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Maternal Health in Sub-Saharan Africa:

Are National User Fee Waiver Policies for Intrapartum Services the Key to Reducing Maternal Mortality?

A Quantitative Cross-Country Comparison

Bachelor Thesis

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Statutory Declaration

I declare that I have developed and written the following thesis completely by myself, and have not used sources without citation in the text. Any thoughts from others or literal quotations are clearly marked. This thesis has not been used in the same or in a similar version to achieve an academic grade nor has it been published elsewhere.

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Hamburg, 14 November 2016

Abstract

Background: The provision of an effective facility-based intrapartum care strategy targeted at all intrapartum women is seen as a priority measure to substantially reduce the burden of maternal mortality, which is currently a major global health concern that especially affects the Sub-Saharan African (SSA) region. Intending to increase access to these services, numerous SSA countries have implemented national user fee waiver policies for facility-based intrapartum care. Evidence regarding the impact of these policies on the utilisation of the corresponding services is scarce and entirely lacking for maternal health outcomes. Therefore, this thesis aims to evaluate differences in related utilisation rates (UR) and maternal mortality ratios (MMR) between SSA countries with national user fee waiver policies for facility-based intrapartum care and those without.

Methods: Using a quantitative cross-country comparison, an intervention group of SSA countries that apply national user fee waiver policies for facility-based intrapartum care (n=15) was compared with a control group of SSA countries without equivalent policies (n=6). Data were extracted from the World Health Organization's Policy Surveys, Demographic and Health Surveys, and the World Bank's World Databank. As primary outcome measures, URs of facility deliveries and caesarean sections and estimated MMRs were used.

Results: URs of facility deliveries of the two groups differed significantly. The intervention group's median accounted for 59.4% and the control group's for 79.0% of all live births (p=0.022). Differences in URs of caesarean sections and MMRs, however, were not significant. The intervention and control group's medians regarding URs of caesarean sections accounted for 4.3% and 5.5% of all live births respectively and regarding MMRs for 398 and 590 maternal deaths per 100,000 live births respectively.

Conclusions: On average, findings revealed lower URs and MMRs in the intervention group. A number of hypotheses could explain the results. These include possible successful needs-based prioritisations of women at risk in the intervention group, a corresponding smaller share of risk groups or particularly effective alternative services. Adverse impacts of facility-based intrapartum care and a resulting positive correlation between URs and MMRs, e.g. due to medical malpractice or hospital-acquired infections, might be a further explanation. Additional research is necessary to prove these hypotheses.

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Abbreviations and Acronyms

AIS	AIDS Indicator Survey
AMDD	Averting Maternal Death and Disability (Research/Training Institute, Columbia University)
ANC	Antenatal Care
BMZ	Federal Ministry for Economic Cooperation and Development (Germany)
CDC	Centers for Disease Control and Prevention
DHS	Demographic and Health Surveys
EmOC	Emergency Obstetric Care
GDP	Gross Domestic Product
GHWA	Global Health Workforce Alliance
GNI	Gross National Income
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th revision
IQR	Interquartile Range
MDG	Millennium Development Goal
MIS	Malaria Indicator Survey
MMR	Maternal Mortality Ratio
MNCAH	Maternal, Newborn, Child and Adolescent Health
MoH	Ministry of Health
MR	Medians' Ratio
PMNCH	The Partnership for Maternal, Newborn & Child Health
s.a.	sine annum (publication date not indicated)
SDG	Sustainable Development Goal
SSA	Sub-Saharan Africa
TBA	Traditional Birth Attendant
UI	Uncertainty Interval
UN	United Nations
UNDP	United Nations Development Programme
UNFPA	United Nations Family Planning Agency
UNICEF	United Nations Children's Fund
UNPD	United Nations Population Division
UR	Utilisation Rate
USD	US-Dollar
WHO	World Health Organization

1 Introduction

Globally, about 303,000 women died due to pregnancy- and childbirth-related complications in 2015. About 99% of these maternal deaths occurred in developing countries, 66% thereof in Sub-Saharan Africa (SSA) (see Appendix A; WHO 2016b; WHO et al. 2015, p. 16 f.).[1] In this particularly highly affected region, the lifetime risk of a 15-year old girl to die of maternity-related causes is estimated to be 1:36, compared to 1:4,900 in developed regions (WHO et al. 2015, p. 17).[2] Achieving improvement in maternal health and sustainably reducing the burden of maternal mortality is therefore a major global health challenge and a substantial public health concern, especially in SSA countries. This is reflected by its consideration in both the Millennium Development Goals (MDGs) (WHO 2015b; WHO et al. 2015, p. 1 f.) and Sustainable Development Goals (SDGs) (WHO 2015a; WHO et al. 2015, p. 1 f.) as well as in numerous development cooperation programmes (see BMZ 2016).

There are strategies that have proven to be extremely effective in preventing or managing life-threatening complications during pregnancy and childbirth and thus in reducing the global burden of maternal mortality (Campbell/Graham 2006, p. 1284 ff.; WHO 2015a). Among those, the provision of a sound intrapartum care strategy targeted at all intrapartum women is a particularly promising approach towards the prevention of maternal death (Campbell/Graham 2006, p. 1284; Lema s.a., p. 28; WHO 2010, p. 11 f.; WHO 2015a). This is due to the epidemiology of maternal mortality, as the majority of maternal deaths occur due to unpredictable complications during labour, delivery or within the first 24 hours postpartum (Campbell/Graham 2006, p. 1284; p. 1291; PMNCH 2011, p. 6).

In this context, the World Health Organization (WHO) (2010, p. 11 f.) recommends the implementation of a *Childbirth Care Package of Interventions*, covering the following services:

1. Basic essential intrapartum services and basic emergency obstetric care (EmOC) in first-level facilities;[3]

[1] This thesis follows the World Health Organization's (WHO) definition of maternal deaths given in the International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10): "A maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes" (WHO 2004a, p. 98).

[2] The underlying indicator "Lifetime risk of maternal death" refers to the probability that a 15-year-old female will eventually die from maternal causes on the assumption of stable levels of fertility and mortality (World Bank 2016a).

[3] First-level facilities are typically primary health care providers, which are characterised by their proximity to the client and cover basic maternity-related care. Conditions that are uncommon or difficult to treat are generally not covered by first-level facilities and are therefore referred to higher-level facilities (PMNCH 2011, p. 9 ff.; WHO 2010, p. 12).

2. Complementary EmOC in cases of severe complications in higher-level referral facilities;[4] and
3. Essential pharmaceuticals and medical supplies.

Additionally, WHO (2010, p. 11 f.) points out the importance of several framework conditions for these interventions, such as the attendance by skilled health professionals, services that are accessible 24 hours seven days a week and the availability of referral and transport systems.

The potential impact of this package is a reduction in maternal deaths due to labour-related complications by 95% and a reduction in the risk of postpartum haemorrhage – a leading cause of maternal mortality (Say et al. 2014, p. e325 ff.) – by 67% (WHO 2010, p. 11 f.). The implementation of a corresponding facility-based intrapartum care strategy targeted at all intrapartum women is therefore seen as a key priority towards reducing maternal mortality effectively (Campbell/Graham 2006, p. 1284, p. 1291; WHO 2010, p. 11 f.).

In SSA countries, however, the related recommended services seem to be under-utilised. Hence, the proportion of births actually attended by skilled health staff in relation to the total number of births ranges from 16% to 93%, with a median accounting for 60% (see Appendix B; World Bank 2016a).[5] This implies that up to 84% of all deliveries are not attended by trained healthcare professionals. As these figures do not differentiate between institutional births and home births, the actual proportion of facility-based deliveries is likely to be even lower.

Even though a broad variety of determinants potentially affects the utilisation of health services (Peters et al. 2008, p. 162 ff.),[6] financial barriers seem to be the most critical factor in this context. Correspondingly, an analysis conducted by Hulton et al. (2010, p. 104 f.) emphasises financial barriers as the foremost constraint for accessing maternal health services in countries with the highest absolute numbers of maternal deaths and/or highest maternal mortality ratios (MMR) globally. Thus, user fees for intrapartum care are particularly problematic because they are usually regressive in nature (Gwatkin et al. 2004, p. 1275), unpredictable, and potentially very high. Hence, they may account for a significant share of a household's income (Dzakpasu

[4] Higher-level referral facilities are generally hospitals that cover more complex maternity-related care, including surgeries, blood transfusions or laboratory tests. Examples for indications where higher-level treatment is usually required are caesarean sections or the induction of labour in case of prolonged pregnancies (PMNCH 2011, p. 9 ff.; WHO 2010, p. 12).

[5] These data refer to the most recent data available from the period between 2010 and 2015 (n=41). The Seychelles, Mauritius and Cabo Verde were excluded as no data were available for these countries. Angola, Botswana, Somalia and South Africa were also excluded as only data prior to 2010 were available (see World Bank 2016a).

[6] Determinants include geographic accessibility, availability, financial accessibility and acceptability of services and their respective determinants on the supply and demand side (Peters et al. 2008, p. 162 ff.). For further information, see Peters et al. 2008, p. 162 ff.

et al. 2014, p. 2). This results in a particular burden on poor households (see Gwatkin et al. 2004, p. 1275).[7]

The enforcement of user fees for intrapartum services, introduced in many SSA countries in the 1980s and early 1990s following e.g. World Bank schemes or the joint WHO and United Nations Children's Fund (UNICEF) *Bamako Initiative* (Dzakpasu et al. 2014, p. 2; UNICEF s.a.),[8] may therefore lead to catastrophic household health expenditures (Dzakpasu et al. 2014, p. 2) or result in exclusion (Hulton et al. 2010, p. 98). However, there is currently a countermovement and numerous SSA countries recently eliminated or reduced user fees for intrapartum services in order to improve access (Dzakpasu et al. 2014, p. 2). As a result, while several countries in SSA still apply user fees for intrapartum services in the public sector, many other countries either have recently introduced partial or complete user fee waivers for these services or have always been waiving the corresponding user fees (see WHO s.a.a).[9] The latter includes countries that generally do not apply formal user fees to medical services in the public sector, for instance in the case of tax-funded systems.

In the light of the probable positive and substantial impact of an appropriate facility-based intrapartum care strategy on maternal mortality and user fees as a potential major access barrier, national user fee waiver policies for these services could be a promising approach to effectively reducing maternal mortality in SSA. In order to gain an overview of the previous research conducted in this field, a systematic literature review was carried out in preparation for this thesis.[10] This review focussed on country comparisons regarding relations between national user fee reforms and utilisation rates (URs) of intrapartum services and/or MMRs in SSA. It indicated that only little evidence exists in this regard (see Appendix C).

Three studies were identified that aimed to compare the impact of national user fee reforms on URs of intrapartum services in different SSA countries (see Appendix C). All three studies are based on a difference-in-differences approach and compared trends in URs between countries that removed or substantially reduced user fees and countries without user fee reforms. They all found consistency in the direction that after the abolition or substantial reduction of user fees the proportion of facility deliveries increased (Leone et al. 2016; McKinnon et al. 2014; McKinnon et al. 2015). This increase ranged widely from 3.1 percentage points (McKinnon et al. 2014) to 27 percentage points (Leone et al. 2016). To a much lesser extent, Leone

[7] Accordingly, a study on health service utilisation in developing countries by Gwatkin et al. (2004, p. 1275) found the rich/poor gap for intrapartum care being larger than for all other analysed health interventions, such as the medical treatment of respiratory infections, fever or diarrhoea and vaccinations.
[8] These adjustments were part of strategies that responded to inefficiencies in health facilities and a lack of resources and supplies. For further information, see Dzakpasu et al. (2014, p. 2); UNICEF (s.a.).
[9] For details on the states of current policies regarding maternity-related services in SSA countries see WHO s.a.a.
[10] Details on the search strategy for the literature review and its results are provided in Appendix C.

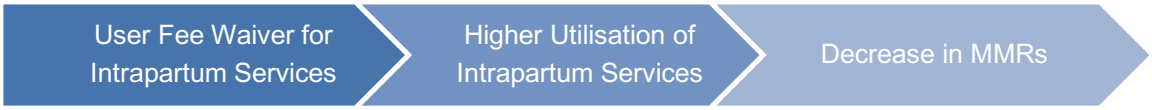
et al. (2016) also found an increase in URs of caesarean sections as a measure of managed complications accounting for 0.7 percentage points. An increase in the utilisation of caesarean sections could not be established by McKinnon et al. (2014) and was not evaluated by the most recent study of McKinnon et al. (2015).

However, the literature review did not identify any evaluations regarding possible impacts of user fee waiver policies on MMRs in SSA. There were also no systematic cross-country comparisons regarding differences in present proportions of corresponding URs and MMRs found for the SSA region. Therefore, this review indicates a research gap (see Appendix C).

2 Objective

As shown in Chapter 1, the provision of a facility-based intrapartum care strategy including EmOC and essential pharmaceuticals/medical supplies targeted at all intrapartum women is seen as a key priority towards reducing maternal mortality effectively. Simultaneously, user fees are thought to be a main access barrier to these services. Thus, national user fee waiver policies could be a promising approach to providing universal access to these services and could therefore lead to the chain of effects illustrated in Figure 1.

Figure 1: Chain of Effects of User Fee Waiver for Intrapartum Services (own illustration)



However, there is only very limited evidence regarding trends in URs after the introduction of corresponding national user fee waiver policies in the particularly highly affected SSA region. There is no evidence at all regarding the effects these policies have on maternal mortality and systematic comparisons of differences in present proportions of URs and MMRs between SSA countries (see Chapter 1).

In order to contribute to this scientific debate and identify entry points for closing the current research gap, this thesis aims to carry out a systematic comparison of

(i) SSA countries that apply national user fee waiver policies for facility-based intrapartum care including EmOC and essential pharmaceuticals/medical supplies and
(ii) SSA countries without equivalent policies.

This comparison shall cover possible impacts of the application of these policies on

(i) URs of facility-based intrapartum care and EmOC and
(ii) MMRs.

Hence, this thesis aims to provide answers to the following research questions:

1. Is there a difference in URs of facility-based intrapartum care and EmOC between SSA countries that apply national user fee waiver policies for facility-based intrapartum care including EmOC and essential pharmaceuticals/medical supplies and those that do not?
2. Is there a difference in MMRs between these two groups of countries?

According to the underlying theory outlined above, the following hypotheses are tested:

1. SSA countries that apply the aforementioned national user fee waiver policies show higher URs of facility-based intrapartum care and EmOC compared to those SSA countries without equivalent policies.
2. SSA countries that apply the aforementioned national user fee waiver policies show lower MMRs compared to those SSA countries without equivalent policies.

The following chapter describes the methodology applied in order to provide answers to the research questions and to test the hypotheses.

3 Methodology

Using a quantitative cross-country comparison, this thesis aims to evaluate differences in present proportions of URs of intrapartum services and MMRs between two groups of SSA countries. For this purpose, the countries were classified based on the current states of their corresponding national user fee waiver policies. In addition, the exposure and outcome measures shown in Table 1 were defined as target figures in accordance with the research questions.

Table 1: Target Figures for Exposure and Outcome Measures (own creation)

Exposure	Presence of national user fee waiver policies for intrapartum services: (i) Facility-based intrapartum care (ii) EmOC (iii) Essential pharmaceuticals/medical supplies
Outcomes Research Question 1	URs of facility-based intrapartum care URs of EmOC
Outcome Research Question 2	MMRs

The evaluation was based on secondary data. Therefore, appropriate indicators for the operationalisation of the target figures needed to be selected. Thus, a prerequisite for the identification of relevant data sources and indicators was the definition of the region SSA. In this

context, this thesis followed the World Bank country classification according to the *World Bank Country and Lending Groups* (World Bank s.a.). This classification includes the 48 countries listed in Appendix D.

As a first step, the following chapters outline the data sources and indicators chosen for the operationalisation of all measures required for the cross-country comparison. On this basis, the sample selection and the classification of the intervention and control group are described. Finally, the preparation of the data set and the approach of the data analyses are summarised.

3.1 Operationalisation of the Target Figures and Data Collection

The following four data sources were used to operationalise all measures required for the cross-country comparison:

(i) Maternal, Newborn, Child and Adolescent Health (MNCAH) Policy Indicator Dashboards (WHO 2016a);
(ii) The Demographic and Health Surveys (DHS) Program's STATcompiler (ICF International 2016);
(iii) World DataBank (World Bank 2016a);
(iv) World Bank Country and Lending Groups (World Bank s.a.).

From these data sources, the indicators illustrated in Table 2 were selected and extracted for further data analyses. In addition to the above-mentioned exposure and outcome measures based on the research questions, country income groups were also taken into account as a control measure. This was decided to consider differing economic capacities of the countries as a potential confounding factor or effect modifier in the further analyses.[11]

The operationalisation of all selected indicators is outlined in the following chapters.

[11] The economic capacities of SSA countries differ widely from low- to high-income economies. Examples for low-income economies include Burkina Faso and Burundi, while the Seychelles are a high-income economy (see World Bank s.a.).

Table 2: Operationalisation of Exposure Outcome and Control Measures (own creation)

	Selected Indicators	Data Source
Exposure	User fee waiver in the public sector for (i) Child births (ii) Caesarean sections (iii) Pharmaceuticals and supplies for maternal & new-born care	WHO s.a.a
Outcomes Research Question 1	URs of facility deliveries (% of all live births) URs of caesarean sections (% of all live births)	ICF International 2016
Outcome Research Question 2	MMRs (per 100,000 live births, modelled estimate)	World Bank 2016a
Control Measure	Country income groups	World Bank s.a.

3.1.1 Exposure

The presence of national user fee waiver policies for facility-based intrapartum care including EmOC and essential pharmaceuticals/medical supplies was defined as the determining exposure for both research questions. This exposure was operationalised by using WHO's national MNCAH policy indicators:

(i) User fee waiver in the public sector for child births;
(ii) User fee waiver in the public sector for caesarean sections;
(iii) User fee waiver in the public sector for pharmaceuticals and supplies for maternal & newborn care.

These indicators were extracted from the dashboard *Selected policies for improving maternal and newborn health in WHO Regions* (WHO s.a.a). It is one of six dashboards that pool data from the *Global MNCAH Policy Indicators Surveys* undertaken by WHO Geneva. These surveys aim to track the progress of countries in adopting WHO's MNCAH recommendations in national health policies. They are carried out every two years by the WHO country offices in collaboration with the national Ministries of Health (MoH) and are targeted at low- and middle-income countries with high levels of maternal mortality and mortality amongst children aged under five (WHO s.a.b, p. 1).

The indicators are based on the following questions (WHO s.a.b, p. 5):

(i) “Are women in reproductive age (15-49) exempt from user fees for child birth (normal delivery)?”
(ii) “Are women in reproductive age (15-49) exempt from user fees for caesarean section?”
(iii) “Are women in reproductive age (15-49) exempt from user fees for pharmaceutical products and/or other medical supplies if required for treatment or delivery?”

Possible characteristic values for the indicators are the presence/absence of the respective policies for all women in reproductive age, their presence for only selected populations or an unknown/not answered, or not enquired status. Thus, only the benefit recipient’s status is considered, i.e. whether the targeted women are required to settle formal out-of-pocket payments for the defined services (see WHO s.a.a; WHO s.a.b). Therefore, the health systems’ organisation in terms of the source of funds – e.g. taxes or external funds from international programmes – is not relevant in this context.

The indicators were selected as they comprise major components of intrapartum services at first- and referral-level. Hence, the policies include standard deliveries that usually occur at first-level facilities and caesarean sections, which are the most common EmOC intervention (WHO et al. 2009, p. 25) and are usually performed in higher-level facilities. Additionally, the policies include the provision of pharmaceuticals/medical supplies, if required. Although not explicitly measured by the outcome measures of this thesis, free-of-charge access to pharmaceuticals and medical supplies on the basis of these policies seems to be crucial in this context, as a provision of these items might play a determining role in the prevention of maternal deaths.[12] Therefore, the three policies were thought to adequately represent the spectrum of facility-based intrapartum care including EmOC and essential pharmaceuticals/medical supplies recommended by WHO (2010, p. 11 f.).

Corresponding data regarding 46 of the 48 SSA countries were available for these indicators, derived from different reporting periods between February 2010 and July 2014 (WHO s.a.a).

3.1.2 Outcomes Research Question 1

URs of facility-based intrapartum care and URs of EmOC were defined as target figures for the first research question. These dependent variables were operationalised by using the DHS indicators:

[12] WHO (2015a) recommends for example an injection of oxytocin directly postpartum to prevent postpartum haemorrhage.

(i) URs of facility deliveries (% of all live births);

(ii) URs of caesarean sections (% of all live births).[13]

Both indicators were extracted from the DHS Program's *STATcompiler* (ICF International 2016). The STATcompiler is a database that contains demographic and health indicators primarily collected through DHS (ICF International 2016). DHS are nationally-representative household surveys carried out approximately every five years per country. They cover a wide range of indicators in the areas of population, health, and nutrition (ICF International s.a.a; ICF International s.a.d). In addition to DHS data, the STATcompiler also contains data from other surveys, such as the AIDS Indicator Surveys (AIS) and Malaria Indicator Surveys (MIS).[14] These are also nationally- or regionally-representative surveys, which are partly based on identical questions as the DHS (see ICF International 2016; ICF International s.a.b; ICF International s.a.c).

Data for both selected indicators are collected by individual interviews with the women in the sampled households, using a standardised individual women's questionnaire (ICF International s.a.e). The data are available as aggregated proportions for the individual countries in the STATcompiler. The indicator *URs of facility deliveries (% of all live births)* represents the proportion of live births, which took place in health facilities within the last three years preceding the survey. Accordingly, the indicator *URs of caesarean sections (% of all live births)* represents the proportion of live births delivered by caesarean section within the last three years preceding the survey (ICF International 2016). URs of caesarean sections were selected because no direct indicator for URs of EmOC was available. As caesarean sections are the most common EmOC intervention (WHO et al. 2009, p. 25), this indicator was deemed an appropriate proxy indicator for the utilisation of EmOC services (see Chapter 3.1.1).[15]

121 surveys from 39 of the 48 SSA countries included data regarding these indicators. In addition to the DHS, two AIS and one MIS contained relevant data. All surveys were carried out between 1990 and 2015 (ICF International 2016). For further analyses, only each country's most recent DHS, AIS or MIS published since 2010 was utilised to ensure up-to-date data. For eight of the 39 countries, no recent data were available. Hence, data covering 31 SSA countries collected through DHS and one AIS were available for the following analyses.

[13] The official naming of these indicators in the DHS reports is "Place of delivery: Health facility" and "Delivery by caesarean section" (ICF International 2016). For enhanced comprehensibility, these names were replaced by the names stated above.

[14] AIS and MIS are household surveys targeted at monitoring national HIV/AIDS programmes and at collecting national and regional/provincial data on internationally recognised malaria indicators respectively (ICF International s.a.b; ICF International s.a.c).

[15] This rationale is in accordance with WHO et al. (2009, p. 25), who use the proportion of caesarean sections as an indicator to monitoring EmOC.

3.1.3 Outcome Research Question 2

MMRs were defined as the target figure for the second research question. This dependent variable was operationalised by using the indicator *MMRs (per 100,000 live births, modelled estimate).*

This indicator was extracted from the World DataBank (World Bank 2016a). This is a database aggregated by the World Bank, which contains time series data on a variety of topics like agriculture and rural development, climate change, education and health (World Bank 2016a; World Bank 2016b). Using secondary data, it compiles indicators from officially recognised sources (World Bank 2016b), such as WHO, UNICEF, the United Nations Family Planning Agency (UNFPA) or the United Nations Population Division (UNPD) (World Bank 2016a).

The indicator *MMRs (per 100,000 live births, modelled estimate)* represents the number of maternal deaths per 100,000 live births on national levels estimated by WHO, UNICEF, UNFPA, the World Bank Group, and UNPD. It was calculated by using a regression model covering information on the proportion of maternal deaths among non-AIDS deaths in women aged 15-49, fertility, birth attendants, and the gross domestic product (GDP) (World Bank 2016a). It was selected since no direct data on maternal deaths were available in the majority of SSA countries.[16]

The latest available data covered the year 2015 and included 47 of the 48 SSA countries (World Bank 2016a).

3.1.4 Control Measure

In order to assess the further analyses regarding confounding or effect modification, *country income groups* were additionally extracted from the World Bank's Country and Lending Groups listings (World Bank s.a.). These listings include country-specific classifications regarding regional, income, and lending characteristics (World Bank s.a.).

Country income groups are used to classify countries into the four categories low-, lower middle-, upper middle-, and high-income economies based on their gross national income (GNI) per capita per annum converted into current US-Dollar (USD).[17] The World Bank currently applies the following threshold values based on national GNIs per capita in 2015 for this classification (World Bank s.a.):

[16] This can be attributed to a lack of civil registration systems and reliable cause of death information in the majority of SSA countries (PMNCH 2012; UN Economic Commission for Africa et al. 2015, p. 27).
[17] The underlying GNI represents the sum of value added by residents from domestic and foreign sources. In order to obtain the GNI per capita, it is divided by the national mid-year population size. For the classification of country income groups, the GNI per capita is converted into current USD by using the World Bank Atlas method. This method aims to smooth fluctuations in prices and exchanges by applying a special conversion factor (World Bank 2016a). For further details, see World Bank 2016a.

(i) Low-income economies: GNI per capita ≤ 1,025 USD;
(ii) Lower middle-income economies: GNI per capita ≥ 1,026 USD ≤ 4,035 USD;
(iii) Upper middle-income economies: GNI per capita ≥ 4,036 USD ≤ 12,475 USD;
(iv) High-income economies: GNI per capita ≥ 12,476 USD.

Data from the current World Bank's 2017 fiscal year covering all 48 SSA countries were available (World Bank s.a.).

3.2 Sample Selection and Classification of the Intervention and Control Group

Assigning SSA countries to either an intervention or control group was the determining categorisation for both research questions. This classification was realised by using the exposure measure outlined in Chapter 3.1.1.

Corresponding measures for 46 of the 48 SSA countries were available. Due to the unclear policy states of the two SSA countries not included in the underlying WHO query, these countries were excluded from further analyses. Countries that were included in the WHO query but indicated an *unknown/not answered* policy status (n=1) and those with only partial policy implementations for selected services or populations (n=24) were also excluded. After the application of these criteria, 21 countries remained eligible for further analyses (see Figure 2).

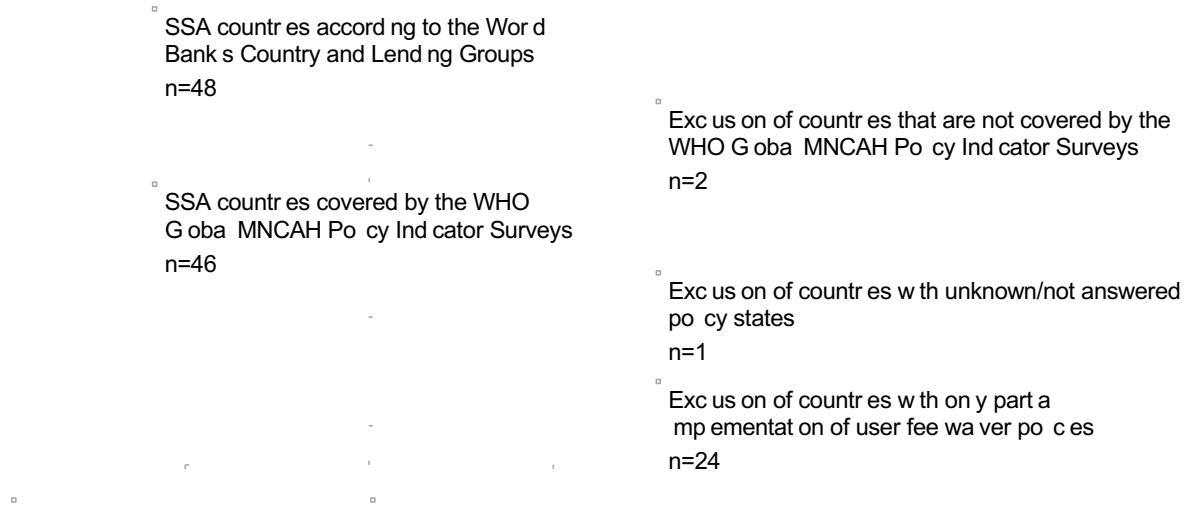
These 21 countries were allocated to the intervention and control group according to their policy states. While the intervention group was defined as the group of countries that apply all three national user fee waiver policies for

(i) Child births;
(ii) Caesarean sections; and
(iii) Pharmaceuticals and supplies for maternal & newborn care;

in the public sector according to WHO (s.a.a), the control group was defined as the group of countries that do not apply any of these policies (see Figure 2).

After this classification of country groups, data regarding URs of both facility deliveries and caesarean sections could be used for 14 of the 21 eligible SSA countries, as DHS data were not available for the entire sample. Data regarding MMRs and country income groups were available for all 21 sampled countries.

Figure 2: Sample Selection and Classification of the Intervention and Control Group (own illustration)



3.3 Preparation of the Data Set and Statistical Analyses

In order to prepare the data set for this thesis, the aforementioned variables for all 21 eligible SSA countries were transferred to IBM SPSS Statistics Version 22.0 for Mac OS X. Additionally, the policy states and income groups of the countries were recoded into numeric values and the variable types and scale levels of all measures were defined.

A descriptive, univariate analysis of the measures of central tendency including dispersion measures of all outcomes was the first step of the subsequent statistical analyses. This step aimed to provide an overview of the data distributions of the total sample and, more specifically, to facilitate plausibility verifications of the data. The following measures were calculated for all outcomes:

(i) Ranges: minimum; maximum;

(ii) Medians;

(iii) Interquartile ranges (IQRs).

Additionally, the frequency distributions of all variables were reviewed regarding extremes.

Thereafter, a comparative analysis was conducted. This analysis was the key step for providing data in order to answer the research questions of this thesis and to test its underlying hypotheses. Therefore, the sample was separated based on the corresponding assignments of the countries to the intervention and control group. Subsequently, the univariate analysis was repeated for the separated samples. In addition, medians' ratios (MRs) were calculated in order to facilitate the comparison of the resulting medians of the intervention and control group.[18] As this calculation could not be executed in SPSS, it was performed by using Microsoft Excel. Furthermore, a Mann-Whitney U test was carried out in order to determine possible statistical significances regarding differences in the distributions of outcomes between both groups of countries. All requirements for the application of the Mann-Whitney U test were previously examined.[19] The testing was deemed significant at $p<0.05$.

Finally, a stratification analysis based on the country income groups was conducted. This step aimed to clarify the potential role of the differing economic capacities of the sampled countries as a confounding or effect-modifying factor. Therefore, in two variations firstly upper middle-income economies and secondly both lower and upper middle-income economies were excluded and the aforementioned comparative analysis was repeated for each outcome measure. This approach was adopted in order to take into account the limited sample sizes, as a separate analysis of each stratum would have led to inconclusive results.

The underlying data set and syntax (SPSS) of the analyses as well as a complementary Excel file are documented on the CD attached to this thesis. An additional overview of the data included in the further analyses is provided in Appendix E. The results of the data analyses are outlined in the following chapter.

[18] To calculate MRs, the intervention group's medians were divided by the control group's medians.

[19] The Mann-Whitney U test requires two independent samples. The dependent variable must be at least of ordinal scale. No special distribution of the dependent variable is required (Bühl 2014, p. 359 f.). Furthermore, according to a recommendation given by Eckstein (2016, p. 133), the sample sizes n_1 and n_2 should be $n_1,n_2 \geq 8$.

4 Results

The following chapters outline the results of this thesis with regard to the univariate analysis of the total sample, the intervention and control group's comparative analysis and the stratification analysis.

4.1 Univariate Analysis

The univariate analysis of the total sample was the first step of the statistical analyses. As DHS data were not available for all sampled countries (see Chapter 3.2; Appendix E), the following sample sizes applied for this analysis:

(i) URs of facility deliveries: n=14;
(ii) URs of caesarean sections: n=14;
(iii) MMRs: n=21.

The total sample's URs of facility deliveries ranged between 11.0% and 80.4% of all live births, with a median of 63.9% (IQR: 58.4; 75.9) (see Table 3). Ethiopia was identified as an extreme with a UR of facility deliveries accounting for 11.0% of all live births (see Appendix F). URs of caesarean sections ranged between 1.6% and 10.3% of all live births, with a median of 4.4% (IQR: 3.2; 5.4) (see Table 3). The Comoros and Lesotho were identified as extremes with URs of caesarean sections accounting for 10.3% and 10.2% of all live births respectively (see Appendix F). MMRs ranged between 129 and 1,360 maternal deaths per 100,000 live births, with a median of 477 maternal deaths per 100,000 live births (IQR: 339; 709) (see Table 3). Sierra Leone was identified as an extreme with a MMR accounting for 1,360 maternal deaths per 100,000 live births (see Appendix F).

Table 3: Univariate Analysis Regarding Outcome Measures (own creation)

	URs Facility Deliveries (% of all live births)	**URs Caesarean Sections** (% of all live births)	**MMRs** (per 100,000 live births)
Min; Max	11.0; 80.4	1.6; 10.3	129; 1,360
Median (IQR)	63.9 (58.4; 75.9)	4.4 (3.2; 5.4)	477 (339; 709)

4.2 Comparative Analysis

The next step of the statistical analyses was the comparative analysis. For this purpose, the total sample was firstly separated based on the assignment of the countries to the intervention and control group.

The intervention group included 71% (n=15) of the total sample's countries and the control group 29% (n=6). Due to the restricted availability of DHS data (see Chapter 3.2; Appendix E), data regarding URs of facility deliveries and caesarean sections were available for 11 of the

15 intervention group countries and for three of the six control group countries. With regard to MMRs, data for all 15 intervention and six control group countries were available (see Table 4).

Table 4: Sample Sizes for the Comparative Analysis (own creation)

		URs Facility Deliveries	URs Caesarean Sections	MMRs
Intervention Group	n	11	11	15
Control Group	n	3	3	6

Table 5 below provides an overview of the key results of the comparative analysis, which are explained in the following.

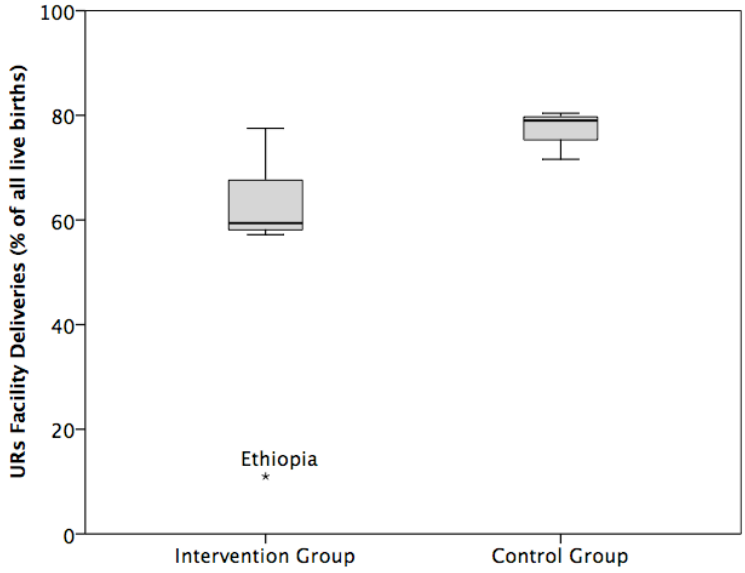
Table 5: Comparative Analysis Regarding Outcome Measures (own creation)

		URs Facility Deliveries (% of all live births)	URs Caesarean Sections (% of all live births)	MMRs (per 100,000 live births)
Intervention Group	Min; Max	11.0; 77.5	1.6; 10.3	129; 1,360
	Median (IQR)	59.4 (57.5; 70.7)	4.3 (3.6; 4.7)	398 (224; 706)
Control Group	Min; Max	71.6; 80.4	2.1; 10.2	342; 882
	Median (IQR)	79.0 (n.a.[a])	5.5 (n.a.[a])	590 (364; 812)
		MR=0.75 *p=0.022*[b]	*MR=0.78* *p=0.456*[b]	*MR=0.67* *p=0.267*[b]

[a] No IQR reported due to small sample size
[b] Exact significance [2*(1-tailed)]

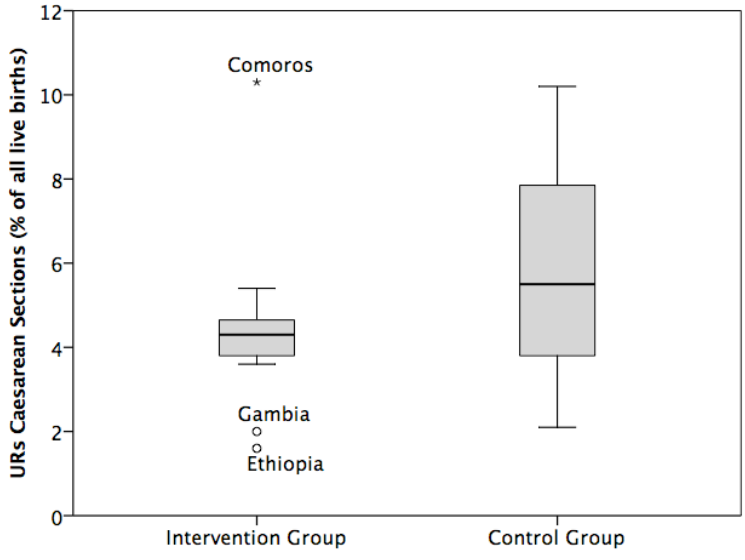
URs of facility deliveries of the intervention group ranged between 11.0% and 77.5% of all live births, with a median of 59.4% (IQR: 57.5; 70.7) (see Table 5; Figure 3). Ethiopia was identified as an extreme with a UR accounting for 11.0% of all live births (see Figure 3). URs of facility deliveries of the control group ranged between 71.6% and 80.4% of all live births, with a median of 79.0% (see Table 5; Figure 3). Due to the control group's small sample size (n=3), no IQR can be reported for this measure. The resulting MR was 0.75. The difference in the outcome distributions between both country groups was deemed significant according to the Mann-Whitney U test (p=0.022) (see Table 5).

Figure 3: Comparative Analysis Regarding URs of Facility Deliveries (own illustration)



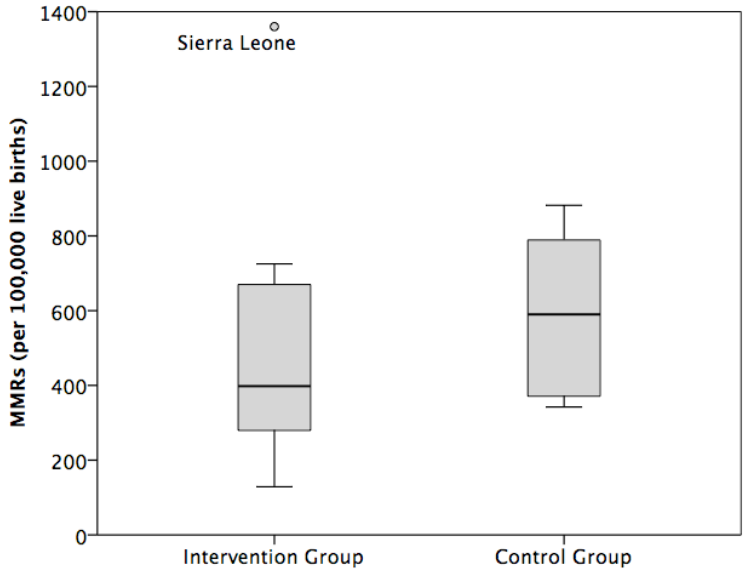
URs of caesarean sections of the intervention group ranged between 1.6% and 10.3% of all live births, with a median of 4.3% (IQR: 3.6; 4.7) (see Table 5; Figure 4). Ethiopia, the Gambia and the Comoros were identified as extremes with URs accounting for 1.6%, 2.0% and 10.3% of all live births respectively (see Figure 4). URs of caesarean sections of the control group ranged between 2.1% and 10.2% of all live births, with a median of 5.5% (see Table 5; Figure 4). Due to the control group's small sample size (n=3), no IQR can be reported for this measure. The resulting MR was 0.78. The difference in the outcome distributions between both country groups was not deemed significant according to the Mann-Whitney U test (p=0.456) (see Table 5).

Figure 4: Comparative Analysis Regarding URs of Caesarean Sections (own illustration)



MMRs of the intervention group ranged between 129 and 1,360 maternal deaths per 100,000 live births, with a median of 398 maternal deaths per 100,000 live births (IQR: 224; 706) (see Table 5; Figure 5). Sierra Leone was identified as an extreme with a MMR accounting for 1,360 maternal deaths per 100,000 live births (see Figure 5). MMRs of the control group ranged between 342 and 882 maternal deaths per 100,000 live births, with a median of 590 maternal deaths per 100,000 live births (IQR: 364; 812) (see Table 5; Figure 5). The resulting MR was 0.67. The difference in the outcome distributions between both country groups was not deemed significant according to the Mann-Whitney U test (p=0.267) (see Table 5).

Figure 5: Comparative Analysis Regarding MMRs (own illustration)

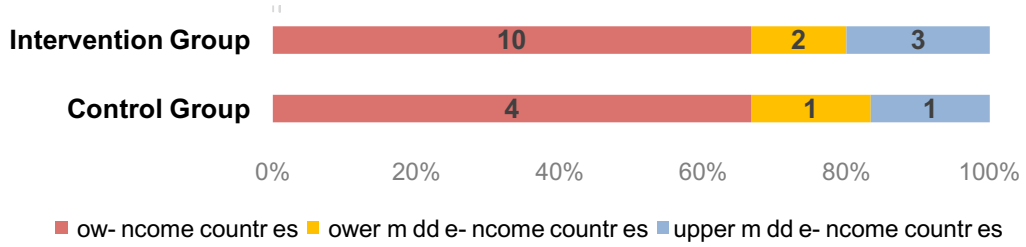


4.3 Stratification Analysis

The last step of the statistical analyses was a stratification analysis based on the country income groups.

All 21 analysed SSA countries were categorised into three income groups (see Appendix E). The majority were classified as low-income economies accounting for 67% (n=14) of the total sample's countries, while 14% (n=3) were classified as lower middle-income economies and 19% (n=4) as upper middle-income economies. Of those, the intervention group included 10 low-income, two lower middle-income and three upper middle-income countries. The control group included the remaining four low-income, one lower middle-income and one upper middle-income countries (see Figure 6).

Figure 6: Frequency Distributions of Country Income Groups for Separated Sample (own illustration)



Two variations of the analysis were carried out. In the first, upper middle-income countries and in the second, both lower and upper middle-income countries were excluded from the total samples of the intervention and control group. However, due to the restricted availability of DHS data (see Chapter 3.2; Appendix E), the sample sizes of both URs of facility deliveries and caesarean sections differed from the sample sizes of MMRs.

Hence, no data regarding URs of facility deliveries and caesarean sections were available for upper middle-income countries. Therefore, no country could be excluded in the first variation and the respective samples for the corresponding comparative analyses are equal to the total sample (intervention group: n'=11; control group: n'=3). As data regarding URs were equally lacking for one lower middle-income economy, the application of the second variation resulted in the exclusion of only one lower middle-income country from the intervention group sample (n''=10) and the control group sample (n''=2) respectively (see Table 6).

In the case of MMRs, the application of the first variation led to three upper middle-income countries being excluded from the total sample of the intervention group (n'=12) and one from the total sample of the control group (n'=5). For the second variation, another two lower middle-income countries were excluded from the intervention group sample (n''=10) and one from the control group sample (n''=4) (see Table 6).

Table 6: Sample Sizes for the Stratification Analysis (own creation)

			Total Sample[a]	Variation 1[b]	Variation 2[c]
URs Facility Deliveries	Intervention Group	n	11	11	10
	Control Group	n	3	3	2
URs Caesarean Sections	Intervention Group	n	11	11	10
	Control Group	n	3	3	2
MMRs	Intervention Group	n	15	12	10
	Control Group	n	6	5	4

[a] Inc udes ow- ncome, ower m dd e- ncome and upper m dd e- ncome countr es
[b] Exc us on of upper m dd e- ncome countr es (rema n ng strata: ow- ncome and ower m dd e- ncome countr es)
[c] Exc us on of ower and upper m dd e- ncome countr es (rema n ng stratum: ow- ncome countr es)

The subsequent comparative analysis on the basis of the first variation resulted in the same findings regarding URs of facility deliveries as the comparative analysis of the total sample due to the above-mentioned unmodified samples (see Table 7). The application of the second variation resulted in equally unmodified ranges of the intervention and control group's minimum and maximum values. However, the medians of both the intervention and control group slightly declined to 59.3% (IQR: 57.4; 67.2) and 76.0% (no IQR reported due to small sample size) of all live births respectively. The resulting MR accounted for 0.78. However, in contrast to the analysis of the total sample, the difference in the outcome distributions between both country groups was not deemed significant according to the Mann-Whitney U test (p=0.121) (see Table 7).

Table 7: Stratification Analysis Regarding URs of Facility Deliveries (own creation)

		URs Facility Deliveries (% of all live births)		
		Total Sample[a]	**Variation 1[b]**	**Variation 2[c]**
Intervention Group	Min; Max	11.0; 77.5	11.0; 77.5	11.0; 77.5
	Median (IQR)	59.4 (57.5; 70.7)	59.4 (57.5; 70.7)	59.3 (57.4; 67.2)
Control Group	Min; Max	71.6; 80.4	71.6; 80.4	71.6; 80.4
	Median (IQR)	79.0 (n.a.[d])	79.0 (n.a.[d])	76.0 (n.a.[d])
		MR=0.75	*MR=0.75*	*MR=0.78*
		p=0.022[e]	*p=0.022[e]*	*p=0.121[e]*

[a] Inc udes ow- ncome, ower m dd e- ncome and upper m dd e- ncome countr es
[b] Exc us on of upper m dd e- ncome countr es (rema n ng strata: ow- ncome and ower m dd e- ncome countr es)
[c] Exc us on of ower and upper m dd e- ncome countr es (rema n ng stratum: ow- ncome countr es)
[d] No IQR reported due to sma samp e s ze
[e] Exact s gn f cance [2*(1-ta ed)]

Also in the case of URs of caesarean sections the comparative analysis on the basis of the first variation resulted in the same findings as the comparative analysis of the total sample due to the above-mentioned unmodified samples (see Table 8). The application of the second variation resulted in an equally unmodified range of the intervention group's minimum and maximum values. The median of the intervention group remained unmodified as well (only the IQR changed to 3.2; 4.9). However, the range of the control group declined and accounted for 2.1% to 5.5% of all live births. The median of the control group equally declined and accounted for 3.8% of all live births (no IQR reported due to small sample size). This decrease in the median of the control group resulted in a reversed MR of 1.13, as the median of the intervention group was higher than the median of the control group after this exclusion of lower middle-income countries. However, similar to the analysis of the total sample, the difference in the outcome

distributions between both country groups was not deemed significant according to the Mann-Whitney U test (p=0.909) (see Table 8).

Table 8: Stratification Analysis Regarding URs of Caesarean Sections (own creation)

		URs Caesarean Sections (% of all live births)		
		Total Sample[a]	**Variation 1[b]**	**Variation 2[c]**
Intervention Group	Min; Max	1.6; 10.3	1.6; 10.3	1.6; 10.3
	Median (IQR)	4.3 (3.6; 4.7)	4.3 (3.6; 4.7)	4.3 (3.2; 4.9)
Control Group	Min; Max	2.1; 10.2	2.1; 10.2	2.1; 5.5
	Median (IQR)	5.5 (n.a.[d])	5.5 (n.a.[d])	3.8 (n.a.[d])
		MR=0.78	*MR=0.78*	*MR=1.13*
		p=0.456[e]	*p=0.456[e]*	*p=0.909[e]*

[a] Inc udes ow- ncome, ower m dd e- ncome and upper m dd e- ncome countr es

[b] Exc us on of upper m dd e- ncome countr es (rema n ng strata: ow- ncome and ower m dd e- ncome countr es)

[c] Exc us on of ower and upper m dd e- ncome countr es (rema n ng stratum: ow- ncome countr es)

[d] No IQR reported due to sma samp e s ze

[e] Exact s gn f cance [2*(1-ta ed)]

The comparative analysis of MMRs on the basis of the first variation resulted in numerous changes of the calculated measures. Hence, the intervention group's range declined and accounted for 156 to 1,360 maternal deaths per 100,000 live births, with a median increasing to 444 maternal deaths per 100,000 live births (IQR: 337; 711). The control group's range also declined and accounted for 371 to 882 maternal deaths per 100,000 live births, with a median increasing to 693 maternal deaths per 100,000 live births (IQR: 429; 836). Similar to the analysis of the total sample, the median was lower in the intervention group. The resulting MR accounted for 0.64. In accordance with the analysis of the total sample, the difference in the outcome distributions between both country groups was not deemed significant according to the Mann-Whitney U test (p=0.279) (see Table 9).

After the application of the second variation, the intervention group's range declined again and accounted for 335 to 1,360 maternal deaths per 100,000 live births, with a median once more increasing to 562 maternal deaths per 100,000 live births (IQR: 351; 715). The control group's range remained unmodified between 371 to 882 maternal deaths per 100,000 live births. However, the corresponding median also increased again and accounted for 741 maternal deaths per 100,000 live births (IQR: 452; 859). Similar to the total sample's and first variation's analyses, the median was lower in the intervention group. The resulting MR accounted for 0.76. In accordance with the total sample's and the first variation's analyses, the difference in the outcome distributions between both country groups was not deemed significant according to the Mann-Whitney U test (p=0.374) (see Table 9).

Table 9: Stratification Analysis Regarding MMRs (own creation)

		MMRs (per 100,000 live births)		
		Total Sample[a]	**Variation 1[b]**	**Variation 2[c]**
Intervention Group	Min; Max	129; 1,360	156; 1,360	335; 1,360
	Median (IQR)	398 (224; 706)	444 (337; 711)	562 (351; 715)
Control Group	Min; Max	342; 882	371; 882	371; 882
	Median (IQR)	590 (364; 812)	693 (429; 836)	741 (452; 859)
		MR=0.67	*MR=0.64*	*MR=0.76*
		p=0.267[d]	*p=0.279[d]*	*p=0.374[d]*

[a] Inc udes ow- ncome, ower m dd e- ncome and upper m dd e- ncome countr es

[b] Exc us on of upper m dd e- ncome countr es (rema n ng strata: ow- ncome and ower m dd e- ncome countr es)

[c] Exc us on of ower and upper m dd e- ncome countr es (rema n ng stratum: ow- ncome countr es)

[d] Exact s gn f cance [2*(1-ta ed)]

The results of these analyses are discussed in the following chapter.

5 Discussion

Using a quantitative cross-country comparison based on aggregated secondary cross-sectional data, this thesis compared the differences in present proportions of URs of facility deliveries and caesarean sections as well as MMRs between SSA countries that apply national user fee waiver policies for intrapartum services and those that do not. By doing so, it contributes to filling a current research gap as no other studies with a comparable approach could be identified and, in particular, there is no evidence regarding statistical relationships between national user fee waiver policies and MMRs for the SSA region.

The main results of this thesis can be summed up in four key messages:

1. There are differences in both URs of facility deliveries and caesarean sections and MMRs between countries that apply national user fee waiver policies for intrapartum services and countries that do not;
2. The difference in URs of facility deliveries is significant;
3. URs of facility deliveries and caesarean sections are, on average, lower in the group of countries that apply national user fee waiver policies for intrapartum services;
4. MMRs are, on average, lower in the group of countries that apply national user fee waiver policies for intrapartum services.

The comparative analysis conducted for this thesis reveals substantial differences in all analysed outcome measures – URs and MMRs – between the intervention and control group. Thus, the intervention group's medians accounted for approximately one quarter to one third

of the control group's medians. The difference in the distribution of URs of facility deliveries between both country groups was significant.

However, in part, the directions of results were different than anticipated. Especially the third key message relating to lower URs in the intervention group was unexpected. According to the underlying theory, the first hypothesis of this thesis assumed that SSA countries that apply national user fee waiver policies for intrapartum services would show higher URs of facility-based intrapartum care and EmOC compared to those SSA countries without equivalent policies (see Chapter 2). This hypothesis had to be rejected. The second hypothesis could, however, be fully confirmed and MMRs were lower in the intervention group.

One key question emerges from these results: How can the simultaneous presence of national user fee waiver policies for intrapartum care and lower URs of corresponding services be explained – especially in the light of equally lower MMRs?

A number of factors need to be considered in order to provide answers to this question. Firstly, methodological limitations need to be taken into account. Secondly, there are further determinants that might explain these results – among those are the differing economic capacities of the countries, which were assessed in the stratification analysis conducted for this thesis. These factors are discussed in the following chapters. Finally, resulting hypotheses are formulated.

5.1 Methodological Limitations

Methodological limitations arise, first of all, from the study design of this thesis. While previous research focussed on assessments of trends in URs after the abolition or substantial reduction of user fees in SSA, this thesis focussed on the evaluation of present proportions of both URs and MMRs depending on current policy states. Possible causalities or trends over time – including before/after comparisons of policy introductions – were thus not evaluated. There were no evaluations of trends over time available for the sample of this thesis. However, possible trends would provide crucial additional information for a full understanding of the relationships between URs, MMRs and national user fee waiver policies and could also provide indications regarding possible causalities. Therefore, an important next step was their evaluation.

Important further methodological limitations might be related to the sample size of the thesis and the methods used in the statistical analyses. From all 48 SSA countries based on the World Bank Country and Lending Groups classification exclusions were conducted due to unclear policy states and data availability. The remaining 14 countries included in the analyses of URs and the 21 countries included in the analyses of MMRs represent a substantial number

of SSA countries and considerably exceed the numbers of countries included in previous research.[20] However, in contrast to previous studies, the evaluations of this thesis were based on aggregated data.[21] Thus, the resulting sample sizes are very limited, which, in turn, results in limitations regarding quantitative analyses. This applies especially to the Mann-Whitney U test as sample sizes exceeding n=8 are generally recommended for each analysed subgroup according to Eckstein (2016, p. 133). In the analyses of this thesis, however, particularly the control group's sample sizes were very small due to the skewed distribution of countries included in each group and reached a maximum of n=6. Therefore, the recommended minimum sample sizes could not be achieved and the corresponding results of the tests of significance must be interpreted carefully.

In addition, the data distributions of all analysed outcomes ranged widely and a number of statistical outliers was observed. Although the statistical methods used in the analyses of this thesis are generally resistant to statistical outliers, in the case of sample sizes of n=3 or n=2 their occurrence could nonetheless have impacted the results. Accordingly, possible incorrect values, e.g. due to survey errors, might have impacted the results greatly. Therefore, further research is necessary to increase data availability and to subsequently repeat the analyses conducted for this thesis on the basis of larger samples.

Not only the sample sizes and methods applied but also the operationalisation of the target figures and thus the indicators' validity to evaluate the underlying research questions could directly limit the results. Although all indicators were selected carefully from a wide pool of freely accessible data, it was not possible to identify indicators that are entirely equivalent to this thesis' target figures based on its research questions.

The main assumption that was made in the course of operationalisation was that caesarean sections were deemed an appropriate proxy indicator for EmOC services. This assumption applied equally to the target figures

(i) Presence of national user fee waiver policies for EmOC; and
(ii) URs of EmOC.

The assumption was made because caesarean sections represent one of the most common EmOC interventions (WHO et al. 2009, p. 25) and no direct indicators were available for either of the target figures.

[20] Both studies conducted by McKinnon et al. (2014; 2015) included 10 SSA countries, Leone et al. (2016) included five SSA countries.
[21] The difference-in-differences approach used by McKinnon et al. (2014; 2015) and Leone et al. (2016) is based on non-aggregated household data.

However, although one of the most common, caesarean sections are only one of many EmOC interventions. Other potentially life-saving measures, such as emergency obstetric hysterectomies or blood transfusions (WHO et al. 2009, p. 25),[22] thus remained unconsidered and were not assessed. Therefore, firstly the question arises, if intervention group countries also provide national user fee waiver policies for other EmOC interventions. This information would be crucial due to the potential impact of these policies on MMRs. Hence, the respective policy states should be assessed within further research. Secondly, it should be clarified through further research whether the utilisation of EmOC interventions is appropriately represented by URs of caesarean sections as a proxy indicator.

In this context, it also needs to be considered that the interpretation of URs of caesarean sections as an EmOC measure is problematic. Firstly, also in the context of low- and middle-income countries, caesarean sections might play a role as elective interventions (see Harrison/Goldenberg 2016). Hence, they may not be carried out as emergency interventions on the basis of medical needs alone. Secondly, an optimum rate for caesarean sections is difficult to estimate, as both low and high rates may be related to risks (WHO et al. 2009, p. 25) and ultimately to maternal mortality. In this context, it must be taken into account that caesarean sections simultaneously offer the chance of being a life-saving intervention and bear significant risks of complications – especially in health facilities with particularly precarious conditions. Thus, caesarean sections might also determine unacceptably high case fatality rates (WHO et al. 2009, p. 25). The corresponding results must therefore be interpreted carefully.

Another potential limitation related to the operationalisation of the outcome measures of this thesis arises due to the fact that all respective indicators are based on proportions of live births. This must be additionally critically questioned as there might be an increased risk of maternal mortality in the case of early fetal death or stillbirths. Hence, further research should assess possible corresponding impacts.

The classification of the countries into the intervention and control group may have led to additional methodological limitations. The differentiation was conducted on the basis of the current policy state of each country regarding the presence or absence of national user fee waiver policies for defined intrapartum services. Countries with unknown policy states or only partial policy implementations for certain services or subpopulations were excluded from the analyses. However, this classification did not consider user fee reductions. Thus, countries that do not apply national user fee waiver policies but substantially subsidise the respective services

[22] Emergency obstetric hysterectomies and blood transfusions are part of the WHO recommendations given in the *Childbirth Care Package of Interventions* (WHO 2010, p. 11 f.).

were equally classified as control countries as those that charge user fees to their full amount.[23] As this effect might have biased the results of the thesis, further research should clarify the detailed policy states of the countries by means of an in-depth policy analysis and analyse possible impacts of user fee reductions. This applies especially to the policy states of the control group countries.

Finally, the methodologies of the underlying data collections and limitations emerging from them must be taken into account. In this context, there is, first of all, a risk of time inconsistencies in the underlying data collections. The latest available WHO data regarding the policy states of the 21 countries included in the analyses covers the reporting periods between January 2013 and July 2014. Data regarding URs were excerpted from each country's most recent DHS or AIS report from 2010 to 2014 and data regarding MMRs from the latest WHO et al. estimate for 2015 (see Chapter 3.1; ICF International 2016; WHO s.a.a; World Bank 2016a). Consequently, there is an incoherence in the dates of the data collections.

Therefore, the underlying survey periods might not match and – especially in the case of URs – the outcomes might have been measured before the policies were adopted. Additionally, the time frames of policy applications might differ between the countries. Thus, the policy implementation period, i.e. if the policy has just been implemented or if it has been in place for several years, might have a crucial impact on the outcome measures as it might e.g. affect the acceptance of the services (see Leone et al. 2016, p. 7; McKinnon et al. 2014, p. 7). Finally, a risk of misclassification arises due to time lags since the latest WHO policy surveys, as countries may have adopted or abolished national user fee waiver policies after the latest WHO data collection. Further research should therefore assess and minimise these risks by updating the databases and clarifying the individual policy states of the countries, particularly regarding their precise time of introduction.

False declarations could additionally have biased the results of this thesis. As false declarations can particularly emerge from surveys, this may especially affect the exposure and URs used in this thesis. However, the risk of false declarations regarding the exposure measure can be considered as subordinated since the respective data are collected through WHO country offices in collaboration with the national MoHs (see Chapter 3.1.1). Therefore, the objectivity and reliability of these data should be ensured. In contrast, the underlying DHS and AIS for assessing URs are household surveys (see Chapter 3.1.2). As they rely on self-reports of the participants and provide hardly verifiable information, they might bear a considerable risk of

[23] E.g. Burkina Faso did not opt for national user fee waiver policies, but substantially reduced user fees for deliveries and EmOC by 80% in 2006 (Ridde et al. 2011).

respondent bias. Especially effects regarding non-response or social desirability could therefore result in over- or underreporting. In this context, the role of countries with authoritarian regimes must be particularly taken into account as these effects might be more distinct in those countries.[24] Further research, e.g. through additional assessments of medical records, could help estimate and minimise these risks.

Similar to false declarations in surveys, false estimates of MMRs would also have biased the results of this thesis directly. These could occur e.g. due to cross-country differences in the data collection as the regression model used for the estimation of the MMRs contains various variables that may be based on different national survey methodologies. However, since civil registration systems and reliable cause of death information are lacking in the majority of SSA countries (PMNCH 2012; UN Economic Commission for Africa et al. 2015, p. 27), there are no reliable alternative data that avoid these risks and directly assess the respective countries' maternal deaths. In order to allow an accurate measurement, data on maternal mortality must therefore be improved in the future.

In summary, there is a variety of potential methodological limitations arising from the study design, the sample size and the methodological approach, as well as from the operationalisation of the target figures and the underlying data collection methodologies. These limitations may have influenced the results of this thesis. The recommendations for further research provided here could minimise the impact of methodological limitations and refine the results reported in this thesis. Further determinants that may additionally have influenced the results are discussed in the following chapter.

5.2 Further Determinants

In addition to the methodological limitations discussed above, a number of further determinants may have influenced the results of this thesis. One of these determinants might be differing economic capacities of the analysed countries. In order to consider these as a potential confounding or effect-modifying factor, the comparative analysis was assessed by means of a stratification analysis taking into account the different income groups of the countries.

The results of the stratification analysis indicate that the country income groups may be an effect modifier for MMRs. The step-by-step exclusion of upper middle-income and both lower and upper middle-income countries resulted in gradually increased MMRs. This applied equally to both country groups so that their respective MRs remained almost constant and

[24] According to the Economist Intelligence Unit Democracy Index of 2015, a number of countries included in the data analyses of this thesis are categorised as "authoritarian regimes", such as Angola, Burundi, the Comoros, Ethiopia, the Central African Republic, the Democratic Republic of the Congo and Equatorial Guinea (Economist Intelligence Unit 2016, p. 7 ff.).

approximated only moderately after the exclusion of both lower and upper middle-income countries. However, as these outcomes result from the exclusion of very small strata of n=1 to n=3, this interpretation should be subsequently validated on the basis of larger sample sizes.

Corresponding indications for URs of facility deliveries and caesarean sections could not be derived conclusively, as the data the stratification analysis is based on was too limited. Thus, in the entire course of the analysis' variations, changes in the results of these outcomes were based on the exclusion of only one country from the intervention and control group sample respectively. In addition, only two countries remained in the control group after the exclusion of both lower and upper middle-income countries. This implies a very high risk of coincidence. Therefore, the impact of differing economic capacities on URs cannot be interpreted on the basis of the sample examined in this thesis. Further research is thus necessary to enhance the corresponding data and to repeat the assessment.

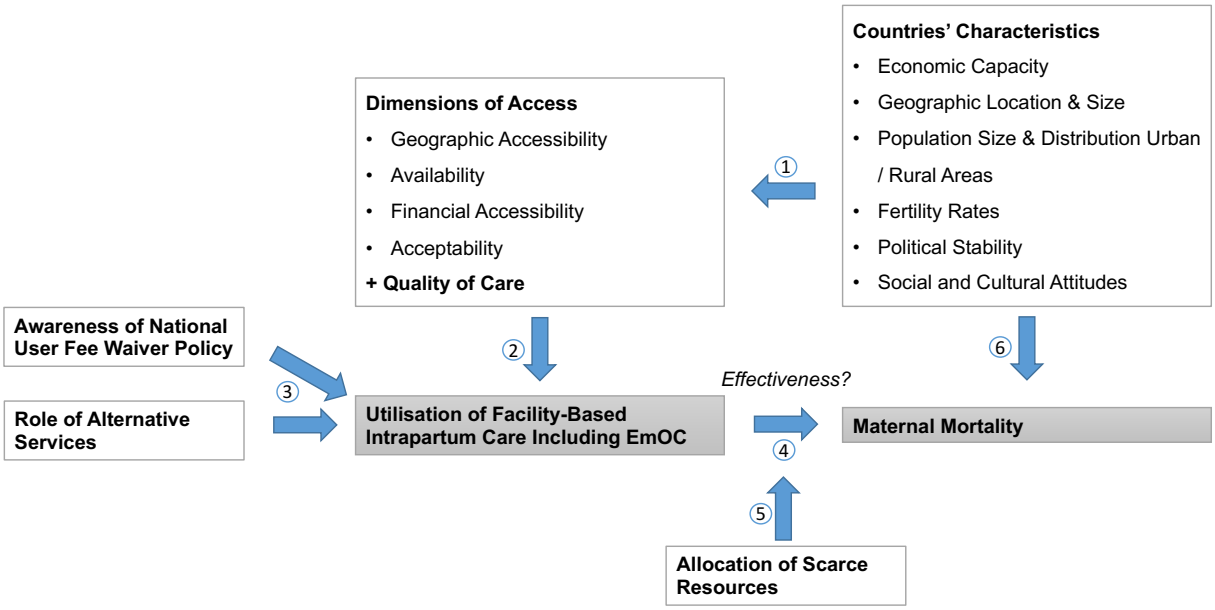
Aside from differing economic capacities, a variety of further determinants may have influenced both URs and MMRs. In this context, it is crucial to take into account the heterogeneity of the countries included in the analyses for this thesis. These countries differ considerably in various factors, such as:

(i) Geographic locations and sizes;[25]
(ii) Population size and distribution in urban/rural areas;[26]
(iii) Fertility rates;[27]
(iv) Political stability;[28] and
(v) Social and cultural attitudes.[29]

The following Figure 7 provides an overview of possible implications that may arise from these characteristics of the countries regarding both the utilisation of intrapartum services and maternal mortality and the interrelationships between the factors. These are explained in detail below.

[25] The geographical sizes and locations of the countries included in the sample of this thesis vary widely. It includes e.g. both very small island states like São Tomé and Principe and very large mainland states like the Democratic Republic of the Congo.
[26] The population sizes of the countries included in the sample of this thesis ranged between 186,342 (São Tomé and Principe) and 96,958,732 (Ethiopia) inhabitants in 2014. The proportion of the total population living in rural areas ranged between 35.5% (São Tomé and Principe) and 88.2% (Burundi) in 2014 (World Bank 2016a).
[27] Fertility rates ranged between 2.4 (South Africa) and 6.1 (Angola) in 2014 (World Bank 2016a).
[28] In the *2016 Global Peace Index*, e.g. Botswana, Sierra Leone, Malawi, Tanzania and Zambia received a high peace ranking, while Burundi, the Democratic Republic of the Congo, the Central African Republic and South Sudan received low and very low peace rankings (Institute for Economics and Peace 2016, p. 10 f.).
[29] The region SSA includes the world's culturally most heterogeneous countries, which is mainly determined by their ethnic, linguistic and religious fractionalisations. For more information, see Alesina et al. (2002).

Figure 7: Overview of Examples for Further Determinants Regarding URs and MMRs (own illustration, dimensions of access based on Peters et al. 2008)



Firstly, the different characteristics of the countries may have an impact on all dimensions of access to facility-based intrapartum care (see Figure 7, array 1). These include (Peters et al. 2008, p. 162 ff.):

1. Geographic accessibility;
2. Availability;
3. Financial accessibility;
4. Acceptability.[30]

Thus, small and politically stable countries with a population concentrated in urban areas and high economic capacities should, for example, be more likely to provide effective geographic accessibility and availability of intrapartum services than countries with contrary characteristics. This applies equally to the intrapartum services' infrastructure on a primary health care level, on a referral-level and regarding emergency transports. The number of births in a family – represented by the fertility rate – combined with the family's economic capacity could, on the other hand, have a direct impact on their ability to pay for intrapartum services and therefore on financial accessibility. Finally, social and cultural attitudes towards factors such as travel

[30] Peters et al. (2008, p. 162 ff.) define these dimensions of access as follows:
(i) Geographic accessibility: physical distance/travel time from users to service delivery points;
(ii) Availability: combination of accessibility of the right type of care (includes e.g. waiting times/opening hours) and appropriateness of service provider/materials for user demands (includes e.g. staffing, equipment, pharmaceuticals/medical supplies);
(iii) Financial accessibility: relationship of services' prices and users' ability and willingness to pay;
(iv) Acceptability: coherence of users' social and cultural attitudes and expectations and characteristics of health services.

and waiting times including perceived risks of travelling, formal and informal payments, medical examinations and interventions, etc., could impact the acceptability of these services and ultimately the users' willingness to utilise them at all (see Hulton et al. 2010, p. 105; Kinney et al. 2010, p. 4) (see Figure 7, array 1).

Factors arising from the characteristics of the countries could additionally impact the quality of care.[31] Hence, e.g. economic capacities and the state of political stability could influence the ability of the supply side to provide appropriate services including suitable, skilled health workers as well as appropriate equipment, pharmaceuticals and medical supplies.[32] These factors might in turn determine the quality of care at the point of service (see Kinney et al. 2010, p. 4). Social and cultural attitudes could furthermore determine the staffs' ability and willingness to apply standard operating procedures or hygiene measures as a further factor regarding the quality of care (see Mahiti et al. 2015, p. 7) (see Figure 7, array 1).

To sum up, there are various characteristics where the countries included in the sample of this thesis may systematically differ. These characteristics might influence the ability of the supply side in the countries to provide an effective, reachable and qualitative infrastructure for intrapartum services including referral networks and emergency transports. They might furthermore influence the ability of the demand side in the countries to utilise these services as well as their acceptance of these services. Therefore, the characteristics of the countries could in turn indirectly systematically influence the URs of the services (see Figure 7, array 2).

Aside from the dimensions of access and the quality of care, other factors might influence the utilisation of intrapartum services. These include e.g. the level of awareness of national user fee waiver policies from both a supply and demand side's perspective and the acceptance and utilisation of alternative intrapartum services, such as traditional birth attendants (TBAs) (see Figure 7, array 3).[33] Thus, it is conceivable that national user fee waiver policies exist but are unknown within the target group or at the point of service (see McKinnon et al. 2014, p. 4; Sharma et al. 2005, p. vii, p. 29). Furthermore, alternative structures, such as TBAs, might be more widely accepted and easier to access in some regions than formal facility-based services

[31] Peters et al. (2008, p. 162) define quality of care as the health services' technical ability to affect users' health. According to Peters et al. (2008, p. 162), the quality of care is an important component of each dimension of access.

[32] In this context, especially the availability of skilled personnel is a main issue in the majority of SSA countries (see GHWA/WHO 2014, p. 19; WHO 2006, p. 1 ff.).

[33] TBAs are generally important providers of maternal services in developing countries (Sibley et al. 2007, p. 2). WHO (1992, p. 4) defines a TBA as "a person who assists the mother during childbirth and initially acquired her skills by delivering babies herself or through apprenticeship to other [TBAs]". Although the roles of TBAs vary, they tend to be older, non-literate women, who provide birth attendance and further services, e.g. bathing and massage, household chores, and care in the postnatal period (Sibley et al. 2007, p. 2).

(see Anafi et al. 2016; Mahiti et al. 2015). There are thus again a number of possible interrelationships between these determinants and both countries' characteristics and the dimensions of access. These include e.g. differing social and cultural attitudes, financial and geographic accessibility and acceptability (for reasons of simplification these interrelations are not shown in Figure 7).

The aforementioned dimensions of access including the quality of care, a lack of awareness of potentially existing national user fee waiver policies and the role of alternative services could also indirectly determine MMRs through the actual or intended utilisation of intrapartum services (see Figure 7, array 4). Examples for corresponding risk factors include:

(i) Delays in treatment due to
    a. delays in the decision to seeking care;
    b. travel time;
    c. supply side shortages at the health facility;[34]
(ii) Early discharge;
(iii) Medical malpractice;
(iv) Poor hygiene standards.

Therefore, a low acceptance of health services, e.g. evoked by a fear of costs, long distances to the nearest health facility or a trust in alternative structures, might lead to a delayed decision to seek formal intrapartum care. This delay, in turn, may prove fatal as complications might already severely aggravate at home. The same applies to long travel times or a lack of transport means in case complications severely aggravate on the way to the health facility. Upon arrival at the health facility further delays might occur and prove fatal, e.g. due to a lack of skilled health staff, equipment, pharmaceuticals/medical supplies or subsequent referral networks (see Thaddeus/Maine 1994, p. 1092 ff.).

Restricted supply side capacities, e.g. in terms of lacking hospitalisation facilities, might furthermore require early discharges. This is a further potential risk factor for maternal mortality as the risk for maternal death remains particularly high within the first 24 hours postpartum (see Chapter 1).[35] Factors such as a lack of skilled health staff could furthermore increase the risk of maternal mortality due to medical malpractice as complications might remain unrecognised or be misinterpreted, which is an interface to quality of care (see WHO 2004b, p. 2 f.). Poor hygiene standards, which might e.g. lead to hospital-acquired infections (see WHO s.a.c,

[34] This framework of delays in treatment is based on „The three delays model" by Thaddeus/Maine (1994, p. 1092 ff.).
[35] Accordingly, findings from Campbell/Graham (2006) point out that women in poor countries spend very little time in health facilities, which "could seriously limit the effectiveness of a health centre intrapartum-care strategy" (Campbell/Graham 2006, p. 1292). However, reasons for this observation are not provided.

p. 151 ff.; WHO 2015a), are a further potential outcome of a low quality of care and must be considered (see Figure 7, array 4).

To sum up, the critical points in this context with a potential impact on maternal mortality are, in particular, a timely treatment, the availability and quality of the provided intrapartum services, emergency transports and referral networks and thus ultimately the effectiveness of the latter (see Figure 7, array 4). These points, in turn, are influenced by a wide range of interacting determinants.

Additionally, the allocation of scarce resources could be a crucial determinant of maternal mortality (see Figure 7, array 5). E.g., needs-based prioritisations of women at risk could therefore ensure the treatment of particularly vulnerable women.[36] In this case there are also a number of possible interrelationships between this determinant and e.g. the dimensions of access and the characteristics of the countries. These include the availability of skilled health workers, who have sufficient know-how to identify the corresponding women, or the availability and acceptability of antenatal care (ANC) services, which might be an important prerequisite to target women at risk.[37] Furthermore, they include e.g. social and cultural attitudes, which might influence conceptions of equity and therefore also conceptions of prioritisations (for reasons of simplification these interrelations are not shown in Figure 7).

In addition to the indirect impact of the characteristics of the countries on maternal mortality, these characteristics might also directly lead to a number of potential further risk factors. Hence, e.g. the geographical location of the countries might determine various communicable diseases, which could in turn increase the risk of maternal mortality. An example is malaria. Its prevalence is determined by climatic factors (CDC 2010) and thus by geographic location. A malaria infection in pregnancy is in turn associated with a higher risk of maternal mortality (Schantz-Dunn/Nour 2009, p. 186 ff.). Another example for such characteristics of the countries that might have a direct effect are social and cultural attitudes, which e.g. potentially determine the age at first pregnancy. Early pregnancies at an age below 15 years are in turn a major risk factor for maternal mortality (WHO 2015a) (see Figure 7, array 6).

As the discussion demonstrates, there is a broad variety of different determinants that might be crucial for the results of this thesis. Examples for accordingly resulting hypotheses are given in the following chapter.

[36] This approach corresponds to the “sickest first” principle of allocation according to Persad et al. (2009), which prioritises individuals “with the worst future prospects if left untreated” and is typically applied in emergency care (Persad et al. 2009, p. 423).

[37] ANC services aim to prevent, alleviate or manage health problems with possible risks on pregnancy and provide women and their families with appropriate information e.g. on a healthy pregnancy and delivery. At least four ANC assessments based on a standard intervention package commencing in the early first trimester are recommended by WHO (2002, p. 1 ff.). For further information, see WHO 2002.

5.3 Resulting Hypotheses

A number of hypotheses can be derived from the network of interrelating further determinants regarding both URs and MMRs illustrated in Chapter 5.2, which were in the majority of cases not assessed by the evaluations of this thesis. The following four hypotheses are examples of possible explanations for the simultaneous presence of national user fee waiver policies for intrapartum care and both lower URs of corresponding services and equally lower MMRs.

Hypothesis 1: Other access barriers than formal user fees hamper the utilisation of intrapartum services in the intervention group. Nevertheless, the health systems of the intervention group are – in comparison to the control group – more effective in preventing maternal deaths e.g. due to a

a) *successful prioritisation of women at risk;*
b) *timely treatment; and/or*
c) *high quality of care.*

According to this hypothesis, on the one hand less women utilise facility-based intrapartum care including EmOC in the intervention group due to other access barriers than formal user fees, e.g. due to a restricted geographic or financial accessibility or bottlenecks in the availability of services. On the other hand, however, the health systems of the intervention group might meet the demand more effectively. This could be the result of a successful needs-based allocation of scarce resources, when women at risk receive priority treatments e.g. in case of bottlenecks of the supply side. Alternatively, this allocation could also be the result of successful self-selections of those women in case of perceived high risks of complications. Thus, women, who are aware of potential individual risks – e.g. due to information gathered in an ANC assessment – might be more willing to e.g. accept long travel or waiting times or settle informal out-of-pocket payments. In addition, factors such as timely treatment, e.g. promoted by the availability and use of time-efficient emergency transport systems, well-functioning referral networks and an adequate staffing at the health facility, as well as a high quality of care could positively contribute to the effectiveness of the health systems.

Hypothesis 2: Other access barriers than formal user fees hamper the utilisation of intrapartum services in the intervention group. However, the proportion of women at risk within the intervention group's population is comparatively lower.

Also according to this hypothesis, less women utilise facility-based intrapartum care including EmOC in intervention group countries due to other access barriers than formal user fees. However, the intervention group's MMRs might nonetheless be lower due to a lower proportion of women at risk in the population. This might result from e.g. lower malaria prevalence or less pregnancies below the age of 15.

Hypothesis 3: There are accepted and effective complementary alternative options to facility-based intrapartum care in the intervention group.

Another possible explanation is that there might be alternative structures to formal facility-based intrapartum care – such as TBAs – in the intervention group, which are broadly accepted and comparatively effective in preventing maternal mortality. Their utilisation might be promoted by a number of factors, such as a simultaneous low acceptance of formal facility-based intrapartum services, their geographic distance, required informal out-of-pocket payments or a lack of awareness regarding the existence of user fee waiver policies.

Hypothesis 4: There are adverse effects of facility-based intrapartum care in both the intervention and control group. Hence, URs correlate positively with MMRs e.g. due to

a) medical malpractice;
b) hospital-acquired infections;
c) delays in treatment.

Finally, the utilisation of facility-based intrapartum care could generally positively correlate with maternal mortality in the sample of this thesis. This could be the result of e.g. medical malpractice due to a lack of skilled personnel, hospital-acquired infections due to poor hygienic standards, or delays in treatment due to bottlenecks regarding the availability of appropriate equipment, pharmaceuticals/supplies, referral networks or emergency transports. Higher URs of facility-based intrapartum care within the control group, regardless of these correlations, might be determined by a lack of alternative structures, whereas alternative services might be accessible in intervention group countries and would therefore explain corresponding lower URs.

Future research could help prove these hypotheses and therefore clarifying the impact of further direct and indirect determinants on both the utilisation of facility-based intrapartum care and maternal mortality. For example, the following assessments could be carried out:

(i) Evaluation of users' reasons for the utilisation/non-utilisation of intrapartum services and willingness and ability to travel, wait and pay studies;
(ii) Capacity assessments of health facilities;
(iii) Assessment of formal and informal prioritisation policies on macro- and meso-level and evaluations of URs of ANC services;
(iv) Evaluations of the proportions of risk groups within the populations of the countries;
(v) Assessment of alternative structures for formal intrapartum services;
(vi) Correlation analysis of URs of facility-based intrapartum services and MMRs and case-control studies regarding reasons for and locations of maternal deaths.

In this context, it is important to take into account the complexity of the interrelationships of the different determinants. Therefore, all assessments should be controlled with regard to the corresponding potential confounders and effect modifiers to the extent possible.

6 Conclusion and Outlook

There are various promising interventions to achieving improvement in maternal health and thus to reducing the global burden of maternal mortality. Among these, the application of a facility-based intrapartum care strategy including EmOC and essential pharmaceuticals/medical supplies targeted at all intrapartum women is seen as one priority measure. However, financial barriers are thought to be the main obstacle to access to these services in the particularly highly affected SSA region. National user fee waiver policies for corresponding intrapartum care might therefore be the key to effectively reducing maternal mortality in this region.

Evidence regarding the impact of these policies on the utilisation of intrapartum services is, however, scarce and entirely lacking for maternal health outcomes. Therefore, the objective of this thesis was to provide answers to the question, if there are differences in URs of facility-based intrapartum care and EmOC as well as MMRs between SSA countries that apply national user fee waiver policies for corresponding services and those without equivalent policies.

This objective was examined by conducting a quantitative cross-country comparison based on secondary aggregated cross-sectional data. To operationalise all required measures, policy indicators regarding national user fee waivers for childbirth, caesarean sections and pharmaceuticals/medical supplies in the public sector were extracted from WHO's policy surveys. Furthermore, URs of facility deliveries and caesarean sections were extracted from DHS data and estimated MMRs from the World Bank's World Databank. SSA countries that apply national user fee waiver policies for childbirth, caesarean sections and pharmaceuticals/medical supplies in the public sector were classified as an intervention group, which was compared with a control group consisting of those SSA countries without equivalent policies.

The results of the cross-country comparison indicated differences in URs and MMRs between both groups of countries. Thus, URs of facility deliveries and caesarean sections as well as MMRs were found to be lower in the intervention group. The difference in URs of facility deliveries was significant. These results were unexpected, as comparatively higher URs and lower MMRs were assumed in the intervention group.

Aside from methodological limitations, a number of hypotheses might explain these results. Possible explanations include successful needs-based prioritisations of women at risk, a smaller share of risk groups or particularly effective alternative services in the countries of the intervention group. Adverse impacts of facility-based intrapartum care and a resulting positive

correlation between URs and MMRs, e.g. due to medical malpractice or hospital-acquired infections, might be a further explanation. In order to prove these hypotheses, further research is necessary. Therefore, the analyses of this thesis should first be refined and the results specified in order to further minimise the impact of methodological limitations. This requires e.g. complementary evaluations of trends over time of the outcome measures, an expansion of the data base and sample sizes, in-depth policy analyses and an assessment of the reliability and validity of the outcome measures. On this basis, the above-mentioned hypotheses should be proved and the impact of further determinants assessed.

In summary, both underlying research questions can be answered positively. The results of this thesis indicate differences in both URs of facility-based intrapartum care and EmOC as well as MMRs between SSA countries that apply national user fee waiver policies for facility-based intrapartum care including EmOC and essential pharmaceuticals/medical supplies and those that do not. However, the guiding question of this thesis *"Are National User Fee Waiver Policies for Intrapartum Services the Key to Reducing Maternal Mortality?"* cannot be conclusively answered based on the results of this thesis. This is due to the fact that there is a complex network of interrelated determinants that might be decisive for maternal mortality. National user fee waiver policies are likely to be a part of this network. Based on the underlying theory and the hypotheses emerging from this thesis it is firstly conceivable that national user fee waiver policies might play an important role in improving access to potentially life-saving services by at least partially eliminating access barriers to the utilisation of facility-based intrapartum care. Alternatively, they could play a rather neutral role, e.g. if these services are not widely accepted within the target group. Moreover, national user fee waiver policies might also cause adverse effects in the case of positively correlating URs and MMRs. Hence, a further clarification of the role of national user fee waiver policies in subsequent research is crucial.

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Appendix

Appendix A: Estimates of Maternal Mortality Indicators by UNPD Regions, 2015

UNPD Region	MMR	Range of MMR Uncertainty (UI 80%)		Number of Maternal Deaths
		Lower estimate	Upper estimate	
Africa	495	464	590	204,000
- Sub-Saharan Africa	555	518	664	197,000
Asia	119	108	141	90,000
Europe	13	11	15	1,000
Latin America and the Caribbean	67	64	77	7,300
Northern America	13	11	15	580
Oceania	82	44	163	530
World	**216**	**207**	**249**	**303,000**

Source: own creation based on WHO et al. (2015, p. 66).

Appendix B: Births Attended by Skilled Health Staff (% of Total), by Country

Country	Births Attended by Skilled Health Staff (% of Total)	Year of Data Collection
Benin	77.2%	2014
Burkina Faso	23.0%	2010
Burundi	60.3%	2010
Cameroon	64.7%	2014
Central African Republic	53.8%	2010
Chad	24.3%	2015
Comoros	82.2%	2012
Congo, Dem. Rep.	80.1%	2014
Congo, Rep	92.5%	2012
Côte d'Ivoire	59.4%	2012
Equatorial Guinea	68.3%	2011
Eritrea	34.1%	2010
Ethiopia	15.5%	2014
Gabon	87.1%	2012
Gambia	64.0%	2013
Ghana	73.7%	2014
Guinea	39.3%	2012
Guinea-Bissau	45.0%	2014
Kenya	61.8%	2014
Lesotho	77.9%	2014
Liberia	61.1%	2013
Madagascar	44.3%	2013
Malawi	87.4%	2014
Mali	40.1%	2013
Mauritania	65.1%	2011
Mozambique	54.3%	2011
Namibia	88.2%	2013
Niger	29.3%	2012
Nigeria	38.1%	2013
Rwanda	90.7%	2015
São Tomé and Principe	92.5%	2014
Senegal	59.1%	2014
Sierra Leone	59.7%	2013
South Sudan	19.4%	2010
Sudan	23.1%	2010
Swaziland	88.3%	2014
Tanzania	42.6%	2012
Togo	44.6%	2014
Uganda	58.0%	2011
Zambia	64.2%	2014
Zimbabwe	80.0%	2014

Source: own creation based on World Bank (2016a).

Appendix C: Search Strategy and Results of the Literature Review

The literature review conducted in preparation for this thesis aimed to identify previous research regarding country comparisons of the impact of national user fee reforms on URs of intrapartum services and MMRs in SSA.

In order to achieve a comprehensive coverage of results, broad search terms were chosen. Thus, the combination of the keywords *Maternal Health*, *Africa* and *User Fees* was determined. The review was carried out using the databases PubMed, Cochrane and the Beluga catalogue of the Hamburg libraries without any language restrictions and included items published in the last ten years. The research was carried out on 28/29 July 2016. The following table provides an overview of the methodology applied.

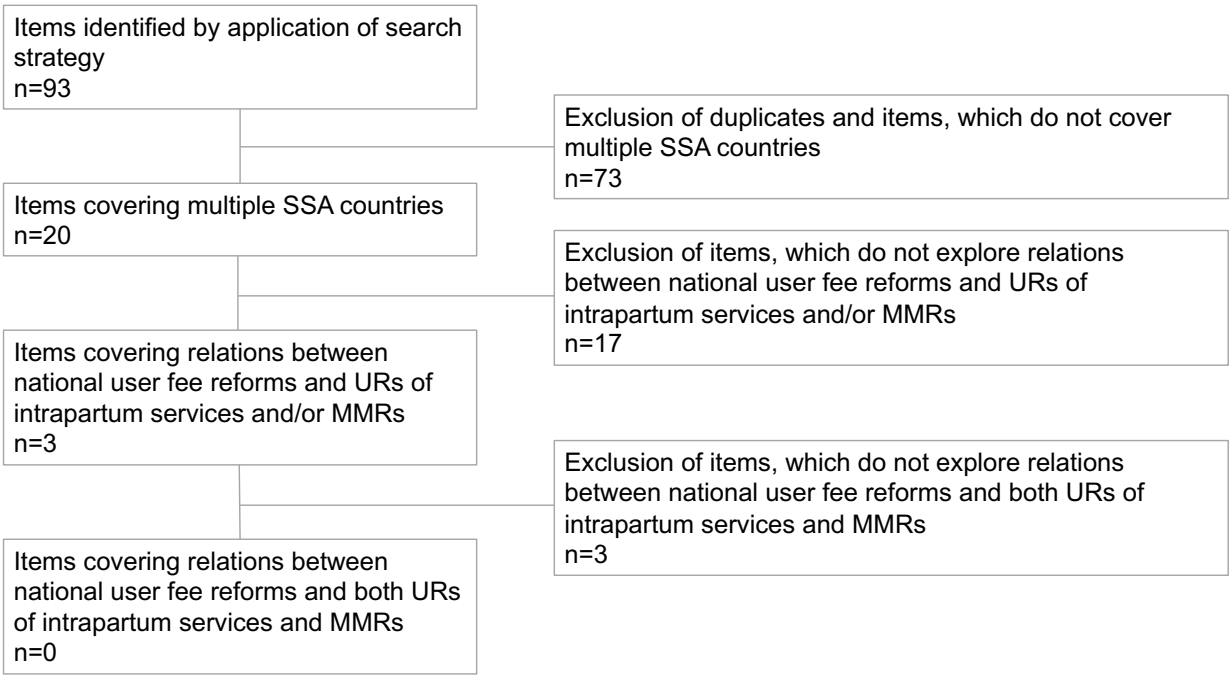
Database	Search Strategy	Years Covered	Results
PubMed	(("maternal health"[MeSH Terms] OR ("maternal"[All Fields] AND "health"[All Fields]) OR "maternal health"[All Fields]) AND ("Africa"[MeSH Terms] OR "Africa"[All Fields])) AND (User[All Fields] AND ("economics"[Subheading] OR "economics"[All Fields] OR "fees"[All Fields] OR "fees and charges"[MeSH Terms] OR ("fees"[All Fields] AND "charges"[All Fields]) OR "fees and charges"[All Fields])) AND ("2006/08/01"[PDat] : "2016/07/28"[PDat])	"last 10 years"	33
Cochrane	Combination of search terms: „maternal health", „Africa" and „user fees"	08/2006-07/2016	6
Beluga	Combination of search terms: „maternal health", „Africa" and „user fees"	2006-2016	54

Source: own creation.

In total, 93 items were identified. These items were subsequently systematically screened according to the objective of the literature review by applying in- and exclusion criteria.

Firstly, duplicates and items that did not cover at least two different SSA countries were excluded (n=73). After this step, 20 items remained. 17 were subsequently excluded as they did not explore relations between national user fee reforms and URs of intrapartum services and/or MMRs. All three remaining items (Leone et al. 2016; McKinnon et al. 2014; McKinnon et al. 2015) covered relations between national user fee reforms and URs. No item was identified that covered relations between national user fee reforms and both URs of intrapartum services and MMRs.

The following figure summarises the application of in- and exclusion criteria.



Source: own illustration.

Appendix D: Geographical Coverage of the Region SSA

Angola	Gabon	Nigeria
Benin	Gambia	Rwanda
Botswana	Ghana	São Tomé and Principe
Burkina Faso	Guinea	Senegal
Burundi	Guinea-Bissau	Seychelles
Cabo Verde	Kenya	Sierra Leone
Cameroon	Lesotho	Somalia
Central African Republic	Liberia	South Africa
Chad	Madagascar	South Sudan
Comoros	Malawi	Sudan
Congo, Dem. Rep.	Mali	Swaziland
Congo, Rep	Mauritania	Tanzania
Côte d'Ivoire	Mauritius	Togo
Equatorial Guinea	Mozambique	Uganda
Eritrea	Namibia	Zambia
Ethiopia	Niger	Zimbabwe

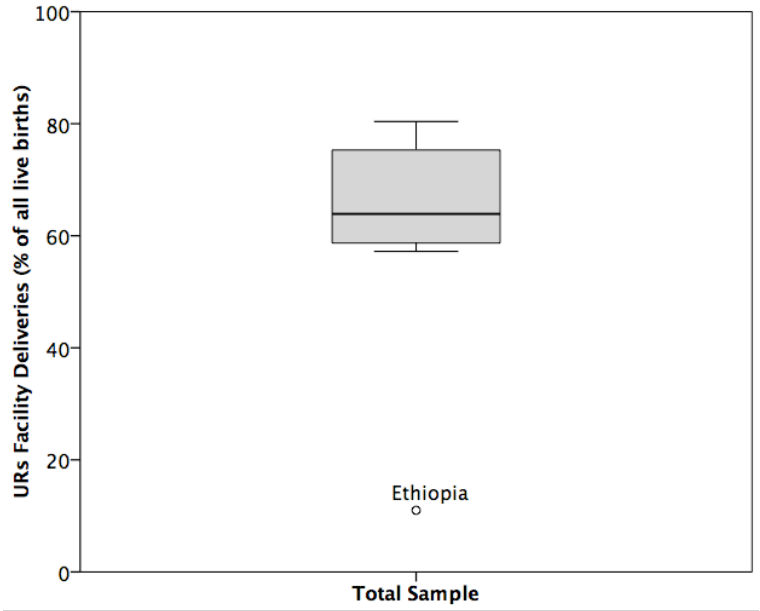
Source: own creation based on World Bank (s.a.).

Appendix E: Data Regarding Exposure, Outcome and Control Measures

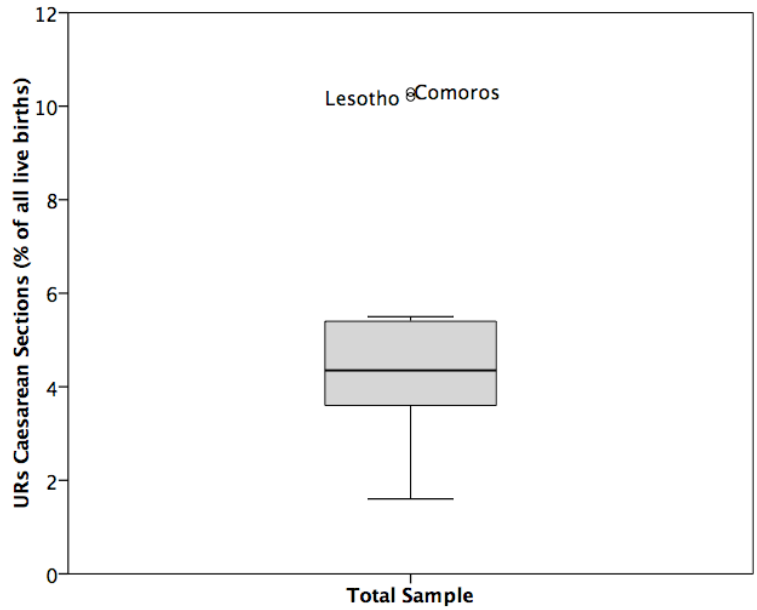
	URs Facility Deliveries (% of all live births)	URs Caesarean Sections (% of all live births)	MMRs (per 100,000 live births)	Income Groups
Intervention Group				
Angola	n.a.	n.a.	477	upper middle-income
Botswana	n.a.	n.a.	129	upper middle-income
Burundi	64.5	4.3	712	low-income
Comoros	77.5	10.3	335	low-income
Ethiopia	11.0	1.6	353	low-income
Gambia	63.3	2.0	706	low-income
Liberia	59.4	4.2	725	low-income
Malawi	75.3	4.7	634	low-income
Mozambique	57.2	4.0	489	low-income
São Tomé and Principe	n.a.	n.a.	156	lower middle-income
Sierra Leone	57.5	3.6	1,360	low-income
South Africa	n.a.	n.a.	138	upper middle-income
Tanzania	58.7	4.6	398	low-income
Uganda	59.1	5.4	343	low-income
Zambia	70.7	4.4	224	lower middle-income
Control Group				
Burkina Faso	71.6	2.1	371	low-income
Central African Republic	n.a.	n.a.	882	low-income
Congo, Dem. Rep.	80.4	5.5	693	low-income
Equatorial Guinea	n.a.	n.a.	342	upper middle-income
Lesotho	79.0	10.2	487	lower middle-income
South Sudan	n.a.	n.a.	789	low-income

Source: own creation based on ICF International 2016; WHO s.a.a; World Bank s.a.; World Bank 2016a.

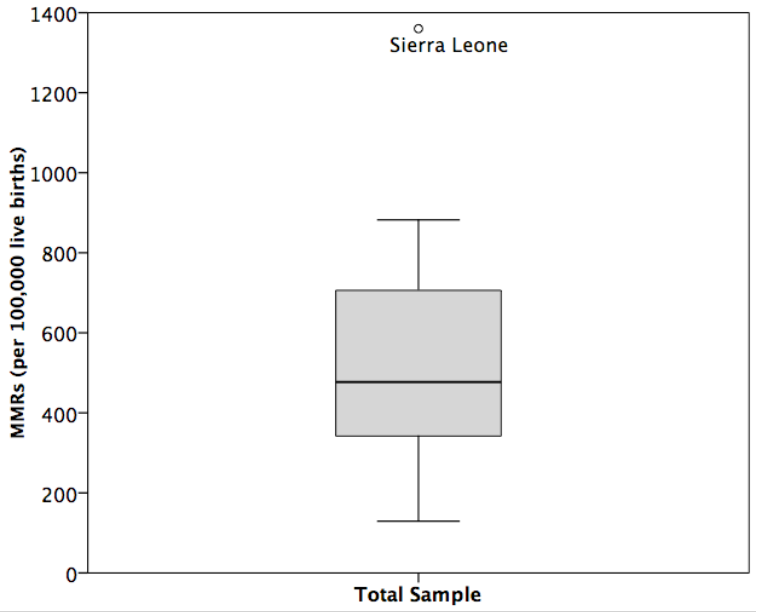
Appendix F: Boxplots for Outcome Measures (Total Sample)



Source: own illustration.



Source: own illustration.



Source: own illustration.