THE HEALTH SYSTEM COST OF POST-ABORTION CARE IN RWANDA

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Key messages: Expenditure on post-abortion care is an important drain on health resources in Rwanda. Preventing unwanted pregnancies through investments in family planning would lead to net savings of scarce health resources.

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Abstract

Based on research conducted in 2012, we estimate the cost to the Rwandan health-care system of providing post-abortion care (PAC), a subject of policy importance not before studied at the national level. Thirty-nine public and private health facilities were randomly selected for data collection from all five regions and from three levels of health care. Data were gathered on drugs, supplies, material, personnel time, and hospitalization. Additionally, direct non-medical costs such as overhead and capital costs were also measured. We found that the average annual PAC cost per client, across five types of abortion complications, was $110. The total cost of PAC nationally was estimated to be $1.5 million per year, 54% of which was expended on direct non-medical costs. Satisfying all demand for PAC would raise the national cost to $2.3 million per year. Post-abortion care comprises a significant share of total expenditure in reproductive health in Rwanda. Investing more resources in provision of contraceptive services to prevent unwanted or mistimed pregnancies would reduce health systems costs. (Word count: 169)

I. Introduction

Nineteen years after the 1994 genocide that destroyed health infrastructure and led to the loss of almost a million lives, Rwanda has made impressive progress in gradually rebuilding its

health system and improving access to health services, including reproductive health services (Rusa *et al*. 2009; Basinga *et al*. 2011). Improvements in reproductive health care include better availability and quality of maternal health services and the inclusion of post abortion care in the services offered at public health facilities (Basinga *et al*. 2012). Over the past ten years, the maternal mortality ratio in Rwanda declined considerably, however according to the World Health Organization it still remains high with 340 deaths per 100,000 live births in 2010 (WHO 2012). In 2010, maternal deaths surveillance and response from health facilities reported severe bleeding and infection as the leading causes of maternal deaths, while unsafe abortion practices were also recognized as contributing to high maternal mortality. The World Health Organization (WHO) estimates the unsafe abortion related mortality ratio to 80 deaths per 100,000 live births in Africa and 100 in Eastern Africa in 2010 (WHO 2011). In Rwanda, the estimate of mortality due to unsafe abortion is unknown.

Until recently abortion was legally permitted in Rwanda only when two physicians certified that it was necessary to save a pregnant woman's life or protect her physical health. The May 2012 revision of the law extended the grounds for which abortion is authorized to include fetal abnormalities, rape, incest and forced marriage, though still subject to regulation via court review and recommendations from at least two doctors (Republic of Rwanda, 2012c). A recent study on abortion in Rwanda showed that the abortion rate (25 abortions per 1,000 women aged 15-44 in 2009) was lower than the rate for Eastern Africa (36 per 1,000 women in 2008) and similar to the 2008 rate of 28 for Africa as a whole (Basinga *et al*. 2012; Sedgh *et al.* 2012).

Although some research has been done on the health consequences of unsafe abortion, the cost of treating post-abortion complications is as yet undocumented in Rwanda.

Complications of unsafe abortion often require 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, Vlassoff *et al*. 2009b). A review of the literature reveals that very little 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). Such estimates are not available for Rwanda. Therefore addressing this knowledge gap will provide important evidence to support policy and program reform in this vital area. The present paper presents the cost of post-abortion care (PAC)[1] to the national health-care system, and puts forward disaggregated estimates by health-care level, region, severity of complication and cost component.

II. Data and Methods

This study is based on data collected from 39 health facilities in April-May 2012. The sample of facilities was randomly selected from a sample frame of 166 facilities providing PAC that was constructed in the study estimating abortion incidence and post abortion care in Rwanda (Basinga *et al*. 2012). Our sample frame consisted of facilities providing different levels of care

[1] In this study the term post-abortion care refers to the medical care and counseling given to patients who present at health facilities with post-abortion complications. It does not refer to any particular PAC program as such.

and facilities with different ownership structures (public, faith-based and private), both rural and urban. This increased the likelihood of obtaining data that covered the full spectrum of PAC experiences. At the tertiary level of care, we selected all three referral hospitals that provide reproductive health care. Hospitals and health centers at the district level were grouped by region (Kigali city, North, West, East and South) and by ownership (public and faith-based). Within each region and type of ownership, we randomly selected one district hospital and two health centers giving a total of 10 district hospitals and 20 health centers. The Kacyiru Police district hospital, located in Kigali, was included given that it has a gender-based violence one-stop center. Private facilities with an annual caseload of less than 12 post-abortion patients treated were excluded. We then grouped the remaining private facilities by type (hospital, polyclinics and clinics) and randomly selected one polyclinic and four clinics. The only currently recognized private hospital was automatically included.

Prior to commencing the research, the study obtained clearance letters from the National Ethic Committee, the National Institute of Statistics and the Ministry of Health. All potential participants were read an informed consent form before survey administration began. No remunerations were offered.

During the pretest of survey instruments, the research team explored the possibility of collecting costing data on PAC directly from facility records. But, an investigation of several types of facilities (referral hospital, district hospital, health center and private clinic) showed

that the data collection effort required for such an approach would have been onerous and costly.

The survey respondents were health care providers who were knowledgeable about post-abortion care in their facilities through many years of hands-on experience as well as administrators familiar with financial and operational aspects of managing facilities. The respondents provided detailed information on inputs[2] which, when summed up, constitute treatments for specific post-abortion complications.

The methodology used in this study to estimate costs was developed by the Guttmacher Institute and is known as the *Post-Abortion Care Costing Methodology* (PACCM). PACCM adopts the "ingredients approach" (Johns *et al*. 2003) and began as an adaption of the WHO's *Mother-Baby Package* costing spreadsheet (Weissman *et al*. 1999). A 2007 study by the Guttmacher Institute developed data-collection instruments for estimating the costs of unsafe abortion to the health system and to women and their households. The study instruments were pilot tested in three countries, Ethiopia, Pakistan and Mexico.[3] The method was first used in Nigeria (Bankole *et al.* 2007) and has subsequently been employed in recent costing studies in Ethiopia (Vlassoff *et al*. 2012a) and Uganda (Vlassoff *et al*. 2012b). The data-collection instruments and the overall methodology of the present study are very similar to those of the Uganda study.

[2] "Input" means anything that is consumed in the providing a particular treatment. Ibuprophen tablets, units of blood, sterile gloves, time spent by health workers and hemoglobin tests are all considered to be inputs.

[3] The unpublished report of the study is available through Guttmacher Institute or from the corresponding author.

PACCM is a low-cost approach designed to yield cost estimates useful for health policy analysis. The costing perspective is that of the health-care system, not that of the individual or household. Two questionnaires, one collecting data on drugs, supplies and materials, the other on all other inputs, gather information from key-informants such as senior health care providers and facility administrators. These data include the time inputs of health workers directly involved in providing PAC treatment, personnel wages and benefits, hospitalization costs, overhead costs and capital costs. Direct-cost data were gathered separately for all five main types of abortion complications—incomplete abortion, sepsis, shock, cervical/vaginal laceration, and uterine laceration/perforation,[4] following the World Health Organization's classification (WHO 1999).

Respondents were queried on the time required to treat each type of abortion complication as well as time spent in non-treatment activities and the length of the work year, for nine categories of health worker directly involved in PAC.[5] In order to gather data on salaries and benefits, 18 categories were used since several cadres had formal sub-cadres with specific ranges of salaries. For example, the cadre of nurses comprises four distinct sub-cadres. Some benefits, such as professional allowances (duty fees, performance allowances), were omitted

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

[5] The nine health-worker categories are: gynecologist/obstetrician, anesthetist, general practitioner (doctor), nurse, midwife, lab technician, pharmacist, assistant pharmacist and social worker.

from the study to save effort. Our personnel cost estimates would thus be underestimates of the true cost of labor.

Data on the cost of hospitalization were also collected. These included the proportion of cases hospitalized, the average length of stay and the fees charged per day. Respondents were also queried on capital costs: infrastructure and equipment replacement costs and their useful lifetimes. [6] Finally, detailed overhead costs were collected. Information on the numbers and salaries of 26 categories of non-medical support staff was gathered as well as on eleven specific overhead expenses such as plant maintenance and utility charges. Specifics of security and cleaning outsourced contracts were also recorded.

Data on the drugs, supplies and materials used in PAC were directed at care providers with extensive experience. Over 100 such inputs were included in the questionnaire, but more than 400 data items were obtained to cover the dimensions of inpatient/outpatient status and type of complication. The list of drugs, supplies and lab tests was based on evidence from previous studies in other countries and the inputs listed in the World Health Organization's *Mother-Baby Package* (WHO 1999). The prices of drugs and supplies were obtained both from the medical procurement and distribution division of the Rwanda Biomedical Center (formerly CAMERWA) and, when local price data were lacking, from several international sources (DrugBank 2012, IDA Foundation 2012, Management Sciences for Health 2012, Pharma Professional Services

[6] Capital costs include both the cost of construction and durable equipment such as furniture, vehicles, x-ray machines, laboratory equipment, etc.

2012, UNICEF 2012 and UNFPA 2009).[7] When required, prices were adjusted to 2012 by using World Bank GDP deflators (World Bank 2012). The price of commodities is the major driver of cost, but not the sole one. Other factors that influence the final cost, either positively or negatively, include spoilage, stocking costs and transportation costs and discounts from centralized procurement. We did not attempt to measure such factors because of the time and cost of doing so.[8] The prices of lab tests were obtained from two private laboratories in Kigali. The cost of blood was obtained from the Rwanda blood costing model used by the national center for blood transfusion division of the Rwanda Biomedical Center.

Data collection took into account several dimensions. Data on labor costs, for example, were divided into nine categories of health workers, five complication types, four facilities types and two regions.[9] Data on drugs and supplies were further divided into two patient statuses. The responses from the experts interviewed are assumed, on average, to provide a reasonable approximation of the true values of the various rates and amounts of specific inputs.
The calculation of the annual capital cost for post-abortion care, disaggregated by type of facility, used the following formula:

[7] About half of the prices used in this study came from the Rwanda Biomedical Center and half from international sources. RBC prices were given preference when both were available. A random sample of input prices, when both sources were available, showed that on average the two sets of prices were quite similar.

[8] Free procurement of drugs and supplies by foreign donors was not an issue since this paper is concerned with how much PAC costs, not with who pays for it.

[9] Although the sample was based on Rwanda's five regions, four regions (North, East, South and West) are largely rural in character whereas the fifth region, Kigali, is largely urban. Since findings from the four rural regions were very similar, in the analysis of the data we opted to contrast Kigali with the four regions taken together. Four out of the country's 41 district hospitals, 24 out of 385 health centers and 34 out of 37 private clinics are located in Kigali.

$$K_i = A_i \times P_i \times N_i \div C_i$$

Where

K_i is the annual capital cost attributable to treating one PAC case,

A_i is the annual amortized cost of capital per year of useful life,[10]

P_i is the proportion of all cases that are PAC cases,

N_i is the number of facilities in Rwanda,

C_i is the number of PAC cases, and

i is the *ith* type of facility.

Quantities of inputs reflected the amounts normally used in treating specific complications. Using these data yielded estimates of *costs per treatment*. Since one case may involve multiple treatments an adjustment, employing the relative shares of complication types, was necessary to calculate *costs per case*.

A sensitivity analysis was performed in order to assess the relative effects of measurement errors on cost estimates. All variables—numbering close to 2,000 in all—were tested using maximum and minimum values for each variable to compute new cost estimates.[11]

[10] Amortization was calculated as follows. 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 3%. "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.

[11] For all variables, the minimum was set at 75% of the mean value and the maximum at 125% of the mean.

Estimating the number of PAC cases

The number of PAC cases in Rwanda in 2012 could be estimated from three sources: the Rwandan Ministry of Health (MOH) statistical records, the study's own data and the 2009 incidence of abortion study (Basinga *et al*. 2012). We preferred to use the estimates available from the 2009 abortion incidence study over estimates from our data or MOH since that study's sample of health facilities was larger and based on a list of existing facilities compiled in cooperation with MOH. We obtained the number of PAC cases for 2012 by adjusting the 2009 estimate using the population growth rate (United Nations Population Division 2012) as a proxy for the growth rate in the number of PAC cases.

As seen in the second panel of Table 1, three-quarters of PAC patients were treated for incomplete abortion, 13% 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. Across all 39 facilities, we found that, on average, each PAC patient was treated for just over one complication, although this ratio varied by facility type and region.

Table 1 also shows the numbers of cases of rare, but very serious complications. These include morbidities such as peritonitis, renal failure, septicemia and heart failure, which are rare but life-threatening complications. As shown in Table 1, very few such cases were reported in our study, amounting to about 1% of admissions at referral hospitals and only 0.1% of all admissions. The cost of treating these rare conditions is omitted in this study, but as each case

where death is not the outcome may be very expensive, the overall cost estimates will be somewhat under-estimated by this omission.

In Rwanda, over four fifths of most PAC cases were treated as inpatients in 2012 (Table 1, third to last panel). While 81% of women suffering from incomplete abortions were admitted as inpatients, 97% with uterine perforations were treated as inpatients. Surprisingly, while around 95% of all PAC cases presenting at health centers were treated as inpatients, a smaller proportion, 82%, presenting at referral hospitals were hospitalized. Private clinics, interestingly, had a much lower proportion of cases treated as inpatients than did public facilities.

Overall, we estimated that 1.17% of all patients presenting at health facilities in Rwanda in 2012 were treated for post-abortion complications (induced or spontaneous). The estimated numbers of PAC cases due to induced abortion in the entire health system of Rwanda are shown in the bottom panel of Table 1. We estimated—after adjusting for population growth—that there were 18,300 PAC cases due to unsafe abortion treated by the health system in 2012, one quarter in Kigali region and three quarters in the other four regions.[12] Even though each health center, on average, treats few PAC cases—about three per month—in total these facilities treat around 56% of all PAC cases.

[12] As the focus of this study is on unsafe abortion, only the cost of PAC cases caused by induced abortion were estimated in this study—PAC cases from spontaneous abortions were excluded. However, a lack of information forced us to assume that the distribution of complication types for induced abortions was the same as the distribution for all abortions. This may have resulted in somewhat underestimating costs, to the extent that miscarriages produce relatively less severe complications.

We know that many women who have unsafe abortions and develop complications never reach a health facility for treatment. Using estimates from the abortion incidence study (Basinga *et al*. 2012), we estimated that in Rwanda in 2012, the number of women with *untreated* abortion complications (at least untreated by the formal health system) was 9,150.

Limitations of the study

Even though our sample of health facilities was selected randomly, the small number of observations (N = 39) argued against the use of statistical probability analysis. We did calculate confidence intervals for the main cost components but they are quite wide due to the small sample size and are not included in this report.[13] However, the sensitivity analysis does provide a kind of confidence interval for our estimate of the total cost of unsafe abortion to the national health-care system. For scaling estimates up to the national level we relied on data from the 2009 abortion incidence survey, which sampled a larger number of facilities (N = 166 from a universe of 466 facilities) and inflated the number of PAC cases in line with population growth to arrive at an estimate for 2012. We assumed that the context of unsafe abortion, in terms of the rate of unplanned pregnancies, the abortion rate, and the accessibility of health care, have not changed over the intervening three years.

The data gathered through the PACCM approach are estimates made by PAC providers and facility administrators. Although the respondents have long experience in post-abortion treatments, the information they provided may suffer from unknown response biases. For

[13] See the supplementary information to this report provided online.

instance, there may be a tendency to inflate the amount of time health workers spend with patients. The PACCM aims to keep research costs low while still generating reliable cost estimates suitable for informing policy decisions, but not managerial ones. It trades off some precision in order to minimize the time and effort in data collection.

Difficulties in measuring specific treatment inputs posed further constraints on our study. Determining the amounts of drugs and supplies used in PAC treatments was complicated by the wide range of nomenclature, presentation, packaging and bundling in which these inputs are supplied in the market. On the demand side we opted for recording amounts in a few basic units such as the milligram; on the supply side we adopted an averaging approach to pricing drugs and supplies. Another example of unavoidable imprecision is the selection of the future rate of inflation, which is an important driver of capital costs. In this case we followed the practice, common nowadays in costing research, of assuming a constant rate of 3% per year in the future. Determining the cost of labor is similarly fraught with imprecision. Although the amounts of time spent by given categories of health providers may be reported with an acceptable degree of accuracy, the proportion of total work time actually spent, directly or indirectly, in treating patients as opposed to idle time or time spent in non-medical activities is harder to gauge as accurately. This imprecision tended to produce an underestimate of the true cost of labor, but perhaps was compensated for by a possible propensity of respondents to inflate their estimates of the time spent in treatment.

III. Results

Direct Medical Costs

Costs of drugs, supplies, materials and laboratory tests

We estimated that the cost per PAC case of drugs, supplies and other physical inputs amounted, on average, to $26 in 2012 (Table 2).[14] Although this cost varied only slightly between Kigali ($28) and other regions ($25), there were notable differences among the types of health facility. Expenditure on drugs and supplies at district hospitals was only a little over half of similar expenditures in referral hospitals. Health centers spent about one quarter as much on physical inputs as referral hospitals and spending at private clinics was around one third that of referral hospitals. Across all facility types, the costs of drugs and supplies were found to be considerably lower for out-patients than for in-patient (not shown in table). For example, in the treatment of cases of shock, an average of $3.40 was spent on drugs and supplies for out-patients but $49.80 was spent for in-patients.[15] For cases of incomplete abortion, the corresponding expenditures were $9.80 versus $29.00.

Costs of physical inputs per treatment are shown in the bottom panel of Table 2. The cost of drugs and supplies used for treating shock, estimated at $53 per treatment, was the most

[14] All costs in this study are given in 2012 United States Dollars (USD).

[15] Outpatients suffering from shock would typically either be admitted as inpatients or referred to a higher level facility. The costs reported at health centers would likely consist of palliatives before transfers took place.

costly, whereas treating cervical and vaginal lacerations was the least expensive, estimated at $12. The high cost of blood transfusions and the abundance of lab tests were the main contributors to the cost of treating patients with shock symptoms. The main drivers of costs of physical inputs in treating sepsis and incomplete abortions were also found to be the number and frequency of lab tests performed. In treating incomplete abortion, for instance, the principal drivers were procedures such as ultrasound and blood tests[16], which were performed in around one third of all such cases. In treating uterine perforations, on the other hand, operating room supplies were the major drivers of cost.

Medicines, supplies and lab tests were the costliest direct inputs used in PAC (Table 2, middle panel), accounting for 52% of direct treatment costs overall. These costs represented 71% of direct medical costs in health centers, compared to around 60% in referral and district hospitals. On the other hand, they comprised only 24% of direct medical costs in private clinics, but this was largely because labor costs were substantially larger in the private sector as well as due to the relative preponderance of less severe PAC cases in private facilities.

Costs of medical personnel

The percentages of PAC cases seen by the various cadres of health workers, the total time each type of worker spent in the treatment of patients and the salary and benefits received by the workers are the three main components of direct labor costs.[17] The proportion of patients seen

[16] Numeration formule sanguine (NFS) in French.

[17] The labor cost of non-medical health personnel are treated below under overhead costs.

by health personnel (not shown in Table 2) varied considerably. For example, gynecologists or obstetricians attended 100% of patients suffering from incomplete abortion at referral hospitals, but only 53% of such patients at district hospitals (looking only at hospitals having gynecologists or obstetricians on staff). Around 20% of incomplete abortion cases received counseling from social workers at referral and district hospitals while 54% did at health centers. One hundred percent of PAC patients being treated for shock or sepsis were seen by nurses at health centers, but at referral hospitals only 37% of such cases were attended to by nurses.[18]

Our study found that the average number of minutes that health workers spent attending patients varied by category of worker and facility, by type of complication and by region. The most notable differences in time spent in treatment were seen in private clinics where our survey found that health workers spent significantly more time with patients. For instance, private clinic midwives spent a total of 14 hours with patients in cases of shock, whereas midwives in district hospitals spent only three hours (not shown in table). In cases of uterine perforation, private nurses spent almost four hours tending patients but nurses at district hospitals spent only 48 minutes on average. Within the public system, time spent generally varied by the severity of the complication. For example, in cases of retained products of abortion we found that on average nurses spent 50 minutes with patients at referral hospitals, 96 minutes at district hospitals and 127 minutes at health centers The corresponding times for gynecologists/obstetricians for cases of sepsis were 73 minutes at referral hospitals, 38 minutes

[18] At referral hospitals PAC cases are usually managed by midwives.

at district hospitals having these specialists and zero minutes at health centers (since there were no obstetricians or gynecologists posted at health centers).

From the above data, together with information on non-treatment time and salaries and benefits, we computed average costs of labor per case by facility type and by region (Table 2, top panel). Overall, the cost of labor per PAC case was estimated to be $19 with wide variations by type of health facility, costing as much as $53 at private clinics. The higher cost within the private sector reflects more time spent attending patients, as we have just seen, but not higher salaries, which were comparable to public-sector remuneration in general. Within the public sector, the cost of labor for PAC was related directly to level of care, as would be expected since severe cases, which require greater inputs of labor, tend to be referred to higher level facilities. Thus, labor cost almost $30 at referral hospitals but only $5 at health centers. Regionally, PAC labor costs were found to vary widely: on average $34 in Kigali compared to only $10 in the other four regions combined. The fact that all private clinics and most referral hospitals are located in Kigali no doubt largely contributed to this disparity.

The cost of labor varied by complication (Table 2, bottom panel), but not in the way that would necessarily be expected *a priori*. While treating an incomplete abortion was estimated to have the lowest average cost of labor ($15), the cost of labor for treating shock was more than twice as high ($39). The average labor cost for repairing perforated uteruses amounted to only about $20.

Hospitalization costs

Data were also collected on hospitalization costs.[19] As seen in Table 2, hospitalization (accommodation and meals only) was a relatively minor component of cost, comprising 10% of total direct medical costs overall. Hospitalization was more expensive at private clinics (around $18) than in public facilities ($1 to $11). The bottom panel of Table 2 shows hospitalization costs by type of complication. Treatment of sepsis incurred the highest cost ($9) while lacerations required only $1.40 in hospitalization costs, both because relatively few laceration cases needed hospitalization and because their average length of stay was shorter than other types of complication.[20]

The average length of stay (not shown in table) varied by both type of facility and by complication. PAC patients on average spent 3.5 days in referral hospitals but only 2.2 days in health centers and 0.9 days in private clinics. In referral hospitals, patients being treated for incomplete abortion stayed, on average, for 1.7 days, 8.0 days for sepsis, 9.3 days for shock and 10.0 days for perforations.

Direct Non-medical Costs

[19] As in other studies using the PACCM methodology, respondents were queried about special fees that patients might have to pay in order to receive service. In Rwanda, however, no such fees, except consultation fees, were reported at all.

[20] Only two large hospitals in Rwanda provide meals. The cost of hospitalization in this study, therefore, largely consists of the lodging costs. Even then, patients usually supply their own bed linen.

Although costing studies of PAC have generally omitted direct non-medical costs (Vlassoff *et al*. 2008), they are a significant component of total costs. The United Nations document on global reproductive health costs reported that direct non-medical costs[21] in 2008 were about twice as large as direct medical costs in Sub-Saharan Africa (United Nations 2009). Vlassoff *et al*. 2008 found that between one quarter and one third of total PAC costs were non-medical in the African and Latin American regions. A recent study of PAC costs in Uganda (Vlassoff *et al*. 2012b), the first thoroughgoing attempt to measure the direct non-medical PAC costs, found that 68% of direct costs were non-medical.

Overhead costs

The upper panel of Table 3 gives estimates of overhead costs. Our study collected overhead costs in two categories: the cost of non-medical workers in the health system; and maintenance and other operational expenses.[22] Outsourcing of security and cleaning services is widely practiced by Rwandan health facilities, so was treated as a separate category of overhead in our study. In 2012, the total annual wage bill for non-medical workers per facility ranged from $366,000 for referral hospitals to $39,000 for health centers. Referral hospitals employed an average of 62 non-medical workers, district hospitals 35 workers, health centers 15 workers and private clinics 11 for ancillary, non-treatment activities (not shown in table). Maintenance and operating expenses are divided into two categories in Table 3: maintenance expenses and

[21] Indirect costs, called "program and system costs," included the costs of 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).

[22] A description of these two categories is found in the notes to Table 3.

outsourced contracts, which were found to be common at hospitals but not at health centers or private clinics. The cost per facility for maintenance expenses ranged from $1.9 million for referral hospitals to $43,000 for health centers. These expenses were almost three times higher for facilities in the Kigali region than in the other four regions. Outsourced contracts for cleaning and/or security cost referral hospitals $367,000 on average, but only $87,000 at district hospitals. Adding up these three components of overhead, the total average overhead cost per sample facility amounted to $163,000 per annum. The portion attributable to PAC (due to induced abortion) averaged $1,300 per facility—$21,700 for referral hospitals, $3,800 for district hospitals, $800 for health centers and $1,300 for private facilities. Overhead per PAC case amounted to $26 at district hospitals, $60 at referral hospitals and $32 health centers. It should be noted that overhead costs per case were arrived at by using the proportions of PAC cases to all cases, under the simplifying assumption that all types of treatments shared overhead expenses equally.

Capital costs

The lower panel of Table 3 presents capital cost estimates. Survey respondents were asked to estimate the costs for the infrastructure and equipment of their facilities, using construction records and purchase documents where possible, as well as the useful lifetimes of the facilities. Referral hospitals, as expected, were the most expensive, costing $66.6 million on average to construct and equip, while health centers were the least costly at $1.5 million per facility. Regionally, capital spending per facility in the Kigali region was more than eleven times that in the rest of the country. The estimated useful lifetimes of facilities varied little among public and

faith-based facilities, within a 40-42 year range, while private facilities had an estimated lifetime of 50 years. Amortized annual costs of capital were computed from the estimated capital costs and effective lifetime data, with the future rate of inflation assumed to be a constant 3%.[23] Overall amortization costs were found to be $2,300 per facility, ranging from $23,800 for referral hospitals to $400-500 for other types of facilities. The cost of capital was greatest for referral hospitals at $177 per PAC case due to induced abortion and least at district hospitals at $3 per PAC case.[24] The cost per PAC case at health centers ($15) was around half the overall average across all facilities ($29). The cost of capital per PAC case in Kigali was estimated to be more than five times higher than in the four surrounding regions.

Total direct costs per case

Table 4 displays the total direct costs of all inputs per PAC case, both medical and non-medical, by facility type and by region, aggregated across all complication types. The average cost per PAC case—computed over all facilities and all regions—was estimated to be $110. The direct medical cost per case was found to be directly related to the level of care: treatment of post-abortion cases at referral hospitals was the most costly ($345 on average); per-case PAC treatment at district hospitals cost $91, while $68 was spent per case at health centers.

We found that non-medical expenditures on capital and overhead, which are necessary for the functioning of the health system although not directly tied to the provision of care, were 55% of

[23] As an example of how inflation assumptions affect this estimate, with inflation at 0%, the cost per PAC case at health centers would fall from $14.70 to $12.60; with inflation at 4%, the annual cost would rise to $15.30.

[24] Our estimate of the percent of the total caseload of district hospitals outside Kigali—where most district hospitals are located—was very low and was based on indirect evidence.

total cost per PAC case (Table 4). This non-medical component ranged from 69% of total cost at referral hospitals to 32% at district hospitals. It was also higher in Kigali (60%) than in the other regions (50%).

National cost of PAC due to unsafe abortion

Our results on cost per case and cost per treatment of post-abortion care can be extended to attempt to measure the full monetary impact of unsafe abortion on the national health system. From our data and from the findings of the 2009 abortion incidence study (Basinga *et al*. 2012), we were able to disaggregate the estimated 18,300 PAC cases in 2012 caused by induced abortions by type of complication, facility type and region. Applying these numbers to the relevant costs per case yielded national cost totals. These are shown in Table 5. The bottom panel of Table 5 displays the total costs to the Rwanda health system for treating PAC in 2012 by facility type and region. Including direct medical and non-medical costs, the grand total for Rwanda was estimated to be $1.5 million. A little over half of this amount, or $837,000, went to non-medical costs (overhead and infrastructure) while the remainder ($706,000) was spent on direct medical inputs (drugs, supplies, labor and hospitalization). Hospitalization accounted for only 2% of total expenditure, drugs and supplies for 28% and the wages of medical personnel for 15%.

Incomplete abortion was by far the costliest PAC complication: 52% of labor costs, 80% of the cost of drugs and supplies and 66% of hospitalization costs were spent in treating this complication (not shown). Treatment of sepsis and shock accounted for most of the remainder

of direct medical costs, while lacerations and perforations together consumed only around 2-4% of direct medical inputs. Most PAC expenditure occurred in health centers ($688,000) followed by district hospitals ($540,000). Referral hospitals accounted for $227,000 or only 15% of total expenditure on PAC caused by unsafe abortion.

IV. Discussion

Sensitivity analysis

Although our sample of health facilities was randomly chosen, with a small sample size (N = 39) the use of statistical inference to test the robustness of our findings was impractical.[25] Since our data were largely based on best estimates of key experts, measuring the precision of the cost estimates was of particular interest. We undertook a sensitivity analysis to address this concern. Data on several hundred inputs were collected in the study.[26] We attempted to test the sensitivity of most, focusing on the effect on the estimates of total national costs of labor, drugs/supplies, hospitalization, overhead and capital.

Some results of a sensitivity analysis are shown in Table 6. The top panel of the table displays the ten non-drug/supplies inputs that had the largest impact on the estimation of total national cost of PAC. Our overall cost estimates were most sensitive to data related to the capital and

[25] Confidence intervals on a range of variables are included in supplemental data and findings online.

[26] Around 250 variables on labor, overhead, hospitalization and capital costs were collected; and more than 1,600 variables on the costs of drugs and supplies were collected in the study.

overhead components as well as some inputs related to labor costs. The three inputs determining capital costs were ranked first, third and sixth in terms of sensitivity. For example, raising the data values for the variable "facility construction and equipment cost" by 25% raised the total national cost estimate by 4.02% (and lowering it by 25% lowered total cost by the same percentage). In terms of sensitivity to overhead inputs, transportation, utilities, building maintenance and outsourced service contracts were the biggest drivers of total PAC cost. Three labor-related inputs also ranked in the top ten sensitive variables: the number of hours in a work year for nurses/midwives and for doctors, and the salaries of midwives. As can be seen, the tenth most significant input had an impact of only 0.74% on total cost in the sensitivity test. Of the 219 non-drug/supplies inputs entered into the sensitivity test, 157 had an impact of less than 0.05% on the total cost of PAC to the national health system.

The lower panel of Table 6 shows the ten inputs of drugs, supplies and materials—including lab tests—that had the greatest effect on total cost when subjected to sensitivity testing. Six inputs in this top-ten list were either laboratory tests or the abdominal ultrasound procedure. The test for syphilis, for example, caused a 0.59% change in total PAC cost when its data values were either raised or lowered by 25%. Of the 526 inputs tested for sensitivity, only 22 had an impact of 0.1% or greater on total cost and 442 inputs had a negligible effect on it (0.01% or less).

Rwanda and Uganda: Contrasting PAC Costs of Two Neighbors

As mentioned, the current study closely mirrors a 2010 costing study in Uganda, both in methodology and in proximity in time, making it interesting to explore the similarities and

differences between the responses of these neighboring countries' health systems to the challenges thrown up by unsafe abortion.

Table 7 lists several indicators which we use for this comparison.[27] We note, first of all, that income levels and overall spending on health were similar in the two countries, while Uganda seemed to spend more per capita on women's health than does Rwanda.[28] The cost of treating post-abortion complications from unsafe abortion was similar in the two countries: $110 per case) in Rwanda and $138 in Uganda. Breaking down the total cost figure into its major components (Table 7, second panel) we see further similarities: drugs/supplies, labor and hospitalization costs are roughly comparable between countries. On the other hand, the overhead-cost component in Rwanda ($32) is 60% higher than the Uganda amount ($20) [29] while capital costs in Rwanda are less than 40% as large as those in Uganda . In the lower panel of Table 7 we see that medical salaries were substantially higher in Rwanda than in Uganda. The amount of time medical cadres spent with PAC patients was also higher in Rwanda than Uganda, further adding to the gap in per-case costs. Table 7 also shows two examples of material inputs: blood sacs for transfusions and hemoglobin tests. In both cases, Rwandan prices were above Ugandan ones.

[27] To the extent possible, Ugandan indicators have been prorated to 2012 to be more comparable to Rwandan indicators.

[28] However, the two measures are not strictly comparable: the Rwandan quantity is expenditure on reproductive health while the Ugandan quantity is expenditure on maternal and newborn health.

[29] Two examples may be cited. The average monthly salary of food preparers in Uganda was estimated to be $48 while it was $250 in Rwanda. The annual expenditure for vehicle maintenance was $3,600 in Uganda and $12,400 in Rwanda. Another factor possibly affecting the overhead cost difference between the two countries was that the questions related to overhead in the Rwandan questionnaire were somewhat more disaggregated than in the Ugandan questionnaire.

The distribution of patients by level of health care was quite similar in the two countries. However, the distribution of PAC cases by type of complication showed that Uganda had a somewhat heavier burden of serious cases. This likely indicates that access to safe, though still clandestine, abortions was probably greater in Rwanda than in Uganda.

V. Conclusion and Implications

We estimated the cost of treating post-abortion complications to the Rwanda health system in 2012 at $1.5 million and, of this total, non-medical costs (overhead and infrastructure) were 54%. Improving "accessibility to quality of, and demand for maternal and child health services" is one of the strategic objectives of the Rwanda health sector strategic plan (Republic of Rwanda, 2012b). This increased government prioritization towards reproductive health services is reflected by the 116% increase in reproductive health total expenditures in 2009-2010 compared to 2006, with an increase of the publicly funded share of reproductive health expenditures from 14% to 38% (Republic of Rwanda, 2012b). Total expenditure on health in Rwanda in 2009-2010 was estimated at $420.3 million and, of this amount around 10%—$41.4 million— were allocated to reproductive health services. Thus our estimates show that the cost of treating post-abortion complications from unsafe procedures was 3.7% of projected spending on reproductive health and 9.6% of total public spending on reproductive health. The cost of unsafe abortion to the health system is therefore a considerable one.

According to Basinga *et al*. (2012), almost one-third of women who experienced post-abortion complications did not receive treatment in 2009. This suggests that if all women with post-abortion complications had been able to access health care services, the total cost of PAC would have amounted to $2.3 million. However, we should note that our estimates are 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 attend. Despite this uncertainty, there is no doubt that treating all women who have an unmet demand for post-abortion care represents a sizable additional financial burden on scarce health resources, should this need be met.

Unsafe abortion generates unnecessary costs to society on a variety of levels (Vlassoff *et al*. 2008). This study focuses on only one component of the cost of unsafe abortion—the cost to the health-care system of treating post-abortion complications. There are many other substantial costs involved (Vlassoff *et al*. 2008) including the treatment of longer-term morbidities that result from unsafe abortion—especially the high cost of infertility treatment—as well as the economic cost to Rwandan households and society of productive time lost through abortion-related morbidity and mortality. The total financial burden of unsafe abortion would therefore be much higher than the costs we are able to report from our study.

Thus, preventing the root causes of unsafe abortion is essential. Findings from Basinga *et al*. (2012) revealed that 114 unintended pregnancies per 1,000 women aged 15-44 occurred in

2009 nationwide, and 47 percent of all pregnancies were unintended—due largely to unmet need for contraception. The substantial cost estimates from our study reinforce the importance of reducing unsafe abortion by increasing contraceptive coverage and PAC in a country where abortion is restricted.

In the end, a better health policy would prevent one of the root causes of unsafe abortion—namely the large number of unintended pregnancies. About 275,000 unintended pregnancies occurred in Rwanda in 2009 (Basinga *et al*. 2012), due largely to unmet need for contraception which stood at around 21% in 2010, having declined from 38% in 2005 (NISR 2009; NISR 2012). Cost-benefit analyses in Nigeria (Bankole *et al*. 2007), Ethiopia (Vlassoff *et al*. 2012a), Burkina Faso (Vlassoff *et al*. 2011) and Uganda (Vlassoff *et al*. 2009a) demonstrated that by spending more on family planning far greater savings would be achieved from reduced expenditure in PAC services. Although no recent data are available on the cost of family planning services in Rwanda, a similar argument can be made if we use costs found in neighboring countries as surrogates. The estimated cost of supplying the methods of contraception, based on an average of neighboring countries, is around $30 per user.[30] Comparing this cost to the per-case cost of PAC ($110) it is clear that there exists a strong economic rationale for preventing unwanted pregnancies in Rwanda through family planning. The marginal benefit-cost ratio of this strategy would be more than 3.5:1; that is, every dollar spent in family planning would save the health system more than 3.5 dollars in PAC treatments averted.

[30] The average costs of family planning per user are as follows: Ethiopia $32.21, Uganda $22.24 and Burkina Faso $34.75. See above for references.

Rwanda has achieved remarkable health gains over the last decade; the cost estimates from this study provide evidence to further improve policies and programs development to continue the positive trend towards increasing contraceptive use and access to post-abortion care.

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VI. Tables

TABLE 1. AVERAGE NUMBER OF PAC CASES PER YEAR AND DISTRIBUTION OF ABORTION COMPLICATIONS BY FACILITY TYPE AND REGION, RWANDA, 2012

	Referral Hospitals	District Hospitals	Health Centers	Private Clinics	Kigali	Other Regions	All Facilities/ All Regions
Average number of PAC cases per year per facility							
From incidence study (2009)*	484	200	37	75	100	44	***57***
Percent of PAC cases with specific complications							
Incomplete abortion	73.2%	70.8%	78.1%	78.9%	70.3%	79.1%	***76.0%***
Sepsis	6.1%	12.5%	12.8%	18.0%	17.6%	10.4%	***13.0%***
Shock	5.2%	14.9%	8.1%	2.5%	7.2%	9.7%	***8.8%***
Lacerations	4.9%	1.5%	0.0%	0.0%	1.7%	0.2%	***0.8%***
Perforations	10.7%	0.3%	1.0%	0.6%	3.2%	0.6%	***1.5%***
Total	***100.0%***	***100.0%***	***100.0%***	***100.0%***	***100.0%***	***100.0%***	***100.0%***
Number of PAC cases with rare complications*							
Number per 1000	9.3	2.5	0.1	0.0	3.0	3.0	***1.4***
Percent of PAC patients treated as <u>inpatients</u>							
Incomplete abortion	76.7%	90.0%	95.2%	21.7%	51.7%	97.6%	***81.1%***
Sepsis	100.0%	97.8%	98.1%	55.0%	80.6%	97.6%	***91.5%***
Shock	100.0%	100.0%	84.0%	99.5%	92.6%	91.2%	***91.7%***
Lacerations	73.3%	100.0%	100.0%	83.3%	87.1%	100.0%	***95.4%***
Perforations	100.0%	100.0%	100.0%	83.3%	92.9%	100.0%	***97.4%***
All Complications	***81.6%***	***92.6%***	***94.7%***	***30.0%***	***63.5%***	***97.1%***	***83.8%***

Percent of all admissions that are PAC cases***							
Percent of all cases	1.24%	2.76%	0.87%	0.77%	0.88%	1.32%	***1.17%***
Estimated number of PAC cases annually (2012) <u>due to induced abortion</u>							
Incomplete abortion	800	4,200	8,100	900	3,000	11,000	***14,000***
Sepsis	100	700	1,300	200	900	1,400	***2,300***
Shock	100	800	800	0	500	1,200	***1,700***
Lacerations	0	100	0	0	100	0	***100***
Perforations	100	0	100	0	100	100	***200***
All complications	***1,000***	***5,800***	***10,200***	***1,200***	***4,600***	***13,700***	***18,300***

* Source: Basinga *et al*. 2012

** Rare complications include peritonitis, renal failure, organ failure, septicemia, poisoning, heart failure, etc.

*** "All admissions" means all patients that present at health facilities, both male and female.

TABLE 2. COST PER CASE FOR POST-ABORTION CARE BY FACILITY TYPE AND REGION AND COST PER TREATMENT BY TYPE OF COMPLICATION, RWANDA, 2012 (USD 2012)

Cost per Case (USD)	Referral Hospitals	District Hospitals	Health Centers	Private Clinics	Kigali	Other Regions	All Facilities/ All Regions
Inputs of drugs, supplies and materials	67.16	36.46	15.60	22.37	27.57	25.05	***25.96***
Inputs of labor	29.59	22.94	5.15	53.48	34.32	10.46	***19.02***
Hospitalization	11.17	2.31	1.09	17.68	9.93	1.82	***4.73***
Total direct costs	***107.92***	***61.70***	***21.84***	***93.52***	***71.82***	***37.33***	***49.71***
Percentage Distribution of Costs							
Inputs of drugs, supplies and materials	62%	59%	71%	24%	38%	67%	***52%***
Inputs of labor	27%	37%	24%	57%	48%	28%	***38%***
Hospitalization	10%	4%	5%	19%	14%	5%	***10%***
Total direct costs	***100.0%***	***100.0%***	***100.0%***	***100.0%***	***100.0%***	***100.0%***	***100.0%***

Components of Cost per Treatment (USD)	Type of Complication				
	Incomplete Abortion	Sepsis	Shock	Lacerations	Perforations
Inputs of drugs, supplies and materials	38.80	29.15	53.20	12.13	30.64
Inputs of labor	15.31	30.65	38.55	15.79	19.56
Hospitalization	3.59	8.66	5.96	1.41	5.40

TABLE 3. OVERHEAD AND CAPITAL COMPONENTS OF PAC COST PER CASE BY FACILITY TYPE AND BY REGION, RWANDA, 2012 (USD 2012)

	Referral Hospitals	District Hospitals	Health Centers	Private Clinics	Kigali	Other Regions	All Facilities / All Regions
Overhead Costs							
Annual wage bill for non-medical workers per facility*	366,000	219,000	39,000	126,000	125,000	54,000	64,000
Annual maintenance and other operational expenses per facility**	1,931,000	323,000	43,000	109,000	199,000	67,000	85,000
Annual cost of outsourced contracts per facility***	367,000	87,000	4,000	0	50,000	8,000	14,000
Total annual overhead expenditure per facility	***2,664,000***	***629,000***	***86,000***	***235,000***	***374,000***	***129,000***	***163,000***
Total annual overhead cost to supply PAC due to induced abortion per facility	20,700	3,800	800	1,300	3,600	900	1,300
Overhead cost per PAC case (due to induced abortion)	***60.21***	***26.41***	***31.65***	***40.92***	***49.66***	***26.30***	***32.18***
Capital Costs							
Construction and equipment costs per facility							
Amount per facility	66,560,000	3,570,000	1,490,000	1,710,000	15,890,000	2,120,000	7,060,000
Useful lifetime							
Number of years	40	40	42	50	46	40	42

*Amortized annual construction and equipment costs to supply PAC due to induced aboortion*****							
Amount per facility	23,800	500	500	400	5,500	400	2,300
Capital cost per PAC case (due to induced abortion)	***177.06***	***2.97***	***14.71***	***43.12***	***59.08***	***11.47***	***28.56***

* Data were collected on 26 categories of non-medical workers such as: guard, cleaner, receptionist, record keeper, supply clerk,etc.
** Data were collected on eleven operational expenses such as: building maintenance, utilities, vehicle maintenance, travel expenses, audio/visual materials, education/reference materials, etc.
*** Cleaning and security.
**** The future annual rate of inflation was assumed to be 3%.

TABLE 4. COST PER CASE FOR POST-ABORTION CARE DUE TO INDUCED ABORTION BY FACILITY TYPE AND REGION, RWANDA, 2012 (USD 2010)

Components of Cost	Referral Hospitals	District Hospitals	Health Centers	Private Clinics	Kigali	Other Regions	All Facilities/ All Regions
Direct Medical Costs*	***107.92***	***61.70***	***21.84***	***93.52***	***71.82***	***37.33***	***49.71***
Indirect Medical Costs*							
Overhead	60.21	26.41	31.65	40.92	49.66	26.30	32.18
Capital	177.06	2.97	14.71	43.12	59.08	11.47	28.56
Total Indirect Medical Costs	***237.27***	***29.38***	***46.36***	***84.04***	***108.73***	***37.77***	***60.74***
Total Cost per PAC Case	***345.19***	***91.08***	***68.20***	***177.56***	***180.55***	***75.10***	***110.45***
Percentage Distribution							
Direct costs	31.3%	67.7%	32.0%	52.7%	39.8%	49.7%	45.0%
Indirect costs	68.7%	32.3%	68.0%	47.3%	60.2%	50.3%	55.0%
Total Cost per PAC Case	***100.0%***	***100.0%***	***100.0%***	***100.0%***	***100.0%***	***100.0%***	***100.0%***

* From Table 2.

** From Table 3.

TABLE 5. ESTIMATES OF TOTAL ANNUAL COSTS AT THE NATIONAL LEVEL OF POST-ABORTION CARE (DUE TO INDUCED ABORTION)
BY FACILITY LEVEL, REGION AND TYPE OF COMPLICATION, RWANDA, 2012 (USD 2012)

Cost Components	Referral Hospitals	District Hospitals	Health Centers	Private Clinics	Kigali	Other Regions	All Facilities/ All Regions
National cost of labor for PAC (USD)							
All Complications	25,000	140,000	52,000	16,000	91,000	142,000	233,000
National cost of drugs, supplies and materials for PAC (USD)							
All Complications	63,000	215,000	154,000	7,000	102,000	336,000	438,000
National cost of hospitalization for PAC (USD)							
All Complications	6,000	13,000	11,000	5,000	11,000	24,000	35,000
National construction and equipment cost to supply PAC (USD)							
Capital cost to system to supply PAC	71,000	18,000	147,000	13,000	108,000	140,000	248,000
National overhead cost to supply PAC (USD)							
Overhead cost to system to supply PAC	62,000	154,000	324,000	48,000	229,000	360,000	589,000
TOTAL NATIONAL COST OF PAC (USD)	227,000	540,000	688,000	89,000	541,000	1,002,000	1,543,000
Total Direct Cost of PAC	94,000	368,000	217,000	28,000	204,000	502,000	706,000
Total Indirect Cost of PAC	133,000	172,000	471,000	61,000	337,000	500,000	837,000

TABLE 6. RESULTS OF SENSITIVITY ANALYSIS:
THE VARIABLES TO WHICH NATIONAL TOTAL PAC COST IS MOST SENSITIVE, RWANDA, 2012

Cost Input	Cost Component Contributed to	Absolute Difference between Minimum and Maximum (USD)	Percent Change in National Total Cost
Labor, Hospitalization, Overhead, Capital			
Facility construction and equipment cost	Capital	124,200	4.02%
Number of hours in work year (nurses/midwives)	Labor	73,500	2.38%
Average lifetime of facility	Capital	68,100	2.21%
Number of hours in work year (doctors)	Labor	59,700	1.94%
Future rate of inflation	Capital	59,700	1.93%
Transport*	Overhead	31,000	1.00%
Salary of midwives	Labor	30,000	0.97%
Cost of outsources service contracts	Overhead	28,800	0.93%
Maintenance and operational costs	Overhead	25,800	0.84%
Utilities**	Overhead	22,700	0.74%
Drugs, Supplies, Lab Tests			
Amoxicillin	Drugs/Supplies	19,600	0.63%
Test for syphillis	Drugs/Supplies	18,300	0.59%
Test for HIV	Drugs/Supplies	18,000	0.58%

Test: complete blood count (NFS)***	Drugs/Supplies	17,500	0.57%
Metronidazole by injection	Drugs/Supplies	16,600	0.54%
Ultrasound	Drugs/Supplies	13,700	0.44%
Ringer Lactate (Hartmann's solution)	Drugs/Supplies	13,600	0.44%
Urine cyto-bacteriological test (ECBU)****	Drugs/Supplies	10,800	0.35%
Blood for transfusion (500ml bag)	Drugs/Supplies	9,600	0.31%
Pregnancy test	Drugs/Supplies	8,600	0.28%

* Fuel, repairs, maintenance, lodging, etc.

** Water, gas, electricity, telephone, waste collection, etc.

*** In French: Numeration formule sanguine (NFS)

**** In French: Examen Cyto-Bacteriologique des Urines (ECBU)

TABLE 7: COMPARING THE COST OF POST-ABORTION CARE IN RWANDA AND UGANDA, 2012		
	Uganda	**Rwanda**
General Indicators		
Total population	36,269,000	11,460,000
Number of women aged 15-44	7,351,000	2,589,000
Number of PAC cases*	113,000	18,300
Number of PAC cases per 1000 woman aged 15-44	15.37	7.07
Gross domestic product per capita**	$1,345	$1,282
Health expenditure per capita (USD, 2010)	$46.72	$55.51
Reproductive health expenditure per capita (USD)***	$9.65	$3.61
PAC expenditure per capita (USD)	$0.38	$0.13
Cost per case of PAC (USD)	$138.17	$110.45
Components of Cost of PAC		
Cost of labor per PAC case (USD)	$11.75	$19.02
Cost of drugs/supplies per PAC case (USD)	$25.46	$25.96
Cost of hospitalization per PAC case (USD)	$5.90	$4.73
Cost of capital per PAC case (USD)	$74.66	$28.56
Cost of overhead per PAC case (USD)	$19.89	$32.18
Specific Cost-related Indicators		
Percent of PAC cases treated at:		
Primary level	64%	60%
Secondary level	28%	34%
Tertiary level	7%	6%
Percent of PAC cases treated for:		

Incomplete abortion	62%	76%
Shock	21%	13%
Sepsis	9%	9%
Lacerations or perforations	9%	2%
Average monthly salary (USD):		
Obstetrician/gynecologist	$592	$946
Nurse-midwife	$219	$401
Pharmacist	$349	$434
Average time spent, doctor, sepsis (minutes)	71	53
Average time spent, nurse, sepsis (minutes)	88	131
Average time spent, doctor, incomp. abortion (min.)	49	46
Average time spent, nurse, incomp. abortion (min.)	88	128
Cost of one unit of blood (USD)	$7.79	$48.60
Cost of hemoglobin test (USD)	$0.85	$1.32

* PAC cases due to induced abortions

** PPP, current international dollars, 2011

*** For Uganda, annual expenditure for maternal and newborn health, 2010

Note: Unless otherwise stated, Ugandan costs inflated by U.S. inflation rate for period 2010-2012.

Sources: World Bank, UN Population Division, U.S, Bureau of Labor, Vlassoff et al. 2012b, data from this study.