of evidence about useful IPV prevention strategies has expanded.[10—17] However, from a policymaking perspective, identifying viable IPV interventions requires additional data on the relative cost-effectiveness of different programs.[18] To date, only two papers have published estimates of the cost-effectiveness of IPV prevention interventions in developing countries, implemented in Uganda and South Africa.[19,20] One recent paper published an estimate of unit costs of pilot interventions targeting violence against women and girls in six countries (Ghana, Kenya, Pakistan, Rwanda, South Africa and Zambia).[21]

Unite for a Better Life (UBL) is a gender-transformative, participatory intervention delivered to men, women and couples in Ethiopia in the context of the coffee ceremony, a traditional forum for community-based discussion. The program aims to reduce physical and sexual IPV and HIV risk behaviours as well as promote healthier, more equitable relationships. UBL was evaluated in a large scale cluster randomized controlled trial conducted in the Gurague zone in southern Ethiopia between 2013 and 2018.

In this paper, we present a cost and cost-effectiveness analysis of UBL. Previous evidence suggests the intervention when delivered to men was effective in reducing women's reported past-year experience of physical and/or sexual IPV and men's reported past-year perpetration of physical and/or sexual IPV, in addition to promoting equitable gender norms and reducing HIV risk behaviors when delivered to men and couples (Sharma et al., manuscript). This paper reports on the overall cost of the program, and its cost-effectiveness relative to the number of direct beneficiaries, the number of community-level beneficiaries, and the cases of past-year physical and/or sexual IPV averted.

Methods

Intervention

Unite for a Better Life is a gender-transformative intervention delivered within the context of the Ethiopian coffee ceremony, a culturally established forum for community discussion. Curricula designed

for women, men and couples were developed by EngenderHealth in collaboration with researchers and program developers from Addis Ababa University (AAU), the Ethiopian Public Health Association (EPHA), and other partner institutions; AAU and EPHA managed the implementation of the intervention. Each curriculum includes 14 participatory sessions (total 38 hours) led by one trained, same-sex facilitator for men's and women's UBL groups, and one female and one male facilitator for couples' UBL groups. The objective of the intervention is to assist participants to identify and transform power imbalances within their relationships and to build skills for healthy, non-violent, equitable relationships.

UBL was delivered in biweekly sessions including approximately 20 individuals per group. Each session included a coffee ceremony, discussion and interactive activities focused on gender norms, sexuality, communication and conflict resolution, HIV/AIDS, and IPV.

Male and female facilitators (48 in total) were recruited from the evaluation districts (Meskan, Mareko, Silte and Sodo districts in the Gurague zone of the Southern Nations, Nationalities and People's Region) and trained in two phases. During the pilot phase of intervention development, the facilitators participated in the full set of intervention sessions as led by master trainers in order to observe high-quality facilitation in practice, and reflect on their own perspective on gender, sexuality and IPV. This was followed by a 10-day training in facilitation skills. The intervention was then implemented in two phases between March and October 2015.

Randomized controlled trial

The UBL intervention was evaluated in a four-arm, cluster-randomised controlled trial (cRCT) conducted between December 2014 and March 2018. The UBL trial was implemented by the Abdul Latif Jameel Poverty Action Lab (J-PAL) at the Massachusetts Institute of Technology (MIT), in partnership with the Addis Ababa University (AAU) School of Public Health, the Ethiopian Public Health Association (EPHA), and EngenderHealth. Ethical approval was obtained from the Committee on the Use of Humans as Experimental Subjects (COUHES) at MIT (protocol number 1211005333) and from the Institutional Review Board at the AAU College of Health Sciences (protocol number 044/12/SPH), and verbal informed consent was obtained from all respondents. The trial was prospectively registered on clinicaltrials.gov (NCT02311699), and at the American Economic Association (AAE) registry (AEARCTR-0000211).

As the intervention was designed for groups of individuals, a cluster design was employed. Sixty-four villages (kebeles) in the evaluation districts were randomly selected for inclusion from the sampling frame of all villages within these districts, and were randomly assigned to one of the four study arms (women's UBL, men's UBL, couples' UBL, and control).

In addition, a second individual-level randomisation was conducted. In each village within the three treatment arms, 80% of individuals enrolled in the trial were randomly sampled to participate in UBL. The remaining 20% were included in baseline and endline data collection only in order to assess intervention spillover effects. Data were collected from enrolled individuals at baseline and from enrolled individuals and their spouses at endline, approximately 24 months post-intervention.

Study findings suggest that the UBL intervention, when delivered to men, significantly reduced women's experience of past-year physical and/or sexual IPV as well as male perpetration of physical and/or sexual

IPV at approximately 24 months follow-up. When UBL was delivered to couples, there was a reduction in experience of IPV that was not statistically significant at conventional levels; there was no observed reduction in IPV when UBL was delivered to women (Sharma et al., manuscript).

In addition, a separate analysis examined the diffusion of the intervention effects to the 20% of individuals enrolled in the trial who were not invited to participate in the intervention (Leight et al., manuscript). Evidence suggests that women in the intervention communities who were not sampled for participation in the intervention reported a decline in experience of past-year IPV of comparable magnitude to that reported for intervention participants. In fact, the hypothesis that the direct and indirect effects are identical cannot be rejected. Accordingly, we interpret the experimental effects as consistent in magnitude for all women in intervention communities.

Patient and public involvement

Implementation of the randomized controlled trial was guided and supported by a community advisory board constituted by local and national stakeholders and policymakers, including representatives of women's groups who work with women experiencing intimate partner violence. The community advisory board met regularly for the duration of the study to provide feedback on the design, the intervention, and the local context. Findings were also presented first to the board in order to enable their feedback on dissemination.

Measuring costs

In order to analyze the intervention's cost-effectiveness, we estimated all costs corresponding to the development and implementation of Unite for a Better Life between 2013 and 2015. Development and piloting was conducted in 2013 and 2014; training and program implementation was conducted in 2015.

For this analysis, we adapted a provider perspective including both financial and economic costs, but excluding the costs associated with participants' attendance. All costs were considered in the year in which they were incurred. The methodology described here draws substantially on existing guidelines for cost-analyses of interventions to prevent violence against women in low-income settings.[22]

All costs are reported in 2015 U.S. dollars. During the project, some costs (personnel for intervention development and travel) were incurred in dollars; these costs are simply converted to 2015 U.S. dollars using inflation rates reported by the World Bank. Costs associated with field implementation were incurred in Ethiopian birr, but expenditure was tracked quarterly by the lead institution (the Abdul Latif Jameel Poverty Action Lab; J-PAL) in dollars, using the exchange rate at the conclusion of each quarter. We use the dollar estimates of these costs, calculated at the point at which these expenses were paid by the lead institution, and again convert to 2015 U.S. dollars.

The costs of intervention development include personnel costs for curriculum development, travel costs associated with curriculum development and piloting, and field piloting. This development cost was treated as an initial investment with long-term returns beyond the scope of this evaluation, consistent with the strategy employed by previous cost-effectiveness analysis of IPV programs.[19,20] Accordingly, the total cost of intervention development was treated as a single capital item, annualized over ten years using a 3% discount rate.

The costs of training facilitators was similarly treated as an investment with medium-term returns; in a context in which UBL was implemented consistently and/or on a large scale, training would be periodic. Accordingly, training cost was again treated as a single capital item, annualized over five years using a 3% discount rate. This strategy is again consistent with previous cost-effectiveness analysis in the IPV literature.[19,20]

Implementation costs for the intervention include only recurrent costs: staff salaries, staff transport (to intervention sites), and materials (coffee ceremony materials, and in-kind incentives for participants). No capital costs were incurred during intervention implementation. Transportation was rented, and the cost of a rented office site is included in the transportation sub-budget.

The intervention sessions themselves were conducted in public spaces in the intervention communities: this included outdoor public spaces and school classrooms. We do not estimate the cost of this space for two reasons. First, it is not obvious what the shadow cost is of a public outdoor space or a school classroom; these spaces are more plausibly considered to be public goods. Second, in no case did the intervention use a space that would be available for rent or purchase, or that is plausibly comparable to another space available for rent or purchase.

In addition, all research costs associated with the randomized controlled trial were excluded from this analysis. However, the principal investigators and research support staff did provide additional monitoring and support for the program's implementation; accordingly, part of the cost of this investigator and staff time is included in the estimate of the program's cost. Implementation was spearheaded by a separate intervention team whose salaries are fully included in the estimated cost of program implementation.

Given that the evaluation included three treatment arms, it may also be informative to examine cost-effectiveness for specific arms. In particular, we focus on the estimated cost-effectiveness for the men's arm, given that the primary results suggest that the reduction in IPV was largest in this arm. In order to estimate the cost of the men's arm only, operational costs such as staff, transportation, and materials can be directly attributed to this specific set of activities. However, indivisible costs (intervention development and training costs) were not assigned or billed to specific intervention arms, and the literature in this case does not provide any clear guidance as to what share of aggregate intervention expenses should be assigned to a specific arm. We estimate that the indivisible costs corresponding to the men's arm are 66% of total costs in these categories (calculating that half of the total costs correspond to joint investment in the intervention as a whole, and half of the total costs are divided across the three intervention arms equally).

Outcomes

Unit cost estimates include the cost per individual invited to the intervention; the cost per individual in intervention communities; and the cost per case of physical and/or sexual IPV averted.

In order to conceptualize the target sample for the intervention, it is important to note that the intervention was delivered to both men and women in married couples in which the age of the wife is between 18 and 49. However, the target beneficiaries of the intervention were women: this includes women who were directly included in the intervention (in the couples' and women's arms), women who

are spouses of men who were directly included in the intervention (in the men's arm), and women in intervention communities who benefited from indirect (spillover) effects (in all three intervention arms).

We calculate the sample of beneficiaries using two different methodologies. First, we analyze the sample of direct and household-level beneficiaries: women who were included in the intervention, or the spouses of men who were included in the intervention. This sample was pre-specified by the research team. Second, given the evidence previously cited that the intervention effects are of comparable magnitude for indirect beneficiaries resident in the intervention communities, we also examine effects on the sample of community-level beneficiaries, defined to encompass all women of reproductive age (between the ages of 18 and 49) in the intervention communities. This is a measure that has also been employed in recent literature.[19]

Detailed census data is not available in this context. Accordingly, to calculate the number of community-level beneficiaries, we use population estimates of 5900 individuals per kebele in the region encompassing the study site, the Southern Nations, Nationalities, and Peoples' Region,[23] and calculate based on nationwide demographic estimates that 20% of the population should correspond to women between the ages of 18 and 49, yielding a sample of 1180 women of reproductive age per kebele.[24]

In order to calculate the number of averted cases of past-year physical and/or sexual IPV, we utilize data collected at endline reporting past-year experience of physical and/or sexual IPV. The adjusted risk difference in prevalence of past-year physical and/or sexual IPV between communities in each intervention arm (couples, women's and men's) and control communities is used to estimate the additional number of cases of IPV that would have been observed in the absence of the intervention in the specified arm. The estimated number of averted cases can then be extrapolated to broader populations of interest. We use the estimated risk differences calculated in the full sample (including households who were included in the evaluation, but not invited to participate in the intervention).

More specifically, we employ the following formula, in which the adjusted difference in risk between treatment and control communities is multiplied by the population.[19] Given that the observed intervention effects are estimated separately for each treatment arm, we estimate the number of cases averted separately in each arm and calculate the sum; here, the subscript m denotes the men's arm, and the subscript cp denotes the couples' arm. The subscript c denotes the control arm. No reduction in IPV was observed in the women's experimental arm, and accordingly this arm is excluded from the calculation of cases averted.

Cases averted = (RIPV_m – RIPV_c) * Pop + (RIPV_cp – RIPV_c) * Pop

The estimated number of cases averted is similarly calculated for both the target sample of direct beneficiaries, and the larger sample of community-level beneficiaries.

Cost effectiveness

We assess the cost effectiveness of the UBL intervention by comparing it to the status quo, represented in this case by the costs and outcomes observed in the control communities. The cost effectiveness ratio (CER) is then calculated as the ratio of total cost to cases of IPV averted.

Sensitivity analysis

Sensitivity analysis was conducted with respect to the following parameters. First, we utilize alternate discount factors of 0% and 6%. Second, we adjust the useful life of the investment in materials development and training, assuming that the useful life of both investments is ten years, and alternately that the useful life of both investments is five years. Third, we calculate the estimated number of cases averted using the parameters estimated for the reduction in male perpetration of IPV, rather than the reduction in female experience of IPV. Fourth, we estimate cost effectiveness of the male arm only employing alternate assumptions for the cost of implementing one arm alone, relative to the cost of implementing the full project. In the low scenario, we assume that the cost of intervention development is only 50% of total development costs, and maintain implementation costs consistent with the original estimate; in the high scenario, we maintain development costs consistent with the original estimate, and assume implementation costs for the men's arm alone constitute 35% of total implementation costs.

Results

UBL intervention cost: Development and implementation

The total estimated cost of the development of the UBL intervention (including drafting and refining the curriculum as well as piloting) is 2015 US$226,035 (see Table 1). For concision, all costs reported will be rounded to the nearest dollar. This cost category can be subdivided as follows: 66% staff, 12% travel, 10% field pilot, and 12% administrative costs. The total estimated cost of intervention implementation is 2015 US$297,442. This cost category can be subdivided as follows: 12% training, 46% salaries, 23% transport, 10% materials, 1% travel, and 8% administrative costs.

Total cost of UBL development (2015 U.S. dollars)			
Cost category	Amount	Share of total	One year of implementation
Staff	148697	0.66	
Travel	27485	0.12	
Pilot	21712	0.10	
Administrative	28141	0.12	
Total	226035		
Total (one year)			26499
Total cost of UBL implementation (2015 U.S. dollars)			
Training	34758	0.12	
Training cost (one year)			7589
Staff	137705	0.46	
Transport	69467	0.23	

Materials	28632	0.10	
Travel	3000	0.01	
Administrative	23880	0.08	
Total implementation and training cost	297442		
Total implementation and training cost (one year)			270273
Total intervention cost (one year)			296772
Total intervention cost (men's arm only, one year)			88396

Table 1: Total cost of Unite for a Better Life

The intervention was fully implemented in a single year (2015). In order to generate an estimate of the costs of one year's implementation, the costs of intervention development and training are amortized over ten and five years, respectively, following the previous literature. This allows us to generate the estimates of one year of intervention implementation, reported in the final column of Table 1. The total cost of one year of implementation of UBL is 2015 US$296,772; this is the cost estimate that we employ in analyzing cost-effectiveness. The estimated cost of one year of implementation for the men's arm only is 2015 US$88,396.

Cost effectiveness

We analyze the unit cost of UBL for two specified target samples (direct and household-level beneficiaries and community-level beneficiaries), and the cost-effectiveness of UBL with respect to the number of past-year physical and/or sexual IPV cases averted in each sample. The sample of direct and household-level beneficiaries includes 80 women in each of 48 intervention kebeles, yielding a sample of 3840 women. The sample of community-level beneficiaries includes all women in the target age range (18—49) in intervention communities; this is an estimated 1180 women per kebele for a total sample of 56,640 women. Using these estimates, we calculate the (annualized) cost of the intervention for each household-level beneficiary woman is 2015 US$74, and the cost per community-level beneficiary is 2015 US$5, as reported in Table 2.

Unit cost	
Per direct or household-level beneficiary	74
Per community-level beneficiary	5.2
Per case of past year physical and/or IPV averted among direct beneficiaries	2726
Per case of past year physical and/or IPV averted among community beneficiaries	194
Unit costs: Men's arm only	
Per direct or household-level beneficiary	66
Per community-level beneficiary	5
Per case of past year physical and/or IPV averted among direct beneficiaries	1430
Per case of past year physical and/or IPV averted among community beneficiaries	102
Unit costs: Implementation only	
Per direct or household-level beneficiary	67
Per community-level beneficiary	5

Per case of past year physical and/or IPV averted among direct beneficiaries	2483
Per case of past year physical and/or IPV averted among community beneficiaries	177
Unit costs: Implementation only, Men's arm only	
Per direct or household-level beneficiary	53
Per community-level beneficiary	4
Per case of past year physical and/or IPV averted among direct beneficiaries	1144
Per case of past year physical and/or IPV averted among community beneficiaries	81

Table 2: Unit cost and cost-effectiveness of UBL development and implementation, 2015 US$

The estimated number of cases of past-year IPV averted due to the intervention is 109 for the sample of direct beneficiaries, and 1529 for the sample of all women in intervention communities. The risk difference is estimated to be a reduction of 4.5 percentage points in the men's UBL arm, and a reduction of 3.6 percentage points in the couples' arm, relative to a mean in the control arm of 43%. Accordingly, the estimated cost per case of IPV averted is 2015 US$2726 for the sample of direct beneficiaries, and 2015 US$194 for the sample of community-level beneficiaries.

We also conduct a comparable analysis for the men's arm only. It is useful to note that in terms of field implementation costs (facilitator staff time and travel, and materials for participants), the couples' intervention incurred twice the cost of the men's or the women's arm, as it had double the number of participants. Accordingly, the direct implementation costs estimated for the men's arm correspond to only a quarter of the total estimated direct implementation costs. As previously noted, 66% of indivisible costs intervention development and training are attributed to the men's arm.

The estimated annualized cost of developing and implementing the men's intervention arm only is 2015 US$88,396. The estimated cost per household-level beneficiary is 2015 US$66, and the estimated cost per community-level beneficiary is 2015 US$5. The estimated cost per case of past-year IPV averted in the sample of direct beneficiaries is 2015 US$1430, and the estimated cost per case of past-year IPV averted in the sample of community-level beneficiaries is 2015 US$102.

In addition, we calculate cost-effectiveness analyzing the implementation costs of the intervention only, inclusive of training but exclusive of intervention development. This analysis is designed to inform a scenario of scale-up in which the developed program is scaled up more broadly.

Analyzing implementation costs only for the full intervention, the estimated cost per household-level beneficiary is 2015 US$67, and the estimated cost per community-level beneficiary is 2015 US$5. The estimated cost per case of past-year IPV averted in the sample of direct beneficiaries is 2015 US$2483, and the estimated cost per case of past-year IPV averted in the sample of community-level beneficiaries is 2015 US$177. Analyzing implementation costs only for the men's arm intervention, the estimated cost per household-level beneficiary is 2015 US$53, and the estimated cost per community-level beneficiary is 2015 US$4. The estimated cost per case of past-year IPV averted in the sample of direct beneficiaries is 2015 US$1144, and the estimated cost per case of past-year IPV averted in the sample of community-level beneficiaries is 2015 US$81.

Sensitivity analysis

The results of the sensitivity analysis are presented in Table 3. In general, alternate assumptions around the cost structure (varying the discount rate and the useful life of investments in intervention development and training) generate limited variation in the estimated cost effectiveness. In Columns (1) through (5), the estimated cost per community-level beneficiary is between 2015 U.S. US$5 and US$6 (relative to 2015 US$5.20 in the primary analysis), while the estimated cost per case of IPV averted varies between 2015 US$191 and US$209 (relative to 2015 US$194 in the primary analysis). (When using coefficient estimates for perpetration of past-year physical and/or sexual IPV, the risk difference is estimated to be a reduction of 4.9 percentage points in the men's intervention arm, and a reduction of 3.0 percentage points in the couples' intervention arm, relative to a mean in the control arm of 38%.)

	Sensitivity analysis						
	Fixed costs amortized 5 years	**Fixed costs amortized 10 years**	**Discount rate: 0**	**Discount rate: 6%**	**Using coefficient estimates: perpe-tration**	**Costs for men's arm only: high**	**Costs for men's arm only: low**
Unit cost							
Per direct or household-level beneficiary	83	76	76	79			
Per community-level beneficiary	6	5	5	5			
Per case of past-year physical and/or IPV averted among direct beneficiaries	2936	2694	2684	2771	2795		
Per case of past-year physical and/or IPV averted among community beneficiaries	209	192	191	197	199		
Unit costs: Men's arm only							
Per direct or household-level beneficiary						60	8
Per community-level beneficiary						4	
Per case of past-year physical and/or IPV averted among direct beneficiaries						1307	1851
Per case of past-year physical and/or IPV averted among community beneficiaries						93	131

Table 3: Sensitivity analysis for unit cost and cost effectiveness for UBL implementation, 2015 $USD

For the men's arm, the cost per community-level beneficiary is between 2015 US$4 and US$6 (relative to 2015 US$5 in the primary analysis) and the estimated cost per case of IPV averted ranges between 2015 US$93 and US$132 (relative to 2015 US$102 in the primary analysis).

Discussion

The estimated annual cost of the development and implementation of Unite for a Better Life intervention is 2015 US$296,772, or 2015 US$74 per individual directly participating in the intervention. The estimated cost per case of past-year IPV averted is 2015 US$2726 for the sample of direct beneficiaries, and 2015 US$194 for the sample of all women in intervention communities These cost estimates join a very limited literature around the cost and cost effectiveness of interventions designed to prevent IPV in low income contexts.

In previous literature, the IMAGE intervention targeting prevention of HIV and IPV in South Africa reports a cost per person reached of 2004 US US$49 in the trial phase.[20] The SASA! intervention in Uganda reports a cost per person in the intervention communities ranging from 2011 US$15 to US$23.[19] A recent analysis of six pilots targeting violence against women and girls reported unit costs ranging from $4 to $1324.[21] The estimated cost per case of IPV averted was 2004 US$813 for IMAGE, and 2011 US$485 for SASA!

Comparing UBL to IMAGE and SASA!, in general the cost per direct beneficiary and per year of IPV averted for direct beneficiaries is higher. However, the cost per community-level beneficiary (US$5) is lower than the comparable cost in both previous trials. In addition, the cost per case of past-year IPV averted among all community-level beneficiaries (2015 US$194) is about 75% lower than the cost per case of past-year IPV averted in the IMAGE trial, and about 60% lower than the cost per case of past-year IPV averted in the SASA! trial. We argue that it is more appropriate to focus on the cost-effectiveness estimates calculated with respect to all community-level beneficiaries given that we have high-quality evidence that the effects for direct beneficiaries (included in the intervention) and other community-level beneficiaries were not significantly different (unlike the IMAGE evaluation, in which the effects for indirect beneficiaries were estimated to be zero), and given that SASA! is a community-level intervention for which the target sample is accordingly considered to encompass all eligible women in intervention communities.

If we utilize the cost-effectiveness estimates generated focusing on the men's arm, the estimated cost per beneficiary is broadly similar to the estimate generated considering all treatment arms (2015 US$66 per individual for direct beneficiaries, 2015 US$5 per individual for indirect beneficiaries). However, the estimated cost per year of IPV averted drops to 2015 US$1430 within the sample of direct household-level beneficiaries, and 2015 US$102 within the sample of community-level beneficiaries. The latter estimate is 80% lower than the estimated cost per case of past-year IPV averted for the IMAGE intervention, and 70% lower than the estimated cost per case of past-year IPV averted for the SASA! intervention.

The IMAGE evaluation also reported additional evidence around cost and cost-effectiveness during a scale-up phase following the initial trial.[20] In the scale-up phase, cost per year of IPV averted fell to around 30% of the comparable cost in the trial phase. A recent analysis of six pilot projects targeting violence against women and girls similarly found evidence of declines in unit costs of between 20% and 40% when interventions were scaled up.[21] In order to ensure comparability across trials, this

discussion has utilized the higher estimate derived from the trial phase. However, scale-up of UBL may similarly lead to a rapid increase in estimated cost-effectiveness. Sensitivity analysis demonstrates that these estimates are relatively robust to alternate assumptions about the cost parameters for the intervention.

This analysis also does not account for benefits of the UBL interventions other than violence averted. We only examine cases of past-year violence averted, and do not consider possible reductions in the intensity of IPV for women who nonetheless continue to experience violence. In addition, previous evidence suggests the UBL intervention had significant effects on a number of additional outcomes beyond IPV, including HIV-related knowledge and risk behaviors, social norms, and intrahousehold task-sharing. These broad impacts suggest this analysis is potentially underestimating the intervention's cost-effectiveness in a cross-sectoral framework. Given broader impacts, a cost-consequence analysis that assesses a broad range of benefits might be appropriate.[25—27]

This study has several weaknesses. First, as previously noted there is imprecision in the cost effectiveness estimates driven by uncertainty in the magnitude of the effects on outcomes. Second, it is not possible to use a final outcome measure such as a disability-adjusted life year (DALY) in this analysis, as there is no DALY estimate corresponding to past-year exposure to IPV. This renders it more challenging to compare the cost effectiveness of this intervention vis-à-vis other interventions related to women's health and well-being.

Conclusions

The Unite for a Better Life program, a gender-transformative educational intervention delivered within the context of a cultural ceremony, is effective in reducing past-year intimate partner violence in rural Ethiopia. This paper reports on the costs of developing and implementing the intervention and estimates its cost-effectiveness, suggesting that the cost per case of past-year IPV averted observed in this context is comparable to or lower than other IPV prevention interventions. Accordingly, the paper adds to a limited but growing literature analyzing the relative effectiveness of interventions targeting at preventing IPV.

Funding

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Ethics Approval and Consent To Participate

Verbal informed consent was obtained from all respondents. Ethical approval was obtained from the Committee on the Use of Humans as Experimental Subjects (COUHES) at MIT (protocol number 1211005333) and by the Institutional Review Board at the AAU College of Health Sciences (protocol number 044/12/SPH).

Consent for publication

Not applicable

Competing Interests

VS and ND received funding for either salary or consulting fees through a grant from an anonymous donor.

Authors' Contributions

VS, JL, and ND designed the study and oversaw acquisition of data. VS conducted the statistical analysis, and JL conducted the cost analysis. JL drafted the manuscript. VS, JL, ND were involved in critical revisions of the manuscript for important intellectual content. VS, JL secured funding for the trial. All authors approved the final draft of the manuscript.

Data availability

Data for the trial analysis of primary and secondary outcomes will be published in conjunction with the relevant manuscripts reporting trial findings. No additional cost data is available beyond what is reported in the exhibits of this paper.

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Cost-effectiveness analysis of an intimate partner violence prevention intervention targeting men, women and couples in rural Ethiopia: Evidence from the Unite for a Better Life randomized controlled trial

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Abstract

Objectives: Experience of intimate partner violence (IPV) is associated with adverse health and psychosocial outcomes for women. However, rigorous economic evaluations of interventions targeting IPV prevention are rare. This paper analyzes the cost-effectiveness of Unite for a Better Life (UBL), a gender-transformative intervention designed to prevent IPV and HIV risk behaviors among men, women and couples.

Design: We utilize an economic evaluation nested within a large-scale cluster randomized controlled trial, analyzing financial and economic costs tracked contemporaneously.

Setting: Unite for a Better Life was implemented in rural southern Ethiopia between 2013 and 2015.

Participants: The randomized controlled trial included 6,770 households in 64 villages.

Interventions: Unite for a Better Life is an intervention delivered within the context of the Ethiopian coffee ceremony, a culturally established forum for community discussion, and designed to assist participants to build skills for healthy, non-violent, equitable relationships.

Primary and secondary outcome measures: This paper reports on the unit cost and cost-effectiveness of the interventions implemented. Cost-effectiveness is measured as the cost per case of past-year physical and/or sexual intimate partner violence averted.

Results: The estimated annualized cost of developing and implementing Unite for a Better Life was 2015 US$296,772, or approximately 2015 US$74 per individual directly participating in the intervention and 2015 US$5 per person annually for each community-level beneficiary (woman of reproductive age in intervention communities). The estimated cost per case of past-year physical and/or sexual intimate partner violence averted was 2015 US$2726 for the sample of direct beneficiaries, and 2015 US$194 for the sample of all community-level beneficiaries.

Conclusions: Unite for a Better Life is an effective and cost-effective intervention for the prevention of IPV in a developing country setting. Further research should explore strategies to quantify the positive effects of the intervention across other domains.

Trial registration: The trial was registered at Clinicaltrials.gov (NCT02311699).

Article summary: Strengths and limitations of this study

-This study contributes to an extremely limited literature around the cost-effectiveness of strategies targeting intimate partner violence and community-based norms transformation in developing countries.

-A key strength of this study is that it draws on high-quality, contemporaneously collected cost and outcome data from a large-scale randomized controlled trial, and generates cost-effectiveness estimates that are relatively robust to different costing assumptions.

-However, one important limitation is that cost-effectiveness can be evaluated only with respect to cases of physical and/or sexual IPV averted.

-No data is available on health outcomes (e.g., health-related quality of life) that would enable the estimation of a more broadly comparable cost-effectiveness measure.

Introduction

Globally, 30% of women experience physical and/or sexual violence by an intimate partner (IPV) in their lifetime.[1] IPV has both immediate and long-term adverse health and social consequences for women and their families.[2–6] Physical effects of IPV include traumatic injuries, chronic illness, and death, and adverse mental health effects include depression and suicide.[1–4] In addition, intimate partner violence has substantial economic costs.[7,8] Evidence suggests rates of IPV are particularly high in sub-Saharan Africa; in Ethiopia, the site of this study, over 70% of women reported lifetime physical/and or sexual IPV in the 2005 WHO Multi-country Study on Women's Health and Domestic Violence.[9]

A growing literature has explored the effectiveness of interventions designed to prevent and reduce IPV in low-income contexts, and thus the body of evidence about useful IPV prevention strategies has expanded.[10–17] However, from a policymaking perspective, identifying viable IPV interventions requires additional data on the relative cost-effectiveness of different programs.[18] To date, only two papers have published estimates of the cost-effectiveness of IPV prevention interventions in developing countries, implemented in Uganda and South Africa.[19,20] One recent paper published an estimate of unit costs of pilot interventions targeting violence against women and girls in six countries (Ghana, Kenya, Pakistan, Rwanda, South Africa and Zambia).[21]

Unite for a Better Life (UBL) is a gender-transformative, participatory intervention delivered to men, women and couples in Ethiopia in the context of the coffee ceremony, a traditional forum for community-based discussion. The program aims to reduce physical and sexual IPV and HIV risk behaviours as well as promote healthier, more equitable relationships. UBL was evaluated in a large scale cluster randomized controlled trial conducted in the rural Gurague zone in southern Ethiopia between 2013 and 2018.

In this paper, we present a cost and cost-effectiveness analysis of UBL. Previous evidence suggests the intervention when delivered to men was effective in reducing women's reported past-year experience of physical and/or sexual IPV and men's reported past-year perpetration of physical and/or sexual IPV, in addition to promoting equitable gender norms and reducing HIV risk behaviors when delivered to men and couples [22,23]. This paper reports on the overall cost of the program, and its cost-effectiveness relative to the number of direct beneficiaries, the number of community-level beneficiaries, and the cases of past-year physical and/or sexual IPV averted.

Methods

Intervention

Unite for a Better Life is a gender-transformative intervention delivered within the context of the Ethiopian coffee ceremony, a culturally established forum for community discussion. Additional details about the intervention are also provided in the primary trial paper.[22] Gender-transformative strategies to reduce IPV seek to address the root causes of gender-based inequalities by actively examining and changing inequitable gender norms and imbalances of power.

Curricula designed for women, men and couples were developed by EngenderHealth in collaboration with researchers and program developers from Addis Ababa University (AAU), the Ethiopian Public Health Association (EPHA), and other partner institutions; AAU and EPHA managed the implementation of the intervention. Each curriculum includes 14 participatory sessions (total 38 hours) led by one trained, same-sex facilitator for men's and women's UBL groups, and one female and one male facilitator for couples' UBL groups. The objective of the intervention is to assist participants to identify and transform power imbalances within their relationships and to build skills for healthy, non-violent, equitable relationships. The duration of the intervention was finalized following extensive piloting to identify a structure of discussions that would allow participants to fully engage in all relevant material, while simultaneously minimizing participant dropout.

UBL was delivered in biweekly sessions including approximately 20 individuals per group. This group size was identified during piloting as appropriate given the competing objectives of facilitating inclusive and well-moderated discussions while simultaneously reaching as many individuals as possible given resource constraints. Each session included a coffee ceremony, discussion and interactive activities focused on gender norms, sexuality, communication and conflict resolution, HIV/AIDS, and IPV. While the sessions did include written materials available for those who were literate, all material was also conveyed orally or visually, and participants were not required to be literate.

Male and female facilitators (48 in total) were recruited from the evaluation districts (Meskan, Mareko, Silte and Sodo districts in the Gurague zone of the Southern Nations, Nationalities and People's Region). The facilitators were drawn from the local region (though they did not work in their own home communities); all facilitators had at least a secondary education, and the majority had some experience in the educational and/or health services.

Facilitators were trained in two phases. During the pilot phase of intervention development, the facilitators participated in the full set of intervention sessions as led by master trainers in order to observe high-quality facilitation in practice, and reflect on their own perspective on gender, sexuality and IPV. This was followed by a 10-day training in facilitation skills. The intervention was then implemented in two phases between March and October 2015.

Randomized controlled trial

The UBL intervention was evaluated in a four-arm, cluster-randomised controlled trial (cRCT) conducted between December 2014 and March 2018. The UBL trial was implemented by the Abdul Latif Jameel Poverty Action Lab (J-PAL) at the Massachusetts Institute of Technology (MIT), in partnership with the Addis Ababa University (AAU) School of Public Health, the Ethiopian Public Health Association (EPHA), and EngenderHealth. Ethical approval was obtained from the Committee on the Use of Humans as Experimental Subjects (COUHES) at MIT (protocol number 1211005333) and from the Institutional Review Board at the AAU College of Health Sciences (protocol number 044/12/SPH), and verbal informed consent was obtained from all respondents. The trial was prospectively registered on clinicaltrials.gov (NCT02311699), and at the American Economic Association (AAE) registry (AEARCTR-0000211).

As the intervention was designed for groups of individuals, a cluster design was employed. Sixty-four villages (kebeles) in the evaluation districts were randomly selected for inclusion from the sampling frame of all villages within these districts, and were randomly assigned to one of the four study arms (women's UBL, men's UBL, couples' UBL, and control). The control arm received a short educational (one hour) session focused on intimate partner violence.

In addition, a second individual-level randomisation was conducted. In each village within the three treatment arms, 80% of individuals enrolled in the trial were randomly sampled to participate in UBL. The remaining 20% were included in baseline and endline data collection only in order to assess intervention spillover effects. Data were collected from enrolled individuals at baseline and from enrolled individuals and their spouses at endline, approximately 24 months post-intervention.

The analysis strategy entails comparing the effectiveness of each of the three intervention arms vis-à-vis the control arm. Study findings suggest that the UBL intervention, when delivered to men, significantly reduced women's experience of past-year physical and/or sexual IPV as well as male perpetration of physical and/or sexual IPV at approximately 24 months follow-up. When UBL was delivered to couples, there was a reduction in experience of IPV that was not statistically significant at conventional levels; there was no observed reduction in IPV when UBL was delivered to women [22].

In addition, a separate analysis examined the diffusion of the intervention effects to the 20% of individuals enrolled in the trial who were not invited to participate in the intervention (Leight et al., in press). Evidence suggests that women in the intervention communities who were not sampled for participation in the intervention reported a decline in experience of past-year IPV of comparable magnitude to that reported for intervention participants. In fact, the hypothesis that the direct and indirect effects are identical cannot be rejected. Accordingly, we interpret the experimental effects as consistent in magnitude for all women in intervention communities.

Patient and public involvement

Implementation of the randomized controlled trial was guided and supported by a community advisory board constituted by local and national stakeholders and policymakers, including representatives of women's groups who work with women experiencing intimate partner violence. The community advisory board met regularly for the duration of the study to provide feedback on the design, the intervention, and the local context. Findings were also presented first to the board in order to enable their feedback on dissemination.

Measuring costs

In order to analyze the intervention's cost-effectiveness, we estimated all costs corresponding to the development and implementation of Unite for a Better Life between 2013 and 2015. Development and piloting was conducted in 2013 and 2014; training and program implementation was conducted in 2015.

For this analysis, we adapted a provider perspective including both financial and economic costs, but excluding the costs associated with participants' attendance. All costs are estimated at the program level, and there is no local or community-level variation in cost. In addition, all costs were considered in the year in which they were incurred. The methodology described here draws substantially on existing

guidelines for cost-analyses of interventions to prevent violence against women in low-income settings.[24]

All costs are reported in 2015 U.S. dollars. During the project, some costs (personnel for intervention development and travel) were incurred in dollars; these costs are simply converted to 2015 U.S. dollars using inflation rates reported by the World Bank. Costs associated with field implementation were incurred in Ethiopian birr, but expenditure was tracked quarterly by the lead institution (the Abdul Latif Jameel Poverty Action Lab; J-PAL) in dollars, using the exchange rate at the conclusion of each quarter. We use the dollar estimates of these costs, calculated at the point at which these expenses were paid by the lead institution, and again convert to 2015 U.S. dollars.

The costs of intervention development include personnel costs for curriculum development, travel costs associated with curriculum development and piloting, and field piloting. This development cost was treated as an initial investment with long-term returns beyond the scope of this evaluation, consistent with the strategy employed by previous cost-effectiveness analysis of IPV programs.[19,20] Accordingly, the total cost of intervention development was treated as a single capital item, annualized over ten years using a 3% discount rate.

The costs of training facilitators was similarly treated as an investment with medium-term returns; in a context in which UBL was implemented consistently and/or on a large scale, training would be periodic. Accordingly, training cost was again treated as a single capital item, annualized over five years using a 3% discount rate. This strategy is again consistent with previous cost-effectiveness analysis in the IPV literature. [19,20]

Implementation costs for the intervention include only recurrent costs: staff salaries, staff transport (to intervention sites), and materials (coffee ceremony materials, and in-kind incentives for participants). No capital costs were incurred during intervention implementation. Transportation was rented, and the cost of a rented office site is included in the transportation sub-budget.

The intervention sessions themselves were conducted in public spaces in the intervention communities: this included outdoor public spaces and school classrooms. The cost of this space is denoted to be zero for two reasons. First, these spaces are plausibly considered to be public goods. Second, in no case did the intervention use a space that would be available for rent or purchase, or that is plausibly comparable to another space available for rent or purchase.

In addition, all research costs associated with the randomized controlled trial were excluded from this analysis. However, the principal investigators and research support staff did provide additional monitoring and support for the program's implementation; accordingly, part of the cost of this investigator and staff time is included in the estimate of the program's cost. Implementation was spearheaded by a separate intervention team whose salaries are fully included in the estimated cost of program implementation. The inclusion of the costs of supervisory staff is standard, given that future program rollout would need to include equivalent staff resources in order to maintain the intervention's quality and therefore effects.

Given that the evaluation included three treatment arms, it may also be informative to examine cost-effectiveness by trial arm. In particular, the estimated cost-effectiveness for the men's arm is of interest, given that the primary results suggest that the reduction in IPV was largest in this arm. In order to

estimate the costs by arm, operational costs such as staff, transportation, and materials can be directly attributed to a trial arm. However, indivisible costs (intervention development and training costs) were not assigned or billed to specific intervention arms, and the literature in this case does not provide any clear guidance as to what share of aggregate intervention expenses should be assigned to a specific arm. In order to generate an estimate of costs comparable to the cost of launching one arm of UBL as an independent program, we estimate that the indivisible costs corresponding to each arm (e.g., men's UBL) are 66% of total costs in these categories (calculating that half of the total costs correspond to joint investment in the intervention as a whole, and half of the total costs are divided across the three intervention arms equally).

Outcomes

For the randomized trial, the pre-specified primary outcomes include women's past-year experience of physical IPV and women's past-year experience of secondary IPV. For this analysis, we pool these measure and focus on women's past-year experience of physical and/or sexual IPV as a summary measure of intervention effectiveness.

Unit cost estimates include the cost per individual invited to the intervention; the cost per individual in intervention communities; and the cost per case of physical and/or sexual IPV averted.

In order to conceptualize the target sample for the intervention, it is important to note that the intervention was delivered to both men and women; however, the target beneficiaries of the intervention were women. We calculate the sample of beneficiaries using two different methodologies. First, we analyze the sample of direct and household-level beneficiaries: women in households directly targeted by the intervention. This is a sample of 1344 women in each intervention arm. Second, given the evidence previously cited that the intervention effects are of comparable magnitude for indirect beneficiaries resident in the intervention communities, we also examine effects on the sample of community-level beneficiaries, defined to encompass all women of reproductive age in the intervention communities. This is a measure that has also been employed in recent literature.[19] To calculate the number of community-level beneficiaries, we use existing population and demographic estimates to estimate a population of 1180 women of reproductive age per kebele, or 18,880 women per study arm (constituted by 16 kebeles).[25,26]

In order to estimate the number of averted cases of past-year physical and/or sexual IPV, we utilize data collected at endline reporting past-year experience of physical and/or sexual IPV. The adjusted risk difference in prevalence of past-year physical and/or sexual IPV between communities in each intervention arm (couples, women's and men's) and control communities is used to estimate the additional number of cases of IPV that would have been observed in the absence of the intervention in the specified arm. The estimated number of averted cases can then be extrapolated to broader populations of interest. We use the estimated risk differences calculated in the full sample (including households who were included in the evaluation, but not invited to participate in the intervention), and adjusted for baseline demographic covariates.

More specifically, we employ the following formula, in which the adjusted difference in risk between treatment and control communities is multiplied by the population.[19] Given that the observed intervention effects are estimated separately for each treatment arm, we estimate the number of cases averted separately in each arm and calculate the sum; here, the subscript m denotes the men's arm, and

the subscript cp denotes the couples' arm. The subscript c denotes the control arm. No reduction in IPV was observed in the women's experimental arm, and accordingly this arm is excluded from the calculation of cases averted. Cases averted are also reported separately for the men's and couples' arms.

Cases averted = (RIPV_m – RIPV_c) * Pop + (RIPV_cp – RIPV_c) * Pop

The estimated number of cases averted is similarly calculated for both the target sample of direct beneficiaries, and the larger sample of community-level beneficiaries.

Cost effectiveness

We assess the cost effectiveness of the UBL intervention by comparing it to the status quo, represented in this case by the costs and outcomes observed in the control communities. The cost effectiveness ratio (CER) is then calculated as the ratio of total cost to cases of IPV averted.

Sensitivity analysis

Sensitivity analysis was conducted with respect to the following parameters. First, we utilize alternate discount factors of 0% and 6%. Second, we adjust the useful life of the investment in materials development and training, assuming that the useful life of both investments is ten years, and alternately that the useful life of both investments is five years. Third, we calculate the estimated number of cases averted using the parameters estimated for the reduction in male perpetration of IPV, rather than the reduction in female experience of IPV. Fourth, we estimate cost effectiveness of the male arm only employing alternate assumptions for the cost of implementing one arm alone, relative to the cost of implementing the full project. In the low scenario, we assume that the cost of intervention development is only 50% of total development costs, and maintain implementation costs consistent with the original estimate; in the high scenario, we maintain development costs consistent with the original estimate, and assume implementation costs for the men's arm alone constitute 35% of total implementation costs.

Results

UBL intervention cost: Development and implementation

The total estimated cost of the development of the UBL intervention (including drafting and refining the curriculum as well as piloting) is 2015 US$226,035 (see Table 1). For concision, all costs reported will be rounded to the nearest dollar. This cost category can be subdivided as follows: 66% staff, 12% travel, 10% field pilot, and 12% administrative costs. The total estimated cost of intervention implementation is 2015 US$297,442. This cost category can be subdivided as follows: 12% training, 46% salaries, 23% transport, 10% materials, 1% travel, and 8% administrative costs.

Total cost of UBL development (2015 U.S. dollars)			
All intervention arms	Couples	Women	Men

Cost category	Amount	Percentage			
Staff	148697	0.66	99131	99131	99131
Travel	27485	0.12	18323	18323	18323
Pilot	21712	0.10	14474	14474	14474
Administrative	28141	0.12	18761	18761	18761
Total	**226035**		150690	150690	150690
One year of implementation	26499		17666	17666	17666
Total cost of UBL implementation (2015 U.S. dollars)					
Training	34758	0.12	23172	23172	23172
Training cost (one year)	7589		5059	5059	5059
Staff	137705	0.46	68852	34426	34426
Transport	69467	0.23	34734	17367	17367
Materials	28632	0.10	14316	7158	7158
Travel	3000	0.01	1500	750	750
Administrative	23880	0.08	11940	5970	5970
Total implementation / training cost	297442		154514	88843	88843
Total implementation / training cost (one year)	270273		136401	70730	70730
Total intervention cost (one year)	296772		154067	88396	88396

Table 1: Total cost of Unite for a Better Life

The intervention was fully implemented in a single year (2015). In order to generate an estimate of the costs of one year's implementation, the costs of intervention development and training are amortized over ten and five years, respectively, following the previous literature. This allows us to generate the estimates of one year of intervention implementation. The total cost of one year of implementation of UBL is 2015 US$296,772; this is the cost estimate that we employ in analyzing cost-effectiveness.

We also report each cost category by arm, corresponding to the estimated cost of implementing this arm as an independent intervention. As previously noted, development and training costs for each arm are estimated to be 66% of total costs, and thus the total cost of the three arms exceeds the estimated program cost reported in the first column. In terms of field implementation costs (facilitator staff time and travel, and materials for participants), the men's and women's arms are parallel in cost, while the couples' intervention incurred twice the cost, given that it had twice the number of participants. The estimated cost of one year of implementation for the men's arm (and the women's arm) is 2015 US$88,396, while the estimated cost of one year of implementation for the couples' arm is 2015 US $154,067.

Effectiveness

The trial results analyzed for the sample of indirect beneficiaries suggest that UBL led to a reduction of past-year experience of physical and/or sexual IPV in the men's arm (estimated risk difference -0.046, 95% CI: [-0.09—0.00], p=0.049) and in the couples' arm (estimated risk difference -0.035, 95% CI: [-0.10—0.03], p=0.287). The coefficient is larger in magnitude and statistically significant in the men's arm. There is no evidence of a reduction in past-year experience of physical and/or sexual IPV in the women's arm (estimated risk difference 0.02, 95% CI: [-0.04—0.08], p=0.464).

The number of reported past-year cases of physical and/or sexual IPV in the control arm is 496 for the trial sample and 7,930 for the full community sample. Accordingly, we can estimate the number of averted cases of past-year IPV in the men's arm (62 cases in the sample of direct beneficiaries, 868 in the sample of indirect beneficiaries) and in the couples' arm (47 cases in the sample of direct beneficiaries, 661 in the sample of indirect beneficiaries). The total number of estimated number of cases of past-year IPV averted in all intervention arms is 109 for the sample of direct beneficiaries, and 1529 for the sample of all women in intervention communities.

Cost effectiveness

We analyze the unit cost of UBL for two specified target samples (direct and household-level beneficiaries and community-level beneficiaries), and the cost-effectiveness of UBL with respect to the number of past-year physical and/or sexual IPV cases averted in each sample. As noted above, the sample of direct and household-level beneficiaries includes 1180 women in each arm or 3840 women total in the three intervention arms. The sample of community-level beneficiaries includes all 18,880 women per arm or 56,640 women total. Using these estimates, we calculate the (annualized) cost of the intervention for each household-level beneficiary woman is 2015 US$74, and the cost per community-level beneficiary is 2015 US$5, as reported in Table 2. The estimated cost per case of IPV averted is 2015 US$2726 for the sample of direct beneficiaries, and 2015 US$194 for the sample of community-level beneficiaries.

Unit cost	
Per direct or household-level beneficiary	74
Per community-level beneficiary	5.2
Per case of past year physical and/or IPV averted among direct beneficiaries	2726
Per case of past year physical and/or IPV averted among community beneficiaries	194
Unit costs: Men's arm only	
Per direct or household-level beneficiary	66
Per community-level beneficiary	5
Per case of past year physical and/or IPV averted among direct beneficiaries	1430
Per case of past year physical and/or IPV averted among community beneficiaries	102
Unit costs: Couples' arm only	
Per direct or household-level beneficiary	115
Per community-level beneficiary	8
Per case of past year physical and/or IPV averted among direct beneficiaries	3275

Per case of past year physical and/or IPV averted among community beneficiaries	233
Unit costs: Implementation only	
Per direct or household-level beneficiary	67
Per community-level beneficiary	5
Per case of past year physical and/or IPV averted among direct beneficiaries	2483
Per case of past year physical and/or IPV averted among community beneficiaries	177
Unit cost: Full intervention	
Per direct or household-level beneficiary	74
Per community-level beneficiary	5.2
Per case of past year physical and/or IPV averted among direct beneficiaries	2726
Per case of past year physical and/or IPV averted among community beneficiaries	194
Unit costs: Men's arm only	
Per direct or household-level beneficiary	66
Per community-level beneficiary	5
Per case of past year physical and/or IPV averted among direct beneficiaries	1430
Per case of past year physical and/or IPV averted among community beneficiaries	102
Unit costs: Couples' arm only	
Per direct or household-level beneficiary	115
Per community-level beneficiary	8
Per case of past year physical and/or IPV averted among direct beneficiaries	3275
Per case of past year physical and/or IPV averted among community beneficiaries	233
Unit costs: Implementation only	
Per direct or household-level beneficiary	67
Per community-level beneficiary	5
Per case of past year physical and/or IPV averted among direct beneficiaries	2483
Per case of past year physical and/or IPV averted among community beneficiaries	177

Table 2: Unit cost and cost-effectiveness of UBL development and implementation, 2015 US$

We also conduct a comparable analysis by arm. For the men's arm, the estimated cost per household-level beneficiary is 2015 US$66, and the estimated cost per community-level beneficiary is 2015 US$5. The estimated cost per case of past-year IPV averted in the sample of direct beneficiaries is 2015 US$1430, and in the sample of community-level beneficiaries it is 2015 US$102. The couples' arm does not perform as well, given that it is more costly to implement ($115 per household-level beneficiary) and less effective (estimated cost of 2015 US$3275 per case of past-year averted in the sample of direct beneficiaries).

In addition, we calculate cost-effectiveness analyzing the implementation costs of the intervention only, inclusive of training but exclusive of development, in order to inform a scenario of scale-up Analyzing implementation costs only for the full intervention, the estimated cost per household-level beneficiary is 2015 US$67, and the estimated cost per community-level beneficiary is 2015 US$5. The estimated cost

per case of past-year IPV averted in the sample of direct beneficiaries is 2015 US$2483, and the estimated cost per case of past-year IPV averted in the sample of community-level beneficiaries is 2015 US$177.

Sensitivity analysis

The results of the sensitivity analysis are presented in Table 3. In general, alternate assumptions around the cost structure (varying the discount rate and the useful life of investments in intervention development and training) generate limited variation in the estimated cost effectiveness. In Columns (1) through (5), the estimated cost per community-level beneficiary is between 2015 U.S. US$5 and US$6 (relative to 2015 US$5.20 in the primary analysis), while the estimated cost per case of IPV averted varies between 2015 US$191 and US$209 (relative to 2015 US$194 in the primary analysis). (When using coefficient estimates for perpetration of past-year physical and/or sexual IPV, the risk difference is estimated to be a reduction of 4.9 percentage points in the men's intervention arm, and a reduction of 3.0 percentage points in the couples' intervention arm, relative to a mean in the control arm of 38%.)

	Sensitivity analysis						
	Fixed costs amortized 5 years	**Fixed costs amortized 10 years**	**Discount rate: 0**	**Discount rate: 6%**	**Using coefficient estimates: perpe-tration**	**Costs for men's arm only: high**	**Costs for men's arm only: low**
Unit cost							
Per direct or household-level beneficiary	83	76	76	79			
Per community-level beneficiary	6	5	5	5			
Per case of past-year physical and/or IPV averted among direct beneficiaries	2936	2694	2684	2771	2795		
Per case of past-year physical and/or IPV averted among community beneficiaries	209	192	191	197	199		
Unit costs: Men's arm only							
Per direct or household-level beneficiary						60	8
Per community-level beneficiary						4	
Per case of past-year physical and/or IPV averted among direct beneficiaries						1307	185

Per case of past-year physical and/or IPV averted among community beneficiaries	93	132

Table 3: Sensitivity analysis for unit cost and cost effectiveness for UBL implementation, 2015 $USD

For the men's arm, the cost per community-level beneficiary is between 2015 US$4 and US$6 (relative to 2015 US$5 in the primary analysis) and the estimated cost per case of IPV averted ranges between 2015 US$93 and US$132 (relative to 2015 US$102 in the primary analysis).

Discussion

These cost estimates for Unite for a Better Life join a very limited literature around the cost and cost effectiveness of interventions designed to prevent IPV in low income contexts. In previous literature, the IMAGE intervention targeting prevention of HIV and IPV in South Africa reports a cost per person reached of 2004 US US$49 in the trial phase.[20] The SASA! intervention in Uganda reports a cost per person in the intervention communities ranging from 2011 US$15 to US$23.[19] A recent analysis of six pilots targeting violence against women and girls reported unit costs ranging from $4 to $1324.[21] The estimated cost per case of IPV averted was 2004 US$813 for IMAGE, and 2011 US$485 for SASA!

Comparing UBL to IMAGE and SASA!, in general the cost per direct beneficiary and per year of IPV averted for direct beneficiaries is higher. However, the cost per community-level beneficiary (US$5) is lower than the comparable cost in both previous trials. In addition, the cost per case of past-year IPV averted among all community-level beneficiaries (2015 US$194) is about 75% lower than the cost per case of past-year IPV averted in the IMAGE trial, and about 60% lower than the cost per case of past-year IPV averted in the SASA! trial. We argue that it is more appropriate to focus on the cost-effectiveness estimates calculated with respect to all community-level beneficiaries given that we have high-quality evidence that the effects for direct beneficiaries (included in the intervention) and other community-level beneficiaries were not significantly different (unlike the IMAGE evaluation, in which the effects for indirect beneficiaries were estimated to be zero), and given that SASA! is a community-level intervention for which the target sample is accordingly considered to encompass all eligible women in intervention communities.

If we utilize the cost-effectiveness estimates generated focusing on the men's arm, the estimated cost per year of IPV averted drops to 2015 US$1430 within the sample of direct household-level beneficiaries, and 2015 US$102 within the sample of community-level beneficiaries. The latter estimate is 80% lower than the estimated cost per case of past-year IPV averted for the IMAGE intervention, and 70% lower than the estimated cost per case of past-year IPV averted for the SASA! intervention.

The IMAGE evaluation also reported additional evidence around cost and cost-effectiveness during a scale-up phase following the initial trial.[20] In the scale-up phase, cost per year of IPV averted fell to around 30% of the comparable cost in the trial phase. A recent analysis of six pilot projects targeting violence against women and girls similarly found evidence of declines in unit costs of between 20% and 40% when interventions were scaled up.[21] In order to ensure comparability across trials, this discussion has utilized the higher estimate derived from the trial phase. However, scale-up of UBL may similarly lead to a rapid increase in estimated cost-effectiveness. Sensitivity analysis demonstrates that these estimates are relatively robust to alternate assumptions about the cost parameters for the intervention.

This analysis also does not account for benefits of the UBL interventions other than violence averted. We only examine cases of past-year violence averted, and do not consider possible reductions in the intensity of IPV for women who nonetheless continue to experience violence. In addition, previous evidence suggests the UBL intervention had significant effects on a number of additional outcomes beyond IPV, including HIV-related knowledge and risk behaviors, social norms, and intrahousehold task-sharing. These broad impacts suggest this analysis is potentially underestimating the intervention's cost-effectiveness in a cross-sectoral framework. Given broader impacts, a cost-consequence analysis that assesses a broad range of benefits might be appropriate.[27–29]

This study has several weaknesses. First, as previously noted there is imprecision in the cost effectiveness estimates driven by uncertainty in the magnitude of the effects on outcomes. Second, it is not possible to use a final outcome measure such as a disability-adjusted life year (DALY) in this analysis, as the trial did not collect any general data on health outcomes and there is no DALY estimate corresponding to past-year exposure to IPV. This renders it more challenging to compare the cost effectiveness of this intervention vis-à-vis other interventions related to women's health and well-being.

Conclusions

The Unite for a Better Life program, a gender-transformative educational intervention delivered within the context of a cultural ceremony, is effective in reducing past-year intimate partner violence in rural Ethiopia. This paper reports on the costs of developing and implementing the intervention and estimates its cost-effectiveness, suggesting that the cost per case of past-year IPV averted observed in this context is comparable to or lower than other IPV prevention interventions. Accordingly, the paper adds to a limited but growing literature analyzing the relative effectiveness of interventions targeting at preventing IPV.

Funding

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Ethics Approval and Consent To Participate

Verbal informed consent was obtained from all respondents. Ethical approval was obtained from the Committee on the Use of Humans as Experimental Subjects (COUHES) at MIT (protocol number 1211005333) and by the Institutional Review Board at the AAU College of Health Sciences (protocol number 044/12/SPH).

Consent for publication

Not applicable

Competing Interests

VS and ND received funding for either salary or consulting fees through a grant from an anonymous donor.

Authors' Contributions

VS, JL, and ND designed the study and oversaw acquisition of data. VS conducted the statistical analysis, and JL conducted the cost analysis. JL drafted the manuscript. VS, JL, ND were involved in critical

revisions of the manuscript for important intellectual content. VS, JL secured funding for the trial. All authors approved the final draft of the manuscript.

Data availability

Data for the trial analysis of primary and secondary outcomes will be published in conjunction with the relevant manuscripts reporting trial findings. No additional cost data is available beyond what is reported in the exhibits of this paper.

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CHEERS Checklist
Items to include when reporting economic evaluations of health interventions

The **ISPOR CHEERS Task Force Report**, *Consolidated Health Economic Evaluation Reporting Standards (CHEERS)—Explanation and Elaboration: A Report of the ISPOR Health Economic Evaluations Publication Guidelines Good Reporting Practices Task Force,* provides examples and further discussion of the 24-item CHEERS Checklist and the CHEERS Statement. It may be accessed via the *Value in Health* or via the ISPOR Health Economic Evaluation Publication Guidelines – CHEERS: Good Reporting Practices webpage: http://www.ispor.org/TaskForces/EconomicPubGuidelines.asp

Section/item	Item No	Recommendation	Reported on page No/ line No
Title and abstract			
Title	1	Identify the study as an economic evaluation or use more specific terms such as "cost-effectiveness analysis", and describe the interventions compared.	Page 1, Line 1
Abstract	2	Provide a structured summary of objectives, perspective, setting, methods (including study design and inputs), results (including base case and uncertainty analyses), and conclusions.	Page 2
Introduction			
Background and objectives	3	Provide an explicit statement of the broader context for the study. Present the study question and its relevance for health policy or practice decisions.	Page 3
Methods			
Target population and subgroups	4	Describe characteristics of the base case population and subgroups analysed, including why they were chosen.	Page □, lines 3-12
Setting and location	5	State relevant aspects of the system(s) in which the decision(s) need(s) to be made.	Page 4, lines 1□-27
Study perspective	6	Describe the perspective of the study and relate this to the costs being evaluated.	Page □, lines 37-3□
Comparators	7	Describe the interventions or strategies being compared and state why they were chosen.	Page □, lines 13-1□
Time horizon	8	State the time horizon(s) over which costs and consequences are being evaluated and say why appropriate.	Page □, lines 1-4
Discount rate	9	Report the choice of discount rate(s) used for costs and outcomes and say why appropriate.	Page □, lines 1□-17
Choice of health outcomes	10	Describe what outcomes were used as the measure(s) of benefit in the evaluation and their relevance for the type of analysis performed.	Page 7, lines 14-17
Measurement of effectiveness	11a	*Single study-based estimates:* Describe fully the design features of the single effectiveness study and why the single study was a sufficient source of clinical effectiveness data.	Page 4, lines 3□-43

	11b	*Synthesis-based estimates:* Describe fully the methods used for identification of included studies and synthesis of clinical effectiveness data.	N/A
Measurement and valuation of preference based outcomes	12	If applicable, describe the population and methods used to elicit preferences for outcomes.	N/A
Estimating resources and costs	13a	*Single study-based economic evaluation:* Describe approaches used to estimate resource use associated with the alternative interventions. Describe primary or secondary research methods for valuing each resource item in terms of its unit cost. Describe any adjustments made to approximate to opportunity costs.	Page □, Lines 12-39
	13b	*Model-based economic evaluation:* Describe approaches and data sources used to estimate resource use associated with model health states. Describe primary or secondary research methods for valuing each resource item in terms of its unit cost. Describe any adjustments made to approximate to opportunity costs.	N/A
Currency, price date, and conversion	14	Report the dates of the estimated resource quantities and unit costs. Describe methods for adjusting estimated unit costs to the year of reported costs if necessary. Describe methods for converting costs into a common currency base and the exchange rate.	Page □, lines □-11
Choice of model	15	Describe and give reasons for the specific type of decision-analytical model used. Providing a figure to show model structure is strongly recommended.	N/A
Assumptions	16	Describe all structural or other assumptions underpinning the decision-analytical model.	N/A
Analytical methods	17	Describe all analytical methods supporting the evaluation. This could include methods for dealing with skewed, missing, or censored data; extrapolation methods; methods for pooling data; approaches to validate or make adjustments (such as half cycle corrections) to a model; and methods for handling population heterogeneity and uncertainty.	Page 7, Lines 2□-4□
Results			
Study parameters	18	Report the values, ranges, references, and, if used, probability distributions for all parameters. Report reasons or sources for distributions used to represent uncertainty where appropriate. Providing a table to show the input values is strongly recommended.	Page □, Lines 31-3□
Incremental costs and outcomes	19	For each intervention, report mean values for the main categories of estimated costs and outcomes of interest, as well as mean differences between the comparator groups. If applicable, report incremental cost-effectiveness ratios.	Page 9, Lines 2-13
Characterising uncertainty	20a	*Single study-based economic evaluation:* Describe the effects of sampling uncertainty for the estimated incremental cost and incremental effectiveness parameters, together with the impact	Page 12, Lines 9-17

		of methodological assumptions (such as discount rate, study perspective).	
	20b	*Model-based economic evaluation:* Describe the effects on the results of uncertainty for all input parameters, and uncertainty related to the structure of the model and assumptions.	N/A
Characterising heterogeneity	21	If applicable, report differences in costs, outcomes, or cost-effectiveness that can be explained by variations between subgroups of patients with different baseline characteristics or other observed variability in effects that are not reducible by more information.	N/A
Discussion			
Study findings, limitations, generalisability, and current knowledge	22	Summarise key study findings and describe how they support the conclusions reached. Discuss limitations and the generalisability of the findings and how the findings fit with current knowledge.	Pages 13-14
Other			
Source of funding	23	Describe how the study was funded and the role of the funder in the identification, design, conduct, and reporting of the analysis. Describe other non-monetary sources of support.	□□sing □e□□
Conflicts of interest	24	Describe any potential for conflict of interest of study contributors in accordance with journal policy. In the absence of a journal policy, we recommend authors comply with International Committee of Medical Journal Editors recommendations.	

For consistency, the CHEERS Statement checklist format is based on the format of the CONSORT statement checklist

The **ISPOR CHEERS Task Force Report** provides examples and further discussion of the 24-item CHEERS Checklist and the CHEERS Statement. It may be accessed via the *Value in Health* link or via the ISPOR Health Economic Evaluation Publication Guidelines – CHEERS: Good Reporting Practices webpage: http://www.ispor.org/TaskForces/EconomicPubGuidelines.asp

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