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Chapter 1. Introduction

Unsafe abortion is the most easily preventable cause of maternal mortality and a leading cause of disability amongst women of reproductive age (1). Recently published studies estimate that unsafe abortions may account for between 8% (2) and 15% (3) of maternal deaths. An abortion performed under safe and sterile conditions is a safe medical procedure with less risk of mortality and morbidity than childbirth (4). Most unsafe abortions occur in low- and middle-income countries where there are legal restrictions and/or societal stigma surrounding terminations of pregnancy (5). It has been estimated that seven million women in these contexts were treated for complications attributed to unsafe abortions in 2012(6). These complications also impose serious economic costs on individuals, families and society (7,8). Whilst mortality is a small and declining consequence of unsafe abortion (9), a substantial, but poorly quantified burden of morbidity persists (6,10,11). The major acute complications and underlying causes of death are sepsis, haemorrhage and traumatic injury (12), while in the medium to long-term women are at risk of chronic pelvic pain, tubal blockage and secondary infertility.

Defining and measuring unsafe and induced abortions is essential for monitoring progress in women's reproductive health. However, there are important methodological challenges to obtaining accurate estimates of the burden, which relate to the conceptualisation of safety, the applicability of the definition of unsafe abortion to measurement, and medical and contextual changes in the provision of abortion. These, in turn, make the monitoring and evaluation of programs and policies to reduce unsafe abortions challenging.

The World Health Organization (WHO) definition of an unsafe abortion is "*the termination of an unintended pregnancy either by persons lacking the necessary skills or in an environment lacking the minimum medical standards or both.*" In restrictive contexts, operationalizing this definition for measurement is difficult because legal and societal restrictions diminish the willingness of women and providers to report induced abortions and the conditions in which they take place (13). The increased availability of both legal and illegal medical abortion (MA) has altered the safety conditions under

which women in low- and middle-income countries obtain induced abortions(6), particularly since 2005, when WHO included misoprostol and mifepristone on the list of essential medications (14). Recent updates to the WHO guidelines as to who can safely provide induced abortions reflect its ease of use (15). These updates give details of conditions when self-provision of MA by women and provision by non-clinician cadres of health workers¹ may be appropriate (15).

Pregnancy terminations induced by MA have a similar clinical presentation to miscarriages and the two are not easy to differentiate. As MAs are easy to conceal, it is even more complex to obtain accurate data on the number of induced abortions and to calculate the proportion of these that are unsafe according to WHO guidelines. Hence, there continues to be considerable uncertainty around available estimates of the incidence of induced and unsafe abortion. Additionally, estimates of the sequelae of unsafe abortion, such as abortion-related mortality or morbidity rates and ratios, are expected to underestimate the true burden(16), and are usually not representative of the population.

To understand the magnitude of the problem and facilitate monitoring and evaluation of abortion-related programs and policies, there is a need to improve the measurement of unsafe abortions. The overall aim of this thesis is to contribute to refinements to the conceptualization of unsafe abortion and its measurement in low- and middle-income countries where the burden is greatest, taking into account technological changes in medical provision. My research for this PhD was conducted in Zambia. Zambia has among the most liberal abortion laws in Sub-Saharan Africa (17) which enable research into induced abortion to be carried out. Although there are no national data on the incidence of safe or unsafe abortion (18) and abortion-related morbidity, a substantial proportion of abortions are estimated to be unsafe (70%)(19), and the Zambian government estimates that 30% of maternal mortality is attributable to unsafe abortion (17). This reflects the overall restrictiveness of the context which is engendered by societal stigma regarding abortion (20) and poor knowledge of the law relating to abortion by women and providers (18,21). Estimating the burden of unsafe abortion in

¹ This includes pharmacists, pharmacy workers, lay health workers and doctors of complementary medicine

Zambia will quantify the need for comprehensive abortion care and family planning and help make the case for greater access to these services by women.

1.1 Outline of Thesis

This is a “research paper style” thesis with three unpublished research papers presented as chapters.

Chapter two presents a background to the research questions addressed by the thesis. It details how unsafe abortions have been defined and measured, the effect of MA on changing measurement methods, the indicators used to describe the burden of unsafe abortion, the limitations of the available approaches and data sources used to measure these indicators. I then propose improvements to these methods.

Chapter three outlines the overall aim and study objectives, describes the reproductive health context of Zambia where the research was conducted and discusses my doctoral research within the larger project in which it was conducted. There is no overall methods chapter because the study design and methods used to address each objective differ. Detailed methods for each study are presented in individual results chapters (chapters 4-6) to avoid repetition.

Chapter four presents the first research paper entitled “How do policy changes affect trends in abortion-related complications and deaths? A segmented regression analysis of Zambian hospital data”. Addressing objective one, this paper describes trends in hospitalizations for abortion-related admissions in the largest hospital in Zambia between 2006 and 2015 and examines the impact of two contextual changes on these trends: (i) the introduction of clinical guidelines to reduce abortion-related morbidity and mortality, and (ii) the availability of MA in pharmacies.

Chapter five presents the second research paper entitled “Incidence of abortion-related near-miss complications in Zambia: a cross-sectional study in Central, Copperbelt and Lusaka Provinces”. This paper addresses the second PhD objective and presents the results of field-testing a proposed operational definition of unsafe abortion in Zambia. It describes the experience of collecting data on abortion near-miss using standardized WHO criteria from routine hospital records in a low- and middle-

income context. It also presents the incidence of near-miss in three provinces in Zambia.

Chapter six presents the third research paper which addresses objective three of my PhD, “How do the numbers compare? Estimating the incidence of induced abortion in Zambia with indirect methods using community and facility data”. I present the results from applying three approaches to estimating the incidence of induced abortion in restrictive contexts. Two approaches used health facility data, whilst the third was an indirect approach within a community-based household survey. In this paper, I describe how the methods were adapted for the Zambian context, examine the strengths and limitations of the methods used and discuss the estimates generated.

Finally, chapter seven synthesizes the main findings from these studies, discusses the internal consistency of my results and their combined implications for researchers regarding measurement of unsafe abortion and provides recommendations for Zambia to improve access to safe abortion care and for future research on this topic.