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Cost of abortions in Zambia: a comparison of safe abortion and post abortion care

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ABSTRACT

Unsafe abortion is a significant but preventable cause of maternal mortality. Although induced abortion has been legal in Zambia since 1972, many women still face logistical, financial, social, and legal obstacles to access safe abortion services, and undergo unsafe abortion instead. This study provides the first estimates of costs of post abortion care (PAC) after an unsafe abortion and the cost of safe abortion in Zambia. In the absence of routinely collected data on abortions, we used multiple data sources: key informant interviews, medical records and hospital logbooks. We estimated the costs of providing safe abortion and PAC services at the University Teaching Hospital, Lusaka and then projected these costs to generate indicative cost estimates for Zambia. Due to unavailability of data on the actual number of safe abortions and PAC cases in Zambia, we used estimates from previous studies and from other similar countries, and checked the robustness of our estimates with sensitivity analyses. We found that PAC following an unsafe abortion can cost 2.5 times more than safe abortion care. The Zambian health system could save as much as US$0.4 million annually if those women currently treated for an unsafe abortion instead had a safe abortion.

KEYWORDS: abortion, termination of pregnancy, Zambia, cost, health system

INTRODUCTION

Despite significant recent improvements in global maternal health, the number of unsafe abortions remains stubbornly high. Unsafe abortion is defined as a "procedure for terminating an unintended pregnancy, carried out either by persons lacking the necessary skills or in an environment that does not conform to minimal medical standards, or both" (WHO, 2012, p. 17). It is a major public health problem, not only in countries where access to safe abortion services is highly restricted legally, but even where it is legal, access, provision and knowledge of services can be inadequate. An estimated 43.8 million abortions took place worldwide in 2008, 49% of which were unsafe and in Africa nearly all abortions were unsafe (Sedgh et al., 2012).

The economic impact on health systems of unsafe abortion is poorly understood and there is relatively little evidence that is of use to policymakers (Woog, Singh, & Bankole, 2007). Health management information systems (HMIS), even in countries where abortion is legal, rarely collect or report abortion data disaggregated by spontaneous (miscarriage) and induced abortion. Health providers under-report or obfuscate reporting of induced abortion treatment because of the stigma associated with abortion for both providers and users (Suh, 2014). Similarly, women presenting for post abortion care (PAC) might not reveal the induced abortion, for reasons of stigma and fear, and instead state that they have had a spontaneous abortion (Sedgh, Rossier, Kaboré, Bankole, & Mikulich, 2011). .

Following an induced (safe or unsafe) or spontaneous abortion, a woman needs to receive appropriate PAC (WHO, 2012). In the case of complete abortion (in which all the products of pregnancy have been expelled), PAC may focus on a physical check-up and counselling for, and provision of, contraception. In the case of abortion complications, treatment ranges from evacuation of the uterus to complex care for internal damage, infection, haemorrhage and shock. Although health system costs of PAC in Africa are likely to be significant, only a few studies provide some estimates. Vlassoff, Walker, Shearer, Newlands, and Singh (2009) estimate that US$171 million is spent annually to treat abortion complications in Africa. In Ethiopia health system costs of providing PAC ranges from US$6.5 to US$8.9 million - a large proportion of the total reproductive health budget (Vlassoff, Fetters, Kumbi, & Singh, 2012) and in Rwanda, it US$1.5 million per year, rising to US$2.3 million if all demand for PAC were met (Vlassoff et al., 2014). Further evidence is

needed to better understand the financial impact of unsafe abortion on health systems in resource-poor countries. This study provides the first estimates of costs of abortion in Zambia, crucial for informing Zambian public policy.

Study context

Maternal mortality remains a significant problem in Zambia, with a maternal mortality ratio (MMR) of 398 deaths per 100,000 live births for 2013, a reduction of 46% since 1990 (CSO, 2014). For sub-Saharan Africa its estimated that 9.6% of maternal deaths are caused by unsafe abortion (Say et al., 2014). Its contribution in Zambia seems to be far greater. Ministry of Health (MOH) 2009 estimates suggest that unsafe abortion accounts for 30% of maternal deaths (GRZ, 2009). Unmet need for contraception remains high in Zambia (21%) and use of modern contraception relatively low (45%) for married women aged 15-49 (CSO, 2014). Access to contraceptive services is poor, especially for rural residents and younger women. (CSO, 2014).

In Zambia, induced abortion – 'termination of pregnancy' - is legal if carried out by a registered medical practitioner; if a pregnancy involves a risk to the life of the pregnant woman, her physical or mental health or that of any of her existing children, is greater than if the pregnancy were terminated; or a child born of the pregnancy would suffer from such physical or mental abnormalities as to be seriously handicapped. When evaluating the risk to health, medical practitioners may take account of the pregnant woman's actual or foreseeable environment and her age (The Termination of Pregnancy Act 1972). The Penal Code Act includes rape or defilement of a girl child (<16 years) as legal reason for inducing abortion and to exempt from prosecution children who have attempted to self-abort in these circumstances. Terminations require signatures of three registered medical practitioners, one of whom must be a specialist obstetrician gynaecologist. This requirement of three signatories makes implementation of the Act impractical and creates barriers for Zambian women. In emergency cases, however, the signature of only one medical practitioner is required (GRZ, 2009). Women who wish to terminate their pregnancy, particularly poorer, younger women, resort to clandestine methods because of resource shortages and some health providers' resistance to provide safe abortion services (Macha, Muyuni, Nkonde, & Faúndes, 2014; Warenius et al., 2006), but most typically, because of limited awareness of how to obtain a safe, legal abortion (Coast, 2014). A survey found that in both rural and urban areas, while

most young men and women thought that induced abortion was common in their community, they also believed abortion is never legal (BBC, 2014). Despite legal provision for safe abortion for over forty years, unsafe abortion remains a significant public health problem in Zambia.

In Zambia abortion services at public facilities should be provided free, with the exception of registration fees ranging from Kw10-Kw80[1]. Private providers charge significantly more. There are 1,489 public, 122 NGO and 271 private health facilities in Zambia (MoH, 2011), but information on how many of them are providing safe abortion is unavailable. Approximately 88 public facilities are supported by the INGO Ipas to provide safe abortion. The number of private registered practitioners providing safe abortions is unknown. At the time of our study (2013) abortion services operated through MSZ (Marie Stopes Zambia) social franchises were suspended, resuming in 2014. Therefore, when our data were collected, the number of registered providers operating in Zambia was reduced.

There are also no reliable estimates of the number of safe abortions provided in Zambia. Recent HMIS data from the MOH do not distinguish between induced and spontaneous abortions (Kalumbo, 2014).The number of (unsafe) abortions carried out by unregistered providers (traditional healers, unregistered medical practitioners and pharmacists) is unknown.

Studies of abortion in Zambia provide contextual information on the characteristics of women seeking hospital-based care (Dahlback, Maimbolwa, Kasonka, Bergstrom, & Ransjo-Arvidson, 2007; Likwa & Wittaker, 1996) and one study reports the number of safe abortions and PAC provided at University Teaching Hospital (Macha et al., 2014). The costs of unsafe abortion to the Zambian health system have never been estimated. This study fills this gap in evidence by calculating and comparing the costs of PAC for unsafe abortion with those of safe abortion for the Zambian public health system. We estimate the costs at two levels – hospital (University Teaching Hospital, UTH) and national.

METHODOLOGY

[1] US$1.36-US$10.87

We use a bottom-up ingredients approach (Vlassoff, Shearer, Walker, & Lucas, 2008) to estimate per case cost for safe and unsafe abortions. Estimation of the costs of induced abortion to Zambia – both safe and unsafe – is a complex and demanding task. The absence of routinely collected data related to induced abortions means that we have to make best, pragmatic use of what data are available. To do this, we used multiple data sources and methods: key informant interviews (KII, n=18); medical records of women receiving safe abortion and PAC (n=107); and, review of facility aggregate records (logbooks). The medical records and logbooks were obtained from the country's largest obstetrics and gynaecology training hospital, UTH in Lusaka, chosen because it is the largest single public provider of safe abortions and PAC in Zambia (Phiri, 2002). Because of stigma, desires for privacy, and the difficulties of accessing care, many women seeking services here come from areas beyond the immediate Lusaka urban area and represent a wide range of backgrounds and cases. The hospital provides: medical abortion (MA) using mifepristone and misoprostol for gestational age 5-9 weeks and surgical abortion by manual vacuum aspiration (MVA) for gestational age 9-14 weeks. PAC for induced abortion range from treatment for incomplete abortion to life threatening sepsis and shock. We estimate the direct costs of providing safe abortion and PAC services at UTH and extrapolate these costs to generate indicative cost estimates for the Zambian public health system.

Key informant interviews

In the absence of routinely collected and high quality data on induced abortions, KII represent a way of determining the proportion of safe and unsafe induced abortions and complications (Singh, Prada, Mirembe, & Kiggundu, 2005; Vlassoff, Mugisha, et al., 2012). Interviews (n=18) were conducted between January 2013 and January 2014 with service providers (doctors, nurses, pharmacists) from a range of settings (UTH, district clinics), health service administrators (UTH and MOH), and staff of INGOs active in the provision and funding of abortion services in Zambia (Table 1). Key informants were sampled purposively and interviewed in English (the national language). Information on treatment protocols was collected using an instrument, tested and used elsewhere in sub-Saharan Africa (Vlassoff, Mugisha, et al., 2012; Vlassoff et al., 2014). We piloted this instrument at UTH and adapted it to reflect the abortion services and treatments available in Zambia.

Medical record data

We assessed medical records of 107 women who received either a safe abortion or PAC from unsafe abortions at UTH. Data from medical records were used to triangulate the information provided by KIIs on treatment protocols.

Logbooks

We extracted data on abortion services provided at UTH from hospital logbooks, including data on the number of safe abortions provided and the number of women admitted for PAC following initiation elsewhere. According to the logbooks, during July 2012-June 2013, 223 safe abortions and 4,246 PACs were conducted at UTH, similar to the numbers reported by Macha et al. (2014) for 2010 (231 safe abortions, 4,794 PACs). The majority of MA (91%) and MVA (80%) were carried out in the first trimester. Logbooks did not distinguish between PAC from spontaneous and induced abortions.

Method for estimating the number of cases of safe abortion and PAC

University Teaching Hospital

UTH logbooks did not record how many women received treatment for complications arising from safe abortions conducted at the hospital. According to KIIs, on average 15% of women receiving safe abortion, require treatment for incomplete abortion. However serious complications (e.g. sepsis and shock) from safe abortions are very rare (less than 1% of cases), as reported elsewhere (Ngo, Park, & Free, 2013).

Because the logbooks did not distinguish between spontaneous and induced abortions, we used estimates from KIIs, which indicated between 40-50% of the PAC cases treated in public facilities in Zambia are thought to be due to complications of unsafe abortions. For analyses we therefore assumed 50% of PAC cases treated at UTH were for unsafe abortion. All these women received treatment for incomplete abortion. By averaging KIIs responses on treatment protocols, on average 18% of these women also received treatment for sepsis and 3% received treatment for shock.

National

Data on induced abortion in sub-Saharan Africa are ‘rare and non-representative’ (Rossier & et al., 2006) and difficult to collect. Zambia has five Demographic and Health Surveys, collected between

1992 and 2014, but the birth histories do not distinguish between induced and spontaneous abortion, making them unusable for analyses of induced abortion. We use the *Adding it up* methodology (Darroch & Singh, 2011) and apply African regional estimates of abortion rates (Sedgh et al., 2012). These estimates place Zambia in the Eastern Africa region, with a total induced abortion rate (safe + unsafe) of 38 per 1000 women aged 15-44 years and an unsafe induced abortion rate of 36 per 1000 women aged 15-44 years (i.e. 2 per 1,000 estimated to be safe). However, Zambia's abortion laws are far more liberal than other countries included in the Eastern African region and the rates are probably closer to the Southern African estimates (total induced abortion: 15 per 1000 women, unsafe induced abortion: 9 per 1000 women (Sedgh et al., 2012)). The lower Southern African estimates likely reflect not only better provision of safe abortion services, but also higher contraceptive prevalence. We, therefore, use the average of the two regions (total induced abortion: 27 per 1000 women, unsafe induced abortion: 22 per 1000 women). To check our assumptions, we also calculated the abortion rate using Bongaarts' proximate determinants of fertility, an approach that estimates the contribution of biological and behavioural factors (e.g. contraceptive use, induced abortion, infertility) to fertility levels (Bongaarts, 1978). This produced an estimate of 26 (safe and unsafe) induced abortions per 1000 women aged 15-44 years, which falls within the Eastern and Southern Africa estimates range. This suggests that the estimates of abortion rates we applied are reasonable. In the sensitivity analysis we further check the robustness of our results by applying both the Eastern and Southern African rates.

Our calculations of the number of safe and unsafe induced abortions in Zambia are shown in Box 1.

BOX 1: Estimates of numbers of safe and unsafe induced abortion in Zambia

Total number of induced abortions (safe+unsafe) in Zambia (per year)

= Abortion Rate/1000 x Number of women 15-44 years[a] *= 81,198*

Total number of unsafe induced abortions in Zambia (per year)

= Unsafe abortion rate/1000 x Number of women 15-44 years = 66,161

Total number of unsafe induced abortions requiring PAC in Zambia (per year) [b]

= Percentage of unsafe induced abortions requiring PAC x Total number of induced abortions

= 27,788

Total number of safe induced abortions in Zambia

= Total number of induced abortions – Total number of unsafe induced abortions

= 15,037

[a] There are 3,007,336 women in Zambia aged between 15-44 years (United Nations, 2013)

[b] Estimate for the percentage of unsafe induced abortion requiring PAC is taken as 42% from the *Adding it up* methodology (Darroch & Singh, 2011)

Method for estimating the costs of safe abortion and PAC

University Teaching Hospital

Key informants were asked detailed questions, using a standardised instrument, on the inputs (e.g. drugs, equipment, and diagnostics) used for each service. For each input, they were asked 'How many women out of 10?' typically receive that input. Their responses were averaged to estimate the average amount of inputs used per safe abortion and PAC service. Interview responses were triangulated with data extracted from medical records. All inputs mentioned in the medical records were included in the standardised instrument. Any discrepancies between the two were discussed with the key informants and inputs were revised accordingly.

Unit costs of drugs and medical supplies for abortion care were collected from senior UTH administrators responsible for procurement and from the MSH/WHO International Drug Price Indicator Guide (Frye, 2012). During our study all mifepristone and misoprostol used for MA at UTH were donated (costing US$4.6 per woman) by NGOs (mainly Ipas and MSZ). In our analysis we have included these costs. The cost of a unit of blood (US$41) was obtained from the Zambian National Blood Transfusion Services and includes the costs of blood collection, treatment and storage. The costs of lab tests should ideally include the costs incurred for conducting the test, including personnel costs, fixed costs and cost of supplies. Since it was not feasible to do a detailed costing of lab tests, we used the price charged to patients. At UTH there are two price levels: 'low-cost' subsidised prices charged to poorer patients and 'high-cost' prices charged to wealthier patients. Assuming that the real costs lie somewhere in between, we used the average of these two prices.

To determine personnel costs, KIIs at UTH (n=11) were asked about the average time required to treat each type of safe abortion and PAC service, stratified by seven categories of health staff (senior consultants, junior residents, nurses, auxiliary attendant, lab technician, pharmacist and counsellor). KIIs responses were averaged to estimate the average time spent by each staff on a

particular service. Data on staff salaries were obtained from UTH and the MOH. We used the median salary for each category as salaries in Zambia differ by length of service, training and location.

At UTH, hospitalisation is free for 'low cost' patients, while 'high cost' patients pay US$14.86 per day, which includes hospitalisation in the private ward and costs of basic lab tests and medical supplies. According to the WHO-CHOICE price database[2], in Zambia hospitalisation costs US$10.59 per day, which we felt reflects a better estimate of hospitalisation costs and falls within the range charged from high- and low-cost patients at UTH. As per KIIs, 40% of women receiving treatment for incomplete abortion are hospitalised for two days on average and all women being treated for sepsis and shock are hospitalised for three days on average.

The cost of each service (MA, MVA, incomplete abortion, sepsis and shock[3]) was calculated by adding up the costs of inputs used (drugs and supplies, lab tests, blood transfusion, personnel, and hospitalisation). All costs were converted to 2013 US$, by applying the exchange rate of 0.186[4]. Due to unavailability of indirect cost data such as overheads and capital costs, these costs were not included.

National

To derive national-level cost estimates we multiplied the number of safe abortions and PAC for induced unsafe abortion in Zambia, with the cost per service previously estimated for UTH. Abortion services meeting the 'safe' criteria tend to be concentrated in hospitals due to the legal requirement of signatures from three registered medical practitioners. Similarly, complicated PAC cases requiring treatment for sepsis and shock are also referred to hospitals as smaller facilities lack appropriate staff and/or infrastructure. The costs at UTH are therefore broadly representative of the costs at public facilities in Zambia and cost per service is likely to be similar across public health facilities: drugs and materials for all public facilities are generally purchased in bulk by the MOH; salaries are also determined by the MOH and are similar across government facilities; and, we did not include indirect costs that would differ across various types of facilities.

[2] http://www.who.int/choice/en/ (accessed on 29.03.2014)
[3] Key informants reported that less than 2% women at UTH require treatment for perforations or lacerations. We therefore decided to drop these two categories and provide costs for five services: MA, MVA, incomplete abortion, sepsis and shock.
[4] Exchange rate as on 29.03.2013 (www.xe.com)

To estimate the future economic costs of safe and unsafe abortions to the public health system in Zambia, we developed 20-year projections. Annual estimates of costs fail to take into account future demand and population growth (including changing age structure) that in our opinion is an important component for policymaking and planning. We projected the number of induced abortions as being constant (i.e. level of unsafe abortion kept constant, no change in the provision of contraception and no change in the proximate determinants of fertility such as marriage patterns). Using Spectrum v4.7, accounting for future population growth by age and gender, we consider the projected number of births using base data from the UN World Prospects 2012 revision (United Nations, 2013). The projected burden of unsafe abortions on the overall public health budget (set to be constant for the next 20 years at real costs) was then calculated given the latest available figure for Zambia of US$1,237,568,000 (WHO, 2013).

Table 2 summarises our sources of data.

Sensitivity analysis

To test the robustness of our results in the absence of national data on induced abortion, we conducted sensitivity analyses on four model parameters (Table 3). Upper and lower values were based on other studies whenever possible; otherwise we used ± 10% of the base case as the lower/upper values. We calculated the costs for each permutation of the four parameters.

RESULTS

Table 4 shows the cost of abortion services at UTH. The costs for a MA and for treating incomplete abortion are similar (US$33); MVA is slightly more expensive (US$39). Costs increase threefold to US$98 for sepsis and almost fivefold to US$162 for shock. Cost of blood transfusion and hospitalisation together cost US$166, 72% of the total cost of treating a woman with shock.

For UTH, the cost of PAC for unsafe abortion is estimated at US$109,811 per year, thirteen times greater than the cost of safe abortion (Table 5). This is because providing MA and MVA cost significantly less than treating sepsis and shock, but also because nine times more PAC for unsafe abortion than safe abortion were provided at UTH. Although MA costs less than MVA, when we

estimate the costs for UTH over a year, MA costs more (US$5898 vs. US$1772) simply because more MA services are provided than MVA. Safe abortion on average costs US$14 per case less than PAC following unsafe abortion. Using these costs we extrapolate that it costs the Zambian public health system 2.5 times more to provide PAC for unsafe abortions than to provide safe abortion. If women requiring PAC following unsafe abortion instead had a safe abortion, we estimate that Zambia's public health system would incur a cost saving of approximately US$375,000 per year. Given recent estimates for the cost of long-acting reversible contraceptive methods, this could cover more than 28,000 couple years' protection (Neukom, Chilambwe, Mkandawire, Mbewe, & Hubacher, 2011). Not accounting for inflation, but considering the increase in births using the UN medium variant projection, we estimate that the projected costs for PAC for unsafe abortion in 2030 alone could be nearly US$11million if the number of abortions, contraceptive prevalence and health budget were to remain constant. The overall financial burden of PAC on the health expenditure budget could potentially increase to 0.9 % (currently 0.2 %).

Sensitivity analysis

Table 6 summarises the results of the sensitivity analyses. The unit cost of safe abortion lies between US$37 and U$39, and for PAC after unsafe abortion between US$47 and US$56. The national estimates have wider ranges. The annual cost of safe abortion ranges from US$221,000 to US$701,000; and for PAC after unsafe abortion, from US$403,000 to US$3.5 million. Overall, the annual cost savings lie between US$66,000 and US$1.2 million, with a base estimate of US$375,000.

DISCUSSION AND CONCLUSIONS

By using a set of scenarios based on a range of estimates, as well as information from KIIs and medical records, we have estimated the financial burden of unsafe abortion on the health system in Zambia. The average cost of treating complications of unsafe abortion is US$52 while the cost of a safe abortion is US$38 per case. It would save the Zambian health system US$14 per case if each woman treated for a complication of unsafe abortion instead had a safe abortion.

The total cost of treating unsafe abortion complications in Zambia was found to be substantial, about US$1.4million per year. The Zambian health system could save around US$0.4 million per year if all these women were able to access safe abortion, a procedure they are legally entitled to under a wide range of circumstances. Given the uncertainty of some of the assumptions used to produce these estimates, sensitivity analysis was used to show that the cost savings most likely fall in the range of US$0.2-0.6 million per year.

Currently, 0.2% of Zambia's health budget of US$1.24 billion (WHO, 2013) is spent on PAC for unsafe abortions. We project that if the service delivery configurations remain unchanged, the burden of unsafe abortions on Zambia's health expenditure budget will increase to 0.9% by 2030, due to Zambia's changing population structure. This could take up potentially a large chunk of the overall budget dedicated to reproductive health. Investing in safe abortion services would considerably decrease the overall economic burden of treating unsafe abortions, as well as prevent avoidable morbidity and mortality. Studies conducted in Rwanda, Ethiopia and Uganda, where safe abortion is highly restricted, also found the cost of unsafe abortions to health systems to be substantial (Vlassoff, Fetters, et al., 2012; Vlassoff, Mugisha, et al., 2012; Vlassoff et al., 2014). These studies show an average cost per case of between US$83 and US$103 for PAC, higher than our estimates as we did not include indirect costs and costs of severe complications such as dialysis.

While this paper estimates the cost savings of transforming unsafe abortions into safe abortions, costs could be reduced further if unwanted pregnancies were reduced through the uptake of contraception. Zambia has high levels of unmet need for contraception (CSO, 2014), and evidence from Nigeria has shown how additional investment in family planning can lead to large net benefits from reduced expenditure in PAC services (Benson, Okoh, KrennHrubec, Lazzarino, & Johnston, 2012). A similar conclusion was reached in a study from Uganda, where investing in contraception would cost six times less than investing in PAC for unsafe abortion (Vlassoff, Mugisha, et al., 2012). Nevertheless, investment in safe abortion services remains important as investing in contraception alone will not eliminate unwanted pregnancies and the need for abortions.

Like most abortion research, our study suffers from not being based on nationally representative data. However, it is unique in its research design – a comparison of the direct health system costs of safe abortions with costs of unsafe abortions – making it highly policy relevant. We have tried to

overcome the lack of reliable data on induced abortion by considering a range of estimates obtained from multiple sources – hospital logbooks, medical records and KIIs. All key estimates are tested in the sensitivity analyses. Even the most restrictive assumptions indicate that the cost of treating unsafe abortion to Zambia is substantial. A second limitation is the reliance on data from UTH to create future costing projections for the national health system. Primary health provision of safe abortion services is desirable and can be expected to be cheaper than care at a referral hospital. The availability of MA should facilitate shifts to induction of abortion at earlier gestational ages and possibilities for services to be provided at lower, less expensive levels of the health system. However, the Zambian legal requirement of signatures from three registered medical practitioners, currently poses implementation challenges at lower (and rural) levels of health systems. Finally, our costs underestimate the full economic burden since we have not included the costs of long-term morbidities such as infertility, indirect costs like overheads and capital costs, and cost of some severe complications (we include costs of two common and severe complications – treatment for sepsis and shock). Data on inputs used in treating major complications that require major surgeries or dialysis are problematic because the course of treatment followed depends on the complexity of the symptoms and treatment varies case-to-case. We therefore did not include these costs. According to KIIs, less than 1% of safe abortions and 6% of PAC cases require major surgeries or dialysis. A study in Nigeria found similar estimates (1% of all PAC cases) and did not include these costs in their calculations (Benson et al., 2012). Since such complications are predominantly in the unsafe abortion group, by not including these costs, our estimates for the cost of PAC for unsafe abortions are probably underestimated as compared to safe abortion.

The substantial costs of PAC from unsafe abortions in Zambia, and elsewhere in sub-Saharan Africa (Rwanda, Uganda and Ethiopia), further add to the call for policy action to prevent unsafe abortion. In Zambia one of the features that make safe abortion costlier and less accessible is the requirement of signatures from three medical practitioners, of which one must be a specialist, for a non-emergency abortion. Zambia had fewer than 1000 registered medical doctors in 2014, of which less than 60 are “specialists” (ZAGO, 2014), to serve a population of 14.5 million. A reduction in the number of signatures required for a non-emergency abortion would make services more accessible especially in rural settings. However, this change alone would not reduce all of the barriers to safe abortion services, as the overall number of medical professionals is inadequate and highly concentrated in urban areas.

Other opportunities for increasing women's access to safe abortion services might involve the greater use of midlevel providers, particularly for early gestation abortions using MA. A systematic review of the safety and effectiveness of abortions performed by doctors compared to midlevel providers showed no statistical differences in incomplete abortion and complications for first trimester surgical and medical abortions (Ngo et al., 2013). Evidence from Nepal shows that midlevel abortion provision can be effective in reducing the levels of unsafe abortion (Puri, Tamang, Shrestha, & Joshi, 2015). The Zambian *Standards and Guidelines* (GRZ, 2009) makes provision for delivery of safe abortion services by midlevel providers. Involving midlevel providers could significantly expand the potential provider vase, however, without the relaxation of the requirement of signatures from three medical practitioners, this is difficult to implement.

In sum, the financial burden of unsafe abortions in Zambia is substantial. However, Zambia has well-established and relatively liberal abortion laws. If provision of safe abortion services were to expand it could significantly increase women's access to safe abortion services and reduce not only the health system costs of unsafe abortion, but also the costs to women's health and lives.

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Table 1. Key Informants (n=18)

UTH (n=11)	Obstetrics and Gynaecology Department: Senior Consultants (2), Junior Residents (2), Senior Nursing Sister (1) Procurement Department: Senior Manager (1) Blood Bank: Senior Manager (1) Laboratory Department: Senior Manager (1) Accounts Department: Senior Manager (1), Cashier (1) Pharmacy Department: Senior Manager (1)
MOH (n=2)	Senior officials from the Directorate of Human Resources & Administration (1), and Directorate of Policy & Planning (1)
Public Health Clinics, Lusaka Province (n=2)	Medical Officers (2)
NGOs (n=3)	Senior and midlevel managers (3)

Table 2. Data sources

	UTH	National-level
Safe abortion cases	UTH logbooks	See Box 1
PAC cases	UTH logbooks. These numbers include miscarriages; KIIs reported that 40-50% of PAC cases treated in public facilities in Zambia are due to unsafe abortions. Therefore we assumed that 50% of PAC cases at UTH arise from unsafe abortions.	See Box 1
Percentage of women who received a MA or MVA, out of all safe abortions	UTH logbooks	Assumed to be the same as UTH
For PAC: percentage of women who were treated for incomplete abortion, sepsis, and/or shock.	As per KIIs, all PAC cases are treated for incomplete abortion, 18% of them are also treated for sepsis and about 3% for shock.	Assumed to be the same as UTH
Inputs used in safe abortion and PAC services – drugs and materials, lab tests, and personnel time.	KIIs with medical staff at UTH. For each input, they were asked the amount of input used, and percentage of women who receive the input.	Assumed to be the same as UTH
Unit costs of drugs and materials	UTH Procurement Department and MSH/WHO International Drug Price Indicator Guide (Frye 2012).	UTH Procurement Department and MSH/WHO International Drug Price Indicator Guide (Frye 2012).
Unit cost of blood	Zambian National Blood Transfusion Services, Lusaka	Zambian National Blood Transfusion Services, Lusaka
Unit costs of lab tests	We used the average price charged for these tests from high- and low-cost patients at UTH	Assumed to be the same as UTH
Personnel salary	Data on pay scales for nine categories of health staff was collected from UTH and from the MOH. For each category, median salary was used.	Data on pay scales for nine categories of health staff was collected from UTH and from the MOH. For each category, median salary was used.
Cost of hospitalisation –	WHO-CHOICE price database	WHO-CHOICE price database

per day rate

Table 3. Parameters varied in the sensitivity analysis

Parameter	Base case	Lower value	Upper value
Induced abortion rate (unsafe abortion rate)[a]	27 (22)	15 (9)[b]	38 (36)[c]
Percentage of safe abortion cases receiving MA	80%	50% [d]	94% [e]
Percentage of unsafe abortions requiring PAC at health facilities	42%	32% [f]	58% [g]
Percentage of PAC cases requiring treatment for sepsis	18%	13% [h]	22% [i]

Notes: [a] Rate for 1000 women aged 15-44 years; [b] Estimates for Southern Africa, 2008 (Sedgh et al., 2012); [c] Abortion rate for Eastern Africa, 2008 (Sedgh et al., 2012); [d] Lowest figure reported by key informants; [e] Highest figure reported by key informants; [f] Lower value is taken to be 10% lower than the base case; [g] As observed in Ethiopia (Vlassoff, Fetters, et al., 2012); [h] As observed in Rwanda, 2010 (Vlassoff et al., 2014); [i] As observed in Uganda, 2010 (Vlassoff, Mugisha, et al., 2012)

Table 4. Direct costs per service in UTH, 2013

	MA		MVA		Incomplete abortion		Sepsis		Shock	
	Cost ($)	% total cost	Cost ($)	% total cost	Cost ($)	% total cost	Cost ($)	% total cost	Cost ($)	% total cost
Drugs and materials	12.67	38	3.52	9	9.74	29	4.89	5	20.90	13
Lab tests & diagnostics	10.58	32	10.69	27	3.03	9	29.94	30	4.87	3
Blood transfusion	0.00	0	12.30	31	5.13	15	14.35	15	87.38	54
Personnel	10.00	30	8.60	22	7.86	24	17.29	18	19.69	12
Hospitalisation	0.00	0	3.97	10	7.41	22	31.77	32	29.12	18
Total cost	**33.26**		**39.08**		**33.17**		**98.25**		**161.97**	

Table 5. Facility-level and national-level annual costs for safe abortions and post abortion care (PAC) for unsafe abortion in Zambia, 2013

Facility-level (UTH)	**Costs ($)**
Safe abortion (N=223)	
MA (n=178)	5,898
MVA (n=45)	1,772
Incomplete abortion (n=34)	856
Total cost of safe abortion	8,525
Average cost per safe abortion	38
PAC for unsafe abortion (N=2123)	
Incomplete abortion (n=2123)	70,410
Sepsis (n=382)	37,544
Shock (n=11)	1,857
Total cost of PAC for unsafe abortion	109,811
Average cost per PAC for unsafe abortion	52

National-level	**Costs ($, '000)**
Total cost of Safe abortion (N=15,037)	574,000
Total cost of PAC for unsafe abortion (N=27,788)	1,437,000
Cost savings [a]	375,000

[a] Cost savings if all women who require PAC for unsafe abortion, were to receive a safe abortion

Table 6 Results of the sensitivity analysis

	Average cost of safe abortion ($)	Average cost of PAC for induced unsafe abortion ($)	Annual cost of safe abortion per year for Zambia ($, '000)	Annual cost of PAC for induced unsafe abortion for Zambia ($, '000)	Annual cost savings for Zambia ($, '000)
Lowest estimate	37	47	221	403	66
Median	38	51	449	1,245	282
Highest estimate	39	56	701	3,506	1,195
Average	38	51	455	1,559	406
Base case	38	52	574	1,437	375