

## **Chapter 7. Discussion**

This chapter synthesizes the findings of my PhD by objective and discusses the findings together. For each objective, I discuss the empirical results from Zambia and the methodological strengths of the approaches used and the challenges encountered (without repeating those mentioned in the results chapters). Thereafter I discuss the implications of my research for measurement and make recommendations for Zambia and for future research.

## **7.1 Summary of the key findings**

Unsafe abortion is a leading and preventable cause of maternal death and ill health that disproportionately affects poor, less-educated, rural and young women in low- and middle-income countries. The circumstances that facilitate unsafe abortions in a context— including legal restriction, poor access to contraceptives, unavailable or poor quality health services and social stigma, infringe on the rights of women to fulfil their reproductive intentions and to make informed and independent decisions about their sexuality and health. Reducing the number of unsafe abortions globally is essential to achieve the sustainable development goals (SDGs) related to women’s health and gender quality. Hence, despite its challenges measuring unsafe abortion is essential to understand the magnitude of this problem and monitor progress at global, national and sub-national levels.

Zambia’s liberal abortion law but restrictive implementation, the regulatory changes that have occurred since 2009, and the lack of representative data on induced and unsafe abortion make it an appealing setting to conduct research on abortion. My research in Zambia aimed to achieve two broad goals. The first was to contribute towards refinements to the conceptualization of unsafe abortion, and to improve its measurement considering technological changes in medical provision in low- and middle-income countries where the burden is greatest. The second was to generate new substantive data on the burden of unsafe and induced abortion in Zambia using data from health facilities and a community-based survey in order to demonstrate the need for greater access to comprehensive abortion care services.

### **7.1.1 Summary of background- defining and measuring unsafe abortions**

Clearly defining and measuring abortion safety in restrictive contexts is challenging due to the societal stigma and/or legal restrictions around the practice, causing abortions to be underreported. The increased availability of medical abortion (MA) also makes it difficult to distinguish from spontaneous abortion. There is an emerging consensus amongst some researchers that abortion safety should not be dichotomized into safe/unsafe but defined and measured along a spectrum incorporating both the process of the abortion and the outcomes (morbidity and mortality). However, my background

concludes that in restrictive contexts, outcome data on complications from health facilities is more readily available than process data on how women obtained pregnancy terminations from surveys or providers and therefore measurement approaches using outcome data only might be more useful for monitoring unsafe abortion. The data source that has been predominantly used to estimate the indicators of unsafe abortion is health facility data. My background chapter outlined how health facility data has been analysed and proposed refinements on how this data can be used to achieve different objectives. I discuss the benefits of exploiting the largely untapped potential of routine facility data to assess the impact of policy/regulatory and other contextual or service-based changes (not just legal changes) in abortion-related admissions over time using time series analysis. I also argue for the advantage of utilizing the concept of abortion-related near-miss, first as a proxy to mortality, to assess the quality of the health system and clinical care, and second to derive population representative indicators of very unsafe abortions for the purpose of evaluation (as has now been done by EVA-PMDUP). Lastly, I discuss the substantial need for additional studies to triangulate estimates from different approaches in the absence of a gold standard to estimate the incidence of all induced abortions.

### **7.1.2 Summary of substantive estimates in results chapters**

My results show that Zambia has a high incidence of induced and, worryingly, unsafe abortions. A considerable number of admissions (~40,000) for abortion-related complications occurred in UTH, Lusaka compared with 233 terminations of pregnancy (TOP's) between 2006 and 2015. This suggests that unsafe abortions outnumber safe abortions in Lusaka district and its environs. Following the introduction of standards and guidelines for comprehensive abortion care by the Ministry of Health and capacity strengthening of health facilities and providers in 2009 there was a significant decline in the monthly number of abortion-related complications at UTH. However, the availability of combination MA for private pharmacies to sell in early 2012 did not have a significant impact on the declining hospitalization trend after May 2009.

Using both health facility and community-based methods of estimating abortion incidence in Central, Copperbelt and Lusaka Provinces, the incidence of induced abortion

is high (ranging from 30-80 per 1000 women depending on the method applied) compared to neighboring countries, and using the community-based estimate of abortion incidence and data from the near-miss study at least 1 in every 110 induced abortions becomes a near-miss case. Overall women with near-miss complications constituted 7% of all admissions for post abortion care (PAC), and there were 14 abortion-related deaths within the 5-month study period. Very few cases of trauma due to invasive unsafe abortion techniques were reported in the near-miss study, with similar data from the confidant's study suggesting that about 19% of women used invasive traditional methods to obtain their induced abortion compared with 38% who obtained abortion services from a health worker (25% of whom used tablets provided by the health provider) and 36% who ingested off counter medication and herbal or homemade concoctions. The results of the health professionals survey similarly suggest that at least a quarter of all women except the rural poor terminate their pregnancies using medical abortion and that 50% of all women except the urban non-poor induce abortions unsafely using other/traditional methods.

The quality of PAC provided was frequently inadequate in at least one aspect, as only a third of women in the near-miss study were documented to have received contraceptive counselling. Two-thirds of those counselled accepted a method highlighting the importance of contraceptive counselling after clinical management of abortion-related complications.

### **7.1.3 Internal consistency of substantive estimates and limitations of the study**

There is consistency in the results for Zambia obtained by the three studies (trend study, near-miss study and abortion incidence studies). The low number of invasive injuries observed amongst near-miss cases is consistent with results from the confidant's study and the health professional's survey within the abortion incidence hospital study estimating that at least a quarter of all women were likely to have terminated their pregnancy using medical abortion. Using the population level estimate of the incidence of abortion from the confidant's study and the incidence of abortion-related near-miss from the near-miss study, near-misses are thought to occur in 1% of induced abortions which is consistent with the rates observed for obstetric near-miss(98). The results of the

near-miss study and abortion incidence hospital study both show that the incidence of induced abortions and abortion-related near-miss complications is highest in the most urbanized Provinces. These indicators are greatest in Lusaka province followed by Copperbelt and then Central province. I am however not able to generate provincial level estimates for the confidant study to compare their levels.

Nevertheless, there is a very wide range in the estimated incidences of abortion in Zambia using data from the near-miss, confidants and abortion incidence hospital studies (AICM). The final estimate of the incidence rate is much greater in the confidant's study (80 per 1000 women years) compared with the AICM (48) and the near-miss study (30). 95% confidence intervals (CI) were calculated for the abortion incidence hospital study (95% CI 27-68) and the confidant's study estimate exceeds its upper 95% confidence interval (68 per 1000 women). The AICM incidence rate of 48 is the most conservative value possible using this approach because private health centers did not contribute any cases to the sample. Exploring an alternative scenario where private health centers have the same caseload as public health centers, the AICM rate becomes 68 per 1000 women (95% CI 47-89) which encompasses the confidant estimate of 80 per 1000 women. The data used to generate the multiplier in the AICM and confidant's studies also gives very different results. Whilst the AICM suggests that 23% of women having an induced abortion get care for complications, the confidant's study suggests that 37% of women do so estimating a smaller multiplier 1.6 times smaller than the AICM. Overall, the confidant method suggests the incidence of abortion is higher and that more women get health facility care for abortion-related complications compared with the AICM. However, it is likely that the confidant method point estimate is too high because if the caseload of induced abortion complications in health facilities is extrapolated using information from the confidant method it is three times the yearly caseload generated from the AICM (14,740). This seems implausibly large for the three provinces in one year.

Specific limitations for each of the analyses conducted have been noted in the relevant chapters. Overall, the main limitation in this PhD is that although the conceptual definition of an unsafe abortion is widely understood, it is hard to operationalize the definition collect data on the process of induced abortions and measure it uniformly in different contexts. Going forward I recommend that the WHO build on the concepts it

has discussed in a recent publication on how the definition of unsafe abortion should be interpreted and work by other researchers(135,188). Their focus should be on laying out measurable components of a safety spectrum incorporating processes and outcomes based on data that can be collected in restrictive contexts. Thereafter this scale should be piloted in multiple countries to assess its feasibility and refined.

## **7.2 Interpretation within the literature on abortion**

### **7.2.1 Trend study**

As noted in the background section, previous studies of the impact of contextual events on abortion-related admissions have utilized a before and after approach (75,77,78) or simply described numbers hospitalized over time(65,69). A before and after approach does not account for the properties of longitudinal data. One 2013 study by Henderson et al in Nepal, utilized a segmented Poisson regression to examine the impact of changes in abortion legislation on admissions for abortion-related complications taking account of the secular trends in their analysis and discussion. This study has attempted to overcome the limitations of not accounting for the nature of time in longitudinal data as much as possible by using an interrupted time series analysis.

The contextual event most frequently examined in studies looking at a specific intervention has been a change in abortion legislation within a country. Two studies from Latin America have considered the impact of misoprostol introduction on the trends observed. Miller et al's 2005 study in the Dominican Republic suggests there is temporal association between the introduction of Misoprostol in 1986 and the decline in abortion-related morbidity (65). Singh's et al's 2012 study on Brazil similarly suggests that increased and more effective use of misoprostol is likely to have contributed to the large decline in hospital admissions for abortion-related morbidity (69). The Nepal study highlights the significant effect of training midlevel providers on declining admission trends as part of its discussion although the event included in the segmented regression analysis was the implementation of the liberalized abortion law (74). To the best of my knowledge, my PhD trend study seems to be the first explicitly examining the effect of other type of interventions such as the impact of clinical guidelines and training interventions on trends in admissions for abortion-related complications. It is relatively

easier to explore the impact of a legal change - as it is often clearly defined and likely to have substantial impact on the abortion context- than regulatory or policy changes, which may not have been implemented at a precise point, or executed uniformly in different parts of a country or at different levels of the health system. My result showing a reduction in the absolute number of admissions for abortion-related complications after clinical guidelines were instituted and capacity building for health provider and facilities on medical abortion occurred are similar to evidence from the Nepal study (74). In the Nepal study, the steepest decline in admission trends for severe abortion-related complications occurred in 2008, which was when the safe abortion program was expanded to include midlevel providers, second trimester training, and medication abortion.

All the previous studies listed above were able to obtain data on the severity of cases admitted, whilst some have information on the socio-demographic and reproductive characteristics of women. One major limitation of the trend study in my PhD is that there was no data available in the hospital registers on the severity of the complications admitted. Hence, I was unable to describe how contextual events in Zambia affect the severity caseload admitted at UTH compared with all abortion-related admissions. To address this limitation, I collected data on abortion-related deaths from the hospital information systems for the period examined (2006-2015), but the number of deaths recorded were very few with little variation over time. Hence, they did not provide additional insight into temporal changes in admission trends for severe complications. Abortion-related mortality is underreported in health facility data as many women will not die in a health facility, and cause of death may be unknown or misreported for women who die in health facilities.

In my trend study, after medical abortion was introduced in pharmacies there was an immediate significant increase in the number of admissions for abortion-related complications. This is most likely because of greater PAC seeking behavior for normal side effects of MA, or non-severe complications accompanying TOPs commenced with medical abortion in a restrictive context. This is similar to, Coelho's 1993 study in Brazil suggesting that the total number of admissions may increase following the availability of MA (161). Although we were unable to assess severity of complications, other studies

provide compelling evidence that increased and more effective use of misoprostol can contribute to reduction in severe complications of unsafe abortions. Singh et al's study from Brazil showing a sizeable decline in admission for serious complications attributes a great deal of this change to the use of misoprostol for TOPs (69). Similarly, Miller et al's 2005 study in the Dominican Republic also shows a drop in proportion of serious complications after 1986 when misoprostol became available (65). Another study in Iran concludes that medical abortion improved abortion outcomes in women between 1994 and 2002 (78). However, medical abortion in this study was intramuscular prostaglandins (Prostine). Similarly, the interventions precipitating the steep decline in admissions with serious complications in the Nepal study included the introduction of MA for safe abortion in the health system. The possibility of increased or unchanged admissions following the availability of MA however suggests that it may not lower the cost to the health system of treating PAC. It is necessary that MA availability be accompanied by training interventions to ensure all providers properly prescribe it and its use is monitored to avoid unnecessary admissions for PAC.

### **7.2.2 Near-miss study**

Like in this PhD, haemorrhage and sepsis were the most common causes of abortion-related morbidity and mortality in most studies and sepsis was the main cause of death except in a study in Uganda where fewer deaths were due to sepsis (116).

Adler et al's 2012 systematic review estimated the incidence of abortion-related near-miss at the population level to be 18 per 100,000 women (range 14-121)(10) , but included articles with near-miss definition based on clinical diagnoses only as the WHO organ dysfunction criteria had not been widely used(10). All the more recent studies I identified which were able to describe the burden of abortion-related near-miss complication using the WHO near-miss criteria or adapting it have collected data on maternal near-misses and not specifically on abortion-related near-miss (83,113–117). Four of these were conducted in Sub-Saharan African countries (Ghana, Nigeria, Tanzania, Uganda and a WHO multi-country study), and all of them collected data prospectively. Like the near-miss study in my PhD, the Tanzania study adapted the WHO criteria to the local context. Comparably, they mainly used the clinical criteria within the

WHO near-miss approach. They reduced the threshold for massive blood transfusion to one or more units of blood and included sepsis or severe systemic infection. No study identified has attempted to generate population representative estimates of the incidence of near-miss abortion complications as done for this PhD (106,114).

The intra-hospital abortion mortality index in our study (3%) was lower than in Tanzania (7%) (114), the WHO multi-country study (8.3%)(115), Brazil (16%)(83) and Ghana (44%) (117). Comparing data from the original prospective and retrospective validation studies of my PhD for March 2013, the two deaths identified in the validation study were missed in the original study whilst the death identified in the original study was missed in the validation study. This suggests that the mortality index I estimated is too low. It may also be that the modified criteria in my PhD classified more complications as near-miss cases than if we had used the WHO criteria increasing the denominator and affecting the mortality index. It may be possible that the studies in other countries missed out a substantial number of abortion-related near-misses reducing the denominator used to calculate the index and inflating the mortality indexes.

Obstetric near-miss is a marker of quality of care, as delays can lead to worse outcomes for women with complications. Ghana's very high mortality index was attributed to the poor quality of care women receive in health facilities. However, it is unlikely that the higher mortality index in Brazil compared with Zambia, Nigeria and Tanzania means that quality of care is better in those contexts. Brazil has good health information systems compared with many Sub-Saharan African countries, and a health system capable of conducting the investigations needed to apply the stringent WHO criteria and providing high-quality care for complications. Perhaps if data quality was better in African hospitals and fewer cases were missing, their mortality indices would be as high as or higher than the estimate from Brazil. It was however surprising that in the Brazil study, the majority of the abortions included as life threatening conditions and severe maternal outcomes were procedures conducted out at the study hospital where data was collected. Evidence suggests that few TOPs induced by qualified providers within the right environment should become near-misses.

### 7.2.3 Abortion incidence hospital study and confidants study

Majority of the studies estimating the incidence of induced abortion in restrictive contexts and in Sub-Saharan Africa have applied the AICM method (30–33,35,37,176,189), and a two have combined data from the PMM (which collects data from hospital records) with the AICM’s HFS (which interviews hospital staff and asks them to estimate the abortion caseload in their health facility) to generate estimates of incidence (31,32). Like in my PhD, hospital admission caseload generated using the PMM was averagely lower than estimates from the AICM HFS in the Malawi study (32) (24% and 12% respectively). The Ethiopia study does not present the results from both methods.

The confidant method has been applied in Burkina Faso (30,119) and India where it was compared to women’s self-reports of their abortion in a survey (122). To the best of my knowledge, there has been only one study in Burkina Faso comparing the confidant method and AICM in the same context, and no study comparing it with any other method of estimating abortion incidence in Africa. Some major components of the confidant study, which will ultimately affect the estimates generated, are defining: who a confidant is, and how the question used to generate a network of confidants is asked.

In the first study in Burkina Faso, a confidant was defined as *“a person who shared or could have shared intimate information with the respondent over the past year”* (119). In the second Burkina Faso study, confidants were *“...all the women and girls who confide in you, who trust you, who share their secrets and problems with you in order to get your advice. We are interested in all women who confided in you during the preceding year, and who are aged between 15 and 49 years”* (30). In the India study, the question asked to elicit confidants was *“It is very common for people to discuss important matters and share secrets with friends or family members that they are close to. I want to know a few things about the people you share the most with. I do not need to know their names, only their initials. Please tell me the initials of up to five women aged 15-44 who are either currently married or have been married before and with whom you discuss important matters”* (122). Applying the confidant method properly is dependent on ensuring we collect information on the women who confide in the respondent interviewed, not the

women who they confide in. Hence there is need to clearly distinguish between these two categories of women in the network generating question. The question asked in India unlike in Burkina Faso asked women to list the people they shared with the most, not specifically those who shared with them. The network-generating question in my PhD was modelled on the Burkina Faso questions and inquired about people who confided in the respondent. Another important consideration is how to convey the concept of confidence accurately to the respondents without introducing biases in the answer provided e.g. by asking specifically women who would confide in them about abortions. This is important as limiting confidence to as a very specific issue such as abortion may stop respondents from providing a representative list of women who could confide such secrets in them and encourage them focus on those they know have had an abortion. This would affect the denominator and inflate the overall estimate. Hence applying the confidant method to estimate abortion incidence requires qualitative information on the study context to develop the most appropriate network generating questions and provide the most representative sample of women in the community.

Additionally, unlike the studies in Burkina Faso and in my PhD where we asked respondents to list all possible confidants who would tell them reproductive health secrets, the confidants tool in India was limited to married women and asked respondents to list a maximum of 5 confidants. This was based on research showing that network generator of five explained most of the variance in the total network (190). The mean number of confidants reported in all studies applying this method have not exceeded five confidants. The average number of confidants reported in my PhD (2.4) was similar to the 2.7 confidants per respondent reported in the 2001 Burkina Faso study but higher than the 1.9 reported in the 2008 study in Burkina Faso and the 1.3 reported in India. Although results from India reported that self-report produced higher estimate than the confidant method, my PhD and the studies in Burkina Faso (30,119) suggest that the confidant method is a viable method to apply to collect data on the incidence in abortion in Sub-Saharan Africa compared with India (122). This is most likely because women still rely on their networks to obtain information on terminating pregnancies and are willing and able to report on pregnancy termination in their networks.

Unlike the study comparing the confidant method and AICM in Burkina Faso, the estimated incidence of abortion with the confidant method is about 2 times higher than the AICM estimate in Zambia, and the multipliers estimated in Zambia are dissimilar whilst those in the Burkina Faso study are comparable. In addition to the possible reasons for these differences discussed in chapter 6, and the limitations of each methodology, (namely our network generating question for the confidant method may have been restrictive inflating our estimates, respondents were unable to provide additional information on 50% of abortions reported and the health professionals survey component of the abortion incidence hospital method is a relatively subjective method of estimating the multiplier) it is likely that the availability and use of medical abortion in Zambia has an impact on the magnitude of estimates from both methods and the differences observed. The 95% confidence intervals around the conservative AICM estimates suggest that even if the confidant method has overestimated the incidence of induced abortion, it is much higher in Zambia than other countries in the region.

### **7.3 Implications for understanding and measuring abortion safety**

A 2010 publication on providing an overview of existing methods to measure induced and unsafe abortion highlights how methods focused on measuring abortion-related morbidity are less developed those measuring abortion incidence (42). My PhD has focused on improving the use of health facility data on morbidity to estimate the burden of unsafe abortions and conducted a triangulation study of different approaches to estimating abortion incidence taking the use of medical abortion into consideration.

Measuring the incidence of induced abortion may appear important to understand the need for safe abortion care and family planning in a context. However, it is resource intensive, imperfect and difficult to do at regular intervals, and may not be the most practical indicator to evaluate the impact of programs and policy changes. Examining trends in admissions for abortion-related complications from large hospitals with large service areas as done in this PhD and Nepal (74) is easier to implement, can provide estimates of the burden of complications from abortion over time and can be used to assess the impact of contextual changes. Although I was not able to obtain this information in my PhD, this kind of data may be used to compare trends in admissions

for severe to non-severe complications, understand what procedures are used for TOPs and PAC over time, and estimate the cost of abortion-related admissions to the health system over time.

On the other hand, when the purpose of measurement is to measure the most unsafe abortions and evaluate changes in their incidence, the abortion-related near-miss rate or ratio is a useful and population-representative indicator to use and should be utilized in conjunction with abortion-related mortality estimates. This PhD suggests that it is feasible to collect data on abortion near-miss from routine hospital records and incorporate near-miss into the commonly used morbidity severity criteria. However, the strict WHO criteria need to be adapted to reflect the health system capability of the contexts that typically have a high burden of unsafe abortion.

Validating and interpreting the estimates from two approaches to measuring the incidence of induced abortion is challenging in the absence of a gold standard method. However, my PhD study has helped highlight some additional limitations of the frequently applied AICM, namely that the health facility survey may overestimate patient caseload and this may differ by type of health facility. It also corroborates evidence from Burkina Faso that the confidant method is a viable approach for estimating abortion incidence in Sub-Saharan Africa and emphasizes the need for preparatory qualitative research to develop an appropriate network-generating question for the study context. In addition to estimates of the incidence of abortion, these methods can be strengthened to provide important contextual data necessary to understand abortion safety by expanding the questions asked to women. Future confidant studies should attempt to collect information on how medical abortion is accessed and used by different categories of women, care seeking after medical, surgical abortions, and other abortion procedures as well as more detailed sociodemographic characteristics of women using various methods to induce abortions.

At the global level, estimating the incidence of unsafe abortion along a spectrum of safety as suggested by Sedgh et al (135) is likely to rely on a model-based approach. Recent estimates of the incidence of induced abortion in 2016 have utilized a Bayesian model informed by a conceptual framework where women are divided into subgroups based on

marital status and contraceptive need (191). It is likely that this approach can be extended to estimate global and regional levels of unsafe abortions. Theoretically, abortion safety incorporates both the process and outcome. Although it is possible to get some outcome data on abortion-related morbidity and mortality from many restrictive contexts, data on the process of induced abortions is not readily available. To include process data into how safety is modelled, it may be useful to incorporate data on medical abortion sales and availability (such as from the AICM and confidant method), predominant methods used to provide PAC and safe abortion (such as from the near-miss study) as well as legal sanctions for women or providers. This information can be used to create subgroups of safety based on the abortion process in different contexts. Outcomes can be compared for women using different processes in different countries, to examine variation and inform the final model.

### **7.3.1 Medical abortion is changing how we can measure the burden of unsafe abortions**

Increased diffusion of medical abortion has transformed the circumstances under which women terminate their pregnancies in all contexts regardless of the legal status of abortion. Even when obtained clandestinely and used sub optimally, the associated side effects and complications are much less severe than invasive abortions (traditional and surgical). Hence, studies in Latin America where utilization is high have documented changing patterns in the severity of abortion-related complications in hospitals. There are no population level estimates of the proportion of women using MA in restrictive contexts, but evidence from our community based study and interviewing experts suggest that about 25% of women use MA to terminate their pregnancies in three provinces in Zambia. Hence, although the near-miss study reported a high incidence of near miss, there were few invasive injuries reported. This is a substantial proportion of women which is important to consider when describing how safe abortions are in Zambia. Collecting data on the method used to induce abortions including MA is challenging and very few women in the near miss study reported inducing their abortion (5%), whilst information on method of induction was missing for 50% of abortions reported in the confidant study. Data from the trend study suggests that after the availability of MA in pharmacies there was a jump in admissions for abortion-related

complications, which are more likely to be non-severe complications or normal side effects of MA use. Going forward this means that interpreting morbidity data from health facilities will be more challenging in an era of greater MA use in persistently restrictive contexts. There appears to be some consistency between estimates from the expert's survey and the community based survey, however, due to how easy it is to hide MA use, expert guesses are more likely to be inaccurate to understand MA use compared with invasive abortions which have more severe physical outcomes. To understand the burden of unsafe abortions in the future, there is a need for consensus on a clear and concise definition of unsafe medical abortions to fit within the proposed safety spectrum used to model estimates. There is also a critical need for data to inform national and global estimates on the methods women are using to terminate their pregnancies. The most viable approach to collecting this data will most likely be community-based studies of women including both surveys and in-depth interviews to understand the changing context and how women choose what method to use

#### **7.4 Implications for provision of abortion care in Zambia**

Although the Zambian abortion law is relatively liberal, and the government has endorsed policy changes and clinical interventions to improve provision of contraceptive commodities and comprehensive abortion care, administrative restrictions to implementation of the law and policies and sociocultural stigma contribute to the high burden of induced and unsafe abortions. These unsafe abortions are a reflection the unfulfilled reproductive intentions of Zambian women and constitute a substantial cost to the government and economy (8,150).

My research suggests improving quality of clinical care through the introduction of clinical guidelines and capacity building of health workers contributed to a steep reduction in abortion-related hospitalizations. With the increased use of medical abortion legally and clandestinely, it is important that interventions to improve abortion care using medical abortion are instituted across the country particularly amongst providers outside of health facilities such as pharmacies and drug sellers. Additionally, the Zambian Ministry of Health should undertake regular audits of abortion-related near-miss cases and deaths to evaluate the standards of abortion care provided and

adherence to national clinical guidelines. Near-miss audits can look through patient records, interview clinical staff and interview women to provide valuable information on clinical deficiencies in patterns of care, the delays women face in accessing care before arriving at a health facility and their experiences thereafter (192–194). Such information can be used to generate action plans for the health system and at the community level to manage deficiencies in the care pathway. In addition to the WHO near-miss criteria which I have adapted for the Zambian context, there is an accompanying WHO audit tool (171) which has been applied in over 30 countries (195) and can be used in Zambia for abortion-related near-miss audits.

It is also essential that provision of high quality post abortion counselling for all women receiving CAC be instituted in all health facilities. To achieve this without creating additional workload for staff in a health system with a high patient to staff ratio mobile phone based interventions may be added to the existing PAC services to enhance availability of information and counselling support for women. This approach has been evaluated in a randomized trial in Cambodia and had increased short-term use of effective contraception and long term use of long-acting contraceptive methods (196).

Furthermore, it is necessary to increase public awareness about the abortion law and access to free safe abortion care in public health facilities (21,150) to increase demand for safe services instead of unsafe providers (140) particularly amongst vulnerable groups of women. Accurate information on the current legal status of abortion for providers and women is particularly important with ongoing debates about the including the “right to life clause” in the Zambian constitution which may restrict the liberal abortion law.

## **7.5 Recommendations for research and policy**

A number of recommendations for future research and policy on how outcome data from health facilities is used to measure the burden of unsafe abortion has been generated from the analyses done in my PhD. I summarize them in this section.

### **7.5.1 Refine the assumptions used to adjust health facility outcome data in methods like the AICM**

There are two important research questions based on how health facility data is usually adjusted to estimate population-level abortion estimates: how to exclude spontaneous abortions from abortion-related hospitalizations and how to estimate a multiplier that accounts for all women who had unsafe abortions missed within hospital data.

The AICM attempts to exclude spontaneous abortions by combining a biological estimate of spontaneous abortions from clinical studies with assumptions about care-seeking behaviour for early and late miscarriages. However, a 2-year cohort concluded in 2013 in Kenya suggest that the proportion of spontaneous abortions they apply to health facility data (3.41%) may be low in African settings. This will result in overestimation of the number of induced abortions admitted. Using available data, the biological proportion of spontaneous abortions should be updated. It would also be useful to conduct additional cohort studies in low- and middle-income countries to estimate the week-by-week patterns of pregnancy loss.

There is little research showing how women actually seek care for early and late miscarriages. Whilst this behaviour might differ by sociodemographic characteristics, it would be valuable to conduct both qualitative and quantitative studies to understand when women become aware of their pregnancies in different low- and middle-income contexts and their care seeking behaviour for morbidity in early pregnancy and pregnancy loss. Empirical estimates of the proportion of women with miscarriage who seek care would improve the accuracy of the adjustment of health facility data

The multiplier used to inflate health facility abortion cases to obtain a population-level estimate is a key component of the accuracy of abortion estimates. The approach used to calculate the multiplier within the AICM is to interview professionals/experts and ask them in what proportion of abortion cases do women seek care. However, our study triangulating different methods shows multipliers estimated from the perspective of experts may differ considerably from that estimated from women in the confidant method, asking them what proportion of their friends sought care after an abortion. I recommend that data informing the multiplier is collected from a wider range of people

who partake in and are knowledgeable about the abortion process and context, including a range of women in the community, notably adolescents and single women, as well as health providers. The multipliers generated by different categories of participants (e.g. women versus health providers) should be compared to allow researchers to understand their different perspectives.

The growing use of medical abortion in restrictive contexts affects the likelihood of women having abortion-related complications requiring care and how they seek care for them. Both factors have an impact on the final multiplier generated. It is necessary to conduct studies recruiting women who have obtained medical abortion from various sources to understand the subsequent outcomes of the pregnancy. Whilst this is challenging in restrictive contexts, small hospital studies recruiting women admitted for complications who provide information on using MA and those who obtain MA within the hospital would provide valuable information.

There has been no way of validating the AICM multiplier as there is no gold standard source of data on induced abortion in most restrictive contexts. However, indirect community-based approaches such as the confidant method (ATPR) can provide valuable data on the process and outcomes of induced abortions amongst a population-representative sample of women. This information can in turn be used to generate a multiplier that can be compared with the AICM multiplier using from a purposive sample of all respondents and from a sub-group of women.

### **7.5.2 Explore approaches to improve reporting in community-surveys of women to generate data on provision and care-seeking for induced abortions**

Surveys with women can provide valuable information of how women obtain their induced abortions. These surveys are becoming more crucial now that women are obtaining abortion at home, sometimes in substandard circumstances and in countries where health facility data is substandard. In the near future community-based surveys are more likely to provide relevant data than standalone health facility studies because of the shift towards medical abortion. However, underreporting in surveys is common due to the sensitive nature of the topic. Typically, surveys have attempted to estimate the incidence of induced abortions. Direct survey approaches have tested different

means to reduce underreporting, but none stands out as a viable solution to the problem particularly in restrictive contexts.

The ATPR method used in this PhD is an indirect method that asks women about their network. In Burkina Faso and Zambia, it has been successfully conducted because the underlying assumption that women find it easier to speak about abortions in their networks than their own has been true. Since respondents provide information on other people's abortions, they are likely to also be more willing to provide information on the process and outcome of the abortion. Thus, the data collected from confidant methods can be used to generate the prevalence of unsafe abortion as well as induced abortion. Refining this method is important, because it can generate information that can be compared with health facility outcome data to understand how consistent its estimates are, and why. Since the success of this method is greatly dependent on the validity of the network-generating question, rigorous qualitative studies to understand how women understand the concept of confidants and how they confide in other women about sexual and reproductive health secrets should be conducted in different settings.

Other important topics for future research include comparing self-report by women with how they report on confidants using the ATPR in Sub-Saharan Africa to compare estimates and calculate an underreporting factor. To advance the measurement of unsafe abortion, it is critical that future research attempt to triangulate estimates from different community-based approaches. Such research can be used to test refinements to existent approaches, explore in-depth the biases of each approach, improve individual approaches and develop novel methods for capturing information on induced and unsafe abortions in restrictive contexts. Examples of such studies include comparing indirect methods such as the ATPR with direct methods focused on improving reporting. Methods which may be appropriate for low- and middle-income contexts include the list experiment which has been applied in Liberia (128) and the Randomized Response Technique (RRT) which has been applied in Botswana (42) and do not necessarily require respondents to be literate like other popular methods such as audio computer-assisted self-interviews (ACASI) (126).

### **7.5.3 Refine the criteria used to describe abortion-related morbidity and the WHO near-miss criteria to increase applicability in low income contexts**

The research presented in this thesis suggests that it is feasible to collect data on abortion near-miss from routine hospital records and incorporate near-miss into the commonly used morbidity severity criteria. However, the strict WHO criteria need to be adapted to reflect the health system capability of the contexts that typically have a high burden of unsafe abortion.

The PMM criteria used to classify abortion-related morbidity can help improve estimates of unsafe abortion if they are incorporated into how safety is classified along a spectrum. I propose that instead of replacing the severe category in the PMM with a near-miss category as I have done in this PhD, both categories are included, since there were many cases that were not near-miss but were more severe than the moderate category criteria. The criteria for women in the moderate, and severe groups could be aligned with the criteria for non-life threatening complications, potentially life threatening complications, as applied in a 2014 study of maternal morbidity in Ghana (197) as these are part of the spectrum of abortion safety within the WHO near-miss approach. It would also be helpful to include a “no complications” group will help account for abortion-related admissions due to expected side-effects of medical or surgical abortions processes that do not actually require clinical intervention to resolve. It is important that clear criteria are specified for each level and that multiple strategies for rigorously dealing with how to classify women with incomplete data within clinical records are developed and tested.

It is also important to understand the patterns and extent of abortion-related morbidity in a context of increasing medical abortion use outside of health facilities. I recommend that studies examining the extent of blood loss, and the need for subsequent clinical intervention in women obtaining medical abortion from various sources (particularly outside public health facilities e.g. private facilities, drug sellers) in restrictive countries in Sub-Saharan Africa are conducted. For ethical and legal reasons such research would be most feasible in countries where the law is fairly liberal but the social context is restrictive such as Zambia. Most studies describing blood loss after medical abortion with mifepristone and misoprostol are clinical trials, majority have been conducted in high-income countries (198–200), and majority have included women with gestational age of

up to 63 days (9 weeks). These trials have found that bleeding may occur from 1-69 days (198,201–204). However even with long durations of bleeding, clinically significant changes in haemoglobin levels (a drop exceeding 2g/dl) have rarely been reported and the risk may be lower among women with gestational age less than 49 days' than among those with gestational age greater than 49 days (57,200). In a number of trials 0.1-0.9% of women undergoing mifepristone misoprostol medical abortion subsequently required transfusions(202,205), whilst 0.4-2.6% required a curettage (202,206). One trial comparing the side effects of misoprostol abortion with surgical abortion in China, Cuba and India shows that although women undergoing medical abortion report heavier bleeding, indicators of clinically significant blood loss were similar between both groups. In reality however, it is likely that some women obtaining MA in restrictive contexts will have pregnancies with gestational age greater than 9 weeks, may not use the combination pill which is more effective, may use the drug obtained for MA unsupervised or may not be prescribed an appropriate dose or adhere to the dosage used in these trials. These factors may increase the risk of bleeding and be accompanied with greater anaemia requiring intervention. There is also need for expert consensus on appropriate cut-offs for abortion-related near-miss anaemia within the morbidity classification.

## **7.6 Conclusion**

The studies in this thesis have contributed knowledge on how to improve the measurement of the burden of unsafe abortion in restrictive contexts taking note of the growing use of medical abortion. The availability of health facility data in many restrictive abortion contexts provides an opportunity to refine how data is analysed to assess the impact of contextual policy and regulatory changes, monitor and evaluate the incidence of the most unsafe abortions and measure the incidence of induced abortion. However, it is necessary to refine community-based data collection approaches to capture the changing context of abortion. Zambia has a high burden of unsafe abortion and needs to improve access to safe comprehensive abortion care services to improve the reproductive health of its women. To advance the reproductive health and rights of women and reduce the burden of preventable maternal mortality, it is necessary to make the research investment in improving the methods and indicators used to measure the burden of unsafe abortions.