THE HEALTH SYSTEM COST OF POST-ABORTION CARE IN UGANDA

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Synopsis: Post-abortion care consumes significant health resources in Uganda. Investing more in family planning programs to prevent unwanted pregnancies would bring net financial benefits.

Abstract

This paper addresses the knowledge gap that exists in costing unsafe abortion in Uganda by presenting estimates of the cost to the health system of providing post-abortion care (PAC), based on research conducted in 2010. Thirty-nine public and private health facilities were selected representing three levels of health care. Cost information on drugs, supplies, material, personnel time, and out-of-pocket expenses were collected using an ingredients approach. Indirect costs in the form of overhead and capital costs were measured. The average cost per client, across five types of abortion complications, was $151. The annual direct cost nationally was estimated to range from $10.6 to $14.5 million. Including indirect costs and satisfying all demand raised the annual national cost to $18.7 million. Post-abortion care consumes a substantial portion of the total expenditure in reproductive health in Uganda. Investing more resources in family planning programs to prevent unwanted pregnancies would reduce health systems costs.

I. Introduction

In Uganda, deaths of women from complications of pregnancy or childbirth is unacceptably high and the maternal mortality ratio, estimated to be 430 per 100,000 live births, is very high (WHO 2010). One of the leading causes of maternal mortality is unsafe abortion. In Uganda legal abortion remains highly restricted and unmet need for contraception is high, leaving many women to seek abortions in unsafe conditions, often from unskilled providers. In 2005, the first-ever study of the national incidence of abortion in Uganda showed that abortion rates in Uganda are among the highest in the developing world, and highlighted unsafe abortion as a major reproductive health issue (Singh *et al.* 2005). Additional evidence is needed, however, if policy makers are to take action to lower the high incidence of unsafe abortion.

Treating the complications of unsafe abortion often requires expensive treatment in terms of skilled personnel, surgical procedures, expensive drugs and supplies, and prolonged hospital

stays (Henshaw *et al*. 2008, Johnston *et al*. 2007, Vlassoff *et al*. 2008); and unsafe abortion continues to be a major contributor to the case load of the maternal and gynecological services of the Ugandan health system. However, studies on the costs of unsafe abortion to health systems at the national level are limited, and attempts to measure costs at the regional level have been made only recently (Vlassoff *et al.* 2008; Vlassoff *et al.* 2009a). A review of the scientific literature reveals that virtually no research has been conducted on the direct economic costs to women and households or to national health systems in sub-Saharan Africa (Woog *et al*. 2007), and no studies of the costs of unsafe abortion have been undertaken in Uganda to date.

In 2007, the Guttmacher Institute pilot tested instruments for measuring the costs of unsafe abortion in three countries, Ethiopia, Pakistan and Mexico, as a part of their effort to develop protocols, questionnaires, and analytical techniques to document these costs (Guttmacher 2010). The methodology used in the pilot study was also employed in a study in Nigeria, that examined the cost of post-abortion care (PAC) and compared it to the cost of providing access to contraceptive services that would have prevented the unwanted pregnancies that resulted in unsafe abortions (Bankole *et al.* 2007). It was also used in a costing study undertaken in Ethiopia in 2008 (Vlassoff *et al*. 2010). These three research efforts serve as precursors to the research to be presented in this paper.

II. Data and Methods

The methodology described above is now called the *Post-Abortion Care Costing Methodology* (PACCM). It is designed to produce reliable cost estimates in research situations where financial resources for data collection are limited. The methodology is a variant of "the ingredients approach" (see Johns *et al*. 2003). The cost estimates produced by the PACCM are evidence-based, and can be used for the formulation of health policy, and to inform strategic decision

making. It must be stressed, however, that the estimates produced by PACCM are not intended to be precise enough to guide everyday decision-making in health management.

The PACCM uses the key-informant approach. The respondents interviewed are experts who are knowledgeable about post-abortion care in the facilities where they work, because of the years of on-the-job experience. The respondents are requested to provide responses on the detailed inputs[1] that *in toto* constitute an intervention for a specific post-abortion complication, and their estimates of the cost of these components. The averages of the respondents' estimates are assumed to yield a good approximation of the true values of the various rates and amounts of specific components.

We administered two questionnaires to health personnel and facility administrators at 39 health facilities. The first, *Questionnaire A*, includes questions on personnel costs, overhead costs, and capital costs associated with the provision of post-abortion care. It was administered at the central level, at regional and district hospitals, and at health centers III/IV. At the central level *Questionnaire A* was primarily aimed at the Federal Ministry of Health.

Personnel, Overhead and Capital Costs. Since referrals and hospitalizations vary by the level of the health facility, *Questionnaire A* has four variants *(Questionnaires A1, A2, A3* and *A4*), corresponding to the four levels of health facilities in Uganda—central, tertiary (national and regional hospitals), secondary (general and private hospitals), and primary (health centers IV and III and NGO clinics). The questionnaire for the central level (*Questionnaire A1*) does not collect data on salaries.[2]

Questionnaire A has four main sections. The first, on abortion complications, asked the respondent to estimate the numbers of women who are treated for each type of possible

[1] "Input" is used here to mean any physical thing that is used in the provision of a particular treatment. Aspirin tablets, syringes, sterile gloves, minutes spent by health workers and sonograms are all examples of inputs.

[2] Previous pretesting showed that salary data was difficult to collect from central ministries of health.

abortion complication (incomplete abortion, sepsis, shock, cervical/vaginal laceration, uterine laceration/perforation) at their facility. The second, on personnel costs, asked about the time required to treat each type of abortion complication as well as non-treatment time worked, for each type of health worker. A range of additional considerations such as salary ranges, professional allowances, housing allowances, transportation allowances and duty fees were taken into account in gathering salary data. Several other benefits, such as health insurance and communication allowance, were not estimated. Thus, personnel cost estimates in this study are likely to somewhat underestimate the true cost of labor. Costs of hospitalization per bed per day are also collected in this section.[3] Finally, in the section on capital and overhead expenses, the respondents were asked to estimate a range of values concerning the life of the equipment, capital costs for constructing new facilities, overhead costs and referral rates from each type of lower level health facility.

Drugs and Supplies Costs. *Questionnaire B* includes questions on the drugs, supplies and materials used in the provision of treatment for specific post-abortion complications. These questions have been developed based on evidence from previous studies in other countries, and the components listed in the World Health Organization's *Mother and Baby Package* (WHO 1999). It is administered at the same facilities as *Questionnaire A*. For *Questionnaire B,* the respondents were medical practitioners with the most experience in treating PAC patients.

Questionnaire B is split into five sections for different types of post-abortion complications: incomplete abortion, sepsis, shock, cervical/vaginal laceration, and uterine perforation.[4] For each section, the respondents were asked to estimate the percent of patients receiving each type of drug or medical supply that is used to treat the condition, as well as the quantity of the drug typically administered. As the questionnaire is lengthy, the interviewer was advised to split the interview into two sessions to minimize respondent fatigue.

[3] To avoid double-counting, only the "hotel" components of the cost of hospitalization will be used in the analysis.

[4] The category "uterine perforation" also includes cases of other lower abdominal perforations as well as hysterectomies.

To determine centralized costs, we consulted various standard price lists (see Table 1). Because the exact presentations, chemical strengths and packaging are not found in any centralized price list, we made the simplifying assumption that the prices of drugs, materials and supplies collected from a variety of international sources are reliable estimates of the true costs of these inputs at the level of the facility. Prices are extrapolated to 2010 by using World Bank GDP deflators. The final list of unit prices for drugs and supplies used a mixture of prices available in the sources shown in Table 1. In order to simplify this data collection process, the PACCM assumes that centralized costs of drugs, materials and supplies approximate their true costs at the facility level. Several factors that might influence the final price, both positive and negative, are ignored. For example, spoilage, stocking costs, and transportation costs, which would typically inflate final prices, are not included in the calculations. At the same time, discounts available through the centralized procurement of drugs and supplies, which would tend to decrease costs, are likewise excluded from the model. [5]

Data. Thirty-nine health facilities were purposively selected in this study to represent three levels of health facilities, both public and private sectors, wide geographical coverage and rural and urban settings (see Table 2). The reference year for this study's estimates is 2010, given that most of the fieldwork was conducted in that year.[6] Data were entered using data entry templates in MS Excel. Double-data-entry has been used to minimize data-entry errors.

III. Results

In this section, we present the costs to the health system resulting from treating the complications of illegal or unsafe abortion. Cost-per-intervention and cost-per-case estimates

[5] Foreign donors may sometimes procure drugs and supplies free of charge to developing countries. We do not take such contingencies into account since we are concerned in this paper with how much PAC costs, not with who pays for it.

[6] All costs are given in US 2010 dollars.

are calculated and disaggregated by health-care level,[7] types of input, cost categories and type of complication. The same analysis is done to estimate total costs at the national level, which yields an estimate of the national health care bill due to unsafe abortion. We present results for the current situation—where a large proportion of women with serious complications do not (or cannot) access care at health facilities, and for a "standard of care" situation—where all women requiring PAC can and do access facility-based care.

Table 3 shows the percentage distribution of the five abortion-related complications that were the focus of this study. Across all 39 facilities, each PAC patient was treated, on average, for 1.08 complications. Two-thirds of the patients were treated for incomplete abortion, 22% for sepsis and 9% for shock. In general, serious complications such as lacerations and perforations were more common at higher level facilities than lower level ones. Table 3 also shows the numbers of rare, but very serious complications. These include morbidities such as peritonitis, renal failure, etc. The cost of treating these rare conditions is not estimated in this study, so the estimates presented here are slightly under-estimated on that account.

The number of PAC cases per year at the 39 sample facilities was estimated both from official statistics and from expert opinion. The estimates provided by experts, tend to be higher, possibly an indication of a certain level of under-reporting in the official statistics. We use the average of these two figures in calculations of total national costs.

Table 3 also shows the reported prevalence of PAC in the health system. Regional hospitals handled about ten times more PAC cases annually than do general (district) hospitals, who in turn treated twice the number of cases as did primary level facilities.[8] The proportion of PAC cases among all patients needing health care is also shown in Table 3. This value is an average of an estimate available from the Ministry of Health (MOH) and from the survey of key

[7] In presenting results, generally "regional hospitals" refers to regional referral hospitals plus the national referral hospital (Mulago). "Health centers" refers to both health centers III and health centers IV.

[8] Mulago Hospital in Kampala, which is the only national hospital treating PAC cases, services between 15,000 and 16,000 cases per year—hence regional referral hospitals see many fewer PAC patients, around 350.

informants. Overall, we estimate that fewer than 5% of all patients at health facilities in Uganda require post-abortion care. In this case, though, the MOH estimates were higher than those of the experts. For instance, MOH distribution of maternal-health cases (which includes PAC) for the period 2005-2008 is shown in Table 4. Combining MOH statistics with expert estimates of the proportion of all cases that are maternal and newborn cases (last panel in Table 3), would have produce PAC shares considerably higher than the percentages we use in calculating total costs.

A study of contraceptive needs in Uganda estimated that around 2.2 million pregnancies occurred in 2008 (Vlassoff *et al*. 2009a). Of these, 56% or about 1.2 million were unplanned. This large number of unwanted pregnancies led to an estimated 362,000 induced abortions in 2008.[9] Assuming that the increases in the annual number of abortions are proportional to population growth, the number of induced abortions in 2010 would be around 386,000.[10] The numbers of women with induced abortions who then sought care at health facilities for complications are shown in Table 5. For 2010, we estimate the total number of PAC cases to be around 124,000. We estimated this by averaging the 2003 abortion incidence study (Singh *et al*. 2005), where around 85,000 PAC cases were detected, and the data from our survey, which yielded higher estimates. Since our sample was not probabilistic and did not adequately cover private midwives, we used the percentage distribution of PAC cases by type of facility from the 2003 study to arrive at the estimates in Table 5.

Many women who have had an unsafe abortion and develop serious complications never reach a health facility. Information is scanty on how large this group of women is, but globally it has been estimated that there is around one such woman for every two PAC cases attended by the health system (Singh *et al*. 2009). Thus, in Uganda in 2010, women with untreated abortion complications (at least by the formal health system) may total 67,800 women.

[9] This number is an extrapolation from the original 2003 estimate of induced abortions. See Singh *et al*. (2005).

[10] The annual population growth rate over the period 2003-2010 in Uganda was 3.23% (UN Population Division, on line data, accessed 22 Nov. 2011).

Most PAC cases are treated as in-patients in Uganda (Table 6). Over all complications and all facilities, around 20% of women are out-patients and 80% are in-patients. However, being an in-patient does not imply hospitalization in the sense of staying in the facility over one or more nights: many in-patients are discharged the same day as they were treated after several hours of recuperation in a facility bed. While hospitals treat only a small percentage of cases of incomplete abortion as out-patients—presumably the less severe cases—health centers reported out-patients for cases of incomplete abortion, sepsis and lacerations. In many of these cases, minimal treatment is given, such as dispensing analgesics, and the patients are referred to a higher-level facility.

We now examine costs of specific PAC inputs derived from the facility survey.

Costs of Drugs and Supplies. The costs of drugs, supplies and other materials used in treating cases of shock, sepsis, incomplete abortion and lacerations are remarkably similar, varying between $23 and $25 per intervention across all patients (Table 7, lower panel). For treatment of uterine perforations, the average per-intervention cost of drugs and supplies is far higher at $74. Costs of drugs and supplies increase with the care level of facilities, from about $21 in health centers to $32 in regional hospitals for all patients. This is expected since more severe complications tend to be concentrated in higher level facilities. Lower-level facilities, lacking the required personnel, supplies and infrastructure, are more likely to refer critical patients.[11] Table 7 also shows that out-patient costs of drugs and supplies are dramatically lower than in-patient costs. This is consistent with the practice in Uganda of treating all but the least severe complications in the in-patient delivery mode.

Costs of Personnel. Several factors are taken into consideration in the calculation of labor (or personnel) costs: the percentage of cases that are attended by each category of health worker;

[11] Other effects may also be influencing this relationship: Higher level facilities may have better access to a wider range of drugs, technology and equipment and may therefore achieve a better standard of care than lower level facilities.

the time spent by health personnel attending patients; salaries, allowances and benefits; the length of the work year; and an adjustment to take into account time spent by health workers in general tasks not related to the direct provision of services. Data were collected for eleven categories of health workers, for the five complication types and for the three levels of facilities. In Table 8, we present only an overall summary analysis of these data.

The proportion of patients seen by health personnel varied considerably (not shown in tables). For example, in regional hospitals only 18% of patients were attended to by anesthetists, but 97% saw midwives and 92% saw drug dispensers. On the other hand, all the patients receiving treatment for perforations were attended to by anesthetists, but only 33% by nursing assistants. The average number of minutes that health workers spent in treating specific complications and attending patients also varied considerably by category of worker and by type of complication (not shown). For instance, at district hospitals general practitioners and gynecologists spent 53-71 minutes (around one hour) with patients suffering from hypovalemic shock, whereas nurses and midwives spent 113-136 minutes (around two hours).

Table 8 presents the personnel unit costs broken down by type of complication and by facility level. Overall, the cost of labor per PAC intervention was found to be around $17. Treating lacerations and incomplete abortions had the lowest average cost of labor ($11.36 and $12.50, respectively). The cost of labor for treating sepsis and shock ranged from $14 to $19 and the labor cost for repairing a perforated uterus was, the most expensive in terms of labor input, amounting to almost $29. Labor costs at district hospitals were higher for some treatments, particularly for treating cases of sepsis, than at regional hospitals. The average cost of labor was $23.76 at district hospitals, $21.48 at regional hospitals and $4.00 at health centers.

Other Direct Costs. Data were also collected on two other direct costs: out-patient special fees and hospitalization costs. Although we classify these costs under “direct costs”, parts of them

may reflect indirect costs (overhead and capital).[12] Table 9 displays estimates of these costs. PAC cases of sepsis on average incur the highest cost of hospitalization ($42.47), followed by treatment of perforations ($30.14). Again, district hospitals have higher hospitalization costs for most treatments than do regional hospitals or health centers.

Out-patients often pay special fees in order to receive treatment. These are shown in the bottom panel of Table 9. The average fees are quite substantial for out-patients—for example $26.10 at regional hospitals—even though the average per PAC case is much smaller ($1.32 for regional hospitals and $2.42 across all facilities), given that most abortion-related cases are handled via the in-patient modality.

Indirect Costs. Very few costing studies of PAC have attempted to compute indirect costs (Vlassoff *et al*. 2008). Indirect costs are, however, an important component of total costs. In the UNFPA Reproductive Health Costing Tool, for instance, indirect costs[13] are estimated at roughly twice the magnitude of direct costs in Sub-Saharan Africa (United Nations 2009). In other studies, one quarter to one third of total PAC costs were estimated to be indirect (Vlassoff *et al*. 2008). This study is the first thorough attempt to measure the indirect costs to the health system with regard to PAC.

Table 10 shows results for both overhead and capital costs. The survey collected overhead costs in two broad categories: the cost of ancillary workers in the health system; and maintenance and other operational costs. The details of what comprised these two categories are given in a note to Table 10. In 2010, the total annual wage bill for ancillary workers per facility was about $41,000 across all health facilities, ranging from $64,000 for large hospitals to around $11,000

[12] For example, the cost of hospitalization covers lodging and meals, which are direct costs, but it may also include the cost of amortization of the capital cost of constructing the facility. In the Ugandan context these items may also have public subsidization built into them, further obscuring the true costs.

[13] Indirect costs are also called "program and system costs" and comprise overhead costs for program management, supervision, health education, monitoring and evaluation, advocacy, human resources training, information systems, commodity supply systems, and capital costs for maintaining and expanding the physical capacity of health facilities (United Nations 2009).

for health centers. The average annual maintenance and operating cost per facility was $53,000 (ranging from $124,000 to $13,000). Thus, the total overhead cost per facility amounted to $94,000 per annum and the portion of that total attributable to the care of post-abortion patients was $4,400 per facility—$10,000 for regional hospitals, $2,800 for district hospitals and $1,100 for health centers. Interestingly, however, the average overhead cost per PAC case is inverted due to the relatively large number of lower level facilities compared to their caseloads. Thus, on average $21.60 of overhead expenses goes into the treatment of one PAC case at health centers, while $11.44 is spent at regional hospitals. Nonetheless, at every level overhead costs are a significant component of the total cost of PAC to the health system.

Capital cost estimates are shown in the lower panel of Table 10. In this case, only global estimates of capital costs for the infrastructure and equipment of the surveyed facilities were requested from the key informants. An estimate of actual facility lifetimes (total years of use) was also obtained. Regional/national hospitals are estimated to cost $43 million on average to construct and equip, while health centers cost $1.3 million. At the same time, respondents reported that facilities were used for several decades before being replaced by new infrastructure: from 68 years for regional hospitals to 33 years for health centers.

The capital cost per PAC case for each type of facility was calculated as follows:

PacCost = AmortAnnualCapitalCost / PacShare

Where

PacCost is the capital cost attributable to treating a single PAC case;

AmortAnnualCapitalCost is the amortized cost per year of useful life;[14] and

PacShare is the proportion of all cases treated by the facility that are related to post-abortion complications.

[14] Note on amortization: If a constant rate of inflation is assumed, then the annual write off or depreciation of capital should take this into account. The annual depreciation amount should be adjusted upwards so that the present value of all such amounts is equal the amount of the original investment. Here, we assume an annual rate of inflation of 2%. "Useful" lifetime means the number of years a facility is actually in use for the purpose for which it was intended until it needs to be replaced.

Using the case of health centers as an example, the amortized cost per year of useful life is around $56,000, the proportion of that amount attributable to PAC is $2,700 and hence the capital cost per PAC case is $52.02.[15] The cost of capital is greatest for district hospitals at $94.57 per PAC case, compared to $71.33 at regional/national hospitals.

Total Costs per Case. The total costs of all inputs, both direct and indirect, per PAC case by facility type across all types of complications are shown in Table 11. The overall cost per PAC case is estimated to be $151. Treatment of post-abortion cases at district hospitals cost $190 on average, while $113 was expended on average at health facilities. Overall, about 55% of the total cost was indirect, namely expenditures in capital and overhead that were not directly tied to the provision of care but which were necessary for the health system to be able to provide care services at all. For regional hospitals, the indirect component of costs were 49% of the total, but for health centers 65% of total costs were indirect. More than three-quarters of indirect costs are capital costs, while the remainder is expended on general maintenance and infrastructure operations.

The direct cost per case—$68.77 overall—is closely related to the level of care. Regional hospitals expend $85.62 on direct inputs to treatment, district hospitals $77.08 and health centers $39.76. The costliest direct input is the medicines and supplies used in treatment, overall accounting for 40% of direct treatment costs. In health centers drugs, supplies and other materials amount to 52% of all direct costs. Hospitalization is also an important component of direct costs, comprising 27-33% of total direct costs. The cost of labor is also a significant cost component. While, overall, 25% of direct costs are due to personnel costs, hospitals spend up to six times more on labor inputs than do health centers, reflecting the greater severity of the cases treated at hospitals as well as the more costly make up of the care givers. For instance, district hospitals spent an average of $23.76 (31% of direct costs) on labor to treat a PAC case, but health centers spent only $4.00 (10% of direct costs). Finally, it is worth noting that, while

[15] As an example of how inflation assumptions affect this estimate, with inflation at 0%, this cost per PAC case would fall to $37.59; with inflation at 4%, the annual cost would rise to $69.84.

special out-patient fees comprised only 3.5% of the total cost per case, they were over 8% of the total for health centers where most out-patient care is concentrated.

National Total Cost of PAC. Using estimates for costs per case, national total annual costs for treating post-abortion complications in Uganda were calculated for 2010. These are shown in Table 12, which breaks down total costs by care level, by abortion complication (where applicable) and by cost component. The total cost to the Uganda health system for treating PAC in 2010, including direct and indirect costs, is estimated to be $12.4 million.[16] Two-thirds of this amount, or $8.3 million, are for indirect costs (overhead and infrastructure) and the remaining third ($4.2 million) are for direct inputs (drugs, supplies, labor, hospitalization, and out-patient fees). Hospitalization accounts for around 13% of total expenditure, drugs and supplies for 10% and the wage bill for 8.5%.

As can be seen in the three upper panels of Table 12, incomplete abortion is by far the costliest PAC complication, comprising about 66% of total direct costs in the areas of labor, drugs/supplies and hospitalization. Sepsis accounts for another 24% of direct expenditures. Treating lacerations and perforations, on the other hand, consumes only 5% of these direct inputs.

In terms of level of care, most PAC expenditure is concentrated in health centers ($7.6 million or 61%), followed by district hospitals ($3.5 million or 28%) and then by regional hospitals ($1.4 million or 11%).

Next steps: Sensitivity Analysis. We are continuing to analyze the data from the survey. As a next step, we intend to do a sensitivity analysis since the data collected are based on estimates of key experts. The sensitivity analysis methodology from a recent study (Vlassoff *et al*. 2010) will be used and expanded upon. For this analysis we will choose those variables that are the most important drivers of overall costs, and select minimum and maximum values for these

[16] Using African regional estimates of PAC costs, Vlassoff *et al*. (2009a) estimated a PAC cost per case of $9.3 million, which included both direct and indirect costs.

variables based on reasonable deviations from the central values of estimates found in the analysis.[17] The results of this analysis will include estimates of the upper bound and lower bound values for unit and total costs. Until the sensitivity analysis is carried out, we use the results of a parallel study in Ethiopia (Vlassoff *et al*. 2010) to make tentative estimates of ranges of estimates that will be derived from that analysis.

IV. Conclusion and Implications

We estimate that the cost of treating post-abortion complications in Uganda in 2010 stood at $12.4 million. Given that the data from the survey may be imprecise, we used a sensitivity analysis from another study, which showed that the total cost of unsafe abortion to the Ugandan health system most likely lies between $10.6 million to $14.5 million.

The total expenditure on health in Uganda in 2011 may be estimated at around $740 million and, of that, the amount expended by the government of Uganda may be roughly $200 million.[18] The total amount spent on maternal and newborn health may be around $350 million (Vlassoff *et al*. 2009a). Thus, our estimates show that the cost of treating post-abortion complications from unsafe procedures may be around 3.6% of total spending on maternal and newborn health and equivalent to around 6.1% of total government spending on health. The cost of unsafe abortion to the health system is therefore a substantial one.

Although evidence is very limited, it is assumed that a large proportion of women suffering abortion complications never access services through he formal health system. Globally, it has been estimated that the number of such women is around 50% of the number who do reach health facilities (Singh *et al*. 2008). This implies that total cost of PAC would amount to $18.7

[17] "Reasonable" maxima and minima will be obtained from the literature and an expert panel as far as possible. Otherwise, values first and third quartiles derived from the data will be used.

[18] These estimates are based on WHO statistics (WHO 2011) and UN Population Division estimate of the total population.

million if all women with complications were able and willing to access facility-based care. We must bear in mind, however, that this estimate is based on expert opinion, not population-based data, and also that women not attending health facilities may have less severe symptoms on average than those who do. Despite this uncertainty, there is no doubt that treating all women who have an unmet demand for PAC would pose a significant additional cost on the health system in Uganda.

It needs to be emphasized that this study looks at only one element of the cost of unsafe abortions—the immediate cost of treating post-abortion complications. There are many other substantial costs involved (see Vlassoff *et al*. 2008 for an extensive treatment of the cost of unsafe abortion) including the treatment of longer-term morbidities—especially the high cost of infertility treatment—as well as the economic cost to Ugandan households and society of productive time lost through abortion-related morbidity and mortality.

Ultimately, better health policy should be aimed at preventing the root cause of unsafe abortion in Uganda - the large number of unintended pregnancies. About 1.2 million unintended pregnancies occur every year in Uganda, due largely to unmet need for contraception (Vlassoff *et al*. 2009a). A cost-benefit analysis in Nigeria showed that extra spending on family planning would lead to large net benefits (savings) from reduced expenditure in PAC services (Bankole *et al*. 2007). A similar argument can be made here. The cost of supplying the methods of contraception most widely used in Uganda for one year has been estimated at around $22 per user (Vlassoff et al. 2009a). If we compare this to the overall cost-per-case for treating post-abortion complications ($151) we can see that there is a large cost-benefit advantage to preventing unwanted pregnancies in Uganda. The benefit-cost ratio is about 7:1; that is, every dollar spent in family planning would save seven dollars in PAC services.

In Uganda, legal abortion remains highly restricted and unmet demand for contraception is high. To promote policy discussion in this area, there is a clear need for the research into the

economic effects resulting from illegal, unsafe abortion. The findings from this study should be interesting for scholars, policy-makers and advocates who are striving to reduce the health and economic costs of unsafe abortion.

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VI. Tables

Table 1. Drugs and Supplies Price Lists and Catalogues	
1.	Durbin PLC, Medical Supplies Catalogue 2005/06 (www.durbin.co.uk)
2.	IDA Foundation E-catalogue, November 2008 (www.ida.nl)
3.	Pharma Professional Services Website (www.druginfosys.com) -- December 2008
4.	UNFPA Reproductive Health Costing Tool Drug/Supply Prices
5.	UNICEF Supply Catalogue: http://www.supply.unicef.dk/catalogue/ and http://www.unicef.org/supply/files/sourcesandprices2005.pdf
6.	MSH International Drug Price Indicator: http://erc.msh.org/dmpguide/index.cfm ?search_cat=yes&display=yes&module=dmp&language=English

Table 2. Health Facilities in Uganda Selected for Survey		
Facility Location	**Facility Level**	**Ownership**
Jinja	Regional Referral Hospital	Public
Soroti	Regional Referral Hospital	Public
Mbale	Regional Referral Hospital	Public
Arua	National Referral Hospital	Public
Gulu	Regional Referral Hospital	Public
Lira	Regional Referral Hospital	Public
Mulago	Regional Referral Hospital	Public
Hoima	Regional Referral Hospital	Public
Mbarara	Regional Referral Hospital	Public
Masaka	Regional Referral Hospital	Public
Fortportal	Regional Referral Hospital	Public
Kabale	Regional Referral Hospital	Public
Kamuli Mission	Hospital	Faith-based
Rubaga	Hospital	Faith-based
Mityana	Hospital	Public
Entebbe	Hospital	Public
Kawolo	Hospital	Public
Amai C0mmunity	Hospital	Faith-based
Ngora	Hospital	Faith-based
Iganga	Hospital	Public
Kibuli	Hospital	Faith-based
International Hospital	Hospital	Private
Lyantonde	Hospital	Public
Bwera	Hospital	Public
Ishaka	Hospital	Faith-based
Kagando	Hospital	Faith-based
Kalisizo	Hospital	Public
Bugolobi	Hospital	Private

Mengo	Hospital	Faith-based
Luweero	Health Center III	Public
Naguru	Health Center IV	Public
Amuria	Health Center IV	Public
Budaka	Health Center IV	Public
Rugarama	Health Center IV	Public
Kibale	Health Center III	Public
Lukaya Dom	Health Center IV	Private Midwife
Kabuyanda	Health Center III	Public
Eseri	Health Center IV	Private Midwife
Zam	Health Center IV	Private Midwife

Table 3. Average Number of PAC Cases per Year and Distribution of Abortion Complications				
	Reg. Hospitals	**Hospitals**	**Health Centers**	**All Facilities**
Average Number of PAC Cases per Year				
From official statistics	1,534	154	79	560
Best estimate of expert	1,672	176	87	613
Percent of PAC Cases with Specific Complications				
Incomplete Abortion	62.1%	67.4%	71.3%	66.7%
Sepsis	29.8%	18.8%	19.3%	22.3%
Shock	12.5%	10.0%	4.5%	9.4%
Lacerations	11.8%	5.9%	1.5%	6.6%
Perforations	7.1%	2.2%	0.1%	3.2%
Total	123.2%	104.4%	96.7%	108.2%
Number of PAC Cases per 1000 with Rare Complications				
Number per 1000	22	5	7	11
Percent of all Cases that are PAC Cases				
Percent of all cases	5.33%	4.33%	4.77%	4.74%
Contacts per year that are for MNH care				
Percent of contacts that are MNH	51.3%	41.8%	37.5%	43.5%

Table 4. MOH National Statistics on Maternal Health Cases, 2005-2008	
Abortion	17.3%
Haemorrhage Related to Pregnancy (APH and/or PPH)	2.4%
High Blood Pressure in Pregnancy	2.7%
Malaria in Pregnancy	71.7%
Obstructed Labour	2.1%
Perinatal conditions (in New borns 0 to 28 days)	3.8%
TOTAL	***100.0%***

Table 5. Annual Number of PAC Cases by Facility Type and Complication Type					
	Reg. Hospitals	**Hospitals**	**Health Centers**	**Private Midwives**	**All Facilities**
Number of PAC Cases annually (2010)					
Incomplete Abortion	5,300	13,000	51,500	17,500	87,300
Sepsis	2,500	3,600	13,900	4,700	24,700
Shock	1,100	1,900	3,300	1,100	7,400
Lacerations	1,000	1,100	1,100	400	3,600
Perforations	600	400	100	0	1,100
Total (per year)	***10,500***	***20,200***	***69,900***	***23,700***	***124,300***
Total (per month)	***900***	***1,700***	***5,800***	***2,000***	***10,400***

Table 6. Proportions of PAC Cases Treated as Out-Patients by Facility Type and Type of Complication				
	Reg. Hospitals	**Hospitals**	**Health Centers**	**All Facilities**
Incomplete Abortion	9.2%	16.5%	37.0%	30.2%
Sepsis	0.0%	0.0%	10.0%	7.0%
Shock	0.0%	0.0%	0.0%	0.0%
Lacerations	0.0%	0.0%	4.0%	2.8%
Perforations	0.0%	0.0%	0.0%	0.0%
All Complications	4.6%	10.6%	29.3%	20.3%

Table 7. Average Cost per Treatment and Cost per Case of Drugs, Materials and Supplies by Complication and by Facility Type (USD 2010)				
	Reg. Hospitals	**Hospitals**	**Health Centers**	**All Facilities**
Cost per treatment (USD 2010)				
In-patients				
Incomplete Abortion	27.26	25.18	29.05	27.16
Sepsis	35.55	23.46	18.01	25.67
Shock	29.76	29.01	12.10	23.62
Lacerations	27.00	27.15	15.78	23.31
Perforations	92.94	83.95	44.81	73.90
Average (Cost per Treatment)	***33.27***	***26.61***	***25.87***	***27.69***
Average (Cost per Case)	***40.97***	***27.77***	***25.87***	***29.95***
Out-patients				
Incomplete Abortion	7.35	15.82	10.84	11.34
Sepsis	0.00	0.00	4.17	4.17
Shock	0.00	0.00	0.00	0.00
Lacerations	0.00	0.00	1.04	1.04
Perforations	0.00	0.00	0.00	0.00
Average (Cost per Treatment)	***3.71***	***10.21***	***8.84***	***7.92***
Average (Cost per Case)	***4.56***	***10.66***	***8.84***	***8.57***
All patients				
Incomplete Abortion	25.43	23.64	22.31	23.79
Sepsis	35.55	23.46	16.62	25.21
Shock	29.76	29.01	12.10	23.62
Lacerations	27.00	27.15	15.19	23.11
Perforations	92.94	83.95	44.81	73.90
Average (Cost per Treatment)	***32.35***	***25.61***	***20.61***	***25.50***
Average (Cost per Case)	***39.84***	***26.73***	***20.61***	***27.59***

Table 8. Average Cost of Labor Inputs by Complication by Facility Type (USD 2010)				
	Reg. Hospitals	**Hospitals**	**Health Centers**	**All Facilities**
Cost of labor per PAC case (in USD)				
Incomplete Abortion	10.54	18.62	7.18	12.50
Sepsis	15.01	32.38	6.04	18.84
Shock	20.26	17.44	3.43	14.33
Lacerations	17.99	12.90	2.11	11.36
Perforations	43.62	37.46	1.25	28.65
All Complications (Averages)	***21.48***	***23.76***	***4.00***	***17.14***

Table 9. Average Cost of Hospitalization by Complication Type and by Facility Type and Cost of Special Fees (USD 2010)				
	Reg. Hospitals	**Hospitals**	**Health Centers**	**All Facilities**
Cost of hospitalization per PAC case (in USD)				
Incomplete Abortion	10.41	16.55	9.17	13.82
Sepsis	38.57	48.07	23.76	42.47
Shock	22.56	45.00	6.99	27.71
Lacerations	25.55	22.84	1.89	17.47
Perforations	64.05	33.97	0.61	30.14
All Complications	***32.23***	***33.28***	***8.48***	***26.32***
Cost per case of out-patient "special fees" (in shillings)				
Average cost per out-patient	26.20	11.14	11.21	12.23
Average cost per PAC case	1.32	0.90	3.29	2.42

Table 10. Overhead and Capital Components of PAC Cost per Case by Facility Type (USD 2010)				
	Reg. Hospitals	**Hospitals**	**Health Centers**	**All Facilities**
Overhead Costs				
Total annual wage bill per facility*	64,000	42,000	11,000	41,000
Total maintenance and other costs**	124,000	23,000	13,000	53,000
Total annual overhead cost per facility	188,000	65,000	24,000	94,000
Total annual overhead cost to supply PAC per facility	10,000	2,800	1,100	4,400
Overhead cost per PAC case	11.44	18.39	21.60	19.89
Capital Costs				
Construction and equipment costs per facility				
Amount per facility	43,090,000	9,830,000	1,330,000	17,880,000
Useful lifetime				
Number of years	68	45	33	49
Amortized annual construction and equipment costs (interest rate = 2%) -- total				
Amount per facility	1,170,000	334,000	56,000	580,000
Amortized annual construction and equipment costs (interest rate = 2%) -- to supply PAC				
Amount per facility	62,300	14,500	2,700	27,500
Capital cost per PAC case	71.33	94.57	52.02	62.57

* Data collected on the following non-medical personnel: guard, cleaner, receptionist, record keeper, supply clerk, maintenance worker, driver, food preparer, health inspector, assistant health inspector, health educator, and assistant health educator.
** Data were collected on the following items: building maintenance, utilities, vehicle maintenance, travel expenses, audio/visual materials, education/reference materials, and printed materials.

Table 11. Total Cost per Case for Post-Abortion Care by Facility Type (USD 2010)				
Cost-per-case Components	**Reg. Hospitals**	**Hospitals**	**Health Centers**	**All Facilities**
Direct Costs				
Inputs of labor	21.48	23.76	4.00	17.14
Inputs of drugs, supplies and materials	39.84	26.73	20.61	27.59
Hospitalization	22.98	25.69	11.86	21.63
Special out-patient fees	1.32	0.90	3.29	2.42
Total direct costs	***85.62***	***77.08***	***39.76***	***68.77***
Indirect Costs				
Overhead	11.44	18.39	21.60	19.89
Capital	71.33	94.57	52.02	62.57
Total indirect costs	***82.77***	***112.96***	***73.62***	***82.47***
Total cost per PAC case	***168.39***	***190.04***	***113.38***	***151.24***
Percentage Distribution of Components of Costs				
Direct Costs				
Inputs of labor	25.1%	30.8%	10.1%	24.9%
Inputs of drugs, supplies and materials	46.5%	34.7%	51.8%	40.1%
Hospitalization	26.8%	33.3%	29.8%	31.5%
Special out-patient fees	1.5%	1.2%	8.3%	3.5%
Total direct costs	***100.0%***	***100.0%***	***100.0%***	***100.0%***

Indirect Costs				
Overhead	13.8%	16.3%	29.3%	24.1%
Capital	86.2%	83.7%	70.7%	75.9%
Total indirect costs	***100.0%***	***100.0%***	***100.0%***	***100.0%***
Direct costs	50.8%	40.6%	35.1%	45.5%
Indirect costs	49.2%	59.4%	64.9%	54.5%
Total cost per PAC case	***100.0%***	***100.0%***	***100.0%***	***100.0%***

Table 12. Estimates of Total Costs at the National Level of Post-Abortion Care by Facility Type (USD 2010)						
Cost Components	**Reg. Hospitals**	**Hospitals**	**Health Centers**	**All Facilities**	**All Facilities Percentages**	
					Within Components	**Across Components**
National cost of labor for PAC (in USD)						
Incomplete Abortion	56,000	243,000	370,000	668,000	63.5%	
Sepsis	38,000	118,000	84,000	240,000	22.8%	
Shock	22,000	34,000	11,000	66,000	6.3%	
Lacerations	18,000	15,000	2,000	35,000	3.3%	
Perforations	26,000	16,000	0	43,000	4.1%	
All Complications	***159,000***	***425,000***	***468,000***	***1,052,000***	***100.0%***	***8.5%***
National cost of drugs, supplies and materials for PAC (in USD)						
Incomplete Abortion	83,000	207,000	848,000	1,138,000	91.1%	
Sepsis	27,000	16,000	46,000	89,000	7.1%	
Shock	4,000	6,000	2,000	11,000	0.9%	
Lacerations	3,000	2,000	0	5,000	0.4%	
Perforations	4,000	1,000	0	5,000	0.4%	
All Complications	***121,000***	***232,000***	***896,000***	***1,249,000***	***100.0%***	***10.0%***
National cost of hospitalization for PAC (in USD)						
Incomplete Abortion	55,000	216,000	472,000	743,000	46.8%	
Sepsis	98,000	175,000	331,000	604,000	38.0%	
Shock	24,000	87,000	23,000	134,000	8.4%	
Lacerations	26,000	26,000	2,000	54,000	3.4%	
Perforations	39,000	15,000	0	53,000	3.3%	
All Complications	***241,000***	***518,000***	***829,000***	***1,588,000***	***100.0%***	***12.8%***
National cost of out-patient "special fees" for PAC (in USD)						
National cost for all out-patients	13,000	24,000	230,000	266,000	100.0%	***2.1%***

Amortized annual construction and equipment costs (interest rate = 2%) -- to supply PAC (in USD)						
Capital cost to system to supply PAC	747,000	1,908,000	3,635,000	6,291,000	100.0%	***50.5%***
National overhead costs for PAC (in USD)						
Overhead cost per PAC case	120,000	371,000	1,509,000	2,000,000	100.0%	***16.1%***
TOTAL COSTS OF PAC	***1,401,000***	***3,478,000***	***7,567,000***	***12,446,000***		***100.0%***
Total Direct Costs of PAC	***534,000***	***1,199,000***	***2,423,000***	***4,155,000***		***33.4%***
Total Indirect Costs of PAC	***867,000***	***2,279,000***	***5,144,000***	***8,291,000***		***66.6%***