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Economic Impact of Unsafe Abortion-Related Morbidity and Mortality: Evidence and Estimation Challenges

Michael Vlassoff, Jessica Shearer, Damian Walker and Henry Lucas

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Summary

Unsafe abortion-related morbidity and mortality (UARMM) exacts a huge price annually in terms of the lives and health of women in developing countries each year. Almost 20 million unsafe abortions occur annually, virtually all in the developing world. More than 5 million of these result in medical complications so serious that they require hospitalisation. The economic cost of UARMM is also enormous, burdening public health systems, the households in which these women live and also the economies of the countries themselves. The empirical data needed to estimate most of these costs are scant and in some cases, practically non-existent, but several studies of direct health-system costs are available in the literature. These data exist in two forms which allow cost estimation using two distinct methodologies, one which uses cost-per-patient data, and one which uses a model of ideal treatment inputs. Examining the cost of UARMM to health systems using both of these methodologies, we find that the total cost to the developing world lies between $375 and $838 million, with a central estimate of around $500 million (2006 US$). Regional cost estimates show that in relation to purchasing power, abortion complications are considerably more expensive to treat in sub-Saharan Africa than in Latin America. Furthermore, millions of other women with serious complications receive no treatment from the health system. If they were able to do so, an additional $375 million or so would be expended, but this estimate rests on scant empirical data. The cost of long-term morbidities, mainly infertility and chronic reproductive tract infections, may cost many billions of dollars annually, while the losses to the economies of developing countries from lower productivity caused by UARMM may be more than $400 million. Out-of-pocket expenses to the women and their families may amount to a further $600 million. Very little data exist to make these latter estimates, but they at least show that the total cost of UARMM would be many times greater than the direct health costs, for which solid evidence does exist.

Keywords: unsafe abortion; cost; morbidity; mortality; infertility; reproductive tract infection; out-of-pocket expense; productivity

Author notes

Michael Vlassoff is a Senior Research Associate at the Guttmacher Institute, a leading research organisation in the field of reproductive health. This report draws on earlier work done for a consultation meeting on the cost of unsafe abortion organised and hosted by the Guttmacher Institute and commissioned by the Hewlett Foundation which took place in New York in June 2006. John Ross and Patricia Justino provided helpful comments on an earlier draft. Further comments are welcome to mvlassoff@guttmacher.org.

Jessica Shearer is a Research Associate in the Department of International Health at the Johns Hopkins Bloomberg School of Public Health. She has research interests in reproductive and maternal health, and is currently working with country level decision-makers to assess and incorporate evidence into public health decisions. Following the IDS technical meeting on UARMM, she provided inputs on the review of the costing literature and assisted with analysing the reported unit costs.

Damian Walker is an Assistant Professor in the Department of International Health at Johns Hopkins Bloomberg School of Public Health. He is a health economist who specialises in evaluating the cost and cost-effectiveness of health interventions in low- and middle-income countries. He is an adjunct Scientist at the International Centre for Diarrhoeal Disease Research, Bangladesh, visiting faculty member at BRAC James P. Grant School of Public Health, and Honorary Lecturer at the London School of Hygiene and Tropical Medicine. He was a member of the technical review panel and participated in the IDS technical meeting on UARMM. He provided inputs on the review of the costing literature and the economic methods used in the report.

Henry Lucas is a Fellow of the Institute of Development Studies (IDS) at the University of Sussex. He is a statistician who specialises in poverty analysis and survey methodologies with particular reference to health and development. He has worked extensively in sub-Saharan Africa and China. He was a member of the technical review panel and participated in the IDS technical meeting on UARMM. He provided inputs on indirect costs and in presentation of the quantitative data.

Preface

This research report is an outcome of work commissioned by the Hewlett Foundation to try to estimate the global economic costs of unsafe abortion related mortality and morbidity (UARMM). It reflects a series of consultations and draft reports to design an acceptable and robust methodology for estimating the costs to households, health systems and communities of UARMM, keeping in mind the data limitations and thin theoretical literatures upon which such a methodology must draw. In 2006, the Hewlett Foundation approached Dr Hilary Standing, Research Fellow at the Institute of Development Studies and Director of the Realising Rights Research Programme Consortium, with a view to developing the next steps in taking this work forward. A set of review activities was devised, structured around a short technical meeting held at the IDS on 17 and 18 April 2007. The workshop brought together economists and other development specialists with expertise in economic and poverty modelling, with experts in unsafe abortion from key agencies working in this area. This report is based on original work by the lead author, Michael Vlassoff. Following the technical deliberations, it was agreed that a report focused on the methodology of UARMM would be particularly valuable to guide others wishing to undertake similar studies. Annex 1 provides further information on the process and findings of the technical meeting.

The authors would like to thank Sara Seims and Tamara Fox of the Hewlett Foundation's Population Program, who funded the work from the start and maintained a very close interest throughout the process. They would also like to thank participants at the IDS technical review meeting for their many valuable contributions to strengthening the methodology and their insights into further areas of costing that could be taken up in future studies. In particular, they would like to acknowledge the comments and suggestions made by Susheela Singh, David Newlands, Jo Borghi, Janie Benson, Eva Weissman and Stan Bernstein. Special thanks to Hilary Standing who not only organised the expert meeting but also provided every organisational support for the research report. Thanks are also due to Jennifer Leavy, Research Officer at the Institute of Development Studies, for her excellent rapporteuring of the technical meeting. Additional costs for publishing this report were met by the IDS Health and Social Change Programme.

1 Introduction

Unsafe abortion-related morbidity and mortality (UARMM) impacts welfare at the individual, household, community and national levels. Out of an estimated 46 million induced abortions that take place every year in the world, around 19.8 million are unsafe abortions (WHO 2007b).[1] More than 5 million of these abortions result in serious medical complications that require hospital-based treatment (Singh 2006). Of these cases, many suffer long-term effects, including an estimated 1.6 million women who annually suffer secondary infertility and a further 3–5 million women experience chronic reproductive tract infections.

The cost that these figures imply is a matter of importance for public policy. Despite this, little research has gone into estimating UARMM costs or developing an overall framework and costing methodology to arrive at cost estimates. The objectives of this report are to survey the empirical information available on costing unsafe abortion, to develop an analytical framework for cost estimation, to describe the methodological approaches available, given the constraints of the subject matter, and finally to estimate cost ranges within the limitations of data on unsafe abortion.

The complications from unsafe abortion have been listed elsewhere, for instance by Bernstein and Rosenfield (1998) and WHO (1995). Empirical studies on abortion complications, however, show that the list of possible complications is a very long one. Annex Table A1 attempts to organise this long list into three categories: immediate complications, later complications and other complications that are reported only sporadically in the literature. A complete costing of abortion-related complications would need evidence on the prevalence of all the complications listed in the table. When we look at empirical costing studies below, however, we will find that in practice only a few of the major complications are taken into consideration.

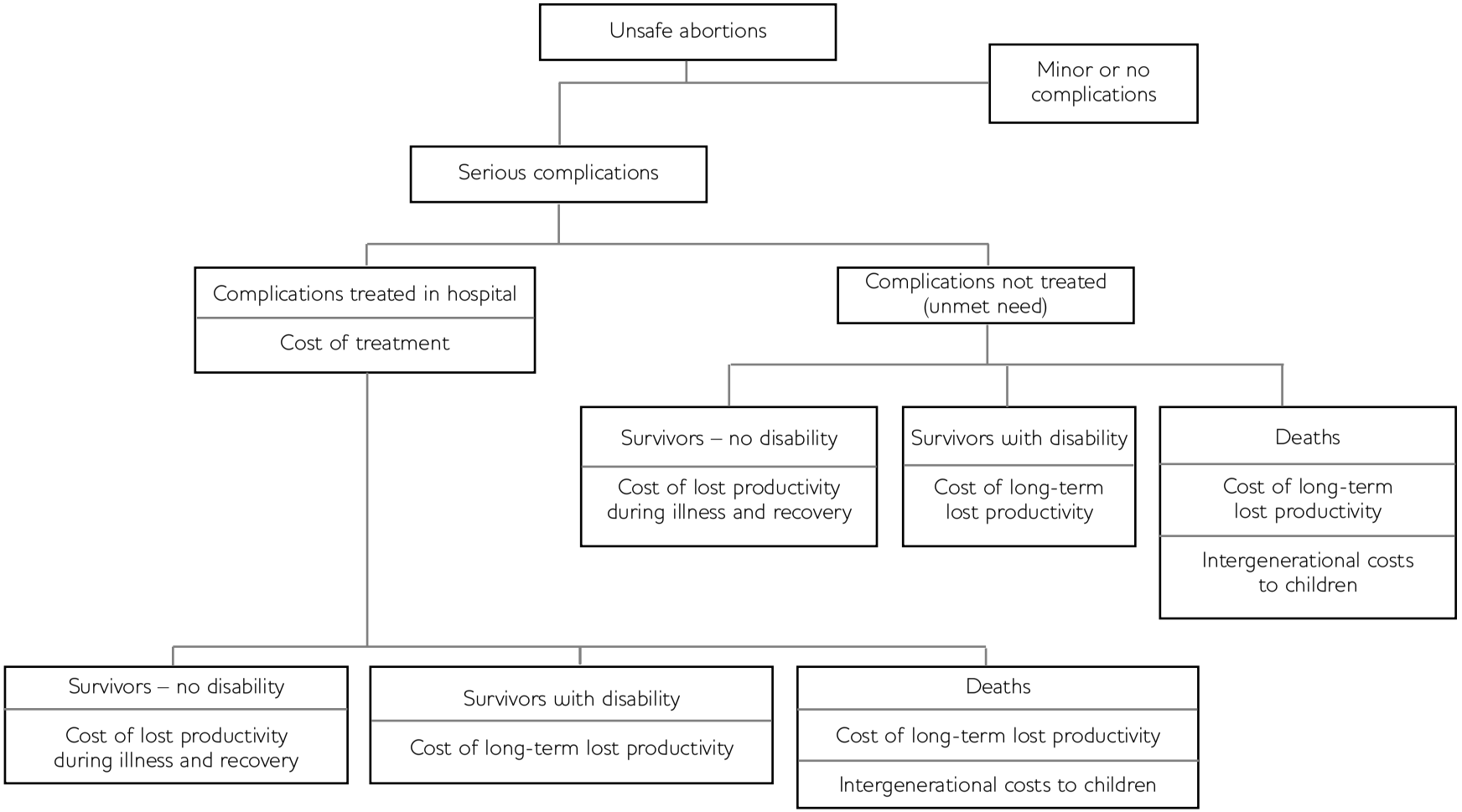
The report is divided into four substantive sections. In the next section, a general framework for the analysis of the costs of unsafe abortion is developed. In the section following this, a review of the literature on the cost of unsafe abortion is presented. This is followed by a section on the estimation of the cost of unsafe abortions to health systems in developing countries. In this section, a discussion of methodological considerations is followed by a series of cost estimations using a variety of methodological approaches. The final substantive section of the report examines other costs listed in the framework for which empirical evidence is less secure. A concluding section summarises the different costs estimated in the report in the light of limitations of data and necessary assumptions, pointing out priorities for future research into UARMM costing.

2 Framework of analysis

Unsafe abortion generates unnecessary costs to society at a variety of levels. Where abortion is illegal, households will generally finance the costs of the abortion procedure from their own resources. Even where abortions are legal, many women will still have recourse to unsafe procedures for a variety of reasons: the stigma that society still attaches to abortion, the desire of the woman to maintain a cloak of secrecy, or the inadequacy of the health system *vis-à-vis* abortion procedures. The 19.8 million women who undergo unsafe abortions annually incur a variety of costs to society, the household and the individual. Figure 2.1 presents a framework for analysing these costs in the form of a decision diagram. An unknown proportion of women who have an unsafe abortion will experience serious complications; some of these women will seek care within the formal health system, while many will seek care outside of the formal health system or not seek

1 The World Health Organization defines unsafe abortion as a procedure to terminate 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 2007b).

Figure 2.1 **Framework of analysis for costing unsafe abortion**



care at all.[2] Where women seek care determines who bears the direct medical costs. In public facilities, the costs may be shared between households and government if fees are charged. The process of seeking care will also incur direct non-medical costs, such as transport costs, which can be significant (Borghi 2006 a,b).

Women suffering from complications face three possible outcomes: survival with no long-term consequences; survival with long-term consequences, such as chronic pelvic infections, sub-fecundity and infertility; or death. Whether, where and how soon care is sought influences the probability of each outcome. Each outcome generates indirect costs in the form of lost productivity, which will be borne by the households affected, and society more broadly. In economies with large pools of unemployed, however, these costs will be more easily offset at the societal level. Indeed, even at the household level, some proportion of short-term lost productivity would most likely be made up by the individuals themselves or friends and family. However, long-term productivity losses cannot be offset at an individual/household level in the same way they can at societal level. Finally, children from households experiencing a maternal death may also suffer in terms of their future health and education potential (Strong 1992), with further economic implications for the household and society.

The emphasis in this framework is on costs that can be measured in monetary terms, although how to value lost productivity, in the case of indirect costs, is a question that is still open for discussion. Social and psychological costs are difficult to monetise, but are nonetheless real. The stigmatisation that women, who are known to have had an abortion, suffer is a very real cost in some societies. Other psychological traumas that post-abortion women may suffer also may impose great costs on the women, which also may be hard to quantify.

While recognising the multidimensional nature and range of potential economic impacts, the focus of this report is on estimating one component – the health-system cost of treating the consequences of unsafe abortion (see the bold block in Figure 2.1). For other costs, where in general data availability is more problematical, the report discusses methodological issues as well as making some preliminary cost estimates.

3 Review of costing literature

Published costing studies were identified by searching databases (Medline, Popline, University of British Columbia library services, Population Index) using the search terms: 'cost* AND abortion*'; 'cost* AND complication*'; and 'cost* AND PAC'. Websites of relevant organisations, including Population Council, Guttmacher Institute, UN, WHO, Pathfinder and IPAS, were searched for project reports. Staff was contacted at the organisations mentioned above, and a hand search was done of relevant journals' tables of contents. Finally, relevant conference proceedings were searched.

The initial search resulted in 35 relevant papers (over 140 articles dealt in some way with abortion and cost, and the total number of papers reviewed from the literature ran into the several hundreds). Selection criteria were applied, and 11 papers were excluded: eight for providing costs from the patient perspective only; two due to insufficient information and one because it was a review paper. However, the individual studies reviewed in the review paper were included in the list of studies (Annex Table A2). Thus, a total of 24 papers, comprising 76 reported unit costs, were analysed. Reported unit costs were converted to 2006 international dollars as well as 2006 United States dollars (US$) using two methods (Kumarayanke 2000). In the first method, study-year costs in US$ were adjusted for inflation using US GDP deflators to arrive at the 2006 US$ costs, which were then converted to 2006 local currency costs using official exchange rates and divided by the purchasing power parity (PPP) conversion factor to arrive at the 2006 international dollars cost. In the second method, the study year cost in the local currency was inflated to 2006 local currency units using local GDP deflators. This figure was then converted to the 2006 international dollar

2 Benson and Crane (2005) estimate that 45 per cent of unsafe abortions result in health complications (26 per cent of them being serious complications and 19 per cent of them minor).

cost using the PPP conversion factor.[3] All historical economic data was taken from the World Bank World Development Indicator website (World Bank 2007). See Annex Table A2 for details of these studies.

Several review parameters were chosen for evaluating the papers found through the literature search in order to critically assess the costing methods used by each study. Published critical reviews and economic evaluation textbooks guided the choice of parameters (Drummond 1996; Mugford *et al.* 1998; Graves *et al.* 2002; Terris-Prestholt *et al.* 2006; Drummond *et al.* 2005; Kumarayanke 2000). The review parameters are listed below.

Study background and context

Issues related to the study itself, such as whether economic analysis was among the study's primary aims, whether sensitivity analysis was performed, and the year and place of publication, indicate the quality and internal validity of the study. Characteristics of the study population, the legal status of induced abortion, geographical location, and a description of the level and type of care provided at study hospitals assisted in interpreting the results and assessing external validity.

Resource inputs

Differences in resource inputs can lead to large variations in cost outputs. Resource inputs include the type and nature of the intervention, as well as the resources that support the interventions and their cost profiles, such as personnel, drugs, supplies and overhead costs. Whether capital resources are included is noted. Additional factors that influence the cost of treatment include the severity of the patient being treated, as well as the average length of stay in health facilities.

Costing methods

The methods used to collect and analyse data ultimately influence the resulting unit cost estimations, as well as the internal validity of the study. Empirical collection of cost data requires a detailed assessment of individual inputs and their quantity, and is sometimes substituted by modelled estimates, which can be less accurate. Empirical costing can be done using a top-down or bottom-up approach, and these methodologies may influence study results, as can the study sample size. It is also important to discern whether a study considers only financial costs, or all economic costs, and whether incremental or full costs of an intervention are presented.

Health and economic outcomes

The cost of abortion care is often presented as a *per case* or *per treatment* outcome. While it is most correct to differentiate between the two (a treatment is a single event whereas a case may include follow-up treatments for the primary complaint), abortion cases often only consist of one treatment, and so the two outcomes are used interchangeably in much of the literature. This review is concerned primarily with the cost to the health system, but costs to patients are also reported where possible.

3 These two methods produced different results, sometimes markedly so. In this report, results are presented using the first method since it seemed to produce more consistent results.

3.1 PAC interventions

Post-abortion complications (PAC) cover a very wide range of medical problems. The treatments and interventions mentioned in the empirical literature, however, are less extensive. Annex Table A3 provides a list of treatments referred to in published empirical studies of PAC. The following is a summary of the medical procedures and treatments reported on in this literature:

Operative procedures

- Colpopuncture
- Colpotomy[4]
- Dilation and curettage
- Hysterectomy
- Intestinal resection
- Laparotomy[5]
- Manual vacuum aspiration
- Resuscitation, intensive care unit
- Surgery (unspecified)

Other procedures

- Blood transfusions
- General anaesthesia
- Intravenous antibiotics
- Intravenous fluids
- Local anaesthesia
- Sedation

Medicine administered

- Abortifacients
- Analgesics
- Antibiotics
- Antimalarial drugs
- Flagyl
- Haematinics[6]
- Tetanus vaccination
- Vitamins

This list is incomplete. For instance, treatment for poisoning, renal failure, psychosis and infertility, *inter alia*, would require interventions not listed here.

4 Colpotomy: an incision made into the wall of the vagina. This was formerly used to confirm the diagnosis of ectopic pregnancy.

5 Laparotomy: a surgical incision into the abdominal cavity, for diagnosis or in preparation for major surgery.

6 Haematinic: an agent that tends to stimulate blood cell formation or to increase the haemoglobin in the blood.

3.2 Data considerations

It can be observed in Annex Table A2 that costs vary greatly from one study to the next, the range being from $2.34 to $389 (in 2006 US$). It seems obvious that the definitions of what constitutes costs must vary widely from one setting to another.[7] A number of possible explanations can be advanced to explain these differences. Personnel time costs may be estimated according to the actual patient–provider contact time in one study but by dividing the salary cost of personnel by the number of patients attended in another study. Indirect costs such as overhead costs, capital depreciation costs, administrative costs, etc. may be included in one study but excluded in another.

Probably the most significant source of variation in costs, however, is the inclusion or exclusion of subsidised costs from study to study. It is scarcely conceivable that PAC costs in Mexico, for instance, could be 15 times the costs in Brazil; two countries with similar social and economic settings. The Mexican cost estimate may include many more of the real costs for post-abortion treatment than does the Brazilian estimate because the latter cost may be highly subsidised, hiding many of the true costs from easy detection. To arrive at reasonable regional or global cost-per-patient estimates, therefore, it will be necessary to make some assumptions about the inclusion/exclusion of certain cost components, all of which are equally valid components of the true cost of PAC, even if some may be more difficult to measure than others.

To get a better appreciation of cost measurement issues, we look briefly at two important components of PAC costs that are often reported in costing studies, namely, hospitalisation and blood transfusions. Annex Table A4 presents all costing studies that have specific findings regarding hospitalisation of patients as part of PAC. The simple average length of stay (ALOS) across all studies is 85 hours, or a little over three days. Again, there is a very wide variation in hospitalisation, from 9.9 hours in an Ecuadorian study to over 26 days in a Nigerian study.[8] Sample designs differ across these studies. Although all studies observed women coming to hospitals for treatment of complications after experiencing induced abortions, there were some studies that covered only the most severely complicated cases or took place in settings where the overall safety of abortion procedures was extremely low, while other studies covered settings where abortion methods were on average less dangerous.

This possibility is reinforced when we divide the available studies into those reporting on operations research (into the introduction of MVA to replace D&C as the preferred technique for evacuating the uterus of the products of conception) and those that are not. Of the 37 studies reporting hospitalisation data, 25 studies were of the former type and 12 were not. The average stay in studies of the MVA-D&C-comparison type was 35 hours, whereas in the remaining studies the average was 153 hours.[9] The former studies typically select women with first trimester abortions and no complication aside from incomplete abortion in order to hold other factors constant while comparing the two procedures; other studies represent a cross-section of women with all types of post-abortion complications.

The relationship between average length of stay and average cost is direct, as we would expect. That is, as length of hospitalisation increases, so does average cost.[10] It is clear, therefore, that in estimating the global cost of unsafe abortion, due consideration should be taken of the escalation in cost per case as complications become more severe.

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7 In general, the published material available do not allow distinctions to be made as to which cost components were included or excluded, nor as to differences in the populations sampled of cases of post-abortion complications. Both these sources of variation can be expected to contribute to cost-per-case variability.

8 The Nigerian study in question (Konje *et al.* 1992) reported an average length of stay far longer than any other study. The study's sample included only patients with post-abortion complications where sepsis was also present. This probably explains the lengthy hospitalisations.

9 If the above-mentioned outlier (Konje *et al.* 1992) is not omitted, the average becomes 193 hours.

10 The simple regression between ALOS and cost (using ordinary least squares) yields the following equation: COST (US$) = 76.6 + (0.52) ALOS (h) [r^2 = 0.22].

Annex Table A5 summarises findings from 14 PAC costing studies that contained data on blood transfusions, an important and expensive component of PAC costs. In these studies, on average, about 8 per cent of women seeking care after induced abortions received blood transfusions. The amount of blood given to women who had transfusions is more difficult to estimate since it often was not reported. The two most recent studies estimated that 1.3 litres were administered per case, whereas the older studies estimated that around 0.6 litres was given per woman (Fortney 1981). It should be noted that some of these studies mentioned that blood transfusions were restricted by the availability of a blood supply in hospitals. The lower figure may therefore be more indicative of supply constraints than of effective demand.

The data presented in Annex Tables A3, A4 and A5 clearly show that a wide range of PAC costs are reported in the literature and that cost variability persists within regions and even within single countries. It is reasonable to assume that studies reporting low costs did, *inter alia*, so because important indirect costs were not measured.

3.3 Severity of complications

A useful categorisation of the severity of post-abortion complications has been developed by Rees *et al.* (1997). In Table 3.1, post-abortion cases are ranked by severity and assigned to one of three categories.

Table 3.1 **Severity of complications**

Severity category	**Symptoms**	
Low	Temp. ≤37.2°C	and
	No clinical signs of infection	and
	No system or organ failure	and
	No suspicious findings on evacuation	
Moderate	Temp. 37.3 – 37.9°C	or
	Offensive products	or
	Localised peritonitis	
Severe	Temp. ≥38°C	or
	Organ failure	or
	Peritonitis	or
	Pulse ≥120	or
	Death	or
	Foreign body/mechanical injury on evacuation	

Source: Rees *et al.* (1997: 433)

Data on abortion-related complications by severity are limited. One study in South Africa (Kay *et al.* 1997) has used this categorisation to estimate PAC costs according to severity of complication. Another study in Kenya has also used this framework, although it did not measure costs (Gebreselassie *et al.* 2005). Data on the pattern of severity from these studies will be used below in estimating global and regional costs.

4 Cost to health system of unsafe abortion: global[11] and regional estimates

The evidence base on the cost of unsafe abortion is limited, and regional or global economic impacts are currently unknown. As the literature review in the previous section has shown, however, a number of empirical studies have examined costs in several developing countries. These studies typically collect data from a specific region of the country or from specific health facilities. Most of the studies estimate costs on a per-case basis. This is most often an overall cost, but at least one study has estimated per-case costs broken down by severity of complication and level of facility (Kay *et al.* 1997). The full direct cost of treatment includes health-system costs as well as out-of-pocket patient costs such as transportation costs and, depending on the health system, co-payments and fees for specific inputs. Generally, however, patient costs have not been reported on. The direct costs estimated in this section, therefore, refer only to costs to the health system.

4.1 Costing methods

The review of literature suggests two different approaches to estimating global and regional costs. One approach is to use estimates of average cost per patient of post-abortion care (PAC) based on available literature. A second approach is to adapt an existing costing framework, incorporating into the model empirical data on the cost of specific components of PAC. This approach models health interventions from the perspective of all the detailed inputs (drugs, supplies, personnel time, overheads, etc.) needed to supply one complete treatment to one patient. If all inputs that make up a particular treatment are known and costs assigned to each of them, the total cost of a particular complication from an unsafe abortion can be estimated in this way, from the 'bottom-up'. The first approach is 'top-down' since it uses empirically derived total treatment costs per case. When combined with estimates of the number of women hospitalised for serious medical complications of induced abortion, the two approaches provide a range of estimates of the direct cost of unsafe abortion to health systems, at the global and regional levels. Each approach is described in detail below.

4.1.1 Average cost per case

The average cost per case of PAC calculated from available empirical studies was the basis for the first costing approach. As mentioned, a systematic literature review identified 24 studies in which estimates of the cost per case of PAC were provided. These are summarised in Table 4.1. Thirteen countries and seven (out of 15) United Nations sub-regions are represented in the table.

11 We use the term 'global' because our estimates include all unsafe abortions; however, virtually all unsafe abortions occur in developing regions.

Table 4.1 **Empirical studies estimating costs per patient for abortion complications**

Country	Region	Publication	Year of study	Complication severity of sample	Sample size	*Cost per patient* Study year US$	2006 US$	2006 Int. $
Bolivia	LAC	Billings *et al.* (2003)	2000	Low severity	30	24.92	28.15	70.25
Bolivia	LAC	Billings *et al.* (2003)	2000	Low severity	22	82.84	93.58	233.52
Bolivia	LAC	Billings *et al.* (2003)	1999	Low severity	37	65.65	74.16	185.06
Bolivia	LAC	Billings *et al.* (2003)	2000	Low severity	54	48.74	55.06	137.39
Bolivia	LAC	Billings *et al.* (2003)	2000	Low severity	47	98.57	111.35	277.86
Bolivia	LAC	Billings *et al.* (2003)	1999	Low severity	97	88.77	100.28	250.23
Bolivia	LAC	Billings *et al.* (2003)	2000	Low severity	51	15.67	17.70	44.17
Bolivia	LAC	Billings *et al.* (2003)	2000	Low severity	30	48.56	54.86	136.89
Bolivia	LAC	Billings *et al.* (2003)	1999	Low severity	19	59.35	67.05	167.30
Bolivia	LAC	Capra *et al.* (2000); JSI (1999)	1997	All levels of severity	NA (modelled)	69.00	83.67	208.78
Brazil	LAC	Fonseca *et al.* (1997)	1996	Low severity	Not stated	9.94	12.25	19.64
Brazil	LAC	Fonseca *et al.* (1997)	1996	Low severity	Not stated	16.70	20.59	33.00
Brazil	LAC	King and Benson (1998) Rogers (1995)	1995	Low severity	11	24.20	30.40	105.20
Brazil	LAC	King and Benson (1998) Rogers (1995)	1995	Low severity	5	78.38	98.47	340.73
Ecuador	LAC	Johnson *et al.* (1993)	1991	Low severity	11	4.35	5.96	9.03
Ecuador	LAC	Johnson *et al.* (1993)	1991	Low severity	3	3.66	5.01	7.60
Ecuador	LAC	Johnson *et al.* (1993)	1991	Low severity	13	3.06	4.19	6.35
Egypt	Northern Africa	Nawar *et al.* (1999)	1997	Low severity	18	10.24	12.42	40.42
Egypt	Northern Africa	Nawar *et al.* (1999)	1996	Low severity	15	7.73	9.37	30.52
Egypt	Northern Africa	Nawar *et al.* (1999)	1997	Low severity	35	15.60	18.92	61.58
Egypt	Northern Africa	Nawar *et al.* (1999)	1996	Low severity	35	14.40	17.46	56.85
El Salvador	LAC	Koontz *et al.* (2003)	1999	Low severity	46	53.80	63.60	135.31
El Salvador	LAC	Koontz *et al.* (2003)	1999	Low severity	108	61.70	72.93	155.18
Ghana	SSA	Asante *et al.* (2004)	2003	All levels of severity	NA (modelled)	45.88	49.92	231.84
Ghana	SSA	Levin *et al.* (2003)	1998	All levels of severity	NA	66.46	79.70	370.13
Ghana	SSA	Levin *et al.* (2003)	1998	All levels of severity	NA	63.88	76.61	355.76
Kenya	SSA	Johnson *et al.* (1993)	1991	Low severity	10	3.09	4.23	9.24

Table 4.1 **Empirical studies estimating costs per patient for abortion complications (cont.)**

Country	Region	Publication	Year of study	Complication severity of sample	Sample size	*Cost per patient* Study year US$	2006 US$	2006 Int. dollars
Kenya	SSA	Johnson *et al.* (1993)	1991	Low severity	11	5.24	7.18	15.67
Kenya	SSA	Johnson *et al.* (1993)	1991	Low severity	11	2.94	4.03	8.79
Kenya	SSA	Johnson *et al.* (1993)	1991	Low severity	45	4.37	5.99	13.07
Kenya	SSA	Johnson *et al.* (1993)	1991	Low severity	17	3.99	5.47	11.93
Kenya	SSA	Johnson *et al.* (1993)	1991	Low severity	5	15.25	20.89	45.60
Malawi	SSA	Levin *et al.* (2003)	1998	All levels of severity	NA	41.77	50.09	215.87
Malawi	SSA	Levin *et al.* (2003)	1998	All levels of severity	NA	29.95	35.92	154.79
Mexico	LAC	Brambila and Garcia (1999)	1997	Low severity	25	180.22	320.68	458.72
Mexico	LAC	Brambila and Garcia (1999)	1997	Low severity	11	264.47	218.53	312.59
Mexico	LAC	Johnson *et al.* (1993)	1991	Low severity	8	65.73	90.03	128.79
Mexico	LAC	Johnson *et al.* (1993)	1991	Low severity	16	140.63	192.63	275.55
Mexico	LAC	Johnson *et al.* (1993)	1991	Low severity	12	83.28	114.07	163.18
Mexico	LAC	Johnson *et al.* (1993)	1991	Low severity	4	79.23	108.53	155.24
Mexico	LAC	Johnson *et al.* (1993)	1991	Low severity	11	235.90	323.13	462.22
Mexico	LAC	Johnson *et al.* (1993)	1991	Low severity	15	106.30	145.61	208.28
Mexico	LAC	Johnson *et al.* (1993)	1991	Low severity	5	143.25	196.22	280.68
Mexico	LAC	Johnson *et al.* (1993)	1991	Low severity	3	150.58	206.26	295.04
Mexico	LAC	Cahuana-Hurtado *et al.* (2004)	2001	All levels of severity	NA (modelled)	187.42	211.72	302.86
Mexico	LAC	PATH (2006)	2005	All levels of severity	NA	102.80	105.81	151.35
Mexico	LAC	PATH (2006)	2005	All levels of severity	NA	134.12	138.05	197.47
Mexico	LAC	PATH (2006)	2005	All levels of severity	NA	192.12	197.74	282.86
Mexico	LAC	PATH (2006)	2005	All levels of severity	NA	95.86	98.67	141.14
Mexico	LAC	PATH (2006)	2005	All levels of severity	NA	169.00	173.95	248.82
Mexico	LAC	PATH (2006)	2005	All levels of severity	NA	124.24	127.88	182.92
Mexico	LAC	PATH (2006)	2005	All levels of severity	NA	53.08	54.63	78.15
Nigeria	SSA	Bankole *et al.* (2007)	2002	All levels of severity	NA (modelled)	103.00	112.08	166.61

Table 4.1 **Empirical studies estimating costs per patient for abortion complications (cont.)**

Country	Region	Publication	Year of study	Complication severity of sample	Sample size	*Cost per patient* Study year US$	2006 US$	2006 Int. dollars
Nigeria	SSA	Konje *et al.* (1992)	1984	Medium and high levels of severity	230	223.11	352.71	524.34
Peru	LAC	Benson and Huapaya (2002)	1996	Low severity	17	118.73	134.13	269.08
Peru	LAC	Benson and Huapaya (2002)	1997	Low severity	17	45.13	50.98	102.28
Peru	LAC	Benson and Huapaya (2002)	2001	Low severity	18	33.45	37.79	75.81
Peru	LAC	Guzman *et al.* (1995)	1994	Low severity	56	84.11	105.66	211.98
Peru	LAC	Guzman *et al.* (1995)	1994	Low severity	51	16.30	20.48	41.08
Peru	LAC	Guzman *et al.* (1995)	1994	Low severity	47	16.70	20.98	42.09
South Africa	SSA	Kay *et al.* (1997)	1994	All levels of severity	NA	303.10	388.54	862.43
South Africa	SSA	Kay *et al.* (1997)	1994	All levels of severity	NA	85.35	109.41	242.85
South Africa	SSA	Kay *et al.* (1997)	1994	All levels of severity	NA	137.18	175.85	390.33
Tanzania	SSA	Magotti *et al.* (1995)	1992	Low severity	92	4.36	5.84	13.55
Tanzania	SSA	Magotti *et al.* (1995)	1992	Low severity	107	1.75	2.34	5.44
Uganda	SSA	Johnston *et al.* (2007)	2006	All levels of severity	NA (modelled)	44.87	55.31	270.16
Uganda	SSA	Johnston *et al.* (2007)	2006	All levels of severity	NA (modelled)	33.61	41.43	202.37
Uganda	SSA	Johnston *et al.* (2007)	2006	All levels of severity	NA (modelled)	6.41	7.90	38.59
Uganda	SSA	Johnston *et al.* (2007)	2006	All levels of severity	NA (modelled)	24.72	30.47	148.84
Uganda	SSA	Levin *et al.* (2003)	1998	All levels of severity	NA	35.43	42.49	207.53
Uganda	SSA	Levin *et al.* (2003)	1998	All levels of severity	NA	57.60	69.08	337.39
Uganda	SSA	Weissman *et al.* (1999)	1996	All levels of severity	NA (modelled)	8.24	10.16	49.61

Notes: SC = sharp curettage; MAV = manual vacuum aspiration; D&C = dilation and curettage. (LAC, Latin America and Caribbean; SSA, Sub-Saharan Africa)

The average cost estimates varies greatly between. Even studies in two broadly comparable countries using what appear to be similar methodologies yielded very different results, e.g. an estimate of $20 per case in Brazil, compared with $320 in Mexico (Fonseca *et al.* 1997; Brambila 1999). Even within the same country, there were large variations in cost estimates, e.g. Mexico or Peru. The studies identified were often not clear on which resources were included, measured and valued, nor on which populations of PAC cases were being sampled. While most or all of the low cost estimates likely omitted some important categories of cost, it was generally not possible from the information provided to determine where this was the case.

When deriving an estimate of average cost from the studies, we tried out a variety of approaches. Given the lack of information on costing methods used by each study, the preferred approach was to take a simple average of all the studies. Studies were also classified by their sample characteristics. To compensate for the fact that the sample average includes studies sampling only low severity cases, we considered the effect of only including those studies which sampled all women reporting to hospital, regardless of trimester and severity, indicated as 'all levels of severity' in Table 4.1. As two further exercises, we examined the effect of excluding studies which did not report length of stay in hospital and older studies based on surveys conducted prior to 1995, in the belief that the remaining studies would better reflect contemporary information and good practice in costing methods. These latter two approaches, however, did not produce average costs very different from the overall average and so were not pursued further.

Faced with these data-quality issues, we finally opted to use four distinct methods for calculating global and regional costs, yielding cost ranges rather than point estimates. As mentioned, a large number of the empirical cost studies restricted their samples to women who presented at a hospital with incomplete abortions, but who otherwise had no serious symptoms. Our first estimation method, then, is to use the average costs per patient of such studies as the basis for global estimates. These estimates represent the *lower boundaries* of the cost ranges since they omit high-severity cases which would be more expensive to treat. Since severe cases were omitted, it is very likely that the true costs will be greater than these estimates.

A second calculation method utilises work done on classifying abortion complications by three levels of severity (Kay *et al.* 1997; Rees 1997), described in the preceding section. In this approach, we treat the lower-boundary cost-per-patient estimates as representing low-severity cases. We then use the severity patterns reported in the literature to estimate medium and high-severity costs. We term the estimates from this method the *central cost estimates* since they take all complication cases into account albeit using scanty data.

A third method of cost estimation specifically addresses a serious lacuna in the empirical literature, namely the almost complete lack of studies from Asia (and Europe). In this approach, we use all available cost-per-patient studies and make three estimates for Asia using sub-Saharan Africa (SSA)-only averages, Latin America and Caribbean (LAC)-only averages and finally combined SSA-LAC averages. These estimates are called the *Asian-variation cost estimates*. European developing countries are treated in the same way.

Finally, existing empirical cost studies have been found, insofar as it can be determined, to omit certain cost components, in particular, overhead and capital costs. We can use the results of applications of the MBP costing model to estimate the relative size of these missing components and assume that the empirically derived cost-per-patient averages measure only the components of drugs, supplies and personnel costs. Estimates using this method represent the *upper boundaries* of the cost ranges.

4.1.2 Mother-Baby Package costing spreadsheet

The 'bottom-up' approach to health-system costing has made use of an 'off the shelf' costing model developed by the WHO, namely, the WHO Mother-Baby Package (MBP) costing spreadsheet (WHO 1994 and 1999). The spreadsheet tool estimates the costs of 12 interventions that comprise the Mother-Baby Package. The underlying strategy of the MBP aims to reduce the number of high-risk and unwanted pregnancies; the number of obstetric

complications; and the case fatality rate in women with complications. Since its development, several countries, including Mexico, Bolivia, Ghana and Uganda, have used the model to estimate the cost of components of maternal and child health services (Weissman *et al.* 1998; Capra *et al.* 2000; Asante *et al.* 2004; Cahauna-Hurtado 2004). The model has also been used to estimate PAC costs in Nigeria (Bankole *et al.* 2007).

One of the interventions contained in the MBP is post-abortion care, which the MBP defines as treatments for the following five specific post-abortion complications: shock/loss of fluid, sepsis, incomplete abortion, cervical/vaginal lacerations and uterine lacerations (and perforations). Using the MBP model to estimate the health-system cost of unsafe abortion has the advantage of tapping into a well-developed model in which all costs are systematically incorporated, including default values for all inputs. This feature allows researchers to design cost-effective studies where the amount of data collection can be traded off against the degree of precision required for the cost estimates. The MBP model's default values are based on international prices for certain inputs – and this can sometimes be preferable to using locally-derived estimates.

Although the MBP model is easy and inexpensive to use, it does have some drawbacks. The majority of defaults are based on values estimated by a panel of WHO experts. In country applications, however, some defaults may be difficult to replace with actual data. The model also uses a three-tier health system (health posts, health centres and hospitals), which may not fit the actual structure in a particular application. Lastly, the MBP spreadsheet assumes fixed proportions for each of the abortion-related complications it models.

4.2 Global and regional cost estimates

In this section, each of the methodologies just described is used to make global and regional estimates of the health-system costs of treating post-abortion complications. Since the two methodologies are quite distinct, one being a 'top-down' approach and the other a 'bottom-up' approach, the estimated costs from one approach will be able to be judged by the results from the other approach. Overall, greater confidence in a range of cost estimates will result from the comparison.

4.2.1 Cost estimates using average cost per case

As mentioned above, the uncertain quality of the data on cost per patient makes it advisable to present a range of cost estimates by varying underlying assumptions. Table 4.2 lists a number of cost per patient estimates based on the 24 empirical studies which yielded usable data. Several articles reported results from multiple samples of women attending health facilities for PAC, while others reported 'bottom-up' facility surveys, such as MBP applications. In all, some 72 distinct samples were surveyed. Many of the studies were investigating the costs and benefits of introducing the manual vacuum aspiration technique for evacuating incomplete abortions instead of other techniques such as dilation and curettage. Such studies typically had at least two samples: one a pre-test and the other a post-test.

The first row of Table 4.2 shows simple averages taking into account all 72 cost estimates available. In terms of US dollars (2006 US$), the average cost per patient is $86.04. Keep in mind that the data comes preponderantly from the sub-Saharan Africa and Latin America and Caribbean regions, and that, even so, only a few countries within these regions are included. Of the 72 samples, 46 can be categorised as low-severity samples, meaning that the women sampled would be classified as having 'low' severity complications using the Kay-Rees severity framework. The other 26 samples included women of all severity categories.[12] Simple averages of these two groups of samples are shown in Table 4.2

12 We loosely use the word 'sample' since a number of bottom-up studies are not based on client samples but rather are facility based, such as the MBP applications, which refer to women with all post-abortion complications. Also, one study (Konje *et al.* 1992) sampled only women with sepsis, which likely corresponds to women with medium or high severity levels.

Table 4.2 **Average costs per patient from 24 empirical investigations**

	No of studies or samples	*Cost per patient* Study year US$	2006 US$	2006 Int. $
1 Simple averages from all samples included in the 24 articles	72	70.56	86.04	176.02
2 Simple averages of low-severity samples	46	57.43	72.07	132.82
3 Simple averages of all-severity samples	26	93.78	110.76	252.45
4 Simple averages from the 24 articles (after taking averages within each study)	24	71.09	88.28	187.16
5 Simple averages of low-severity samples	12	54.91	67.72	126.88
6 Simple averages of all-severity samples	12	87.26	108.84	247.45
7 Africa	12	62.93	82.63	212.87
8 *Sub-Saharan Africa*	*11*	*67.56*	*88.82*	*227.92*
9 Asia and Pacific, Europe*	0	71.09	88.28	187.16
10 Latin America and Caribbean	12	79.24	93.92	161.45
11 **Cost estimation method 1:** Lower boundaries (all regions)	24	54.91	67.72	126.88
12 **Cost estimation method 2:** Severity patterns (all regions)	24	93.21	114.96	215.38
Cost estimation method 3: Asia, Europe Variants				
13 Asia and Pacific, Europe (SSA costs)	11	67.56	88.82	227.92
14 Asia and Pacific, Europe (SSA-LAC costs)	24	71.09	88.28	187.16
15 Asia and Pacific, Europe (LAC costs)	12	79.24	93.92	161.45
Cost estimation method 4: Adding overhead, capital costs				
16 Africa	12	87.02	114.26	294.35
17 *Sub-Saharan Africa*	*11*	*93.42*	*122.82*	*315.16*
18 Asia and Pacific, Europe*	0	98.29	122.07	258.80
19 Latin America and Caribbean	12	109.57	129.87	223.25

* Costs are averages of sub-Saharan Africa (SSA) and Latin America and Caribbean (LAC) costs.

(rows 2–3). The average cost per patient for treating low-severity complications is $72.07, while the average cost for samples of women with all types of complication is $110.76.

A few studies contribute many samples to the total of 72, possibly biasing the average costs. To investigate this possibility, the averages were recalculated by first obtaining averages for all studies that contained multiple samples. Then simple averages of the 24 studies were obtained. In this way, each study contributed the same weight to the averages. Average costs using this procedure are shown in rows 4–6 of the table. The overall average increases slightly to $88.28, while the average for low-severity samples decreases a little to $67.72 and the all-severity average cost per patient declines to $108.84. Overall, it makes little difference which of the two calculation methods is used. In calculations below, nevertheless, we choose the second method (first averaging each multi-sample study, then taking averages across all studies) since it pes the same weight on each study.

Of the 24 studies, 12 took place in Africa (11 in sub-Saharan Africa) and 12 in Latin America and the Caribbean. Average costs per patient by region are shown in rows 7–10 of Table 4.2. In terms of US dollars (2006 US$), there is little variation by region, from $82.63 in all of Africa to $93.92 in LAC. Since no empirical data are available for either the Asia/Pacific region or for developing countries in Europe, the average of African and LAC costs ($88.28) is used in these regions (row 9). It is interesting to compare costs in terms of international dollars (2006). Even though cost per patient is higher in LAC than in SSA in real terms, in terms of international dollars, the average cost in SSA is substantially higher (c.$228 vs. $161), showing that in relation to purchasing power, abortion complications are considerably more expensive to treat in sub-Saharan Africa than in Latin America, despite the former being the poorer region.

Row 11 of the table contains average costs that will be used in the first of four methods for estimating regional and global total health-system expenditures, as explained above. This method will give us the lower boundary estimates of total costs since it assumes that low-severity cost per patient can be applied to all women seeking PAC, and as such is most likely to under-estimate total expenditures. As can be seen, row 11 is identical to row 5 of the table.

Row 12 shows the costs per patient for the second calculation method, where information about the incidence and cost of treatment by severity level is used. The average cost is calculated to be $114.96 per patient. Two studies (Kay *et al*. 1997; Gebreselassie 2005) provide information on severity patterns in South Africa and Kenya. Combining the two studies, we assume that low-severity cases are 63.6 per cent, mid-severity cases 15.9 per cent and high-severity cases 20.5 per cent of the total. Using these percentages as weights together with the estimated costs by severity of the South African study, we arrive at an average cost across all levels of severity. This approach is, of course, a crude one, extrapolating the experiences of two SSA countries to the whole developing world. It is worth using this method, nonetheless, because it takes into account available data on the severity pattern of post-abortion complications, even if in a crude way.

Rows 13–15 of Table 4.2 show the costs per patient used in the third calculation method, where three variants are used for the two regions lacking empirical data, namely, Asia and Pacific and Europe. The three variants use SSA estimates alone, LAC estimates alone, and the average of SSA and LAC estimates, which range from $88.28 to $93.92 (2006 US$).

Finally, in rows 16–19, average costs using the fourth calculation method are shown. This method assumes that most studies have underestimated the true cost of treatment by omitting certain, hard-to-measure cost components. In particular, overhead and capital costs are frequently omitted. Using information from the five studies which applied the MBP costing model (see Table 4.3), rough estimates of the shares of overhead and capital costs in total treatment costs were made. Based on these five studies, direct costs are estimated to be 72 per cent, overhead 16 per cent and capital 12 per cent of total costs.[13] Observed costs are then inflated by a factor of 1.38 (1.00/0.72 = 1.38) to take into account overhead and capital. The estimated costs using this method are higher than those from any of the other three methods and so form the upper boundaries of the cost ranges.

13 The breakdown of costs by component varied between studies. In some, this breakdown was available only for all MBP interventions taken together: in others, the breakdown was available for abortion complications separately. Studies also generally had results for both 'current', meaning actual, and 'standard' practice, meaning WHO standard MBP protocols for treatment. First, an overall direct-cost average was calculated. (An inflation factor of 1.24 was used to increase direct costs for data relating to all interventions combined. The factor was estimating by comparing all-intervention costs with abortion-complication costs, whose treatments seem to have fewer indirect costs.) Second, the overhead and capital average costs were calculated and inflated until the total of the three cost components equalled 100 per cent.

Table 4.3 **Global and regional estimates of health-system costs of PAC (2006 US$) using cost per patient averages**

Developing regions	No of PAC cases treated	Method 1: Determining lower boundaries ($)	Method 2: Using severity complication patterns ($)	Method 3: Asia, Europe Variant (SSA costs $)	Method 3: Asia, Europe Variant (SSA-LAC costs $)	Method 3: Asia, Europe Variant (LAC costs $)	Method 4: Adding overhead, capital costs ($)	Central estimates ($)
Africa	1,730,000	117,000,000	199,000,000	154,000,000	153,000,000	163,000,000	198,000,000	168,000,000
Sub-Saharan Africa	*1,180,000*	*80,000,000*	*136,000,000*	*105,000,000*	*104,000,000*	*111,000,000*	*145,000,000*	*117,000,000*
Asia and Pacific	2,280,000	155,000,000	262,000,000	203,000,000	201,000,000	214,000,000	279,000,000	225,000,000
Latin America and Caribbean	1,040,000	70,000,000	120,000,000	92,000,000	92,000,000	98,000,000	135,000,000	105,000,000
Europe (developing countries)	560,000	38,000,000	64,000,000	50,000,000	49,000,000	52,000,000	68,000,000	55,000,000
Developing world	**5,610,000**	**380,000,000**	**645,000,000**	**499,000,000**	**495,000,000**	**527,000,000**	**680,000,000**	**553,000,000**

Source: Number of PAC cases from Singh (2006) with exceptions noted below.
Notes: (1) Number of PAC cases for developing countries in Southern and Eastern Europe: hospitalisation rate of 8 per 1,000 is assumed.
(2) Number of PAC cases for developing countries in Oceania added to figure for Asia: hospitalisation rate of 3 per 1,000 is assumed.
(3) For Northern Africa, Europe, Asia and Oceania, average costs are assumed (average of sub-Saharan Africa and Latin America and Caribbean).

Regional and global estimates of health-system costs are presented in Table 4.3 for the four proposed calculation methods. Globally, the total cost estimates range from $383 million to $681 million. The central estimate of global expenditure by health systems for PAC is $555 million.[14] Of the four methods, the first one, which uses low-severity average costs, is the least likely scenario and is included mainly to set lower bounds for the probable cost ranges. Methods 2 and 4 make use of additional data apart from the empirically derived costs per patient. In each case, however, the added information, though theoretically appealing, is scant and necessitates assumptions that only roughly approximate reality. For example, the pattern of severity is maintained constant across all regions for lack of more specific regional data. This limitation probably distorts regional prevalence estimates. For instance, only 19 per cent of all serious complications in the developing world are estimated to occur in sub-Saharan Africa, even though around 43 per cent of all maternal deaths due to unsafe abortion come from that region. Obviously, more data on both severity patterns and omitted cost components should be collected through further research in order to improve the precision of these estimates.

4.2.2 Cost estimates using the Mother-Baby Package costing spreadsheet

To apply the MBP model at the country level, each type of PAC treatment is broken down into the quantities and unit costs of its constituent inputs (drugs, materials, equipment, personnel, overheads and infrastructure). As mentioned, the model has been applied in five studies and further studies are planned.[15] The five existing studies are summarised in Tables 4.4 and 4.5.

Table 4.4 **Applications of the MBP costing spreadsheet: study characteristics**

Study area	Year of study	Data-collection sites	Publications
Uganda	1996	Iganga and Mbarara Districts (relatively high accessibility to services)	Weissman *et al.* (1998)
Bolivia	1997	El Alto, Santiago de Machaca, Valle Bajo (Quillacollo), Sur Oeste (Capinota), and Valle Puna Districts	Capra *et al.* (2000); JSI (1999)
Ghana	2003	Wassa West District	Asante *et al.* (2004)
Mexico	2001	Sanitary District #3, Morelos State	Cahuana-Hurtado *et al.* (2004)
Nigeria	2005	32 hospitals in 8 states (Ekiti, Gombe, Kaduna, Kano, Kogi, Lagos, Imo and Rivers)	Bankole *et al.* (2007)

The purpose of the studies, except for the Nigeria study, was to estimate costs for the entire Mother-Baby Package, not just PAC costs. The Nigerian study, on the other hand, focused solely on PAC costs. As can be seen, all studies covered only selected districts of the country, so none of them can claim to yield estimates that apply to the whole country. The approach used in Uganda, Bolivia and Ghana was to collect data on current practices, then estimate 'standard' practice, meaning following WHO protocols set down for the MBP initiative.

14 The central estimates are the simple averages of the estimates from methods 1-4. (For method 3, the three variants are first averaged.)

15 The Guttmacher Institute, with funding support from the United Nations Population Fund, is currently undertaking a project to pilot test data-collection instruments towards estimating health-system costs, *inter alia*. Research institutes in Ethiopia, Mexico and Pakistan are collaborating in this effort.

Table 4.5 **Applications of the MBP costing spreadsheet: cost of PAC (US$)**

Study area	Cost of PAC – Health Centres (cost per case, current US$)		Cost of PAC – Hospitals (cost per case, current US$)		Cost of PAC – Overall (cost per case, current US$)		Cost of PAC – Overall (cost per case, 2006 US$)	
	Current	*Standard*	*Current*	*Standard*	*Current*	*Standard*	*Current*	*Standard*
Uganda	1.71	9.78	12.16	34.51	8.24	25.24	10.16	31.24
Bolivia	–	–	–	–	69.00	109.00	83.67	132.17
Ghana	36.90	36.09	54.85	56.40	45.88	46.25	49.92	50.33
Mexico	–	94.07	–	198.36	–	187.42	–	211.72
Nigeria	74.00	–	132.00	–	103.00	–	112.08	–

Notes: **Bolivia:** Costs given in per capita terms. South American population and number of hospitalised PAC cases used to convert costs to per-case basis.
Ghana: Study does not give shares of cases treated in health centres and in hospitals; 50%:50% shares assumed.
Two right-most columns show costs converted to 2006 US$ (using IMF GDP deflators). All other costs refer to year of study.

Table 4.6 **Applications of the MBP costing spreadsheet: global and regional estimates of cost of PAC (2006 US$)**

Developing regions	No of PAC cases treated	Cost of PAC (2006 US$)		Sensitivity analysis: Minimum estimated cost of PAC (2006 US$)		Sensitivity analysis: Maximum estimated cost of PAC (2006 US$)	
		Current	*Standard*	*Current*	*Standard*	*Current*	*Standard*
Africa	1,731,016	114,000,000	141,000,000	99,000,000	112,000,000	128,000,000	171,000,000
Sub-Saharan Africa	*1,180,012*	*68,000,000*	*76,000,000*	68,000,000	76,000,000	68,000,000	76,000,000
Asia and Pacific	2,282,190	190,000,000	270,000,000	131,000,000	147,000,000	248,000,000	392,000,000
Latin America and Caribbean	1,039,707	113,000,000	179,000,000	113,000,000	179,000,000	113,000,000	179,000,000
Europe (developing countries)	557,359	46,000,000	66,000,000	32,000,000	36,000,000	61,000,000	96,000,000
Developing world	**5,610,272**	**463,000,000**	**656,000,000**	**375,000,000**	**474,000,000**	**550,000,000**	**838,000,000**

Source: Number of PAC cases from Singh (2006) with exceptions noted below.
Notes: (1) Number of PAC cases for developing countries in Southern and Eastern Europe: hospitalisation rate of 8 per 1,000 is assumed.
(2) Number of PAC cases for developing countries in Oceania added to figure for Asia: hospitalisation rate of 3 per 1,000 is assumed.
(3) For Northern Africa, Europe, Asia and Oceania, average costs are assumed (average of sub-Saharan Africa and Latin America and Caribbean).

Table 4.5 shows the cost-per-case results of the empirical studies. The overall costs per patient (in 2006 US$) show a lot of variability, from about $10 to $106, under current practice, and from $31 to $213, under 'standard' practice. Latin American costs seem to be substantially higher than African costs, as we would have predicted. Also, except for the Ghana study, 'standard' costs are substantially higher than current costs. One reason for this may be that current treatment regimes are actually sub-standard in that insufficient resources are being applied to each case. We must not forget the other possibility, however, namely that standard treatment protocols include inflated resource input requirements and that, in practice, requirements are less than the standard protocol, allowing savings to be realised without decreasing service quality.

With only five empirical studies having used the MBP costing spreadsheet, precise estimates of global and regional costs of PAC treatment are not possible. Nonetheless, with three countries covered in sub-Saharan Africa and two in Latin America and Caribbean, rough estimates of the magnitude of PAC costs are possible for those two regions. If we make the simplifying assumption that the per-case costs in the other developing regions are averages of the former two regions, we can make first-approximation estimates for all developing regions.

Table 4.6 illustrates the probable magnitude of global and regional costs of treating the complications of unsafe abortion. Roughly speaking, the estimates shown under 'current' correspond to expenditures actually made for treatment, whereas those under 'standard' correspond to what would be expended if PAC treatment protocols matched the standards recommended by WHO. For the developing world as a whole, we estimate that about $463 million is currently being expended on treating the 5.6 million hospitalisations due to unsafe abortion. If standard WHO-recommended protocols were being followed, however, an estimated $656 million would be expended. Note that these estimates do not include the millions of women who have serious complications but never reach a health facility.

As mentioned, no empirical data exist – using the MBP methodology – for the Asian region, Northern Africa, or developing countries in Europe. We have assumed that simple cost averages for the two regions where data do exist can be used to estimate costs in the other regions. We can perform a simple sensitivity analysis to find a range of estimates for total expenditures by using the lowest cost estimates (from sub-Saharan Africa) to find the lower bound of the range, and the highest cost estimates (from Latin America and Caribbean) to calculate the upper bound of the range. These lower and upper limits are shown in the rightmost four columns of Table 4.6. For actual or 'current' expenditures, we see that the range is from $375 million to $550 million, while for WHO 'standard' coverage, the total cost ranges from $474 million to $838 million.

The total cost estimates from the MBP studies tend to be higher than the estimates derived from average costs per patient (see section 4.2.1 above). Overall, the MBP-derived estimates are about 20 per cent higher. Regionally, the SSA estimate from MBP data is more than 70 per cent above the cost-per-patient estimate, while the LAC central estimate (MBP approach) is lower than the cost-per-patient central estimate. This may indicate that in SSA data on cost per patient has tended to omit more cost components than data from LAC studies. It should be noted that the two sets of estimates are not completely independent of one another since in the 24 cost-per-patient studies are included the five MBP-application studies.

5 Other costs: review of evidence, methods and assumptions

Within the rubric of direct health costs, the following four costs of treatment from post-abortion complications may be distinguished:

- Direct costs resulting from women hospitalised for post-abortion complications (dealt with in section 4 above).
- Direct costs that would result if women, who need hospital-based treatment but receive no treatment, were in fact to obtain treatment.
- Direct costs to women with less severe complications needing/receiving care at the primary healthcare level.
- Direct costs that would result if women suffering infertility due to unsafe abortion were to receive adequate treatment.

We now look at the latter three categories of direct health costs and then at other economic costs (indirect costs) that result from morbidity and mortality related to unsafe abortion.

5.1 Treating unmet need: women with serious complications from unsafe abortion

A major lacuna in abortion macro-analysis is the almost complete lack of information about the prevalence of women with serious complications who fail to receive medical attention from a regular health facility. Some informed estimates put this proportion at between one-third and one-half of those who experience complications in countries where access to abortion is highly restricted (Alan Guttmacher Institute 1999; Benson and Crane 2005). On the basis of very incomplete data, Benson and Crane estimate that 45 per cent of unsafe abortions – 8.9 million – may result in complications annually. Using the estimate of Singh (2006), namely that around 15–25 per cent of women undergoing unsafe abortions suffer untreated complications, we estimate that between 3 and 5 million women have an unmet need for PAC, in addition to the 5.6 million hospitalisations that occur annually.[16]

Some of these women may be treated in non-formal or traditional medical systems and some may receive no treatment at all. Much of the abortion-related mortality takes place in this group of anonymous women. It is also likely that the inadequacies of formal health systems in low-income countries explain a large part of why a significant proportion of such women do not seek care or are unable to access it. Thus, the direct costs to the health system estimated in the previous section do not tell the whole story. If all the unmet demand for PAC were met by the health systems – in other words if the 3–5 million women who presently go untreated were to be treated, in accordance with the main goal of the ICPD – then the direct health-system costs would be much higher than the estimates given in section 4.

An idea of the magnitude of the increase in costs is shown in Table 5.1. If the cost-per-case method of estimation is used, another $293–$488 million would need to be spent by national health systems. If we use the MBP 'bottom-up' approach, an additional $277–$432 million would be needed to meet the unmet demand. Whatever the true size of the expenditure that would be needed to treat this largely unknown group of women, it is surely a sizeable proportion of the actual healthcare expenditures for PAC (Table 5.1) and points up a critical shortcoming in the current delivery of health services in the developing

16 Benson and Crane (2005) estimates that only around 75 per cent of women needing hospital care after unsafe abortions actually present themselves at hospitals. Kay *et al.* (1997: 446), however, quoting an older study from Chile, reports that perhaps only '10–50% of women who have had unsafe abortions actually receive medical attention'. In this study, the 15–25 per cent range reported by Singh (2006) has been used.

Table 5.1 **Estimating the cost of PAC if untreated women with serious complications received care**

Developing regions	**Cost of PAC (2006 US$) 'top-down' method**			**Cost of PAC (2006 US$) MBP method**		
	Actual estimated costs	***Cost of treating unmet demand***		**Actual estimated costs**	***Cost of treating unmet demand***	
		Minimum estimate	**Maximum estimate**		**Minimum estimate**	**Maximum estimate**
Africa	168,000,000	82,000,000	136,000,000	114,000,000	85,000,000	112,000,000
Sub-Saharan Africa	*117,000,000*	*68,000,000*	*114,000,000*	*68,000,000*	*40,000,000*	*66,000,000*
Asia and Pacific	225,000,000	145,000,000	242,000,000	190,000,000	122,000,000	204,000,000
Latin America and Caribbean	105,000,000	59,000,000	98,000,000	113,000,000	64,000,000	106,000,000
Europe (developing countries)	55,000,000	7,000,000	12,000,000	46,000,000	6,000,000	10,000,000
Developing world	**553,000,000**	**293,000,000**	**488,000,000**	**463,000,000**	**277,000,000**	**432,000,000**

Source: Number of PAC cases from Singh (2006), with exceptions noted below.

Table 5.2 **Costs of MBP interventions in five applications (2006 US$)**

Current coverage											
Study area	**Antenatal**	**Eclampsia**	**Haemorrhage**	**Sepsis**	**Anaemia**	**Family planning**	**C-section**	**Syphilis**	**Gonorrhea**	**Normal delivery**	**Neonatal**
Uganda	1.81	1.59	1.65	–	–	5.43	–	–	1.71	9.86	–
Bolivia	17.10	37.87	57.42	81.85	–	75.75	–	–	–	–	51.31
Ghana	8.36	–	38.38	–	–	11.06	74.83	–	–	8.97	82.74
Mexico	46.78	–	–	–	–	18.54	–	11.49	7.61	113.26	–
Nigeria	–	–	–	–	–	–	–	–	–	–	–

Standard coverage											
Study area	**Antenatal**	**Eclampsia**	**Haemorrhage**	**Sepsis**	**Anaemia**	**Family planning**	**C-section**	**Syphilis**	**Gonorrhea**	**Normal delivery**	**Neonatal**
Uganda	6.64	50.14	18.26	10.83	1.27	5.78	–	4.99	3.23	15.82	5.05
Bolivia	39.09	43.98	151.49	96.51	–	70.86	–	–	–	–	180.81
Ghana	15.99	182.41	53.10	34.64	4.84	32.26	89.59	7.58	4.49	23.27	56.07
Mexico	57.19	–	130.43	68.14	9.65	17.11	–	10.96	9.93	83.02	–
Nigeria	–	–	–	–	–	–	–	–	–	–	–

Average regional costs											
Region/ coverage	**Antenatal**	**Eclampsia**	**Haemorrhage**	**Sepsis**	**Anaemia**	**Family planning**	**C-section**	**Syphilis**	**Gonorrhea**	**Normal delivery**	**Neonatal**
SSA Current	5.09	–	20.01	–	–	8.25	–	–	–	9.41	–
SSA Standard	11.32	116.28	35.68	22.73	3.05	19.02	–	6.29	3.86	19.55	30.56
LAC Current	31.94	–	–	40.93	–	47.14	–	–	–	–	–
LAC Standard	48.14	–	140.96	82.33	–	43.99	–	–	–	–	–

Notes: **Nigeria:** MBP application focused solely on abortion complications. **Aggregation:** Costs generally refer to health post and/or health centre costs. Where multiple costs were reported, simple averages were taken. **Selection:** In calculating overall averages, eclampsia, haemorrhage and C-section costs were not used, under the assumption that they would bias the averages upward.

Table 5.3 **Global and regional estimates of treatment costs of minor complications of unsafe abortion (2006 US$)**

Developing regions	Number of cases of minor complications	Estimated cost per case		Cost of treatment		Sensitivity analysis: minimum estimated costs		Sensitivity analysis: maximum estimated costs	
		Current	*Standard*	*Current*	*Standard*	*Current*	*Standard*	*Current*	*Standard*
Africa	308,000	12.74	21.49	3,900,000	6,600,000	2,300,000	4,500,000	5,500,000	8,800,000
Sub-Saharan Africa	*210,000*	*7.58*	*14.55*	*1,600,000*	*3,100,000*	*1,600,000*	*3,100,000*	*1,600,000*	*3,100,000*
Asia and Pacific	407,000	23.79	36.35	9,700,000	14,800,000	3,100,000	5,900,000	16,300,000	23,700,000
Latin America and Caribbean	185,000	40.00	58.15	7,400,000	10,800,000	7,400,000	10,800,000	7,400,000	10,800,000
Europe (developing countries)	100,000	23.79	36.35	2,400,000	3,600,000	800,000	1,500,000	4,000,000	5,800,000
Developing world	**1,000,000**			**23,400,000**	**35,800,000**	**13,600,000**	**22,700,000**	**33,200,000**	**49,100,000**

Source: Number of cases of minor complications from Benson and Crane (2005).
Notes: (1) Cost-per-case estimates calculated from Table 5.2.
(2) Distribution of cases by region is proportional to the distribution of hospital PAC cases (see Table 4.6).
(3) Sensitivity analysis: minimum costs for N. Africa, Asia and Europe use SSA costs per case; maximum costs use LAC costs per case.

world. With no regional data available, Table 5.1 merely uses global estimates of unmet need to calculate regional costs. However, if regional data were available, it might well show that costs would increase disproportionately in regions such as sub-Saharan Africa where health systems are poorly organised.

5.2 Treating unmet need: women with minor complications from unsafe abortion

Besides the costs to health systems for treatment of the estimated 5.6 million women receiving care in a hospital setting, there are many other women who suffer from minor complications that can be treated at the primary healthcare level or privately. Very little is known about how many of the 19.8 million women experiencing unsafe abortion each year fall into this category. One study (Benson and Crane 2005) has roughly estimated their number at 1 million women, based on their survey of several small-scale country studies. Pain management, treatment for anaemia and counselling are typical treatments that could be delivered at this level of care.

Unfortunately, no empirical study was found that had cost data on minor complications. In lieu of better data, we can hazard a first approximation of the cost of treating minor post-abortion morbidities by assuming that a visit to a primary healthcare post by a woman with a minor post-abortion complication might cost about the same as the average of the other health interventions of the Mother-Baby Package. The costing model developed by the WHO for the MBP has standard default values (which were estimated by a panel of WHO experts and calibrated based on conditions in rural areas of Uganda) that can be used to obtain a proxy value of the cost per case for women attending primary healthcare facilities for MBP interventions. The MBP models basic reproductive healthcare at three service levels including the primary level ('health posts' and 'health centres').

Table 5.2 gives details of the costs of individual MBP interventions for the available country applications of the MBP costing spreadsheet. Using these results we can calculate average costs of primary healthcare visits across a variety of maternal and newborn interventions for sub-Saharan Africa and Latin America and Caribbean. These averages are shown in the third and fourth columns of Table 5.3. For sub-Saharan Africa, the average MBP-related visit costs $7.58 actually and would cost $14.55 if WHO standard protocols were followed. For Latin America and Caribbean the estimated average costs are $40 and $58, respectively. Since there are no empirical data available for other regions, we assume that average costs in those regions are simple averages of the SSA and LAC regions. Using the Benson-Crane estimate of one million cases of minor post-abortion complications annually, regional shares are calculated to mirror regional proportions for hospital admissions (see Table 4.6).

For the developing world as a whole, we estimate that minor complications of unsafe abortion cost about $23 million each year. If WHO standards for treatment were followed, the global cost would rise to about $36 million. As a simple test for the sensitivity of these results to different assumptions, we take as lower-bound cost estimates those where all regions except the LAC region have costs per case equivalent to those in the SSA region. Upper-bound cost estimates, likewise, are those where all regions except the SSA region have LAC-level costs per case. As can be seen from Table 5.3, this results in a range of estimated global cost totals of $13.6 to $33.2 million. If countries followed WHO standards, the global-cost range goes from $22.7 to $49.1 million. These costs may be borne by the public healthcare system if primary healthcare is provided without charge to all women, while the costs may represent out-of-pocket expenses to women or households in settings where such care is provided privately. In other situations, these costs might be shared between a partially subsidised public health system and private contributions.

5.3 Treating unmet need: the cost of infertility resulting from unsafe abortion

One of the most important long-term disabilities associated with unsafe abortion is secondary infertility resulting from serious complications, including acute infections or uterine perforations. The incidence of post-abortion secondary infertility is not well documented, but recent work at WHO has estimated the proportion of women suffering from infertility as a result of unsafe abortion in the range of 3–12 per cent depending on region (Åhman *et al.* 2005). From these data, it is possible to obtain rough estimates of the numbers of women suffering from post-abortion infertility.

We can safely assume that very few women in developing countries, except those coming from the highest income strata, are able to seek infertility treatment, given the high cost of techniques such as in vitro fertilisation, which, in developed countries, can easily cost several thousands of dollars. Also, in developing countries, infertility treatment within public health systems is virtually unknown. We can conclude with certainty that almost all women who suffer from infertility as a consequence of unsafe abortions belong to the group of women with an unmet need for infertility treatment. However, it has been suggested (IDS 2007) that in some societies and in certain circumstances – e.g. in cases of powerlessness to use contraception – some women may resort to unsafe abortion as a form of contraception, calculating that the procedure may lead to infertility, an outcome that these women desire. Thus, even if we know how many women suffer infertility as long-term sequelae of unsafe abortion, we do not necessarily know the proportion of these women who desire to be treated if such treatment were available to them. Obviously, this is an important question that will need empirical research before it can be answered.

No studies on the cost of infertility treatment in a developing setting have been carried out. In fact, such studies in developed countries are rare. Only one source was found describing costs in a developed country (Finland) of successful in vitro fertilisation (IVF) for infertile couples (Koivurova *et al.* 2004). In the study, the estimated cost for a successful IVF treatment was 3,291 *euros* (2003). This cost was reduced to 3,181 *euros* by excluding the cost of a three-day sick leave, then converted into US dollars (2006), using an exchange rate of 0.90 and an inflation factor of 9.55 per cent over the period (US GDP deflator index). The resulting cost was $3,870. Note that this cost does not include the cost of any unsuccessful IVF treatments. Thus, this average cost underestimates the real cost since it assumes, unrealistically, that all women become pregnant from their first treatment.

From the estimate of infertility morbidity given by Åhman *et al.* (2005), there may be 1.5 million women annually who become infertile after unsafe abortions. If treatment costs around $4,000 for each of these women, then the potential cost of the global unmet need for infertility treatment could amount to $6 billion each year.[17] This estimate would decrease if we could factor in the proportion of infertile women who would not want to be treated, but at the same time it would increase if could estimate the average number of IVF treatments needed before a successful pregnancy occurs.

Even though infertility treatment has almost never been part of the reproductive health services of public health services in the developing world – meaning that only the wealthiest strata can afford treatment – it is nevertheless important to highlight the magnitude of the cost that would be incurred if every case of post-abortion infertility were to receive adequate treatment. Although lack of data prevents precise estimation of this cost, there is no doubt that it is a very substantial amount indeed.

17 The 1.5 million women who suffer secondary infertility in a given year will not all seek infertility treatment (if it were available) in the same year. Some would never seek it at all and the treatments of those who did would be spread out over a number of subsequent years. However, if we can assume that this pattern remains roughly constant over several years, we can validly make the simplifying assumption that all 1.5 million cases sought treatment in the same year. Nonetheless, the problem of not knowing how many women would never seek treatment, even if it were available, remains, as does the problem of multiple treatments before successful pregnancies.

Table 5.4 **Summary of studies of out-of-pocket expenses of women with post-abortion complications (2006 US$)**

Country	Author	Location	Sample	Date of survey	*Losses during treatment*			*Losses (time period not given)*		
					Productive days lost before treatment	Expenses (self)	Productive days	Productive days lost after treatment	Expenses (self)	Income (others)	Productive days
Burkina Faso	Population Council (2000b)	2 large urban hospitals	330 women seeking PAC (pre)	1996–1998	–	41.54	1.5	–	–	–	–
Burkina Faso	Population Council (2000b)	2 large urban hospitals	456 women seeking PAC (pre)	1996–1998	–	18.33	0.8	–	–	–	–
Cambodia	Potdar *et al.* (2007)	3 Govt. referral hospitals, 2 PHC centres, 5 NGOs	110 women seeking elective abortion; rural, urban	Nov–Dec 2005	–	–	–	–	4.82	2.26	3.0
Kenya	Ominde *et al.* (1997)	5 hospitals	481 women seeking PAC	1996	–	9.94	1.7	–	–	–	–
Nigeria	Bankole *et al.* (2007)	7 teaching hospitals, 10 second hospitals, 16 private hospitals	2,330 women seeking PAC	2002–2003	–	104.07	2.9	–	–	–	–
Senegal	Population Council (2000a)	Le Dantec University Teaching Hospital, Dakar	320 women seeking PAC (pre)	1997	–	74.52	2.3	–	–	–	–
Senegal	Population Council (2000a)	Le Dantec University Teaching Hospital, Dakar	543 women seeking PAC (post)	1997	–	56.20	1.9	–	–	–	–
Senegal	Dabash (2003)	Fatick, Kaolack regions; 6 h. centres, 12 h. posts	48 women seeking PAC (pre)	2001	–	15.58	1.3	–	–	–	–
Senegal	Dabash (2003)	Fatick, Kaolack regions; 6 h. centres, 12 h. posts	55 women seeking PAC (post)	2001	–	12.78	0.4	–	–	–	–
Thailand	Narkavonnakit and Bennett (1981)	Chayapoom province	37 women hospitalised needing PAC	1980	6.9	–	2.0	2.6	–	–	–
				Simple averages:	**6.9**	**41.62**	**1.6**	**2.6**	**4.82**	**2.26**	**3.0**

Note: In some cases, expenses or productive days lost were reported as distributions. In such cases, weighted averages were calculated from the distributions.

5.4 Out-of-pocket expenses

In the calculations of health-system costs presented in previous sections of this report no attempt was made to separate costs borne by the public health system from those borne by the patient or the household to which she belongs. Regarding treatment costs, in some cases health systems have a well-defined schedule of co-payments which patients must pay as part of the service. In other, less well-organised systems, many of the costs that are formally contributed by the public system are in fact often borne by the patients themselves. For example, supplies and medicines may be habitually out-of-stock in public hospitals, so individuals must purchase these items on their own prior to receiving treatment. Thus, some double-counting may occur if patients' out-of-pocket expenses are added to estimated total treatment costs. It is interesting, nonetheless, to examine out-of-pocket expenses on their own, since they may be an onerous cost from the woman's viewpoint, particularly if her household income is low to begin with.

The out-of-pocket expenses of women seeking PAC are not confined to incidental (or not so incidental) expenses associated with the treatment itself. They also include such expenses as transportation costs to and from the health facility, food and lodging while awaiting treatment, income foregone while seeking treatment, during treatment and after treatment during the recuperation period, as well as any income foregone by other household members while caring for women with post-abortion complications. To date, very little data have been collected on such costs.

The studies that do provide some partial data on out-of-pocket costs are shown in Table 5.4. As can be seen in the table, the ten such studies primarily provide data on out-of-pocket expenses associated with the PAC treatment itself. The same is true of productive days lost: almost all studies have reported time lost in terms of average length of stay, usually in hospitals, while the treatment was administered. Only the 1980 study in Thailand reported on days lost before, during and after treatment. The Cambodia study reported on all three time periods but provided only aggregate results.

The data presented in Table 5.4 are obviously limited in geographical coverage. Eight of the studies took place in sub-Saharan Africa, the other two in Asia. None have been carried out in Latin America and Caribbean, northern Africa or Europe. The quality of the data is also suspect. For example, the Nigerian and Cambodian studies both measured out-of-pocket treatment costs, but in Nigeria these costs amounted to $104 whereas in Cambodia the cost was only about $7. The two sets of studies in Senegal, too, show quite different out-of-pocket cost ranges (e.g. from $16 to $75 for women seeking PAC during the pre-test phase of the studies) even though they employed similar methodologies.

Average-length-of-stay data, on the other hand, show much less variation, with an average of 1.6 days. However, a better estimate of average length of stay (ALOS) may be obtained from a wider set of studies that report ALOS even though they do not report on out-of-pocket expenses. Annex Table A4 compiles ALOS from 38 articles (some of which contained more than one sample), including the ones listed in Table 5.4. The average length of stay over all these studies – which include some studies sampling women with severe complications necessitating longer hospital stays – is 3.3 days.

Given the paucity of data, it is not yet possible to get a complete picture of out-of-pocket costs associated with the treatment of post-abortion complications. We have some data, mainly for parts of sub-Saharan Africa, on treatment expenses borne by the woman herself or her household as well as average length of stay during treatment. African data suggests that SSA total out-of-pocket expenses for PAC treatment may amount to just under $200 million. Except for the dated Thai study, however, we have no information on productive days lost before treatment, transportation, food and lodging costs, or on productive days lost by the woman and other household members during the convalescence period. The Thailand data suggest that the before and after periods may account for the majority of lost income from post-abortion complications compared with the time lost during the treatment itself. Extrapolating the Thai data to all developing countries, foregone income

before, during and after treatment may total more than $400 million.[18] With so many missing pieces of information, nevertheless, estimating global or regional out-of-pocket costs is little more than guesswork.

5.5 Other indirect costs to individuals or households

The costs of UARMM to public health systems are not the only costs occasioned by post-abortion complications. Certain other costs are borne by the affected women themselves or by the household in which they live. One such indirect cost of abortion-related mortality is the *cost of orphanhood*. Several studies of orphanhood costs after AIDS-related deaths of parents are available, which could serve as models for costing this aspect of UARMM. Another indirect cost is the negative effect on *children's future prospects*, mainly through losing out on educational opportunities, but also via the negative effects of chronic poor health and nutrition. In all these cases, the causal chain would run from either crippling household costs from treatment, or from the death of the mother or from her long-term disability, to reduced expenditure on education, health or food. Finally, there are *psychological costs* as well. Secondary infertility in many settings is extremely damaging psychologically and stigmatising to the woman. Chronic PID, teratogenicity[19] and dyspareunia[20] can also cause marital stress and lead to psychological trauma.

The costs of orphanhood have been most widely studied, mainly with regard to AIDS. There are some theoretical issues, however, which need to be resolved before including such costs here. Researchers in the HIV/AIDS area have generally used the concept of 'effective orphanhood' based on findings that show that a large percentage of children do not live with the father after the death of the mother. In the case of women's abortion-related deaths, where there would generally be a surviving father, it is not clear that the same approach would be appropriate. Moreover, given the extensive fostering arrangements prevalent in many cultures, it is difficult to say what proportion of such children are really orphaned, since fathers may still be supporting the children via payments to the foster parents. Another conceptual problem is that a child, whether orphaned or not, is a consumer of basic commodities such as food, clothing and education. In this sense, the orphaning of a child does not incur any additional costs. It is only a question of who bears the costs: the family, foster parents or the state. Knowing what extra obligations the state takes on when orphans are created through abortion-related mortality would be interesting from a policy perspective, but better measurement of real orphanhood rates would first need to be made.

Another indirect cost is an intergenerational effect, namely, the lower productivity of children – and hence a lower future income stream – as a result of less education and/or poorer nutrition and health occasioned by UARMM of mothers. At this point, however, no empirical studies linking UARMM with changes in schooling or nutrition of children have been done. If a quantitative linkage could be documented, estimation of this impact on future income would be possible and worthwhile.

The psychological impact of unsafe abortion – another indirect cost – has been studied even less thoroughly despite its obvious importance. Even if the mental health aspect of UARMM had been adequately researched, it might still prove to be an intractable undertaking to translate psychological costs into monetary terms for a costing study such as the present one.

Another indirect cost, for which little or no data are available, is the monetary and/or social costs of infertility aside from the treatment costs dealt with earlier. Another indirect cost, which at present can only be speculated upon for lack of data, is the cost in terms of lost productive time to caregivers looking after women with PAC.

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18 This estimate is based on 5.6 million women seeking PAC, the averages of lost productive time given in Table 5.4 and the global average for per capita income given in Table 5.6.

19 Teratogenicity: the presence of an agent or factor that causes malformation of an embryo.

20 Dyspareunia: difficult or painful sexual intercourse.

Table 5.5 **Economic impact of abortion-related mortality: changes in per capita income**

Developing regions	Population 2006	Women aged 15–49	No. of deaths due to abortion	Average age at death (years) from unsafe abortion	No. of survivors to age 60 of 'non-deaths'	Income per capita (2006) (2006 Internat.$)	Income per capita (no deaths) (2006 Internat.$)	Addition to national income (2006 Internat.$)	Addition to national income (2006 US$)
Africa	944,011,000	221,581,000	35,900	25.25	21,960	2,694.228	2,694.236	7,600,000	3,247,000
Sub-Saharan Africa	*751,103,000*	*170,449,000*	*34,800*	*24.65*	*21,060*	*2,103.408*	*2,103.417*	*6,810,000*	*2,435,000*
Asia and Pacific	3,789,857,000	1,003,179,000	28,550	28.87	24,240	5,870.500	5,870.505	18,082,000	4,663,000
Latin America and Caribbean	565,123,000	151,931,000	1,900	27.45	1,710	9,137.771	9,137.775	2,372,000	1,385,000
Europe (developing countries)	323,420,000	82,810,000	25	28.87	20	12,095.077	12,095.078	47,000	26,000
Developing world	**5,622,411,000**	**1,459,501,000**	**66,375**	**–**	**47,930**	**6,023.660**	**6,023.665**	**28,101,000**	**9,321,000**

Sources: UN Population Division website (population, women in reproductive ages); WHO (2007b) (number of deaths); Shah and Aahman (2004) (average age); WHO (2002) (survival rates); World Bank *World Development Indicators Online* (GDP).

5.6 Impact of unsafe abortion on the economy

Death and disability affect a country's economy chiefly by lowering labour productivity and by lessening savings and investment. Bloom *et al.* (2005) explains that:

> … healthier workers have better attendance rates and are more energetic and mentally robust. Workers in healthy communities, moreover, need to take less time off to care for sick relatives. Body size, which is greatly influenced by one's health during childhood, has been found to have large impacts on long-term productivity. (Bloom *et al.* 2005: 32)

Furthermore, they calculate that

> … a one-year increase in life expectancy improves labour productivity by 4 per cent. (Bloom 2005 *et al.*: 32)[21]

Health also impacts the economy through its effect on savings and investment:

> Healthier people expect to live longer, so they have a greater incentive to save for retirement. They are also able to work productively for longer, giving them more time to save. Workers and entrepreneurs therefore have a larger capital base to draw on for investment, leading to greater job creation and higher incomes. The savings booms in the East Asian 'tiger' economies in the last quarter of the 20th century were largely driven by rising life expectancy and greater savings for retirement. (Bloom 2005 *et al.*: 32)

In this report, we follow the approach of Bloom *et al.* (2005) in valuating the gains to the economy through the mechanisms just described. Building on prior work by Weil (Weil 2005), Bloom calculated the gains accruing to better survival through better health: '… each extra surviving adult in a group of 1,000 boosts income per capita by 0.119 per cent' (Bloom *et al.* 2005: 35).

5.6.1 Economic impact of abortion-related mortality

We first look at the impact that abortion-related mortality has on the economy or, conversely, the added economic benefits that would accrue in the absence of abortion-related deaths. Around 66,000 such deaths occur each year in the developing world (see Table 5.5). In order to make use of Bloom's estimate of gain in per capita income from a reduction in mortality, we must estimate the number of additional women surviving to age 60 if all abortion-related deaths were eliminated.

As an example, if a woman who would have died from an unsafe abortion at age 28 instead does not die, then her future productivity will incrementally add to per capita income. However, not all such women would survive to age 60 (the terminal year that Bloom *et al.* 2005 use in their calculations). In fact, the number of such women who will live to at least age 60 would be reduced due to the pattern of normal mortality, which can be found in life tables. Once we calculate the number of women who would live to age 60, we can estimate the positive impact on per capita income using the relationship suggested by Bloom *et al.* (2005).

Thus, the first step in measuring the impact of mortality is to make the simplifying assumption that in each region, all abortion-related deaths occur at the observed average age of unsafe abortion. Data on age patterns are available (Shah 2004) and are shown in column 4 of Table 5.5. Unsafe abortions occur at relatively young ages in Africa, older ages in Asia, and intermediate ages in Latin America. There are no data on the European age patterns. We assume that the Asian pattern of relatively late abortions is followed in

21 Another approach to valuation is described in Hutubessy *et al.* (1999).

Europe. So few abortion-related deaths occur in Europe that the effect of mis-estimating average age at death will in any case be negligible. Notice that we are also assuming that the age pattern of abortion-related deaths mirrors the age pattern of unsafe abortion. Lack of data on the former practically necessitates making this assumption, but it should be recognised as another potential source of error.

We therefore assume that all abortion-related deaths occur at the mean age of unsafe abortion. For Asia, for example, all 28,550 deaths are assumed to occur to women aged 28.87 years (see Table 5.5). Using survival rates for the various sub-regions within Asia, we then calculate how many of those women, *if they had not died from abortion complications*, would have survived to age 60. Column 5 of the table shows the number of these hypothetical survivors: about 48,000 of the 66,000 women would survive to age 60 if they did not die from unsafe abortion.

Once we know the number of additional surviving women, it is a simple matter to apply the Bloom *et al.* (2005) analysis. The impact on income[22] is shown in the last four columns of Table 5.5. As is evident, with such small incremental numbers, per capita income increases by an insignificant amount – only one US cent or less – depending on the region. For all developing regions combined the estimated cost of premature death due to unsafe abortion, in terms of lost productivity, is about $28 million (2006 International dollars). International dollars are constructs using purchasing power parity (PPP) measures that allow better international comparisons. International dollars, however, are far greater than US dollars, especially for low-income countries. The final column of Table 5.5 converts International dollars to US dollars (2006); the total mortality effect on total income thus being reduced to US$9.3 million.

Methodological note. Table 5.5 shows estimates only for the major developing regions.[23] However, since mortality patterns vary significantly within sub-regions, we have calculated survivors based on sub-regional survival rates, rather than using the large regional aggregates.[24] Sub-regional per capita income averages were also used.[25]

5.6.2 Economic impact of abortion-related morbidity

The long-term health consequences of abortion complications have not been well studied. Among those noted in the literature (see Annex Table A1) are secondary infertility, hysterectomy, severe anaemia, and pelvic inflammatory disease (PID). Empirical data on the incidence of these long-term morbidities, however, are almost non-existent. The only source of quantitative information on post-abortion morbidities comes from the World Health Organization. A WHO report (Åhman *et al.* 2005) gives global estimates for both secondary infertility (see section 5.3 above) and PID.[26] According to this report, between 15 and 30 per cent of women having unsafe abortions develop reproductive tract infections (RTI) which can lead to secondary infertility as well as PID. The study estimates the incidence of infertility at

22 In this analysis, GDP is used as a proxy for income.

23 Recall that in the case of Europe, this report includes only those countries in Eastern Europe and Southern Europe designated as developing countries by the United Nations.

24 Regional adult survival rates were estimated from WHO life tables (WHO 2002: 96-124). The 15 UN-defined sub-regions used in this study are: Eastern Africa, Middle Africa, Northern Africa, Southern Africa, Western Africa, Eastern Asia, South-central Asia, South-eastern Asia, Western Asia, Eastern Europe, Southern Europe, Caribbean, Central America, South America, and Oceania. Specific countries omitted from these sub-regions are as follows: Japan is omitted from East Asia; Bahrain, Israel, Kuwait, Saudi Arabia and United Arab Emirates are omitted from West Asia; Southern Europe consists of Albania, Bosnia and Herzegovina, Croatia, Serbia and Montenegro, Slovenia and Macedonia; Puerto Rico is omitted from Caribbean; and Australia, Guam and New Zealand are omitted from Oceania.

25 Data are from the World Bank's World Development Indicators series 'GDP per capita, PPP at current international US dollars' (see: www.worldbank.org/data). National-level data were weighted by population size to calculate regional averages.

26 Aahman *et al.* (2005) estimated that 16.5 per cent of women with unsafe abortions develop chronic PID.

3–12 per cent of these women. Furthermore, from the WHO/World Bank Global Burden of Disease project, disability weights for infertility and chronic RTI are available.[27]

Using these sparse empirical estimates as a starting point, it is possible to approximate the effect that unsafe abortions have in lowering the productivity of women who subsequently suffer long-term morbidities (at least the two that are identified in the Global Burden of Disease (GBD) work). To estimate the indirect cost of decreased functioning, we assume that the disability weights given by the GBD are reasonable proxies of the reduced productivity of women suffering from those disabilities. For example, a woman suffering infertility sequelae has a GBD disability weight of 0.18 (Lopez *et al.* 2006). In a setting where the woman's average income is, say, $1,000 per annum, the value of lost income due to her disability would be estimated at $180 per year.

Valuating the income foregone in such circumstances is difficult, since much work done by women is performed within the household and hence its cost is not available to statisticians as would be work performed for formal remuneration. Goldschmidt-Clermont (1993; and Goldschmidt-Clermont and Pagnossin-Aligisakis 1995) found that the value of non-market time, in industrialised countries, is half the value of GDP and that the contribution of non-market production to private consumption amounted to 60 per cent. In developing countries these percentages should be even higher, given the greater importance of non-monetised household production in developing settings. However, to the extent that women having abortions come from lower-income strata (this needs further research), using per capita income would tend to overestimate the total loss of income, since such women would have, on average, lower incomes. On the other hand, if women's non-monetised productive activities could be valuated and included in the measurement of GDP, per capita GDP would then be much higher than it presently is. Given these offsetting tendencies, we assume here that the value of a woman's work is equivalent to the national per capita income of the country in which she lives.[28]

Since the empirical evidence on morbidity incidence is weak, we calculate central estimates of the numbers of women suffering long-term disability effects using WHO's suggested rates, as well as lower-bound and upper-bound estimates to form ranges within which we can be more confident that the true incidence numbers lie. In the case of secondary infertility, WHO assigns incidence rates of 3, 5, 8 and 12 per cent of unsafe abortion cases to specific WHO regions, so we also vary the incident rates by sub-region. For the lower bounds, we use the following rates, respectively: 3 per cent (no change), 4.5 per cent (a drop of 10 per cent), 6.4 per cent (a drop of 20 per cent) and 8.4 per cent (a drop of 30 per cent). This pattern assumes that the higher reported incidence rates, which occur in low-income sub-regions, are the most likely to have been over-estimated. For the upper bounds of infertility incidence, we use, respectively, 4.5 per cent (an increase of 50 per cent), 6.5 per cent (an increase of 30 per cent), 9.2 per cent (an increase of 15 per cent) and 12 per cent (no change). The reasoning behind this pattern is similar: the high reported incidence rates are unlikely to be *under*estimated, while the low rates are more likely to be. Obviously, the patterns chosen for determining range boundaries are to an extent arbitrary, but will likely include the correct overall incidence rates.

There is even less certainty in the case of the WHO estimates of RTI incidence among women having unsafe abortions, which WHO gives as between 15 and 30 per cent (Åhman *et al.* 2005). For the central estimates of the numbers of women with this disability, we apply the lower percentage to higher-income sub-regions and the higher percentage to low-income sub-regions. We estimate the lower range boundaries by using an incidence rate of 15 per cent for all sub-regions. For the upper boundaries, we apply a 30 per cent incidence rate across all sub-regions.

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27 The GBD disability weight for infertility is 0.180, meaning that on average a women suffering from infertility is physically disabled for 18 per cent of her life *post facto*. The disability weight for chronic RTI is 0.067 (Lopez 2006).

28 In this exercise, GDP per capita was used as a proxy for income (see footnote 26).

Table 5.6 **Economic impact of abortion-related morbidity: estimates of lost income (one year)**

Developing regions	**No. of women with unsafe abortions (2006)**	***No. of women with secondary infertility (2006)***			***No. of women with long-term RTI (2006)***		
		Central estimate	**Lower-bound estimate**	**Upper-bound estimate**	**Central estimate**	**Lower-bound estimate**	**Upper-bound estimate**
Africa	5,600,000	602,000	431,400	617,000	1,500,000	840,000	1,680,000
Sub-Saharan Africa	*4,600,000*	*552,000*	*386,400*	*552,000*	*1,350,000*	*690,000*	*1,380,000*
Asia and Pacific	9,820,000	897,600	685,880	983,940	2,418,000	1,488,000	2,976,000
Latin America and Caribbean	3,900,000	117,000	117,000	175,500	585,000	585,000	1,170,000
Europe (developing countries)	500,000	15,000	15,000	22,500	75,000	75,000	150,000
Developing world	**19,820,000**	**1,631,600**	**1,249,280**	**1,798,940**	**4,578,000**	**2,988,000**	**5,976,000**
	Income per capita (2006 Internat.$)	***One-year income loss (infertility disability) (2006 Internat.$, millions)***			***One-year income loss (PID disability) (2006 Internat.$, millions)***		
		Central estimate	**Lower-bound estimate**	**Upper-bound estimate**	**Central estimate**	**Lower-bound estimate**	**Upper-bound estimate**
Africa	2,694	292	209	299	271	152	303
Sub-Saharan Africa	*2,103*	*209*	*146*	*209*	*190*	*97*	*194*
Asia and Pacific	5,871	948	725	1,040	951	585	1,171
Latin America and Caribbean	9,138	192	192	289	358	358	716
Europe (developing countries)	$12,095	$33	$33	$49	$61	$61	$122
Developing world	**$6,024**	**$1,466**	**$1,159**	**$1,677**	**$1,641**	**$1,156**	**$2,312**
	Income per capita (2006 US$)	***One-year income loss (infertility disability) (2006 US$, millions)***			***One-year income loss (PID disability) (2006 US$, millions)***		
		Central estimate	**Lower-bound estimate**	**Upper-bound estimate**	**Central estimate**	**Lower-bound estimate**	**Upper-bound estimate**
Africa	892	97	69	99	90	50	100
Sub-Saharan Africa	*620*	*62*	*43*	*62*	*56*	*29*	*57*
Asia and Pacific	1,345	217	166	238	218	134	268
Latin America and Caribbean	4,594	97	97	145	180	180	360
Europe (developing countries)	3,062	8	8	12	15	15	31
Developing world	**1,699**	**419**	**340**	**495**	**503**	**380**	**760**

Notes: RTI = reproductive tract infections; PID = pelvic inflammatory disease; Internat.$ = International dollars (PPP based).

Table 5.6 shows estimates of the impact of lower productivity on economic output. Out of 19.8 million women experiencing unsafe abortions annually, around 4.6 million are estimated to suffer from long-term PID and a further 1.6 million from secondary infertility (central estimates). For infertility morbidity, we estimate that the range that likely includes the true incidence figure goes from 1.2 million to 1.8 million women. For RTI/PID incidence, the range is from 3 million to 5 million women. This wide range seems appropriate given the weakness of the incidence rate estimates.

In the two lower panels of Table 5.6 we apply GBD disability weights to the incidence numbers and multiply by per capita income (using GDP per capita as a proxy).[29] The middle panel uses International dollars (2006), which are preferable when one wants to make inter-regional comparisons, while the lower panel uses US dollars (2006), which better reflect actual in-country costs. We estimate that infertility morbidity costs between $340 and $495 million over a one-year period, the central estimate being $419 million. For RTI long-term morbidity, the estimated range is $380–$760 million and the central estimate is $503 million. Combining the two long-term morbidities, disability caused by unsafe abortions may cost from $720 million to $1.2 billion in lost income and production measured over one year. However, since we have no data on the extent to which these two disabilities might overlap, adding together the estimated costs of the two quite likely over-estimates the total cost. For example, if 50 per cent of all women suffering from post-abortion infertility also suffered from long-term PID, then the combined range of cost estimates would be lower: $550 million to $1 billion.

In this estimation of costs, we account for only one annual cohort of women undergoing unsafe abortions and evaluate the economic cost over a period of only one year. But each year, about 19 million women suffer the same fate. To the extent that long-term disabilities persist for longer than one year – which is very likely – there would be a multiplier effect of women from previous years whose productivity was still adversely affected by lingering disability. Without better data on how these disabilities persist over time, however, it is not possible at present to include a multiplier in these cost estimates. It is safe to say, however, that the cost estimates presented in Table 5.6 are substantial underestimates of the true cumulative economic costs.

Methodological note. Table 5.6 shows estimates only for the major developing regions. However, since the morbidity patterns of infertility vary significantly within sub-regions, as do per capita income averages, we have performed the calculations described above for 15 sub-regions and then aggregated results to the large regions.[30]

29 Note that the infertility disability weight, 0.180, has not changed from the original GBD estimates for 1990 to the latest ones. The disability weight for RTI, however, was originally estimated to be 0.169 but has been lowered to 0.067 in the latest GBD edition (Lopez 2006).

30 See footnotes 26–28 for further methodological notes.

6 Conclusions

The purpose of this report was to develop methodologies to estimate the costs, in monetary terms, of unsafe abortion-related morbidity and mortality in developing countries. We formulated a framework for the analysis of costs related to unsafe abortion and were able to examine a number of specific costs by marshalling the available empirical evidence, scanty though it is in many areas. In the face of empirical data limited both quantitatively and qualitatively, it is important to be able to make reasonable, if imprecise cost estimates since they may be of great use in developing health policy to confront the problem of unsafe abortion.

Most emphasis was placed on estimating costs to health systems of treating the complications arising from unsafe abortion, both because more data exist in this area than in other costing areas and because such estimates are of immediate policy relevance. Even though at least 24 empirical studies are available on these costs, they are unevenly spread across regions, being few in Asia and Europe. Even within regions they tend to be concentrated in a few countries. The most important data limitation, however, is the very wide range of costs reported. Our analysis revealed several probable causes for this variation and the methodology we employed was designed to take these limitations into account. Future research should be more careful to specify clearly which cost components are being measured and which are not. It would also be very useful for future studies to adopt the three-category typology of abortion complications proposed be Kay *et al.* (1997) and Rees *et al.* (1997) so that more precise cost estimations may be made. An even better approach would be to collect cost data by each main type of complication.

With appropriate caveats for data limitations, global cost estimations were arrived at for several different aspects of the total economic impact of unsafe abortion. Considering only central estimates, these include:

- $555 million – health-system costs for PAC (cost-per-patient 'top-down' approach)
- $463 million – health-system costs for PAC (MBP costing model 'bottom-up' approach)
- $373 million – notional health-system cost, if unmet need for PAC were to be met
- $23 million – cost of treating minor complications of unsafe abortion
- $6 billion – possible cost to treat all post-abortion infertility cases
- $200 million – out-of-pocket expenses in *sub-Saharan Africa* for PAC treatment
- $400 million – out-of-pocket expenses for income lost before, during and after treatment
- $9 million – economic cost, in lower productivity, from mortality due to unsafe abortion
- $419 million – economic cost, in lost income, from long-term disability due to infertility caused by unsafe abortion
- $503 million – economic cost, in lost income, from long-term disability due to PID caused by unsafe abortion.

With respect to minor complications costs, very little hard data are available to estimate these costs, either in terms of the prevalence of such complications or in terms of the cost-per-case of treatment. We compiled all available data and used results from MBP costing applications to make rough approximations of costs in this area. Despite the dearth of data in this costing area, it seems that this cost component is not of major importance from a policy perspective.

With respect to infertility treatment costs, even though infertility treatment is supposed to be an integral component of reproductive care, in fact it is not. Developing countries in particular do not give it high priority, because treatment is very expensive and because the advanced technology required is often unavailable. The incidence of secondary infertility after unsafe abortion has not been measured with much precision and for treatment costs one

has to rely on evidence coming from developed countries. Despite these limitations, it seems clear that addressing this reproductive health issue would be very costly, perhaps even costing more than hospital-based treatment of immediate complications.[31]

Besides direct treatment costs, the report also examined indirect costs to the national economy and/or to the income of the household.

The total estimated cost of foregone income as well as out-of-pocket expenses are quite large. However, the data underpinning the estimates are largely inadequate, except for data on length of hospital stay. Only one study was found that looked at both the time prior to treatment when the affected woman would be unable to work as well as the time after treatment when the woman would be recuperating and too weak to work. The whole issue of valuating women's work, especially in developing settings where so much of it is 'non-market' employment, is complex and not yet satisfactorily solved. In the estimates in this report, it was assumed that non-market work has the same value as work in the formal sector. Lacking more precise data, we have also assumed that the income pattern of women who have unsafe abortion is the same as the pattern for all women, which may result in overestimating this impact.

In the area of economic impact of mortality, we have relied on general health-economics studies, assuming that abortion-related deaths affect the economy in the same way as deaths from other illnesses. Confirmation of this, through UARMM-specific studies, would be desirable. At any rate, the methodology we employed showed that abortion-related deaths do not seem to have a significant impact on the economy through productivity losses.

Economic impact of morbidity

The lack of data and the assumptions necessitated in this area make the estimated costs of morbidity liable to rather large confidence intervals. They rely in large part on the disability weights determined through a Delphi approach by the Global Burden of Disease project. The assumptions mentioned above for foregone income were made here as well. A further assumption, made due to lack of data, was that disabilities last for only one year. This clearly leads to under-estimating costs in this area but is the only viable assumption possible until studies on the long-term impact of abortion-related disabilities on productivity become available. Despite the limitations of the available data, we can safely say that costs in this area are significant but that more research should be devoted to measuring these costs more accurately.

We have not attempted to add up the various cost estimates into a grand total. The costs should be viewed separately for several reasons. For one thing, the agency which would bear the costs differs from one cost to another. For example, the cost of treating major post-abortion complications in hospitals is generally borne by the state or jointly by the affected women and the state. The cost of income foregone during treatment and convalescence, on the other hand, is generally borne by the women themselves and their families.

A second reason for considering the costs separately is that some costs represent actual expenditures while some are only putative. The estimated cost of infertility treatment, for instance, is almost completely notional since effective treatment is not included in any public-health service package.[32] As it is, only a tiny fraction of the well-off in developing countries are able to afford such treatment privately. It does, nonetheless, represent the cost that would be incurred by the state or through an insurance scheme if infertility treatment were an integral part of reproductive healthcare, as is called for by the ICPD. On the other hand, the cost of PAC at hospitals is an actual cost for which all countries expend resources to meet all or part of the need, depending on circumstances.

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31 As mentioned earlier, not all such women will want infertility treatment, making the total cost an overestimate. On the other hand, neither can it be assumed that a woman seeking to terminate a pregnancy at a particular moment in her life will never want to have children in the future.

32 Some health systems may include infertility services but these usually amount to only the barest of information/counselling offered at the PHC level.

These costs of UARMM should not be lumped together, moreover, because the uncertainty of the estimates varies greatly from one to another due to limitations of data and the assumptions that underlie them.

The methodologies used to estimate these different costs needed to accommodate several data deficiencies and their accuracy can only be verified once further empirical studies have furnished better information concerning the prevalence of different levels of complication as well as the precise costs of treating those complications. A theoretical issue concerning the valuation of women's work in non-market settings must also be resolved before greater confidence can be placed in the accuracy of costing the impact of abortion-related morbidity. Despite these limitations, however, the costs presented in this report demonstrate substantial impacts on public health systems as well as for individuals and households.

Annex 1 Acronyms

ALOS	Average length of stay (in hospital)
UARMM	Unsafe abortion-related morbidity and mortality
D&C	Dilation and curettage
GBD	Global Burden of Disease Project
GDP	Gross domestic product
ICPD	United Nations International Conference on Population and Development (Cairo 1994)
IVF	In vitro fertilisation
MBP	Mother-Baby Package (developed by WHO)
MVA	Manual vacuum aspiration
PAC	Post-abortion care
PHC	Primary healthcare
PID	Pelvic inflammatory disease
PPP	Purchasing power parity
UNFPA	United Nations Population Fund
WHO	World Health Organization

Annex Table A1a **Immediate complications from unsafe abortion: review of empirical studies**

Author(s) of article	Area/year of study	Uterine perforation	Other organ injuries	Haemorr-hage	Embolus	Lacerations	Bleeding	PID	Pelvic abscesses	Sepsis	Peritonitis	Septicaemia	Hypo-volaemic shock	Genital burns/ vaginal scarring	Incomplete abortion
Adetoro (1986)	Nigeria, Ilorin 1983–4	Mentioned in study				Mentioned in study			Mentioned in study		Pelvic p. 79.4%, generalised p. 20.6%, total 100%	5%			
Adetoro (1989)	Ilorin, Nigeria 1972–6			20.8% of deaths	1.9% of deaths							66% of deaths			
Adewole (1992)	Nigeria, Ibadan 1980–9	With/ without bowel perforation: 16.2%	Lower genital tract injuries: 9.5%	Haem. 'requiring transfusion' 35.2%	Embolism 0.2%					86.20%					
AGI (2005)	Nigeria 2002–3		Instru-mental injury 10.9%	33.30%				Pelvic infection 20.3%		22.30%					Retained products of conception 48.4%
Ahmed (1999)	Bangladesh 1996–7; two rural sub-districts			48/143 women			Irregular bleeding: 3/143 women	Lower abdominal pain alone: 39/143 women		Sepsis: 31/143 women					17/143 women
Archibong (1991)	Nigeria 1985–8, univ. hospital	8.80%	Bowel perforation: 0.7%	41.20%						Sepsis (including pelvic abscess): 72.1%		'Shock': 5.1%			
Bernstein Rosenfield (1998)	World		e.g. Urinary, bladder or intestines		Amniotic fluid embolus	Cervical or vaginal lacerations	Post-abortal bleeding	Acute pelvic inflammatory disease			Generalised peritonitis			From agents inserted into the vagina, often resulting in severe dyspareunia and/or urinary tract complications	

David (1983)	Developing world	Mentioned in study	Bladder, intestines	Mentioned in study	Cervical lacerations	Mentioned in study	Pelvic infection			Mentioned in study	Shock mentioned		Mentioned in study	
Figà-Talamanca *et al.* (1986)	Turkey, Nigeria, Venezuela, Malaysia; hospitals 1976–8					Purulent vaginal bleeding: NG 26.3%, TK 11.4%				NG 15%, TK 0.7%				
Fortney (1981)	Latin America, 9 countries, 39 hospitals, 1972–9	Also mentioned		Also mentioned	Cervical lacerations also mentioned				Most common symptom; septic/ non-septic data					
Gebreselassie *et al.* 2004	Kenya (all) 2002	1%	Signs of 'mechanical injury': 5.1% (includes uterus, gut); 'gut injury' 0.1%					1.50%	'Sepsis/ septicaemia': 2%, gangrene: 0.1% offensive discharge: 11.7%	Localised p.: 0.7%, generalised p: 0.7%	'septicaemia shock': 0.5%	5.8% (Possibly same as haemorr-hage)		'Offensive products of conception': 15.1%
Goyaux *et al.* (2001)	Benin, Cameroon, Senegal 1993–5		'Injury': 126/959 (4 died)						22/923 (8 died)					
Jeppsson *et al.* (1999)	Ethiopia 1996	55%		69%	Mentioned in study		Mentioned in study	Mentioned in study	Localised infection 51%	Mentioned in study	100%			
Jewkes *et al* (2002)	South Africa 1994, 2000				Mech. or chem. injury to genitals: 3.2% 0.6%				Offensive discharge: 13.5% 6.4%	Localised: 1.7% 0.7% generalised: 0.1% 0.1%	Septic shock: 0.3% 0.2%	1.6% 2.5%		Offensive products: 12.6% 9.4%
Kay *et al.* (1997)	South Africa 1994													
Khan *et al.* (1984)	Bangladesh, Dhaka 1977–80	8.40%		'Excessive blood loss' 23.6%	Cervical lacerations 2.6%				Sepsis and other complic. 24.5%, sepsis alone 14.6%, other complic., no sepsis 10.6%					

Annex Table A1a **Immediate complications from unsafe abortion: review of empirical studies (cont.)**

Author(s) of article	Area/year of study	Uterine perforation	Other organ injuries	Haemorr-hage	Embolus	Lacerations	Bleeding	PID	Pelvic abscesses	Sepsis	Peritonitis	Septicaemia	Hypo-volaemic shock	Genital burns/ vaginal scarring	Incomplete abortion
Konje *et al.* (1992)	Nigeria, Ibadan 1981–7	10.40%	Small bowel injury 1.3%, post fornix: 2.6%	1.30%		Cervical: 4.3%			Abdomino-pelvic: 6.5%, pelvic: 26.1%		Pelvic: 40.9%, generalised: 27.4%	Septic shock: 3%, septicemia: 12.6%			
Kruse *et al.* (2000)	USA														
Ladipo (1989)	Developing countries			Haem. usually caused by retained products or trauma to cervix, vagina or uterus; rarely from anaesthesia due to uterine atony						Septic abortion: whenever endometrial cavity is infected. Sequelae: PID pyrexia, tachycardia dehydration, lower abdom. pain, rebound tenderness, endotoxic shock; uterine perforation may be a cause					Incomplete abortion without sepsis: pelvic or abdom. pain, cramps, persistent bleeding, soft, tender uterus
Lema *et al.* (1996)	Kenya 1988–9		Genital injury 16.6%	12.40%						34.30%		Septic shock 2.4%			
Machungo *et al.* (1997)	Mozambique, Maputo n.d.		Rectal fistula (1%)								6%	8%		Local burns (vaginal and cervical) from chemicals such as potassium permanganate (12%)	
Megafu and Ozumba (1991)	Nigeria, Enugu 1982–6						51%				18%	Septicaemia 51%; septicaemic shock 10%			

Misago *et al.* (1998)	Brazil, Forteleza 1992–3						Heavy bleeding (more than menstrual flow) 8.3%				Admitted with infection: 9.3%							
Mpangile *et al.* (1999)	Tanzania, Dar es Salaam, n.d.		Trauma to genitals, commonly cervix 53%			Of 53% (col D), lacerations 45%	Heavy bleeding 33%					15%						
Okojie (1976)	Nigeria, Benin City 1974–5	17%	Gut perforation 3.4%			Cervical laceration 13.5%; laceration of posterior formix 1.7%			Pelvic ab. 8.5% abdomino-pelvic ab. 8.5%		Septic (raised temp. only) 37%; endotoxic shock 5%	Pelvic peritonitis 18.5%; general p. 9%						
Okonofua *et al.* (1992)	Nigeria, Ile-Ife 1988–9	8%	Gut perforation 2%, bladder p. 1%	51%		Cervical l. 4%			1%		84%		Septic shock 4%					
Olukoya *et al.* (2001)	Developing world (adolescents)	cited	cited	Bowel cited	cited				Pelvic infection or abscess		cited							
Omu *et al.* (1981)	Nigeria, Benin City 1974–9, adolescents (<20)	cited as 'less common'	Bowel cited as 'less common'	cited as 'common'		(Cervical) cited as 'common'					Sepsis cited as 'common'; endo toxic shock 'less common	cited as 'less common' ,		cited as 'common'				
Rees *et al.* (1997)	South Africa 1994		Mechanical injury to genitalia 3.9%; foreign body 1.2%								Offensive discharge 16.1%	Generalised p. 0.2%, localised p. 2.1%	Septicaemic shock 0.5%	1.90%		Offensive products 18.4%		
Richards *et al.* (1985)	South Africa, Durban 1984	1%									5%							
Trichopoulos *et al.* (1976)	Greece, Athens 1973–4																	
Unuigbe *et al.* (1988)	'Nigeria, Benin City 1973–85 (causes of death)'	16%	Colon 3%	19%					see Sepsis		Septicaemia, peritonitis, pelvic abscess: 62%, endotoxic shock 5%	see Sepsis	see Sepsis					

Annex Table A1b **Later complications from unsafe abortion: review of empirical studies**

Author(s) of article	Area/Year of study	Anaemia	Infertility	Poisoning	Tetanus	Other
Adetoro (1986)	Nigeria, Ilorin 1983–4					
Adetoro (1989)	Ilorin, Nigeria 1972–86			Native drug intoxication: 7.5% of deaths	3.8% of deaths	
Adewole (1992)	Nigeria, Ibadan 1980–9					Renal failure: 0.35%, 'coma' 0.35%
AGI (2005)	Nigeria 2002–3			1.70%		Fever 33.1%, fever of 103°F or above 17.8%
Ahmed (1999)	Bangladesh 1996–7; two rural sub-districts					'Fever alone': 19/143 women
Archibong (1991)	Nigeria 1985–8, univ. hospital				0.70%	'Acute renal failure': 1.5%, 'deep vein thrombosis': 0.7%
Bernstein Rosenfield (1998)	World	Severe anaemia				Chronic pelvic pain, ectopic pregnancy, endometritis, thrombophlebitis (results in pulmonary embolism), complications of anaesthesia
David (1983)	Developing world		Mentioned in study	Mentioned in study		Renal failure, intense vomiting, fistulas
Figà-Talamanca *et al.* (1986)	Turkey, Nigeria, Venezuela, Malaysia hospitals 1976–8					Fever: MY 32.7%, NG 31%, TK 9.4%, adnexal tenderness: MY 0.4%, NG 4.6%, TK 0.4%

Fortney (1981)	Latin America, 9 countries, 39 hospitals, 1972–9				
Gebreselassie *et al.* (2004)	Kenya (all) 2002			0.10%	Fever: 10.9% and 6.2%,high pulse: 4.8%, low systolic BP: 4.3%, pallor: 30.9%, foreign body: 1.4%, tender uterus: 20%
Goyaux *et al.* (2001)	Benin, Cameroon, Senegal 1993–5				Foreign body: 42/960 (2 died)
Jeppsson *et al.* (1999)	Ethiopia 1996	Mentioned in study	Mentioned in study	1%	
Jewkes *et al.* (2002)	South Africa 1994, 2000				Tender uterus: 8.4% 3.7%,disseminated intravascular coagulation; respiratory distress; renal failure; foreign body
Kay *et al.* (1997)	South Africa 1994				
Khan *et al.* (1984)	Bangladesh, Dhaka 1977–80				
Konje *et al.* (1992)	Nigeria, Ibadan 1981–7				Jaundice 12.2%, psychiatric disorders 3.5%, acute renal failure 4.7%, hepatorenal failure 2.2%, heart failure 1.7%, DIC 1.7%, gynatresia 0.9%
Kruse *et al.* (2000)	USA				Teratogenicity from misoprostol in continuing pregnancies

Annex Table A1b **Later complications from unsafe abortion: review of empirical studies (cont.)**

Author(s) of article	Area/Year of study	Anaemia	Infertility	Poisoning	Tetanus	Other
Ladipo (1989)	Developing countries			Toxic reactions: hepatorenal failure (jaundice, oliguria, anuria), severe central nervous system effects		
Lema *et al.* (1996)	Kenya 1988–9	17.80%				Other 4.1%
Machungo *et al.* (1997)	Mozambique, Maputo, n.d.	Severe anaemia (<6 g/l) (17%)				'Indication for hysterectomy' (2%), endometritis-myometritis (12%)
Megafu and Ozumba (1991)	Nigeria, Enugu 1982–6	44%			4%	Fever (51%), abdominal pain (48%), foul smelling vaginal discharge (46%), jaundice (18%), fetid vomitus (11%), 'west pain' (11%), 'ileus' (10%), diarrhoea (8%), dizziness (8%)
Misago *et al.* (1998)	Brazil, Forteleza 1992–3					
Mpangile *et al.* (1999)	Tanzania, Dar es Salaam, n.d.					Shock due to haemorrhage or trauma 0.7%, foreign bodies 3%
Okojie (1976)	Nigeria, Benin City 1974–5	Packed cell volume 10–14 6.8%, 15–19 10%, 20–24 13.5%, 25–29 22%, 30+ 42.7%				

Okonofua *et al.* (1992)	Nigeria, Ile-Ife 1988–9			Reactive psychosis 1%
Olukoya *et al.* (2001)	Developing world (adolescents)		cited	Psychological problems, spontaneous abortion, ectopic pregnancy
Omu *et al.* (1981)	Nigeria, Benin City 1974–9, adolescents (<20)			
Rees *et al.* (1997)	South Africa, 1994		0%	DIC 0.5%, renal failure 0.2%, respiratory distress syndrome 0.1%, tender uterus 12.1%, Severity: low 66.4%, moderate 18.6%, high 15.0%
Richards *et al.* (1985)	South Africa, Durban 1984			
Trichopoulos *et al.* (1976)	Greece, Athens 1973–4	Link between abortion (induced or spont.) and secondary infertility		
Unuigbe *et al.* (1988)	'Nigeria, Benin City 1973–85 (causes of death)'		16%	cardiac failure, hepatorenal failure, carcinoma 16%

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria**

Country, Author, Year	**Egypt, Nawar *et al.* (1999) Abou hospital, post-)**	**Egypt, Nawar *et al.* (1999) (Abou hospital, pre-)**	**Egypt, Nawar *et al.* (1999) (Menia hospital, post-)**	**Egypt, Nawar *et al.* (1999) (Menia hospital, pre-)**	**Malawi, Levin *et al.* (2003)**	**Malawi, Levin *et al.* (2003) (mission, cost only)**
Title	**Cost analysis of post-abortion services in Egypt**	**Cost analysis of post-abortion services in Egypt**	**Cost analysis of post-abortion services in Egypt**	**Cost analysis of post-abortion services in Egypt**	**Costs of maternal healthcare services in 3 anglophone African countries**	**Costs of maternal healthcare services in 3 anglophone African countries**
Type of study (1 = peer review; 0 = report or book)	0	0	0	0	1	1
Base year of study	1997	1997	1997	1997	1998	1998
Region (0 = Africa, 1 = Latin America)	0	0	0	0	0	0
Inclusion criteria (see note)	0	0	0	0		
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)	0	0	0	0	0	1
Level of care (0 = primary, 1 = secondary, 2 = tertiary)	1	1	2	2	1	1
Full or incremental (incremental = 0, full = 1)	0	0	0	0	0	0
Economic or financial (financial = 0, economic = 1)	0	0	0	0	1	1
Description of treatment/service provided (0 = dc, 1 = mva)	1	0	1	0		
ALOS	2.90	9.40	12.85	18.48		
Unit cost (study year US$)	10.24	7.73	15.60	14.40	41.77	29.95
Study-year GDP deflator (US)	95.41	95.41	95.41	95.41	96.47	96.47

2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.21	1.21	1.21	1.21	1.20	1.20
Unit cost (2006 US&)	12.42	9.37	18.92	17.46	50.09	35.92
Official exchange rate (2006 LCU/US$)	5.73	5.73	5.73	5.73	136.01	136.01
Unit cost (2006 LCU)	71.15	53.71	108.39	100.05	6,813.01	4,885.07
PPP conversion factor (2006 LCU per International.$)	1.76	1.76	1.76	1.76	31.56	31.56
Unit cost (2006 International dollars)	40.42	30.52	61.58	56.85	215.87	154.79
Exchange rate (study year LCU per US$)	3.39	3.39	3.39	3.39	31.07	31.07
Unit cost (study year LCU)	34.71	26.20	52.88	48.82	1,297.79	930.55
Study-year GDP deflator	154.16	154.16	154.16	154.16	390.01	390.01
2006 GDP deflator	240.41	240.41	240.41	240.41	1,680.05	1,680.05
Ratio	1.56	1.56	1.56	1.56	4.31	4.31
Unit cost (2006 LCU)	54.14	40.87	82.47	76.13	5,590.52	4,008.52
PPP conversion factor (2006 LCU per International.$)	1.76	1.76	1.76	1.76	31.56	31.56
Unit cost (2006 International dollars)	30.76	23.22	46.86	43.25	177.14	127.01

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria (cont.)**

Country, Author, Year	**Ghana, Asante *et al.* (2004) (current hospital cost only)**	**Ghana, Asante *et al.* (2004) (current)**	**Ghana, Asante *et al.* (2004) (standard)**	**Ghana, Asante *et al.* (2004) (standard; hospital costs only)**	**Ghana, Levin *et al.* (2003)**	**Ghana, Levin *et al.* (2003) (mission, cost only)**
Title	**Costing Safe Motherhood (Making pregnancy safer) Initiative in Ghana: Case study Wassa West District**	**Costing Safe Motherhood (Making pregnancy safer) Initiative in Ghana: Case study Wassa West District**	**Costing Safe Motherhood (Making pregnancy safer) Initiative in Ghana: Case study Wassa West District**	**Costing Safe Motherhood (Making pregnancy safer) Initiative in Ghana: Case study Wassa West District**	**Costs of maternal healthcare services in 3 anglophone African countries**	**Costs of maternal healthcare services in 3 anglophone African countries**
Type of study (1 = peer review; 0 = report or book)	0	0	0	0	1	1
Base year of study	2003	2003	2003	2003	1998	1998
Region (0 = Africa, 1 = Latin America)	0	0	0	0	0	0
Inclusion criteria (see note)	1	1	1	1		
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)	0	0	0	0	0	1
Level of care (0 = primary, 1 = secondary, 2 = tertiary)	1	0	0	1	1	1
Full or incremental (incremental = 0, full = 1)	1	1	1	1	0	0
Economic or financial (financial = 0, economic = 1)	0	0	0	0	1	1
Description of treatment/service provided (0 = dc, 1 = mva)	0	0				
ALOS						

Unit cost (study year US$)	54.85	36.90	36.09	56.40	66.46	63.88
Study-year GDP deflator (US)	106.32	106.32	106.32	106.32	96.47	96.47
2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.09	1.09	1.09	1.09	1.20	1.20
Unit cost (2006 US$)	59.68	40.15	39.27	61.37	79.70	76.61
Official exchange rate (2006 LCU/US$)	9,174.38	9,174.38	9,174.38	9,174.38	9,174.38	9,174.38
Unit cost (2006 LCU)	547,563.15	368,369.74	360,283.57	563,036.67	731,207.44	702,821.72
PPP conversion factor (2006 LCU per International.$)	1,975.54	1,975.54	1,975.54	1,975.54	1,975.54	1,975.54
Unit cost (2006 International dollars)	277.17	186.47	182.37	285.00	370.13	355.76
Exchange rate (study year LCU per US$)	8,677.37	8,677.37	8,677.37	8,677.37	2,314.15	2,314.15
Unit cost (study year LCU)	475,953.74	320,194.95	313,166.28	489,403.67	153,798.41	147,827.90
Study-year GDP deflator	554,160.25	554,160.25	554,160.25	554,160.25	179,326.08	179,326.00
2006 GDP deflator	835,067.94	835,067.94	835,067.94	835,067.94	835,067.94	835,068.00
Ratio	1.51	1.51	1.51	1.51	4.66	4.66
Unit cost (2006 LCU)	717,218.01	482,504.00	471,912.45	737,485.80	716,193.21	688,390.70
PPP conversion factor (2006 LCU per International.$)	1,975.54	1,975.54	1,975.54	1,975.54	1,975.54	1,975.54
Unit cost (2006 International dollars)	363.05	244.24	238.88	373.31	362.53	348.46

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria (cont.)**

Country, Author, Year	**Kenya, Johnson *et al.* (1993) (MVA)**	**Kenya, Johnson *et al.* (1993) (MVA; KEN2 cost only)**	**Kenya, Johnson *et al.* (1993) (MVA; KEN3 cost only)**	**Kenya, Johnson *et al.* (1993) (MVA; KEN4 cost only)**	**Kenya, Johnson *et al.* (1993) (SC)**	**Kenya, Johnson *et al.* (1993) (SC; KEN2 cost only)**
Title	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**
Type of study (1 = peer review; 0 = report or book)	1	1	1	1	1	1
Base year of study	1991	1991	1991	1991	1991	1991
Region (0 = Africa, 1 = Latin America)	0	0	0	0	0	0
Inclusion criteria (see note)	0	0	0	0	0	0
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)	0	0	0	0	0	0
Level of care (0 = primary, 1 = secondary, 2 = tertiary)	1	1	1	2	1	1
Full or incremental (incremental = 0, full = 1)	0	0	0	0	0	0
Economic or financial (financial = 0, economic = 1)	0	0	0	0	0	0
Description of treatment/service provided (0 = dc, 1 = mva)	1	1	1	1	0	0
ALOS	20.70	23.90	19.40	18.80	40.90	100.70
Unit cost (study year US$)	3.09	5.24	2.94	4.37	3.99	15.25

Study-year GDP deflator (US)	84.46	84.46	84.46	84.46	84.46	84.46
2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.37	1.37	1.37	1.37	1.37	1.37
Unit cost (2006 US$)	4.23	7.18	4.03	5.99	5.47	20.89
Official exchange rate (2006 LCU/US$)	72.10	72.10	72.10	72.10	72.10	72.10
Unit cost (2006 LCU)	305.17	517.50	290.35	431.58	394.05	1,506.09
PPP conversion factor (2006 LCU per International.$)	33.03	33.03	33.03	33.03	33.03	33.03
Unit cost (2006 International dollars)	9.24	15.67	8.79	13.07	11.93	45.60
Exchange rate (study year LCU per US$)	27.51	27.51	27.51	27.51	27.51	27.51
Unit cost (study year LCU)	85.01	144.15	80.88	120.22	109.76	419.53
Study-year GDP deflator	27.07	27.07	27.07	27.07	27.07	27.07
2006 GDP deflator	123.29	123.29	123.29	123.29	123.29	123.29
Ratio	4.55	4.55	4.55	4.55	4.55	4.55
Unit cost (2006 LCU)	387.16	656.54	368.36	547.53	499.92	1,910.73
PPP conversion factor (2006 LCU per International.$)	33.03	33.03	33.03	33.03	33.03	33.03
Unit cost (2006 International dollars)	11.72	19.88	11.15	16.58	15.14	57.85

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria (cont.)**

Country, Author, Year	**Nigeria, Bankole *et al.* (2006) (AGI)**	**Nigeria, Konje (1992)**	**South Africa, Kay *et al.* (1997) (high severity)**	**South Africa, Kay *et al.* (1997) (low severity)**	**South Africa, Kay *et al.* (1997) (medium severity)**
Title	**Estimating the cost of post-abortion care in Nigeria: a case study**	**Health and economic consequences of septic induced abortion**	**An analysis of the cost of incomplete abortion to the public health sector in South Africa 1994**	**An analysis of the cost of incomplete abortion to the public health sector in South Africa 1994**	**An analysis of the cost of incomplete abortion to the public health sector in South Africa 1994**
Type of study (1 = peer review; 0 = report or book)	0	1	1	1	1
Base year of study	2003	1987	1994	1994	1994
Region (0 = Africa, 1 = Latin America)	0	0	0	0	0
Inclusion criteria (see note)	1	2	2	0	1
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)		0			
Level of care (0 = primary, 1 = secondary, 2 = tertiary)		2			
Full or incremental (incremental = 0, full = 1)	0	0	0	0	0
Economic or financial (financial = 0, economic = 1)	0	0	0	0	0
Description of treatment/service provided (0 = dc, 1 = mva)					
ALOS		26.40			

Unit cost (study year US$)	103.00	223.11	303.10	85.35	137.18
Study-year GDP deflator (US)	106.32	73.18	90.25	90.25	90.25
2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.09	1.58	1.28	1.28	1.28
Unit cost (2006 US$)	112.08	352.71	388.54	109.41	175.85
Official exchange rate (2006 LCU/US$)	128.65	128.65	6.77	6.77	6.77
Unit cost (2006 LCU)	14,418.76	45,376.63	2,630.41	740.70	1,190.50
PPP conversion factor (2006 LCU per International.$)	86.54	86.54	3.05	3.05	3.05
Unit cost (2006 International dollars)	166.61	524.34	862.43	242.85	390.33
Exchange rate (study year LCU per US$)	129.22				
Unit cost (study year LCU)	13,309.66	1,098.70	1,076.00	303.00	487.00
Study-year GDP deflator	2,948.29	100.00	61.86	61.86	61.86
2006 GDP deflator	5,795.37	5,795.37	147.39	147.39	147.39
Ratio	1.97	57.95	2.38	2.38	2.38
Unit cost (2006 LCU)	26,162.42	63,673.73	2,563.72	721.94	1,160.34
PPP conversion factor (2006 LCU per International.$)	86.54	86.54	3.05	3.05	3.05
Unit cost (2006 International dollars)	302.32	735.77	840.56	236.70	380.44

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria (cont.)**

Country, Author, Year	**Tanzania, Magotti *et al.* (1995) (EC)**	**Tanzania, Magotti *et al.* (1995) (MVA)**	**Uganda, Johnston *et al.* (2007)**	**Uganda, Johnston *et al.* (2007) (liberal-conventional cost only)**	**Uganda, Johnston *et al.* (2007) (liberal-recommended cost only)**	**Uganda, Johnston *et al.* (2007) (restricted-recommended cost only)**
Title	**Cost-effectiveness of managing abortions: manual vacuum aspiration compared to evacuation by curettage in Tanzania**	**Cost-effectiveness of managing abortions: manual vacuum aspiration compared with evacuation by curettage in Tanzania**	**Reducing the costs to health systems of unsafe abortion: a comparison of four strategies**			
Type of study (1 = peer review; 0 = report or book)	1	1	1	1	1	1
Base year of study	1992	1992	1996	1996	1996	1996
Region (0 = Africa, 1 = Latin America)	0	0	0	0	0	0
Inclusion criteria (see note)	0	0				
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)						
Level of care (0 = primary, 1 = secondary, 2 = tertiary)						
Full or incremental (incremental = 0, full = 1)	0	0	0	0	0	0
Economic or financial (financial = 0, economic = 1)	0	0	0	0	0	0

Description of treatment/service provided (0 = dc, 1 = mva)	0	1	0	0	1	1
ALOS	17.56	10.70				
Unit cost (study year US$)	4.36	1.75	44.87	33.61	6.41	24.72
Study-year GDP deflator (US)	86.40	86.40	93.85	93.85	93.85	93.85
2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.34	1.34	1.23	1.23	1.23	1.23
Unit cost (2006 US$)	5.84	2.34	55.31	41.43	7.90	30.47
Official exchange rate (2006 LCU/US$)	1,251.90	1,251.90	1,831.45	1,831.45	1,831.45	1,831.45
Unit cost (2006 LCU)	7,308.67	2,933.52	101,300.75	75,879.62	14,471.54	55,809.11
PPP conversion factor (2006 LCU per International.$)	539.48	539.48	374.96	374.96	374.96	374.96
Unit cost (2006 International dollars)	13.55	5.44	270.16	202.37	38.59	148.84
Exchange rate (study year LCU per US$)			1,046.08	1,046.08	1,046.08	1,046.08
Unit cost (study year LCU)	1,299.50	522.50	46,937.61	35,158.75	6,705.37	25,859.10
Study-year GDP deflator	100.00	100.00	89.16	89.16	89.16	89.16
2006 GDP deflator	617.96	617.96	142.39	142.39	142.39	142.39
Ratio	6.18	6.18	1.60	1.60	1.60	1.60
Unit cost (2006 LCU)	8,030.39	3,228.84	74,960.14	56,149.11	10,708.59	41,297.41
PPP conversion factor (2006 LCU per International.$)	539.48	539.48	374.96	374.96	374.96	374.96
Unit cost (2006 International dollars)	14.89	5.99	199.92	149.75	28.56	110.14

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria (cont.)**

Country, Author, Year	**Uganda, Levin *et al.* (2003)**	**Uganda, Levin *et al.* (2003) (mission, cost only)**	**Uganda, Weissman/ WHO (1999)**	**Bolivia, Billings *et al.* (2003) (Hospital de la Mujer, post-test)**	**Bolivia, Billings, (2003) (Hospital de la Mujer, post-test: SC cost only)**	**Bolivia, Billings *et al.* (2003) (Hospital de la Mujer, pre-test)**
Title	**Costs of maternal healthcare services in 3 anglophone African countries**	**Costs of maternal healthcare services in 3 anglophone African countries**	**Uganda safe motherhood programme costing study**	**Testing a model for delivery of EOC and family planning services in the Bolivian public health system**	**Testing a model for the delivery of EOC and family planning services in the Bolivian public health system**	**Testing a model for the delivery of EOC and family planning services in the Bolivian public health system**
Type of study (1 = peer review; 0 = report or book)	1	1	0	0	0	0
Base year of study	1998	1998	1996	2001	2001	2001
Region (0 = Africa, 1 = Latin America)	0	0	0	1	1	1
Inclusion criteria (see note)			1	0	0	0
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)	0	1	0	0	0	0
Level of care (0 = primary, 1 = secondary, 2 = tertiary)	1	1	2	2	2	2
Full or incremental (incremental = 0, full = 1)	0	0	0	0	0	0
Economic or financial (financial = 0, economic = 1)	1	1	0	0	0	0
Description of treatment/service provided (0 = dc, 1 = mva)				1	0	0

ALOS				10.68	49.08	33.96
Unit cost (study year US$)	35.43	57.60	12.16	24.92	82.84	65.65
Study-year GDP deflator (US)	96.47	96.47	93.85	102.41	102.41	102.41
2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.20	1.20	1.23	1.13	1.13	1.13
Unit cost (2006 US$)	42.49	69.08	14.99	28.15	93.58	74.16
Official exchange rate (2006 LCU/US$)	1,831.45	1,831.45	1,831.45	8.01	8.01	8.01
Unit cost (2006 LCU)	77,816.15	126,508.90	27,453.02	225.49	749.59	594.05
PPP conversion factor (2006 LCU per International.$)	374.96	374.96	374.96	3.21	3.21	3.21
Unit cost (2006 International dollars)	207.53	337.39	73.22	70.25	233.52	185.06
Exchange rate (study year LCU per US$)	1,240.31	1,240.31	1,046.08	6.61	6.61	6.61
Unit cost (study year LCU)	43,944.18	71,441.86	12,720.33	164.72	547.57	433.95
Study-year GDP deflator	100.00	100.00	86.16	232.28	232.28	232.28
2006 GDP deflator	142.39	142.39	142.39	329.57	329.57	329.57
Ratio	1.42	1.42	1.65	1.42	1.42	1.42
Unit cost (2006 LCU)	62,572.12	101,726.06	21,021.91	233.71	776.92	615.70
PPP conversion factor (2006 LCU per International.$)	374.96	374.96	374.96	3.21	3.21	3.21
Unit cost (2006 International dollars)	166.88	271.30	56.06	72.81	242.03	191.81

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria (cont.)**

Country, Author, Year	**Bolivia, Billings *et al.* (2003) (JS Porcel, post-test)**	**Bolivia, Billings *et al.* (2003) (JS Porcel, post-test: SC cost only)**	**Bolivia, Billings *et al.* (2003) (JS Porcel, pre-test)**	**Bolivia, Billings *et al.* (2003) (Maternidad, post-test)**	**Bolivia, Billings *et al.* (2003) (Maternidad, post-test: SC cost only)**	**Bolivia, Billings *et al.* (2003) (Maternidad, pre-test)**
Title	**Testing a model for the delivery of EOC and family planning services in the Bolivian public health system**	**Testing a model for the delivery of EOC and family planning services in the Bolivian public health system**	**Testing a model for the delivery of EOC and family planning services in the Bolivian public health system**	**Testing a model for the delivery of EOC and family planning services in the Bolivian public health system**	**Testing a model for the delivery of EOC and family planning services in the Bolivian public health system**	**Testing a model for the delivery of EOC and family planning services in the Bolivian public health system**
Type of study (1 = peer review; 0 = report or book)	0	0	0	0	0	0
Base year of study	2001	2001	2001	2001	2001	2001
Region (0 = Africa, 1 = Latin America)	1	1	1	1	1	1
Inclusion criteria (see note)	0	0	0	0	0	0
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)	0	0	0	0	0	0
Level of care (0 = primary, 1 = secondary, 2 = tertiary)	2	2	2	2	2	2
Full or incremental (incremental = 0, full = 1)	0	0	0	0	0	0
Economic or financial (financial = 0, economic = 1)	0	0	0	0	0	0
Description of treatment/service provided (0 = dc, 1 = mva)	1	0	0	1	0	0
ALOS	19.88	45.93	38.64	4.36	26.24	34.25

Unit cost (study year US$)	48.74	98.57	88.77	15.67	48.56	59.35
Study-year GDP deflator (US)	102.41	102.41	102.41	102.41	102.41	102.41
2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.13	1.13	1.13	1.13	1.13	1.13
Unit cost (2006 US$)	55.06	111.35	100.28	17.70	54.86	67.05
Official exchange rate (2006 LCU/US$)	8.01	8.01	8.01	8.01	8.01	8.01
Unit cost (2006 LCU)	441.03	891.93	803.25	141.79	439.40	537.04
PPP conversion factor (2006 LCU per International.$)	3.21	3.21	3.21	3.21	3.21	3.21
Unit cost (2006 International dollars)	137.39	277.86	250.23	44.17	136.89	167.30
Exchange rate (study year LCU per US$)	6.18	6.18	6.18	6.18	6.18	6.61
Unit cost (study year LCU)	301.21	609.16	548.60	96.84	300.10	392.30
Study-year GDP deflator	232.28	232.28	232.28	232.28	232.28	232.28
2006 GDP deflator	329.57	329.57	329.57	329.57	329.57	329.57
Ratio	1.42	1.42	1.42	1.42	1.42	1.42
Unit cost (2006 LCU)	427.38	864.31	778.38	137.40	425.80	556.62
PPP conversion factor (2006 LCU per International.$)	3.21	3.21	3.21	3.21	3.21	3.21
Unit cost (2006 International dollars)	133.14	269.26	242.49	42.80	132.65	173.40

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria (cont.)**

Country, Author, Year	**Bolivia, JSI (1999)**	**Brazil, Fonseca (1997) (MVA)**	**Brazil, Fonseca (1997) (SC)**	**Brazil, Rogers (1995) (MVA)**	**Brazil, Rogers (1995) (SC)**	**Ecuador, Johnson *et al.* (1993) (MVA)**
Title	**Cost of the Mother-Baby Package in Bolivia**	**Uso da aspiracao**	**Uso da aspiracao**	**Sustainability of post-abortion care in Peru**	**Sustainability of post-abortion care in Peru**	**Costs of alternative treatments of incomplete abortion**
Type of study (1 = peer review; 0 = report or book)	0	1	1	0	0	0
Base year of study	1997	1996	1996	1995	1995	1991
Region (0 = Africa, 1 = Latin America)	1	1	1	1	1	1
Inclusion criteria (see note)	1	0	0	0	0	0
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)	0	0	0	0	0	0
Level of care (0 = primary, 1 = secondary, 2 = tertiary)		2	2	2	2	
Full or incremental (incremental = 0, full = 1)	0	0	0	0	0	0
Economic or financial (financial = 0, economic = 1)	0	0	0	0	0	0
Description of treatment/service provided (0 = dc, 1 = mva)		1	0	1	0	1
ALOS		8.40	36.50	9.91	38.30	12.97
Unit cost (study year US$)	0.98	9.94	16.70	24.20	78.38	4.35
Study-year GDP deflator (US)	95.41	93.85	93.85	92.09	92.09	84.46
2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.21	1.23	1.23	1.26	1.26	1.37
Unit cost (2006 US$)	1.19	12.25	20.59	30.40	98.47	5.96
Official exchange rate (2006 LCU/US$)	8.01	2.18	2.18	2.18	2.18	1.00
Unit cost (2006 LCU)	9.52	26.71	44.88	66.28	214.66	5.96
PPP conversion factor (2006 LCU per International.$)	3.21	1.36	1.36	0.63	0.63	0.66
Unit cost (2006 International dollars)	2.97	19.64	33.00	105.20	340.73	9.03

Exchange rate (study year LCU per US$)	5.25	1.01	1.01	0.92	0.92	0.04
Unit cost (study year LCU)	5.15	10.04	16.87	22.26	72.11	0.17
Study-year GDP deflator	201.40	77.38	77.38	66.09	66.09	80.93
2006 GDP deflator	329.57	165.88	165.88	165.88	165.88	190.58
Ratio	1.64	2.14	2.14	2.51	2.51	2.35
Unit cost (2006 LCU)	8.42	21.52	36.16	55.88	180.99	0.41
PPP conversion factor (2006 LCU per International.$)	3.21	1.36	1.36	0.63	0.63	0.66
Unit cost (2006 International dollars)	2.62	15.82	26.59	88.70	287.28	0.62

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria (cont.)**

Country, Author, Year	**Ecuador, Johnson *et al.* (1993) (MVA2 cost only)**	**Ecuador, Johnson *et al.* (1993) (SC)**	**El Salvador, Koontz *et al.* (2003) (MVA)**	**El Salvador, Koontz *et al.* (2003) (SC)**	**Mexico, Brambila (1999) (post)**	**Mexico, Brambila (1999) (pre)**
Title	**Costs of alternative treatments of incomplete abortion**	**Costs of alternative treatments of incomplete abortion**	**Treating incomplete abortion in El Salvador: costs saving with manual vacuum aspiration**	**Treating incomplete abortion in El Salvador: costs saving with manual vacuum aspiration**	**Estimating costs of postabortion services at Dr Aurelio Valdivieso General Hospital, Oaxaca, Mexico**	**Estimating costs of postabortion services at Dr Aurelio Valdivieso General Hospital, Oaxaca, Mexico**
Type of study (1 = peer review; 0 = report or book)	0	0	1	1	0	0
Base year of study	1991	1991	1999	1999	1997	1997
Region (0 = Africa, 1 = Latin America)	1	1	1	1	1	1
Inclusion criteria (see note)	0	0	0	0	0	0
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)	0	0	0	0	0	0
Level of care (0 = primary, 1 = secondary, 2 = tertiary)			2	2	2	2
Full or incremental (incremental = 0, full = 1)	0	0	0	0	0	0
Economic or financial (financial = 0, economic = 1)	0	0	0	0	0	0
Description of treatment/service provided (0 = dc, 1 = mva)	1	0	1	0	1	0
ALOS	1.71	9.23	19.70	27.20	17.40	27.00
Unit cost (study year US$)	3.66	3.06	53.80	61.70	180.22	264.47
Study-year GDP deflator (US)	84.46	84.46	97.87	97.87	95.41	95.41
2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.37	1.37	1.18	1.18	1.21	1.21
Unit cost (2006 US$)	5.01	4.19	63.60	72.93	218.53	320.68
Official exchange rate (2006 LCU/US$)	1.00	1.00	1.00	1.00	10.90	10.90

Unit cost (2006 LCU)	5.01	4.19	63.60	72.93	2,381.94	3,495.46
PPP conversion factor (2006 LCU per International.$)	0.66	0.66	0.47	0.47	7.62	7.62
Unit cost (2006 International dollars)	7.60	6.35	135.31	155.18	312.59	458.72
Exchange rate (study year LCU per US$)	0.04	0.04	1.00	1.00	7.92	7.92
Unit cost (study year LCU)	0.15	0.12	53.80	61.70	1,427.34	2,094.60
Study-year GDP deflator	80.93	80.93	169.07	169.07	230.12	230.12
2006 GDP deflator	190.58	190.58	210.17	210.17	498.32	498.32
Ratio	2.35	2.35	1.24	1.24	2.17	2.17
Unit cost (2006 LCU)	0.34	0.29	66.88	76.70	3,090.88	4,535.82
PPP conversion factor (2006 LCU per International.$)	0.66	0.66	0.47	0.47	7.62	7.62
Unit cost (2006 International dollars)	0.52	0.44	142.29	163.19	405.63	595.25

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria (cont.)**

Country, Author, Year	**Mexico, Cahuana-Hurtado *et al.* (2004) (hospital)**	**Mexico, Cahuana-Hurtado *et al.* (2004) (urban health centre)**	**Mexico, Johnson *et al.* (1993) (MVA)**	**Mexico, Johnson *et al.* (1993) (SC)**	**Mexico, Johnson *et al.* (1993) (SC; MEX2 amb)**	**Mexico, Johnson *et al.* (1993) (SC; MEX3 amb)**
Title	**Cost of mother–child care in Morelos State**	**Cost of mother–child care in Morelos State**	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**
Type of study (1 = peer review; 0 = report or book)	1	1	1	1	1	1
Base year of study	2001	2001	1991	1991	1991	1991
Region (0 = Africa, 1 = Latin America)	1	1	1	1	1	1
Inclusion criteria (see note)	1	1	0	0	0	0
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)	0	0	0	0	0	0
Level of care (0 = primary, 1 = secondary, 2 = tertiary)	1	0	2	1	1	1
Full or incremental (incremental = 0, full = 1)	0	0	0	0	0	0
Economic or financial (financial = 0, economic = 1)	0	0	0	0	0	0
Description of treatment/service provided (0 = dc, 1 = mva)			1	0	0	0
ALOS			11.36	23.73	20.76	11.71
Unit cost (study year US$)	274.14	15.24	65.73	140.63	83.28	79.23
Study-year GDP deflator (US)	102.41	102.41	84.46	84.46	84.46	84.46
2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.13	1.13	1.37	1.37	1.37	1.37
Unit cost (2006 US$)	309.69	17.22	90.03	192.63	114.07	108.53

Official exchange rate (2006 LCU/US$)	10.90	10.90	10.90	10.90	10.90	10.90
Unit cost (2006 LCU)	3,375.61	187.66	981.37	2,099.66	1,243.40	1,182.94
PPP conversion factor (2006 LCU per International.$)	7.62	7.62	7.62	7.62	7.62	7.62
Unit cost (2006 International dollars)	442.99	24.63	128.79	275.55	163.18	155.24
Exchange rate (study year LCU per US$)	9.34	9.34	3.02	3.02	3.02	3.02
Unit cost (study year LCU)	2,560.47	142.34	198.50	424.70	251.51	239.27
Study-year GDP deflator	362.71	362.71	79.83	79.83	79.83	79.83
2006 GDP deflator	498.32	498.32	498.32	498.32	498.32	498.32
Ratio	1.37	1.37	6.24	6.24	6.24	6.24
Unit cost (2006 LCU)	3,517.78	195.56	1,239.12	2,651.11	1,569.96	1,493.62
PPP conversion factor (2006 LCU per International.$)	7.62	7.62	7.62	7.62	7.62	7.62
Unit cost (2006 International dollars)	461.65	25.66	162.61	347.91	206.03	196.01

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria (cont.)**

Country, Author, Year	**Mexico, Johnson *et al*. (1993) (SC; MEX3 ward)**	**Mexico, Johnson *et al*. (1993) (SC; MEX4 amb)**	**Mexico, Johnson *et al*. (1993) (SC; MEX5 amb)**	**Mexico, Johnson *et al*. (1993) (SC; MEX5 ward)**	**Mexico, PATH (2006) (D&C; MEX1)**	**Mexico, PATH (2006) (D&C; MEX2 cost only)**
Title	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**	**Costs and resource utilisation for the treatment of incomplete abortion in Kenya and Mexico**	**Estimating the costs of unsafe abortion in Mexico City**	**Estimating the costs of unsafe abortion in Mexico City**
Type of study (1 = peer review; 0 = report or book)	1	1	1	1	0	0
Base year of study	1991	1991	1991	1991	2005	2005
Region (0 = Africa, 1 = Latin America)	1	1	1	1	1	1
Inclusion criteria (see note)	0	0	0	0	1	1
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)	0	0	0	0	0	0
Level of care (0 = primary, 1 = secondary, 2 = tertiary)	1	1	1	1	1	2
Full or incremental (incremental = 0, full = 1)	0	0	0	0	0	0
Economic or financial (financial = 0, economic = 1)	0	0	0	0	1	1
Description of treatment/service provided (0 = dc, 1 = mva)	0	0	0	0	0	0
ALOS	29.94	20.49	20.61	19.66	5.00	8.00
Unit cost (study year US$)	235.90	106.30	143.25	150.58	102.80	134.12
Study-year GDP deflator (US)	84.46	84.46	84.46	84.46	112.40	112.40
2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.37	1.37	1.37	1.37	1.03	1.03
Unit cost (2006 US$)	323.13	145.61	196.22	206.26	105.81	138.05
Official exchange rate (2006 LCU/US$)	10.90	10.90	10.90	10.90	10.90	10.90

Unit cost (2006 LCU)	3,522.08	1,587.10	2,138.78	2,248.22	1,153.32	1,504.70
PPP conversion factor (2006 LCU per International.$)	7.62	7.62	7.62	7.62	7.62	7.62
Unit cost (2006 International dollars)	462.22	208.28	280.68	295.04	151.35	197.47
Exchange rate (study year LCU per US$)	3.02	3.02	3.02	3.02		
Unit cost (study year LCU)	712.42	321.03	432.62	454.75	1,130.79	1,475.27
Study-year GDP deflator	79.83	79.83	79.83	79.83	477.09	477.09
2006 GDP deflator	498.32	498.32	498.32	498.32	498.32	498.32
Ratio	6.24	6.24	6.24	6.24	1.04	1.04
Unit cost (2006 LCU)	4,447.10	2,003.93	2,700.50	2,838.68	1,181.11	1,540.92
PPP conversion factor (2006 LCU per International.$)	7.62	7.62	7.62	7.62	7.62	7.62
Unit cost (2006 International dollars)	583.61	262.98	354.40	372.53	155.00	202.22

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria (cont.)**

Country, Author, Year	**Mexico, PATH (2006) (D&C; MEX3 cost only)**	**Mexico, PATH (2006) (MVA: MX1)**	**Mexico, PATH (2006) (MVA: MX3 cost only)**	**Mexico, PATH (2006) (MVA; MX2 cost only)**	**Mexico, PATH (2006) (MVA; MX4 cost only)**	**Peru, Benson and Huapaya (2002)**
Title	**Estimating the costs of unsafe abortion in Mexico City**	**Estimating the costs of unsafe abortion in Mexico City**	**Estimating the costs of unsafe abortion in Mexico City**	**Estimating the costs of unsafe abortion in Mexico City**	**Estimating the costs of unsafe abortion in Mexico City**	**Sustainability of postabortion care in Peru**
Type of study (1 = peer review; 0 = report or book)	0	0	0	0	0	0
Base year of study	2005	2005	2005	2005	2005	2001
Region (0 = Africa, 1 = Latin America)	1	1	1	1	1	1
Inclusion criteria (see note)	1	1	1	1	1	0
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)	0	0	0	0	2	
Level of care (0 = primary, 1 = secondary, 2 = tertiary)	2	1	2	2	1	2
Full or incremental (incremental = 0, full = 1)	0	0	0	0	0	0
Economic or financial (financial = 0, economic = 1)	1	1	1	1	1	0
Description of treatment/service provided (0 = dc, 1 = mva)	0	1	1	1	1	0
ALOS	24.00	5.00	10.00	8.00	2.50	33.30
Unit cost (study year US$)	192.12	95.86	169.00	124.24	53.08	118.73
Study-year GDP deflator (US)	112.40	112.40	112.40	112.40	112.40	102.41
2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.03	1.03	1.03	1.03	1.03	1.13
Unit cost (2006 US$)	197.74	98.67	173.95	127.88	54.63	134.13
Official exchange rate (2006 LCU/US$)	10.90	10.90	10.90	10.90	10.90	3.27
Unit cost (2006 LCU)	2,155.40	1,075.46	1,896.02	1,393.85	595.51	438.59
PPP conversion factor (2006 LCU per International.$)	7.62	7.62	7.62	7.62	7.62	1.63

Unit cost (2006 International dollars)	282.86	141.14	248.82	182.92	78.15	269.08
Exchange rate (study year LCU per US$)						3.51
Unit cost (study year LCU)	2,113.31	1,054.52	1,859.01	1,366.65	583.86	416.74
Study-year GDP deflator	477.09	477.09	477.09	477.09	477.09	155.96
2006 GDP deflator	498.32	498.32	498.32	498.32	498.32	190.38
Ratio	1.04	1.04	1.04	1.04	1.04	1.22
Unit cost (2006 LCU)	2,207.35	1,101.45	1,941.73	1,427.46	609.84	508.72
PPP conversion factor (2006 LCU per International.$)	7.62	7.62	7.62	7.62	7.62	1.63
Unit cost (2006 International dollars)	289.68	144.55	254.82	187.33	80.03	312.10

Annex Table A2 **Empirical studies on the cost of unsafe abortion and inclusion criteria (cont.)**

Country, Author, Year	**Peru, Benson and Huapaya (2002) (stage 2, cost only)**	**Peru, Benson and Huapaya (2002) (stage 3, cost only)**	**Peru, Guzman *et al.* (1995) (IN CU)**	**Peru, Guzman *et al.* (1995) (MVA)**	**Peru, Guzman *et al.* (1995) (OP CU)**
Title	**Sustainability of postabortion care in Peru**	**Sustainability of postabortion care in Peru**	**Manual vacuum aspiration versus curettage in the maternal perinatal institute in Lima, Peru**	**Manual vacuum aspiration versus curettage in the maternal perinatal institute in Lima, Peru**	**Manual vacuum aspiration versus curettage in the maternal perinatal institute in Lima, Peru**
Type of study (1 = peer review; 0 = report or book)	0	0	0	0	0
Base year of study	2001	2001	1995	1995	1995
Region (0 = Africa, 1 = Latin America)	1	1	1	1	1
Inclusion criteria (see note)	0	0	0	0	0
Type of hospital (0 = public, 1 = private, not-for-profit, 2 = private for profit)			0	0	0
Level of care (0 = primary, 1 = secondary, 2 = tertiary)	2	2	2	2	2
Full or incremental (incremental = 0, full = 1)	0	0	0	0	0
Economic or financial (financial = 0, economic = 1)	0	0	0	0	0
Description of treatment/service provided (0 = dc, 1 = mva)	1	1	0	1	0
ALOS	6.40	6.70	43.90	4.50	4.80
Unit cost (study year US$)	45.13	33.45	84.11	16.30	16.70
Study-year GDP deflator (US)	102.41	102.41	92.09	92.09	92.09
2006 GDP deflator (US)	115.69	115.69	115.69	115.69	115.69
Ratio (US:US)	1.13	1.13	1.26	1.26	1.26
Unit cost (2006 US$)	50.98	37.79	105.66	20.48	20.98
Official exchange rate (2006 LCU/US$)	3.27	3.27	3.27	3.27	3.27

Unit cost (2006 LCU)	166.71	123.57	345.52	66.96	68.60
PPP conversion factor (2006 LCU per International.$)	1.63	1.63	1.63	1.63	1.63
Unit cost (2006 International dollars)	102.28	75.81	211.98	41.08	42.09
Exchange rate (study year LCU per US$)	3.51	3.51	2.25	2.25	2.25
Unit cost (study year LCU)	158.41	117.41	189.25	36.68	37.58
Study-year GDP deflator	155.96	155.96	100.00	100.00	100.00
2006 GDP deflator	190.38	190.38	190.38	190.38	190.38
Ratio	1.22	1.22	1.90	1.90	1.90
Unit cost (2006 LCU)	193.37	143.32	360.29	69.82	71.54
PPP conversion factor (2006 LCU per International.$)	1.63	1.63	1.63	1.63	1.63
Unit cost (2006 International dollars)	118.63	87.93	221.04	42.84	43.89

Note Inclusion criteria; severity of case (0 = routine case, no complications; 1 = any complications of abortion with medium severity complications; 2 = septic and high severity complications).

Annex Table A3 **Treatment of complications from unsafe abortions: review of empirical studies**

Author(s) of article	**Geographical area/ year of data collection**	**Treatments**	**Comments**
Archibong (1991)	Nigeria, university hospital 1985–1988	Broad-spectrum antibiotics; uterine evacuation of retained product; laparotomy (drain abscess); colpotomy (drain abscess)	Not linked to specific conditions
Brown *et al.* (2003)	South Africa, public hospitals 2000	Antibiotics 33.5%; blood/blood products 8.3%; evacuation 87.8%; anaesthetic: local 7.8%, general 54.2%, sedation 33.8%; abortifacient 33.2%	Packed cells 72.5%; whole blood 27.5%; sharp curettage 82%; MVA 14.8%
Gebreselassie *et al.* (2004)	Kenya (all) 2002	Antibiotics 100%, only 44% with symptoms; 95% whole blood, 75% 1 unit, 21% 2 units; 1/3 had IV, but 63% of them no symptoms and 22% of non-IV cases did have symptoms; MVA 80% of cases, SC 14%	Used severity typology of Kay *et al.* (1997) and Rees *et al.* (1997)
Goyaux *et al.* (2001)	Benin, Cameroon, Senegal 1993–1995	322/947 had surgery (13 died); 95/968 had transfusion (5 died); 50% 0–1 day in hospital, 50% 2+ days	Data of 3 countries combined
Guttmacher (2005)	Nigeria 2002–2003	MVA 53.7% D&C/D&E 17.1% other 6.6%; surgery 13.0%; blood 23.8%; IV antibiotics 49.0%, oral antibiotics 82.0%; uterotonics 38.4%; other medicine (see comments), other 1.9%	Other medications: pain relievers 48.6%, hematinics 20.2%, IV fluids 13.2%, Flagyl 0.2%, malaria/tetanus/vitamins 25.0%
Jewkes *et al.* (2002)	South Africa 1994, 2000	Antibiotics 43.6% 33.5%; blood given 13.4% 8.3%; evacuation: 88.9% 87.8%; anaesthesia 1994 2000: local 1.1% 3.9%, general 70.1% 54.2%, sedation 23.7% 33.8%	Comparison of before/after legalisation of abortion
Kay *et al.* (1997)	South Africa 1994	Low severity: evacuation in outpatient theatre (if exists); moderate: evacuation in op. theatre, admitted as inpatient high: admitted,	'10–50% of women who have had unsafe induced abortions actually receive medical attention' (p. 446)

Annex Table A3 **Treatment of complications from unsafe abortions: review of empirical studies (cont.)**

Author(s) of article	**Geographical area/ year of data collection**	**Treatments**	**Comments**
		surgery, resuscitation, ICU – for evacuation, laparotomy, colpotomy, colpopuncture, hysterectomy	
Khan *et al.* (1984)	Bangladesh, Dhaka 1977–1980	Hysterectomy 2.2%; ALOS: 6 days; transfusions 33.5%; antibiotics 36.9%	
Konje *et al.* (1992)	Nigeria, Ibadan 1981–1987	Suction evacuation 53%; antibiotics alone 17%; laparotomy/drainage abscess/repair uterus 13.9%; suct. evac. and colpotomy 6.1%; colpotomy 4.3%; colpotomy, then laparotomy 3%; hysterectomy 1.7%; intestinal resection 0.9%	Studied treatment of patients with septic abortion
Megafu and Ozumba (1991)	Nigeria, Enugu 1982–1986	Evacuation 68%; laparotomy 23%; laparotomy + gut resection 6%; laparotomy + hysterectomy 2%; colpotomy 1%	
Misago *et al.* (1998)	Brazil, Forteleza 1992–1993	Antibiotics 20.6%	
Mpangile *et al.* (1999)	Tanzania, Dar es Salaam, n.d.	Needed blood transfusion 20%; laparotomy <1%	
Nawar *et al.* (1999)	Egypt 1994	General anaesthesia (for D&C) 35%	
Okojie (1976)	Nigeria, Benin City 1974–1975	Blood transfusion 27%	
Okonofua *et al.* (1992)	Nigeria, Ile-Ife 1988–1989	Antibiotics 100%; evacuation 76%; laparotomy 7%; hysterectomy 3%	
Omu *et al.* (1981)	Nigeria, Benin City 1974–1979	Antibiotics 93.8%; evacuation 75.4%; laparotomy 12.3%; colpotomy 2.4%; blood transfusion 53%	Study of adolescents (<20); study notes that colpotomy ineffective since most had subsequent laparotomy
Richards *et al.* (1985)	South Africa, Durban 1984 abortions;	Laparotomy 6.4% of septic hysterectomy 5.4% of septic abortions	

Annex Table A4 **PAC costing studies reporting hospitalisation**

Country	Sub-region	ALOS (days)	Year	Reference
Ethiopia	Africa, East	1.2	1996	Jeppsson *et al.* (1999)
Kenya	Africa, East	1.5	1991	Johnson *et al.* (1993)
Kenya	Africa, East	1.7	1996	Ominde *et al.* (1997)
Kenya	Africa, East	1.0	n.d.	Kizza and Rogo (1990)
Tanzania	Africa, East	0.6	1992	Magotti *et al.* (1995)
Tanzania	Africa, East	2.4	n.d.	Mpangile *et al.* (1999)
Egypt	Africa, North	0.5	1994	Nawar *et al.* (1999)
Burkina Faso	Africa, West	1.1	1997	Population Council (2000a)
Nigeria	Africa, West	10.5	1977	Figà-Talamanca *et al.* (1986)
Nigeria	Africa, West	10.6	1977	Omu *et al.* (1981)
Nigeria	Africa, West	26.4	1984	Konje *et al.* (1992)
Nigeria	Africa, West	8.0	1985	Adewole (1992)
Nigeria	Africa, West	11.8	1988	Okonofua *et al.* (1992)
Nigeria	Africa, West	2.9	2002	Guttmacher (2005)
Senegal	Africa, West	2.1	1997	Population Council (2000b)
Senegal	Africa, West	0.9	2001	Dabash (2003)
El Salvador	America, Central	2.1	1977	Fortney (1981)
El Salvador	America, Central	1.0	1999	Koontz *et al.* (2003)
Guatemala	America, Central	2.1	1977	Fortney (1981)
Honduras	America, Central	2.0	1977	Fortney (1981)
Mexico	America, Central	1.6	1977	Fortney (1981)
Mexico	America, Central	0.9	1991	Johnson *et al.* (1993)
Mexico	America, Central	1.1	1992	King *et al.* (1998)
Mexico	America, Central	0.9	1996	Langer *et al.* (1997)
Panama	America, Central	2.9	1977	Fortney (1981)
Bolivia	America, South	0.9	2000	Billings *et al.* (2003)
Brazil	America, South	2.5	1977	Fortney (1981)
Brazil	America, South	1.0	1994	King *et al.* (1998)
Brazil	America, South	0.9	1997	Fonseca *et al.* (1997)
Chile	America, South	2.6	1977	Fortney (1981)
Colombia	America, South	1.3	1977	Fortney (1981)
Ecuador	America, South	0.4	1991	Johnson *et al.* (1993)
Peru	America, South	3.1	1977	Fortney (1981)
Peru	America, South	1.1	1999	Benson and Huapaya (2002)
Venezuela	America, South	4.7	1977	Figà-Talamanca *et al.* (1986)
Malaysia	Asia, South-East	4.8	1977	Figà-Talamanca *et al.* (1986)
Thailand	Asia, South-East	2.0	1980	Narkavonnakit, Bennett (1981)
Turkey	Asia, West	1.7	1977	Figà-Talamanca *et al.* (1986)
Simple average:		**3.3**		

Notes: (1) ALOS = Average length of stay in hospital/health centre;
(2) Year = Year of data collection (n.d. = no date).

Annex Table A5 **Studies reporting blood transfusions**

Country	Sub-region	% of cases receiving blood	Blood received (in litres)	Year of survey	Reference
Brazil	America, South	5.50%	0.035	1977	Fortney (1981)
Chile	America, South	11.50%	0.070	1977	Fortney (1981)
Colombia	America, South	7.20%	0.065	1977	Fortney (1981)
El Salvador	America, Central	15.50%	0.113	1977	Fortney (1981)
Guatemala	America, Central	6.20%		1977	Fortney (1981)
Honduras	America, Central	10.50%	0.035	1977	Fortney (1981)
Malaysia	Asia, South-East	Not given	0.200	1977	Figà-Talamanca *et al.* (1986)
Mexico	America, Central	5.30%	0.033	1977	Fortney (1981)
Nigeria	Africa, West	Not given	1.300	2002	Guttmacher (2005)
Nigeria	Africa, West	Not given	0.600	1977	Figà-Talamanca *et al.* (1986)
Nigeria	Africa, West		1.270	1984	Konje *et al.* (1992)
Panama	America, Central	7.10%	0.037	1977	Fortney (1981)
Peru	America, South	2.80%	0.016	1977	Fortney (1981)
Venezuela	America, South	Not given	0.750	1977	Figà-Talamanca *et al.* (1986)
Simple averages		**7.96%**	**0.348**		

Notes: (1) The Figà-Talamanca *et al.* (1986) study gives blood quantities in 'units', not in litres.;
(2) The AGI (2005) and Konje *et al.* (1992) studies report quantities of blood of patients who received blood.

Annex Table A6 **Age distribution of women with complications from unsafe abortion: review of literature**

Author(s) of article	Geographical area	Age Group 1	%	Age Group 2	%	Age Group 3	%	Age Group 4	%	Age Group 5	%	Age Group 6	%	Age Group 7	%	Average age
Abdella (1996)	Ethiopia, Jimma 1992–1993	15–19	28.5%	20–24	37.7%	25–29	25.8%	30–34	6.0%	35–50	2.0%					
Adetoro (1986)	Nigeria, Ilorin 1983–1984	11–15	10.8%	16–20	55.9%	21–25	20.6%	26–30	6.8%	31–35	3.9%	36–40	2.0%			
Adetoro (1989)	Ilorin, Nigeria 1972–1986	15–19	32.2%	20–24	24.5%	25–29	18.9%	30–34	13.2%	35–39	7.5%	40–44	3.7%			
Adewole (1992)	Nigeria, Ibadan 1980–1989	15–19	26.0%	20–24	31.0%	25–29	22.0%	30–34	7.0%	35–39	10.0%	40+	4.0%			
AGI (2005)	Nigeria 2002–2003	11–19	24.5%	20–24	29.6%	25–29	22.3%	30 +	23.7%							
Ahmed (1999)	Bangladesh 1996–1997; two rural sub-districts	≤ 19	7.0%	20–24	19.0%	25–29	30.0%	30–34	22.0%	35–46	22.0%					
Archibong (1991)	Nigeria 1985–1988, univ. hospital	≤ 14	2.9%	15–19	69.1%	20–24	18.4%	25 +	9.6%							
Benson *et al.* (1996)	Kenya	≤ 19	5.0%	20 +	95.0%											
Benson *et al.* (1996)	Nigeria	≤ 19	61.0%	20 +	39.0%											
Benson *et al.* (1996)	Nigeria	≤ 19	75.0%	20 +	25.0%											
Benson and Huayapa (2002)	Peru, Lima 1996–2001															27.6
Billings *et al.* (2003)	Bolivia 1999–2001															26.4
Crowther *et al.* (1985)	Zimbabwe, Harare, n.d.	≤ 14	2.0%	15–19	17.0%	20–24	29.0%	25–29	22.0%	30–34	15.0%	35–39	15.0%	40+	3.0%	
EngenderHealth (2003)	Senegal, Rural 2001–2002	15–24	42.0%	25–34	40.0%	35 +	19.0%									
Figà-Talamanca *et al.* (1986)	Malaysia															22.5
Figà-Talamanca *et al.* (1986)	Nigeria															22.0

Figà-Talamanca *et al.* (1986)	Turkey																29.0
Figà-Talamanca *et al.* (1986)	Venezuela																26.2
Goyaux *et al.* (1999)	Ivory Coast, Abidjan 1993–1995	≤ 19	13.0%	20–29	56.0%	30 +	31.0%										
Goyaux *et al.* (2001)	Benin	≤ 19	19.6%	20–24	28.4%	25–29	17.5%	30–34	18.4%	35 +	16.1%						
Goyaux *et al.* (2001)	Cameroon	≤ 19	28.7%	20–24	32.8%	25–29	18.0%	30–34	8.2%	35 +	12.3%						
Goyaux *et al.* (2001)	Senegal	≤ 19	17.0%	20–24	42.6%	25–29	21.0%	30–34	13.6%	35 +	5.8%						
Guzman *et al.* (1995)	Peru, Lima 1994–1995	≤ 19	16.9%	20–24	21.4%	25–29	20.8%	30–34	18.8%	35 +	22.1%						
Hardy *et al.* (1997)	Mozambique, Maputo 1994	13–19	44.3%	20–29	43.6%	30 +	12.1%										
Jewkes *et al.* (2002)	South Africa 1994, 2000																27.4
Khan *et al.* (1984)	Bangladesh, Dhaka 1977–1980																28.4
Konje *et al.* (1992)	Nigeria, Ibadan 1981–1987	≤ 15	15.0%	16–20	38.0%	21–25	28.0%	26–30	12.0%	31–35	5.0%	36 +	3.0%				
Koontz *et al.* (2003)	El Salvador, 1999																24.4
Lema *et al.* (1996)	Kenya, 1988–1989	15–19	29.0%	20–24	37.0%	25–29	15.0%	30–34	6.0%	35–39	6.0%	40+	2.0%				
Megafu and Ozumba (1991)	Nigeria, Enugu 1982–1986	≤ 15	6.0%	16–20	65.0%	21–25	14.0%	26–30	8.0%	31–35	4.0%	36 +	3.0%				
Misago *et al.* (1998)	Brazil, Forteleza 1992–1993	≤ 19	22.6%	20–24	36.0%	25–29	23.6%	30–34	11.7%	35 +	6.1%						
Mpangile *et al.* (1999)	Tanzania, Dar es Salaam, n.d.	14–17	14.0%	18–19	19.0%	20–29	50.0%	30 +	17.0%								
Okojie (1976)	Nigeria, Benin City 1974–1975	17	52.5%	18–21	35.6%	22–25	8.5%	26 +	3.4%								
Paiewonsky (1999)	Dominican Republic, Santo Domingo 1992	≤ 14	0.3%	15–19	16.2%	20–24	32.7%	25–29	25.3%	30–34	14.8%	35–39	6.0%	40+	4.8%		

Annex Table A6 **Age distribution of women with complications from unsafe abortion: review of literature (cont.)**

Author(s) of article	Geographical area	Age Group 1	%	Age Group 2	%	Age Group 3	%	Age Group 4	%	Age Group 5	%	Age Group 6	%	Age Group 7	%	Average age
Rasch *et al.* (2000)	Tanzania, Dar es Salaam 1997	≤ 19	54.7%	20 24	33.3%	25 29	8.3%	30 34	2.2%	35 +	1.4%					
Richards *et al.* (1985)	South Africa, Durban 1984	≤ 19	8.6%	20 25	29.5%	26 30	24.5%	31 40	20.0%	41 +	9.7%					
Thapa *et al.* (1992)	Nepal 1984–1985	≤ 19	7.0%	20 24	20.0%	25 29	16.0%	30 34	27.0%	35 39	18.0%	40 49	13.0%			
Thonneau *et al.* (2004)	Ivory Coast 1998–2001	≤ 19	37.6%	20 29	48.9%	30	13.5%									

Note: Average in years.

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