Zambia
Saving Mothers, Giving Life
Maternal Mortality Endline Census in Selected Districts
2017

Central Statistical Office
Lusaka, Zambia

University of Zambia Department of Population Studies
Lusaka, Zambia

Centers for Disease Control and Prevention
Lusaka, Zambia

Centers for Disease Control and Prevention
Atlanta, Georgia, USA

United States Agency for International Development
Lusaka, Zambia, and Washington, DC, USA

ICF
Rockville, Maryland, USA

This report summarizes findings of the 2017 Saving Mothers, Giving Life (SMGL) Maternal Mortality Endline Census in Zambia (2017 SMGL Census) carried out by the Central Statistics Office and the University of Zambia Department of Population Studies, under the guidance of SMGL partners, the Centers for Disease Control and Prevention (CDC) Zambia, the U.S. Agency for International Development (USAID), and ICF. Funding for the study was provided by a public-private partnership between the United States Government, namely, the U.S. President's Emergency Plan for AIDS Relief, USAID, CDC, and Merck Sharp & Dohme. ICF provided technical assistance through all stages of the project.

Additional information about the 2017 SMGL Census may be obtained from the Central Statistics Office in Lusaka, Zambia: Telephone: +260211251377, Email: infor@zamstats.gov.zm; or from the University of Zambia Department of Population Studies: Telephone: +260 211296079/69744034469, Email: population @unza.zm.

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Contents

List of figures and tables

List of figures

List of tables

List of Appendix 2 supplementary tables

Abbreviations

ANC	Antenatal Care
ASDR	Age-specific Death Rate
ASFR	Age-specific Fertility Rate
CAPI	Computer-assisted Personal Interviewing
CDC	Centers for Disease Control and Prevention
CDR	Crude Death Rate
CSPro	Census and Survey Processing system
CSO	Central Statistical Office
DHS	Demographic and Health Survey
EA	Enumeration Area
GRZ	Government of the Republic of Zambia
ICD	International Classification of Diseases
MCDMCH	Ministry of Community Development, Mother and Child Health
MDSR	Maternal Death Surveillance and Response
MMEIG	Maternal Mortality Estimation Inter-Agency Group
MMR	Maternal Mortality Ratio
MoH	Ministry of Health
SMGL	Saving Mothers, Giving Life
TFR	Total Fertility Rate
UN	United Nations
UNZA	University of Zambia
USAID	United States Agency for International Development
WHO	World Health Organisation
ZDHS	Zambia Demographic and Health Survey

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Gratitude goes to the survey and data processing teams from CSO HQ, UNZA, ICF, and CDC who worked tirelessly in providing oversight and coordination of the trainings, fieldwork, and data processing activities. Without the dedication and commitment from everyone throughout the whole process, this exercise would have been futile.

We would like to recognize and profoundly thank all the supervisors and enumerators who worked on this Census activity. We realize that they endured challenging situations and for this we are very grateful. Special thanks go to the MoH personnel who committed their time to work as Verbal Autopsy Interviewers. We also extend special gratitude to CSO regional officers from Eastern, Luapula, and Southern provinces for their support in the trainings, and supervision of the fieldwork.

Finally but definitely not the least, special gratitude goes to the respondents, community members, and traditional leaders for their cooperation and support towards this Census. Respondents provided us with valuable inputs, especially on the sensitive topic of maternal mortality, which undoubtedly reminded them the loss of their beloved. We forever remain grateful.

Musonda Lemba
Department of Population
Studies University of Zambia

Preface

The government has partnered with various stakeholders to develop effective interventions to address maternal mortality in Zambia. One of the key approaches is the Saving Mothers, Giving Life (SMGL) initiative, which is a public private partnership initiated by the United States Government in 2012 with the aim of a 50 percent reduction in maternal mortality in selected districts of Zambia between 2012 and 2016. SMGL has built on Government of the Republic of Zambia platforms and strategies, including the Campaign to Accelerate the Reduction of Maternal Mortality in Africa and the Road Map for Accelerating the Attainment of the Sustainable Development Goals.

The SMGL initiative was designed to integrate measurements of interventions and health outcomes during the period of implementation. Prior to project initiation, in 2012, a census of all households in the SMGL focus districts of Kalomo, Mansa, Nyimba, and Lundazi was conducted to measure maternal mortality at baseline. Five years after the implementation of the baseline, an Endline Census was conducted in the same districts that included Zimba and Chembe that were split from Kalomo and Mansa, respectively, after the 2010 Census of Population and Housing. The Endline Census Report shows the progress that has been achieved during the five-year period of interventions.

The 2016 SMGL Endline Census was implemented by Central Statistical Office (CSO). The University of Zambia (UNZA) Department of Population Studies and ICF provided technical and financial support. The Centers for Diseases Control and Prevention (CDC) Atlanta, CDC Zambia, the United States Agency for International Development (USAID), and Merck Sharp & Dohme provided financial support.

The Census collected birth, death, and population data from all households in SMGL target districts. The main objective was to compare key indicators for the endline reference year, 2016, with comparable indicators for the baseline reference year, 2011, from the 2012 SMGL Census. This information helps the government and partners to evaluate the impact of interventions on maternal and new born survival and to design new initiatives for health policies.

I would like to thank all CSO and UNZA staff involved in the development of this important output from the SMGL Census. I also thank and appreciate the support of the technical staff of ICF, CDC Zambia, CDC Atlanta, and the SMGL team from USAID.

Sincere gratitude goes to the field monitors, supervisors, interviewers, and drivers for their hard work and commitment. Gratitude also goes to the respondents for their patience and willingness in providing the required information. The census would not have been a success without their cooperation.

Goodson Sinyenga
Acting Director—Census and Statistics

Executive summary

Saving Mothers, Giving Life (SMGL) is a 5-year initiative that was established as a public-private partnership to reduce maternal and new-born mortality. From 2012 through 2016, SMGL interventions were implemented in target districts in Zambia to reduce high levels of maternal mortality. The 2017 SMGL Endline Census, conducted between July and September 2017, was designed to produce representative estimates for key maternal mortality and other indicators for the six target districts, for the reference period January 1 to December 31, 2016. This report presents those results and, where possible, compares them to results from the SMGL Baseline Census conducted in 2011/12.

Chapter 1 introduces the methodology of the Endline Census and appraises the age and sex data in target districts. Since the 2010 national census until 2017, SMGL districts show an annual population growth rate of 1.7 percent. This growth is slower than projected from the 2010 Census, which assumed a stable 2.4 percent growth rate per annum for rural areas. The difference in the observed and expected growth rates may be partly explained by a shrinking population among children ages 0–4, suggesting that birth rates are lower in the study period than levels projected in 2010. The difference may also be explained by a long-term pattern of out-migration, evident in SMGL districts in 2010, 2012, and 2017, especially among young men.

Chapter 2 shows women's use of maternal health care services for two periods corresponding to the baseline period (2009–2011) and the endline period (2014–2016). In 2016, total fertility rates in SMGL districts, which are primarily rural, are on par with the national average from 3–6 years ago and are lower than the rural total fertility rate during that period. Fertility is decreasing in these areas as well as in the rest of the country. Indicators of the use of maternal care services confirm that almost all women continue to access antenatal care services from a skilled provider, and there is no remarkable change between the two periods in the number and timing of antenatal care visits. Indicators of delivery care, on the other hand, show improvements in the percentage of women delivering in a health facility and their delivery being attended by a skilled provider.

Chapter 3 presents indicators of general mortality in SMGL districts, including crude death rate, life expectancy, infant and under-5 child mortality, adult mortality, and perinatal mortality. The levels of several of these indicators in 2016 are lower than national averages for the same period, and they are also lower than comparable estimates from the 2011/12 SMGL Census. Although these trends suggest improvements in mortality over the SMGL period, some of the decrease may point to challenges in obtaining a complete enumeration of deaths. Results pertaining to perinatal mortality, on the other hand, indicate that the level has not changed from 2009–2011 to 2014–2016.

Chapter 4 synthesises the evidence of lower fertility, higher use of delivery services, and lower general mortality and concludes that maternal mortality has decreased in the target districts. This report presents a 46 percent reduction in the maternal mortality ratio over the intervention period (2011–2016), and researchers may apply different appraisal and adjustment techniques to further refine the results. Comparing the causes of maternal death between the baseline and endline periods, a significantly larger share at the endline period is attributed to the category of abortions, miscarriages, and ectopic pregnancies.

Chapter 1. Introduction

1.1 Overview

Maternal mortality persists as a global health priority on the international development agenda. Millennium Development Goal 5 called for reducing maternal mortality by three-quarters between 1990 and 2015. Sustainable Development Goal 3 furthers progress by defining a target to reduce the global maternal mortality ratio (MMR) to less than 70 per 100,000 live births by 2030 (United Nations Statistical Division 2017).

Improvements in maternal health and survival also rank prominently in Zambia's national development strategies. Maternal mortality is among Zambia's health indicators whose levels have been monitored since 1970 (Government of the Republic of Zambia [GRZ] 2006). It also features as one of the top health priorities towards which the government scales up high-impact interventions (Ministry of National Development Planning [Zambia] 2017). In the health sector, maternal mortality and other determinants of maternal health are tracked closely to ensure that investments are allocated to areas in which improvements are most needed (MOH 2017).

In the period 1990–1996, Zambia's MMR was 649 deaths per 100,000 live births (Central Statistical Office [CSO] et al. 1997). The national Millennium Development Goal target for 2015 was 162 maternal deaths per 100,000 live births (Ministry of Community Development, Mother and Child Health [MCDMCH] and Ministry of Health [MoH] 2013). To reach this target, Zambia's MMR would have had to have decreased at an average annual rate of about 5.5 percent. Zambia had an estimated 224 deaths per 100,000 live births in 2015 (World Health Organisation [WHO] 2015). Despite improvements in MMR during this period, the country's decrease in maternal mortality fell short of the target, measuring a 3.8 percent annual average decrease over the target period 1990–2015 (WHO 2015). Nevertheless, substantial reductions were made as a result of a range of interventions, including improved birth spacing, higher-quality services such as emergency obstetric care and post-abortion care, community-level advocacy by safe motherhood action groups, and access to new and upgraded health facilities. Zambia's Vision for 2030 defines a new MMR target of 180 maternal deaths per 100,000 live births by 2030 (GRZ 2006).

Saving Mothers, Giving Life (SMGL) is a 5-year initiative that was established as a public-private partnership to reduce maternal and new-born mortality in Zambia, Uganda, and Cross River State in Nigeria. In Zambia, since 2012–2013, SMGL strengthens district health networks in targeted districts with high maternal mortality (Centers for Disease Control and Prevention [CDC] 2014). The SMGL interventions are multi-pronged and designed to:

- Better equip facilities to treat women with complications
- Improve the supply system to ensure available commodities
- Train and mentor staff to provide quality services
- Mobilise the community to use facility services
- Strengthen communication and transportation linkages
- Contribute to the evidence base through data collection and information management

In Zambia, phase 1 of SMGL implementation started with the 2011/12 SMGL Baseline Census (hereafter, 2011/12 SMGL Census), after which routinely reported maternal deaths recorded by health facilities were tracked in target districts. The routine monitoring of maternal deaths complements the maternal

death review reports that were part of the Zambia Maternal, Newborn, and Child Health Road Map, and ultimately the national maternal death surveillance and response (MDSR) system (MCDMCH and MoH 2013; WHO 2017). Phase 2 of SMGL implementation continued routine maternal death surveillance and concluded with the 2017 SMGL Endline Census (hereafter, 2017 SMGL Census).

This report presents results from the 2017 SMGL Census and compares them with the 2011/12 SMGL Census. It also presents levels of fertility; trends in use of maternal care services; and perinatal mortality, for which data were not available in the 2011/12 SMGL Census.

Objectives

The 2017 SMGL Census collected birth, death, and population data from all households in SMGL target districts to compare key indicators for the endline reference year (2016) with comparable indicators published for the baseline reference year (2011) from the 2011/12 SMGL Census. This information helps the government and partners evaluate the impact of interventions on maternal and new-born survival and design new initiatives for health policies.

Key indicators

The 2017 SMGL Census was designed to produce representative estimates for key indicators for the six target districts combined, focusing on the period from January 1 to December 31, 2016. The maternal mortality indicators and their standard definitions are as follows:

Maternal mortality rate: The number of maternal deaths divided by the number of women of reproductive age, expressed as 1,000 women ages 15–49

Maternal mortality ratio: The number of maternal deaths per live birth, expressed as 100,000 live births

Proportion of maternal deaths among all death of females of reproductive age: Expressed as a percentage of all deaths of women of reproductive age

Lifetime risk of maternal death: The probability of a woman dying from maternal causes over the course of her reproductive lifespan

In addition, the 2017 SMGL Census provided data for indicators in the following groups:

Fertility: Crude birth rate, age-specific fertility rates, total fertility rate, and general fertility rate

Utilization of services: Proportion of births where mother accessed timely prenatal care from a professional, and proportion of births delivered in an institution

All-cause mortality: Crude death rate, life expectancy at birth, infant and under-5 mortality, and adult mortality

Perinatal mortality: Stillbirths and early neonatal deaths per 1,000 live births and pregnancies 28+ weeks duration

Causes of maternal death: Proportions of direct causes, indirect causes, other causes, and ill-defined and unknown causes

1.2 Methodology

The Zambia SMGL initiative measures maternal mortality by identifying maternal deaths in targeted areas by using a specially designed census. The maternal mortality census methodology for the purpose of measuring maternal mortality has evolved since the early 2000s with technical inputs and funding from multiple partners. The first set of guidelines was developed by Kenneth Hill and colleagues in 2001 (Hill et al 2001). A decade later, the guidelines were updated and published by the World Health Organisation (WHO) (WHO 2011a). Most recently, WHO made available guidelines with related analysis templates to implement a maternal mortality census (WHO 2013).

A maternal mortality census is generally carried out by adding two sets of questions to a decennial, national population census. These questions are designed to collect data on recent deaths in the household and the timing of adult female deaths relative to pregnancy. Information from responses to these questions is the basis for computing the level of pregnancy-related mortality. SMGL adapted the methodology to collect data at a subnational level, in six target districts, at the beginning and at the end of a 5-year intervention period. SMGL also gathered information in verbal autopsy questionnaires to attribute a probable cause of death, thereby distinguishing causes of maternal deaths from incidental pregnancy-related deaths and other causes of death.

As with other methods to measure maternal mortality, there are limitations in the census methodology. One limitation is that the census method is prone to underreporting of deaths. A large number of households must be enumerated within a short period of time, and sometimes the available respondent is not fully knowledgeable to report all the needed information. Furthermore, recent maternal deaths occur in less than 1 percent of households, and some of these households may dissolve after a woman dies, with the remaining members absorbed into other households. A second limitation is misclassification of a maternal cause of death. Misclassification occurs for various reasons, including failure to identify pregnancies at an early stage, stigma related to pregnancies among girls, and hidden abortions.

SMGL took measures to capture all deaths as thoroughly as possible during fieldwork. For example, in addition to training and supervising field staff during the main data collection to ensure that all maternal deaths were captured, the census data were compared to deaths reported in the MDSR system**.** This routine reporting system is an independent source of maternal cause of death data that are collected in health facilities. The deaths of women of reproductive age that were identified during the census were compared with the maternal deaths recorded in the MDSR system that occurred during the same period of study and in the same districts as the census. For deaths identified in the MDSR but not during the census enumeration, verification teams were deployed to follow up on these deaths and administer the SMGL Verbal Autopsy Questionnaire. These post-enumeration cases were added to the main dataset and flagged for proper use in the analysis.[1]

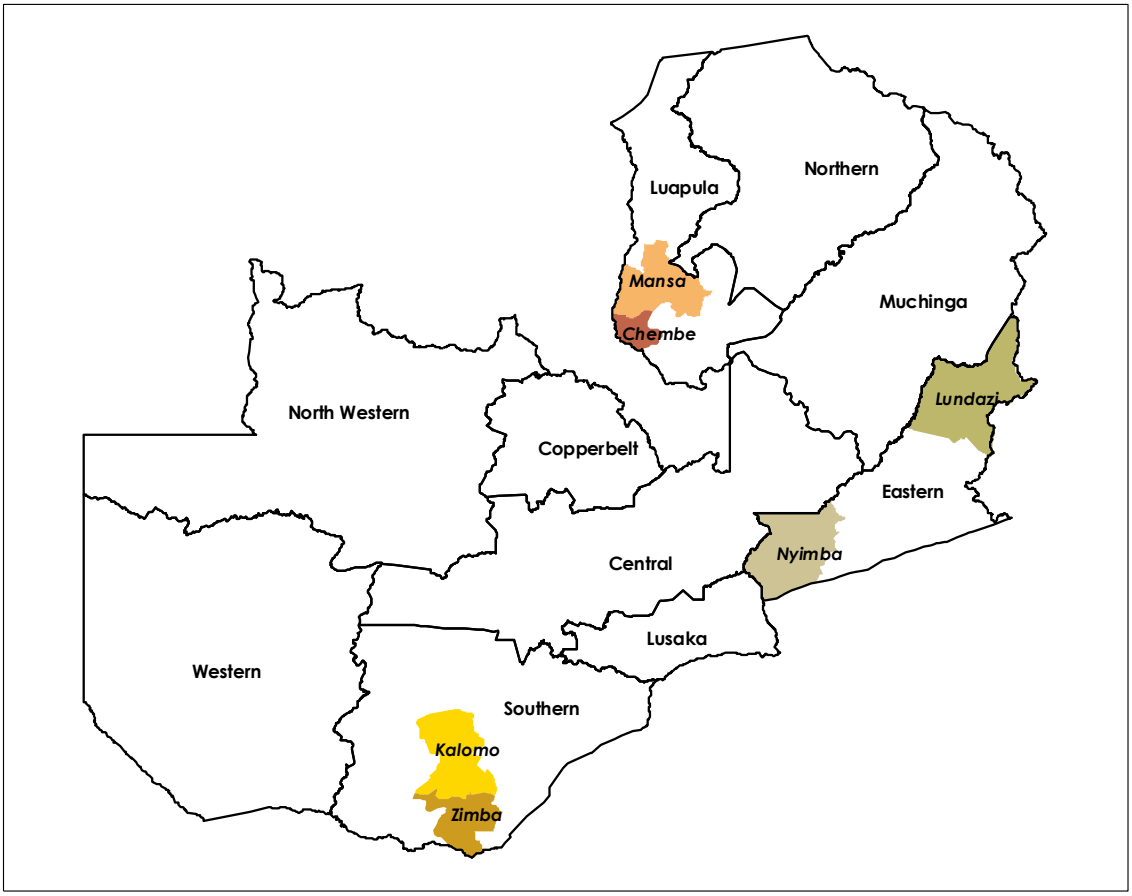
The census was further designed to select a random woman of reproductive age, in a randomly selected 10 percent of households in the census, to respond to the Pregnancy History Questionnaire. Information from this sample provided data for a trends analysis for indicators not available from the 2011/12 SMGL Census, namely, maternal care service use and perinatal mortality.

[1] The post-enumeration deaths were excluded from the proportion of maternal deaths computation in which randomness needed to be preserved and were included in the description of causes of death (see Chapter 4).

Targeted areas

The 2017 SMGL Census target areas consist of six primarily rural districts: Kalomo and Zimba districts in Southern province, Chembe and Mansa districts in Luapula province, and Nyimba and Lundazi districts in Eastern province. Figure 1.1 shows the location of the SMGL districts and provinces in Zambia.[2]

Figure 1.1: Location of SMGL districts and provinces, Zambia SMGL 2017



Source: Central Statistical Office

The 2010 Census of Population and Housing in Zambia served as the sample frame for the SMGL censuses (CSO 2012). The Central Statistical Office (CSO) selected 1,930 enumeration areas (EAs) that covered the target districts for the 2017 SMGL Census. Although this is the same total number of EAs that were in 2011/12 SMGL Census, the number of EAs within districts differ between the two censuses in part because CSO redefined boundaries for several EAs after 2012 to correct for the minimum and maximum number of households allowed per EA.[3] Nevertheless, the changes in EA boundaries are confined to the borders of the original districts so that the geographical area remains the same for both

[2] The 2012 SMGL Census targeted four districts: Kalomo, Lundazi, Mansa, and Nyimba. Two of those districts, Kalomo and Mansa, were since divided into two separate districts, thus resulting in six districts where the 2017 SMGL Census was conducted.

[3] The differences in the number of EAs were mainly in Mansa district in Luapula province, and Kalomo district in Southern province. In Mansa, several EAs were merged as a result of increasing commercial areas in urban Mansa and consequently a reduction in the number of households. The increase in the number of households in Southern province resulted in large clusters being split in Kalomo.

censuses. Up-to-date maps of households in selected EAs help guide enumerators to households and ensure full and unduplicated coverage of geographical areas (United Nations [UN] 2008). Unfortunately, it was not possible to carry out a household listing or mapping exercise in the EAs prior the baseline or endline census enumerations.

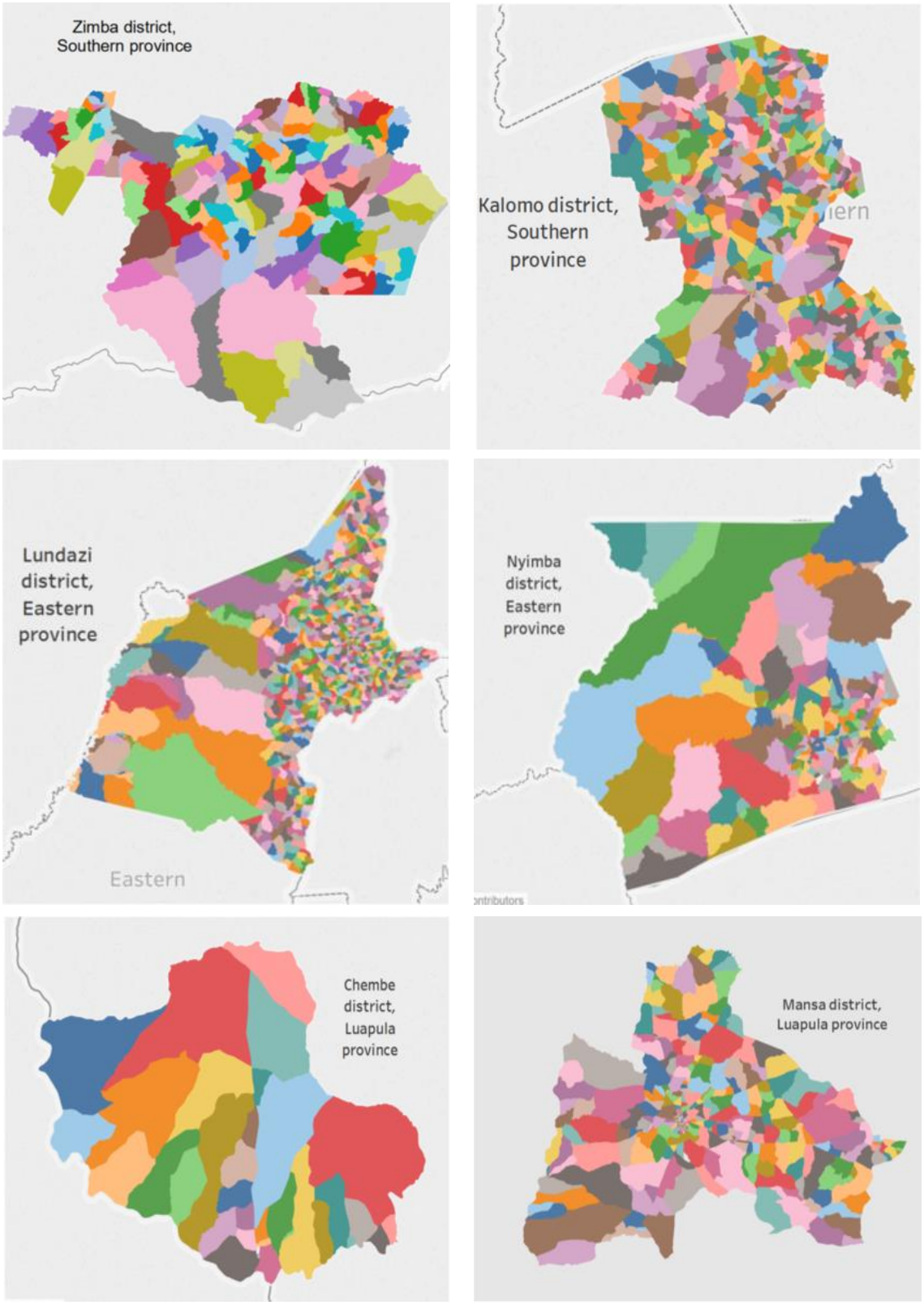
Table 1.1 shows the number of EAs selected and enumerated in the 2017 SMGL Endline Census. Of the 1,930 selected EAs, two were not enumerated because field teams discovered during data collection that they had been converted into non-residential areas after the terrain was purchased for farmland. Another EA was combined with a neighbouring EA and the two were enumerated together.

Table 1.1: Number of selected and enumerated EAs by district, Zambia SMGL 2017

Province	District	Number of EAs selected	Number of EAs enumerated	Reason for discrepancy
Eastern	Lundazi	756	755	Two EAs (no. 404 and no. 405) were combined and enumerated as one EA.
	Nyimba	190	188	Two EAs (no. 759 and no. 842) were under game management with no residences.
Luapula	Chembe	34	34	
	Mansa	383	383	
Southern	Kalomo/Zimba	567	567	
Total		1,930	1,927	

Figure 1.2 shows the boundaries of the six target districts and the repartition of EAs in each district. The average number of households in an EA is 106. EAs that are larger represent areas with low population density and more remotely located residences; EAs covering a smaller territory represent relatively more densely populated areas. Overall, Chembe district is the most sparsely populated district; the other districts show a mix of sparsely populated areas and areas with greater population density.

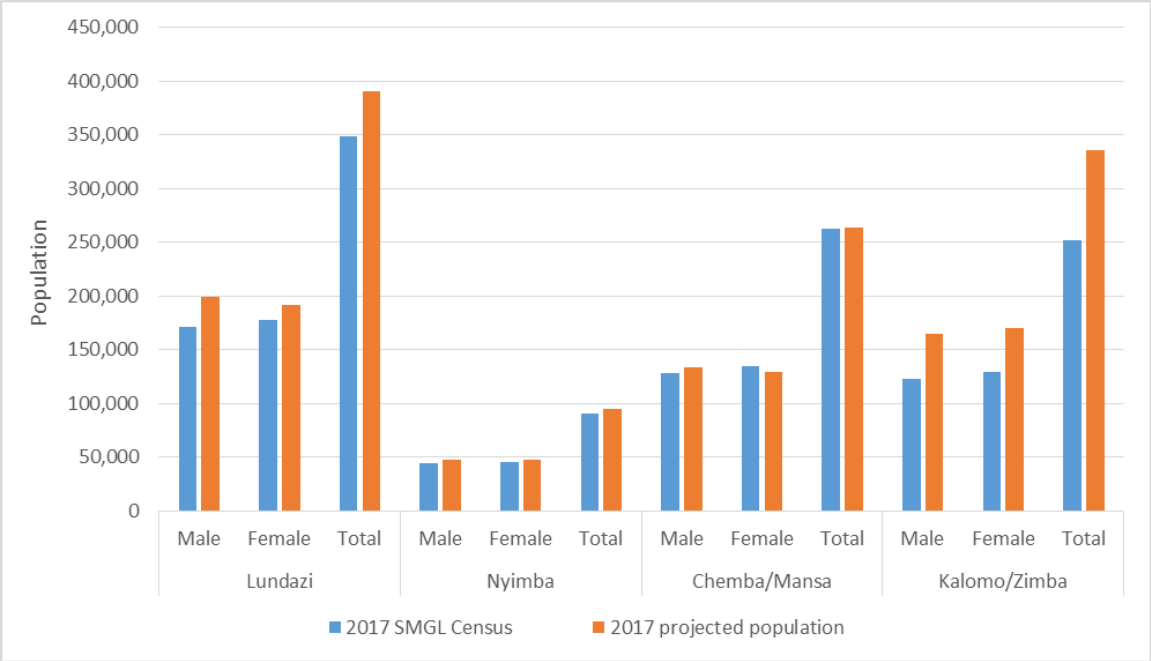
Figure 1.2: EAs enumerated, Zambia SMGL 2017



Source: EA shapefiles were provided by CSO; publicly available district boundaries were downloaded from the internet GADM. "Database of Global Administrative Areas, version 2.8," last modified November 2015. http://www.gadm.org/

Figure 1.3 compares the total population enumerated during the 2017 SMGL Census to the district census projections for 2017. The projected populations are higher than the enumerated populations in every district. In particular, in Lundazi district, the enumerated population is below the projected numbers by about 50,000, and in Kalomo/Zimba district the enumerated population is below the projected numbers by about 75,000. The differences suggest that the 2.4 percent annual growth projected for rural populations exceeded the observed growth of 1.7 percent for the six districts combined (CSO 2013a).

Figure 1.3: 2017 SMGL Census populations compared to 2017 population projections, by district



Source 2017 projected population: Central Statistical Office. 2013. *2010 Census of Population and Housing. Population and Demographic Projections 2011-2035.* Lusaka, Zambia: Central Statistical Office.

Questionnaires

Three questionnaires were used in the 2017 SMGL Endline Census. All the questionnaires provided data comparable with the 2011/12 SMGL Baseline Census data. They also incorporated additional questions to measure fertility, perinatal mortality, and use of maternal care services. The questionnaires were programmed in English in the Census and Survey Processing System computer-assisted personal interviewing (CSPro CAPI) data entry application.[4]

The Household Questionnaire collected basic sociodemographic information on each household member and on recent deaths in the household since January 1, 2016, including:

- Age, sex, marital status, education, and employment of usual household members
- Age at death, sex, and timing of adult female deaths relative to pregnancy

The household member roster was used to identify all women of reproductive age who were eligible for an individual interview. In a random 10 percent of households, if more than one woman was eligible,

[4] CSPro was developed by the U.S. Census Bureau, ICF, and Serpro S.A. with funding from the Unites States Agency for International Development.

one of those women was selected randomly to respond to a more detailed questionnaire on her pregnancy history and circumstances surrounding maternal-related care. The household death roster identified deaths of women of reproductive age for whom interviewers would administer the Verbal Autopsy questionnaire to a caregiver or other person who was knowledgeable about circumstances surrounding the death.

The Woman's Questionnaire collected information from all women ages 15–49. Women were asked questions on:

- Exact age
- Children ever born
- Children surviving
- Deaths of children
- Recent pregnancies resulting in a live birth
- Recent pregnancies not ending in a live birth

In addition, a longer version of the Woman's Questionnaire was used to collect information on a full pregnancy history and use of maternal health services. The longer version was administered to a randomly selected woman in a random 10 percent sample of households.

The Verbal Autopsy Questionnaire is an adaptation of a previous version of the WHO International Verbal Autopsy questionnaire for adults (WHO 2018). The instrument is designed to capture symptoms and circumstances surrounding the death, including maternal deaths.

1.3 Organisation and implementation

Implementing partners for the 2017 SMGL Census included the national implementing agency, the CSO, and those providing technical or financial assistance, including the University of Zambia (UNZA) Department of Population Studies, the Centers for Disease Control and Prevention (CDC) Atlanta, CDC Zambia, the United States Agency for International Development (USAID), and ICF.

Training and fieldwork

The two national partners, CSO and UNZA, organized a pre-test of the questionnaires, CSPro CAPI application, and fieldwork procedures during the period March 10–17, 2017. CSO and UNZA led the training of 20 master trainers, supported by resource personnel from CDC Atlanta, USAID, and ICF. The master trainers were part of the core team that designed the data collection instruments and the pre-test exercise. Following a review of the census tools and tablet applications, the procedures were tested in a semi-urban practice area outside Lusaka. Modifications were made to the questionnaires and CAPI based on the pre-test experiences.

CSO recruited about 350 men and women candidates to be the SMGL data collection field staff. The master trainers conducted main field staff trainings in three locations simultaneously—Livingstone in Southern province, Chipata in Eastern province, and Mansa in Luapula province—from July 12 to 20. The trainings consisted of fieldwork organisation, interviewing techniques, administration of questionnaires using CAPI, and routine data management procedures. Supervisors and selected enumerators were specially trained on administering the Verbal Autopsy Questionnaire. Parallel trainings took place to further train supervisors on their roles.

The field staff were organized into 68 teams of five persons each, including a supervisor and four enumerators, two of whom were trained as verbal autopsy interviewers. Each team had a vehicle and

chauffeur and was assigned a list of EAs in the six SMGL target districts, in which they were responsible for enumerating all households. Field staff used a mobile application, MAPS.ME, to identify boundaries of the EA. Fieldwork was launched following the main training, and the main data collection period lasted for two months, from July 23 until September 21.

CDC, in collaboration with CSO and UNZA, led a death certification workshop in Lusaka, from October 17 to 26, with 20 physicians from the Ministry of Health. During the workshop, each verbal autopsy questionnaire was reviewed by two physicians independently. The physicians recorded the causes of death on the certificate of cause of death forms and identified the probable underlying cause of death in accordance with International Classification of Diseases (ICD) rules. For a given death, if the results on the completed forms were discordant, then a third physician reviewed the Verbal Autopsy Questionnaire and that cause of death was considered the final result.

Quality assurance

Throughout the data collection fieldwork, field teams uploaded data as soon as possible after completing enumeration in an EA. The field teams often experienced difficulty in uploading new data in a timely fashion when they were working outside of network coverage. The information technology team at CSO produced a new set of 16 field check tables every week during data collection and shared them with partners at ICF, USAID, CDC, and UNZA for review.

CSO and UNZA monitored fieldwork by ensuring a rotating team of coordinators during the enumeration period. On weekly teleconference calls, CSO updated partners on any issues in the field, and partners provided feedback and recommendations to CSO based on observations from the field check tables.

An ICF technical advisor made a quality assurance visit to Zambia from August 28 to September 8. The primary purpose of the visit was to ascertain the quality of fieldwork and address any issues with central administration and field staff.

Data processing and analysis

The CSPro CAPI application incorporated logical controls, consistency checks, and plausible ranges, so data errors and inconsistencies were minimal in the raw dataset. Among the issues that needed to be addressed was incorporating the supervisors' corrections of enumerator data following a random spot-check or other data entry issue. The corrected data were captured in a separate file and required a careful incorporation in the dataset at the time of cleaning.

A large effort was also required to ensure that households were assigned to the correct EA in the dataset. Some field staff did not always enumerate households only within the boundaries of the EA and enumerated additional households outside the boundary in a neighbouring EA. Because the Global Positioning System coordinates were captured for all households, the misplaced households were able to be re-assigned to the correct EA during data cleaning.

The household and individual woman datasets were finalized in February 2018, and CSO shared the anonymized versions with SMGL Zambia partners. The verbal autopsy dataset was finalized in April 2018. Some duplicate cases were a result of adding deaths identified from the MDSR that later were found to have been enumerated during the main data collection. Other duplicate cases were those that had been reviewed by more than one pair of physicians and, because the cause of death data entry was not centralized, the same cases, now with cause of death assigned, were re-entered as separate cases.

CDC and ICF analysed data using a variety of software packages. The data were captured and cleaned using CSPro 6.0. EA maps were produced using QGIS 2.14[5] and Tableau 10.4.[6] Tables and indicators were produced using CSPro 6.0 and the statistical software packages SAS, Stata, and SPSS. Various demographic software packages were used to assess populations and deaths: the U.S. Census Bureau Population Analysis System for Excel,[7] United Nations (UN) MortPak,[8] the International Union for the Scientific Study of Population[9] demographic tools for demographic estimation, and the WHO Maternal Mortality Ratios Package Built-in Functions Worksheets.[10]

1.4 Household enumeration and response rates

The 2017 SMGL Census Training Manual defines household as "a group of persons who normally live and eat together; these people may or may not be related by blood, but make common provision for food or other essentials for living and they have only one person whom they all commonly regard as head of the household." Members of the household are those who normally live and eat together even if they do not sleep under one roof.

Table 1.2 shows the distribution of enumerated households by district. A total of 188,181 occupied households were listed in the target areas. Mansa is a provincial centre and has the highest percentage of urban households (11 percent); the remaining districts comprise households in areas that are almost wholly rural.

Table 1.2: Percentage of occupied households, by residence, Zambia SMGL 2017

Province	District	Rural	Urban	Total	Number of households
Eastern	Lundazi	35.1%	1.6%	100.0%	68,945
	Nyimba	8.6%	1.0%	100.0%	18,054
Luapula	Chembe	3.0%	0.0%	100.0%	5,666
	Mansa	13.5%	11.1%	100.0%	46,176
Southern	Kalomo	16.5%	2.7%	100.0%	36,101
	Zimba	6.8%	0.3%	100.0%	13,239
Total		83.4%	15.6%	100.0%	188,181

Table 1.3 presents the response rates for household, woman, and verbal autopsy interviews. Among the occupied households, 96 percent completed an interview. Women's overall response rates were 92 percent, and slightly higher for the subsample of women (94 percent). The response rates compare favourably with the 2013-14 Zambia Demographic and Health Survey (ZDHS), which had slightly higher household response rates (98 percent) and response rates among women (96 percent) (CSO et al. 2014).

The verbal autopsy response rate is 88 percent for the target districts, ranging from 83 percent in Nyimba to 90 percent in Kalomo/Zimba. This response rate is a result of verification teams going back to

[5] QGIS website, https://www.qgis.org/en/site/
[6] Tableau. 2017. Tableau Desktop Professional Edition 10.4
[7] United States Census Bureau. 2014. Population Analysis System Software. https://www.census.gov/data/software/pas.html
[8] United Nations Population Division. 2013. MortPak version 4.3. http://www.un.org/en/development/desa/population/publications/mortality/mortpak.shtml
[9] International Union for the Scientific Study of Population. 2014. Tools for Demographic Estimation. http://demographicestimation.iussp.org/
[10] WHO. 2013. Maternal Mortality Ratios Package Built-in Functions Worksheets. http://www.who.int/reproductivehealth/publications/monitoring/9789241506113/en/

the field to complete interviews that had not been completed during main data collection. During the main data collection, often the most qualified respondent was not available for the interview, so verification teams were instructed to find the next best respondent knowledgeable about the deceased woman's circumstances leading to death. This follow-up activity improved response rates to the Verbal Autopsy Questionnaire.

Table 1.3: Results of the household, woman, and verbal autopsy interviews

Number of households, number of interviews, and response rates, according to district, Zambia SMGL 2017

	Lundazi	Nyimba	Chembe/ Mansa	Kalomo/ Zimba	Total
Household interviews					
Households occupied	68,945	18,054	51,844	49,338	188,181
Households interviewed	67,410	17,511	48,906	46,450	180,277
Household response rate[a]	97.8	97.0	94.3	94.1	95.8
Interviews with women ages 12–49 (all women)					
Number of eligible women	90,304	23,829	71,350	63,736	249,219
Number of women interviewed	84,477	22,202	64,598	58,133	229,410
Eligible women response rate[b]	93.5	93.2	90.5	91.2	92.1
Pregnancy history interviews with women ages 12–49 (random woman selected in 10% of households)					
Number of eligible women	5,092	1,267	3,090	3,168	12,617
Number of women interviewed	4,873	1,208	2,816	2,938	11,835
Eligible women response rate[b]	95.7	95.3	91.1	92.7	93.8
Verbal autopsy interviews					
Number of deceased women ages 15–49	278	118	423	172	991
Number of verbal autopsy interviews completed	245	98	376	154	873
Verbal autopsy response rate[c]	88.1	83.1	88.9	89.5	88.1

[a] Household interviewed/households occupied

[b] Women interviewed/eligible women

[c] Verbal autopsies conducted/deceased women of reproductive age

Household members

Information on key aspects of the composition of households is presented in Table 1.4. Overall in the target districts, about one-quarter of households are headed by women (23 percent, compared to 27 percent in the 2013-14 ZDHS in rural areas). The mean size of households is 5.3 people, with little variation between the target districts and similar to the average number of 5.4 in the 2013-14 ZDHS.

Table 1.4: Household members

Percentage distribution of households by sex of head of household and by household size, mean size of household, according to district, Zambia SMGL 2017

	Lundazi	Nyimba	Chembe/ Mansa	Kalomo/ Zimba	Total
Characteristics of household head					
Male	80.1	73.8	77.5	73.6	77.1
Female	19.9	26.2	22.5	26.4	22.9
Total	100.0	100.0	100.0	100.0	100.0
Number of usual members					
1	4.7	5.0	4.9	5.0	4.9
2	8.7	6.9	7.6	7.7	7.9
3	14.0	13.0	12.0	12.8	13.1
4	15.6	17.1	15.2	15.4	15.6
5	15.7	16.3	15.1	14.6	15.3
6	14.5	14.4	14.1	13.1	14.0
7	11.0	11.2	11.5	11.0	11.2
8	6.8	7.6	8.5	7.9	7.6
9+	9.0	8.5	11.0	12.4	10.4
Total	100.0	100.0	100.0	100.0	100.0
Mean size of households	5.2	5.2	5.4	5.4	5.3
Number of households	67,410	17,511	48,906	46,450	180,277

1.5 Appraisal of population data

Any census is a large undertaking that is prone to data quality issues resulting from finite time and resources for training and fieldwork and for coverage of remote EAs. For these reasons and others, census data, including data from the SMGL Censuses, contain errors and inconsistencies that ultimately affect the accuracy of indicators. We used basic demographic methods to assess the age and sex structure of the 2017 SMGL Census population and identify common errors such as underreporting and age misreporting.

Information on age and sex provide the basic data for analysis of fertility and mortality measures. Table 1.5 presents the distribution of the household population by age and sex. The 2017 SMGL Census enumerated a total of 954,750 persons (466,884 males and 487,866 females). About half the population is under age 15 (48 percent), and 16 percent is under age 5. Persons age 65 and older account for about 3 percent of the total population. These proportions are similar across the SMGL targeted areas (see Appendix 2, Table 1.1). They do not vary more than one or two percentage points from proportions in the 2013-14 ZDHS.

Table 1.5: Household population by age and sex

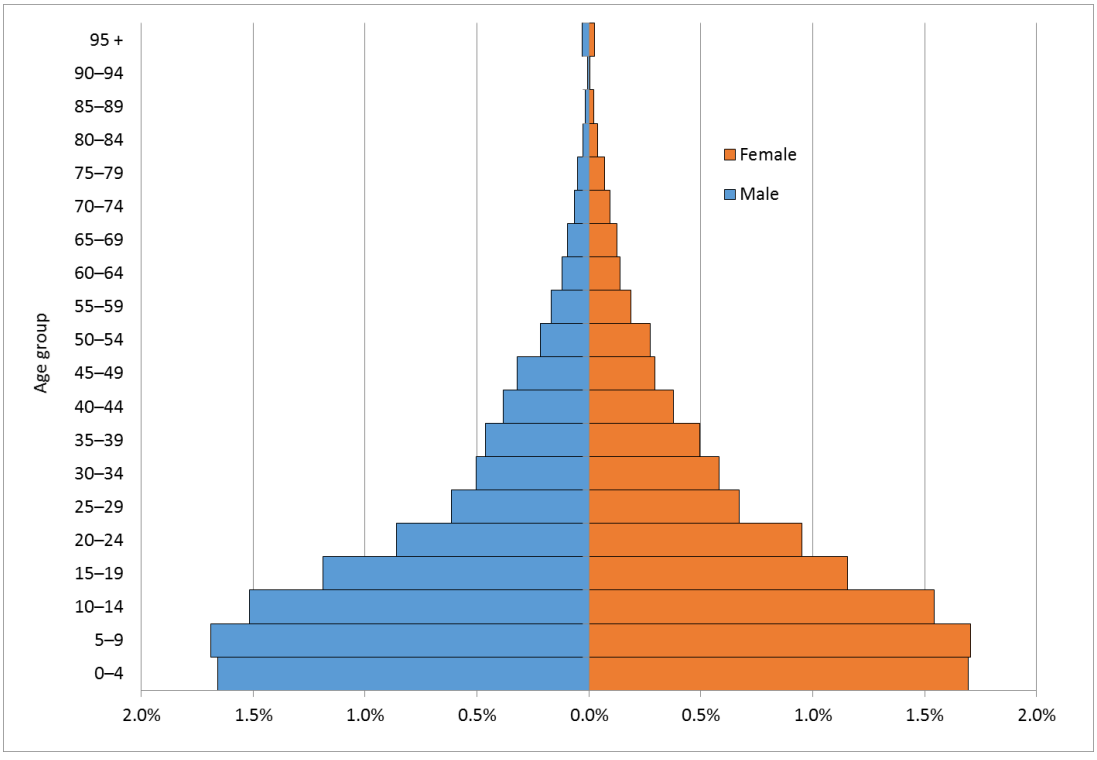
Percentage distribution of the household population by 5-year age groups, according to sex, Zambia SMGL 2017

	Male	Female	Total
Age			
<5	16.6	16.2	16.4
5–9	16.9	16.3	16.6
10–14	15.2	14.8	15.0
15–19	11.9	11.1	11.5
20–24	8.6	9.1	8.9
25–29	6.2	6.4	6.3
30–34	5.0	5.6	5.3
35–39	4.6	4.7	4.7
40–44	3.8	3.6	3.7
45–49	3.2	2.8	3.0
50–54	2.2	2.6	2.4
55–59	1.7	1.8	1.7
60–64	1.2	1.3	1.3
65–69	1.0	1.2	1.1
70–74	0.6	0.9	0.8
75–79	0.5	0.7	0.6
80+	0.8	0.9	0.8
Total	100.0	100.0	100.0
Number	466,884	487,866	954,750

Population pyramid

Figure 1.4 shows the population pyramid by 5-year age groups for the 2017 SMGL Census. The broad base represents Zambia's young population under 5 years of age. The horizontal bar at the base is the same or slightly smaller than the one above it, indicating that fertility has declined over the last 5 years.

Figure 1.4: Population pyramid by 5-year age groups, by sex, Zambia SMGL 2017



Population by single years

The population distribution in single years reveals age preference for ages ending in the digits 0 and 5 (Figure 1.5). This is not uncommon when the household respondent may not be able to report the accurate ages of other household members, and when household members may not even know their own exact age. Using Whipple's Index to test for age heaping, the 2017 SMGL Census female data show less heaping on the digits 0 and 5 than the male data.[11] The data for females are categorized as "approximately accurate data" (Whipple's index at 0 and 5 is 116.3), and the data for males are categorized as "rough data" (Whipple's index at 0 and 5 is 136.8).

Figure 1.5: Population distribution by single-year age groups, by sex, Zambia SMGL 2017

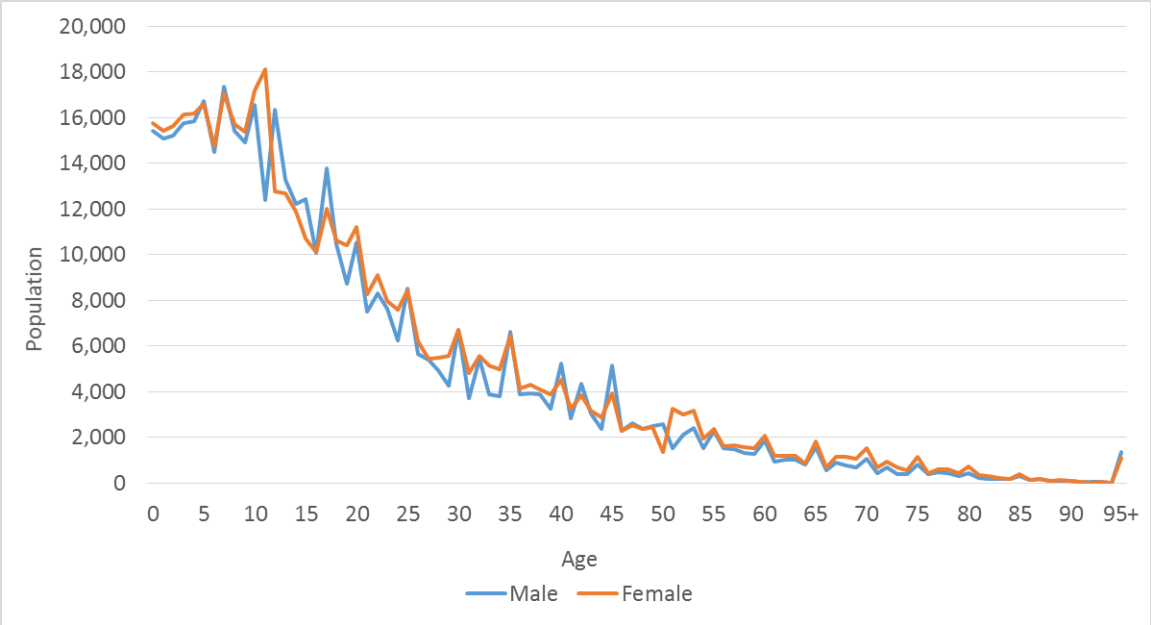
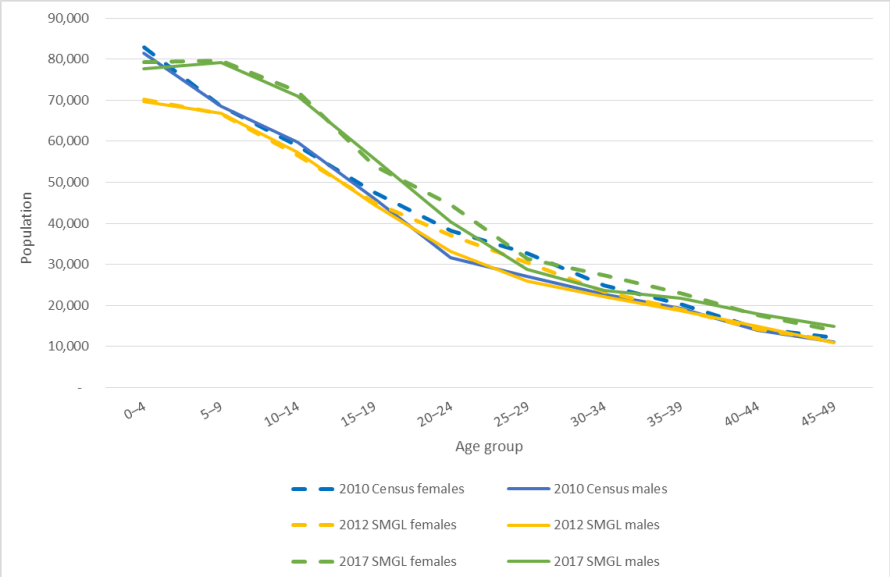
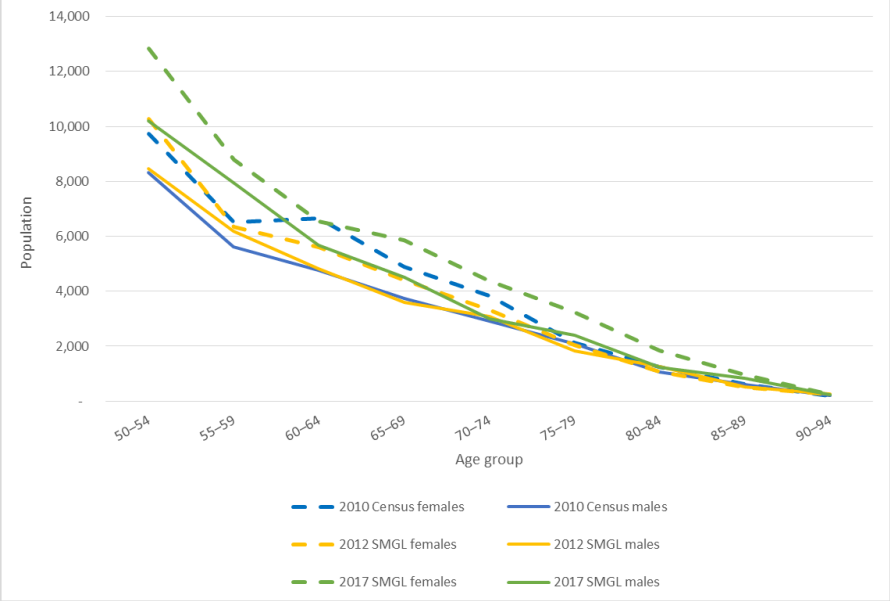


Figure 1.6 shows a comparison of the age and sex distributions for the three censuses used for producing mortality statistics, including the 2017 and 2011/12 SMGL Censuses and the 2010 Population and Housing Census. (The data are truncated at 50 years because there were no distinguishable differences between these lines in older age groups.) We expect the 2010 and 2012 census populations to be similar because the enumeration reference period was less than 18 months apart (mid-October 2010 for the Population and Housing Census and mid-March 2012 for the 2011/12 SMGL Census). The 2017 SMGL Census was conducted 5 and a half years after the 2011/12 SMGL Census (mid-August 2017). The 2012 and 2017 distributions suggest reductions in the numbers of births since 2010, and the ages over 5 indicate an expanding population through age 25. All three censuses show an excess of women starting in the 15–19 age group through the 30–34 age group.

[11] Respondents to a census or other survey sometimes report their age or date of birth as a round number (typically ending in 0 or 5). Whipple's index (or index of concentration), invented by American demographer George Chandler Whipple (1866–1924), is a method to measure the tendency for individuals to inaccurately report their actual age or date of birth.

Figure 1.6: Age and sex distribution of the SMGL target areas, Zambia Census 2010, Zambia SMGL 2011/12, and Zambia SMGL 2017



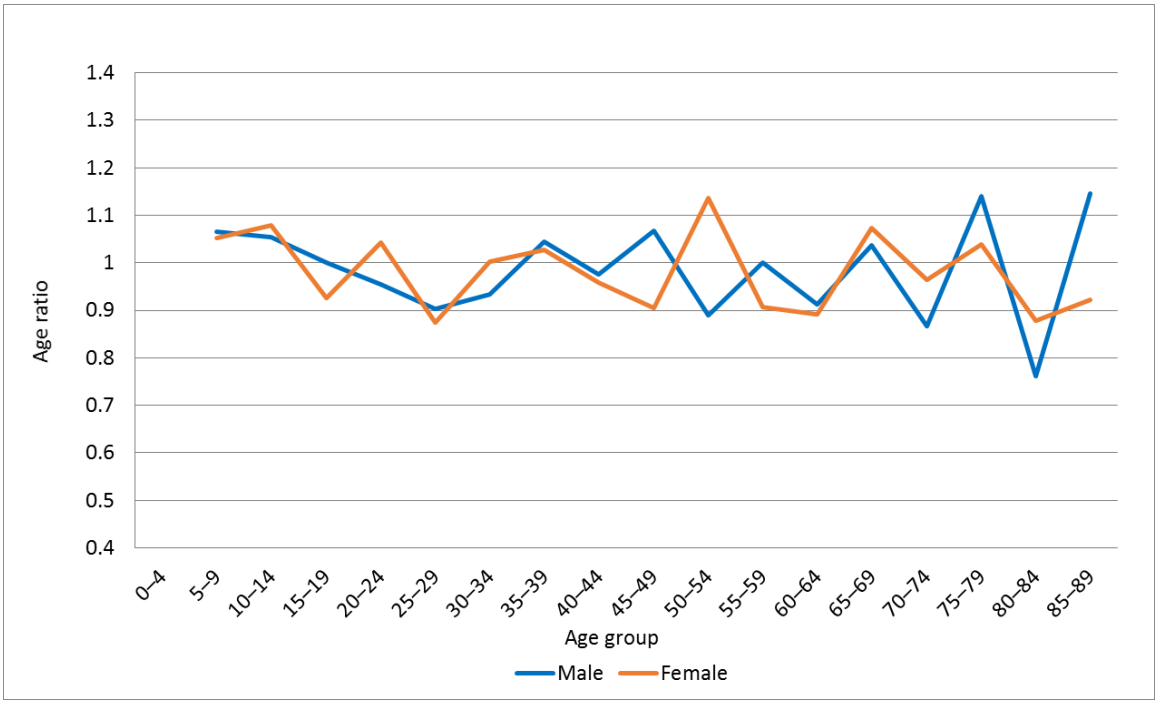


Age ratios

Figure 1.7 plots age ratios by 5-year age groups, in which the age ratio for a given age group is the ratio of twice the population in that age group to the sum of the population in each of the adjacent age groups. An age ratio of more than one means that there are more than the number of expected people in that age category and, conversely, fewer than expected in one or both neighbouring age categories.

The graph reveals evidence of some age transference among women, from age group 45–49 to age group 50–54. This is noted in the spike above the value of 1.1 for age group 50–54 (and the associated decreases in the two neighbouring age groups).

Figure 1.7: Age ratios for males and females, Zambia SMGL 2017



Sex ratios

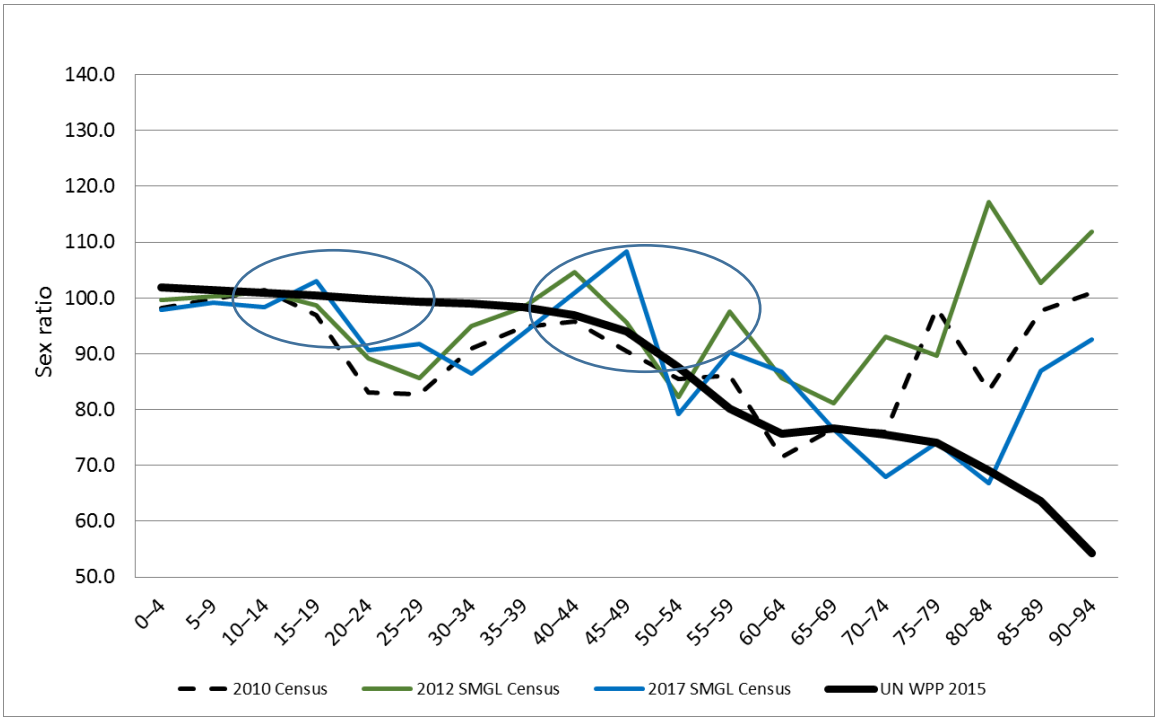
The sex ratio naturally varies across age groups as death and migration patterns influence the population sex and age structure. A sex ratio of 100 indicates the same number of males and females in an age category; a sex ratio below 100 indicates more females than males.

Overall, SMGL districts have an average of 96 men per 100 women. Figure 1.8 compares the expected age and sex ratio pattern from the 2015 World Population Profile estimates for Zambia with the 2017 SMGL Census data, the 2010 Population and Housing Census data, and the 2011/12 SMGL Census data (United Nations Population Division 2017).

The sex ratios from the census population counts are not as smooth as the estimates, as is expected. Two notable divergences from the expected pattern are: (1) a deficit of men relative to young women between ages 20 and 34, and (2) a surplus of men in older adult ages. The first observation is most interesting for SMGL purposes because we focus on these age groups to understand changes in maternal health and survival. The relative deficit of young men is likely explained by the trend of men migrating from rural to urban areas (CSO 2013b).

At the older ages, age 75 and older, the sex ratios are very high—in excess of 100—which may be due to age exaggeration among older men.

Figure 1.8: Sex ratios by 5-year age groups, 2015 World Population Profile estimates for Zambia compared to Zambia SMGL 2017, Zambia Census 2010, and Zambia SMGL 2011/12



UN WPP=UN World Population Prospects

Chapter 2. Maternal health

2.1 Objectives

This chapter presents information on selected determinants related to maternal health and mortality, namely, fertility levels, and access to antenatal and delivery care. The fertility indicators are for 2016, and the antenatal care (ANC) and delivery care indicators are for 2009–2011, corresponding to the SMGL baseline period, and 2014–2016, corresponding to the SMGL endline period.

Key indicators

The fertility indicators are derived from all women of reproductive age who responded to the 2017 SMGL Census Woman's Questionnaire:

Age-specific fertility rates (ASFRs): The number of live births per 1,000 women, categorized in 5-year age groups

Total fertility rate (TFR): The number of live births a woman would have if she were subject to the current age-specific fertility rates throughout her reproductive years (15–49 years)

General fertility rate: The number of live births per 1,000 women ages 15–44. The number of births is adjusted whereby the ASFRs are applied to the age structure of women in the household population.

Crude birth rate: The number of live births per 1,000 population during a specified period

The maternal health indicators are derived from the subsample of women who responded to the more detailed 2017 SMGL Census Pregnancy History Questionnaire. These indicators are grouped as ANC indicators and delivery care indicators as follows:

Antenatal care: Type of ANC provider, number and timing of ANC visits, reasons for not accessing ANC services, place of most recent ANC visit

Delivery care: Place of delivery, reasons for not delivering in a facility, assistance during delivery

2.2 Background characteristics of women

Table 2.1 shows the sociodemographic profile of women ages 12–49 who were interviewed. The number of women in each age category decreases continuously from age group 15–19, indicating the young age structure of the population. More than half of the women are married or living with a partner (55 percent). Relatively small proportions of women are separated (5 percent) or divorced (2 percent).

Table 2.1: Background characteristics of women ages 12–49

Percentage distribution of women ages 12–49 by selected background characteristics, Zambia SMGL 2017

	Percentage	Number
Age		
12–14	15.2	37,872
15–19	21.6	53,943
20–24	17.8	44,403
25–29	12.6	31,318
30–34	10.9	27,219
35–39	9.2	23,040
40–44	7.1	17,648
45–49	5.5	13,776
Marital status		
Never married	37.7	94,031
Married/in union	55.0	136,970
Divorced/separated	5.3	13,232
Widowed	2.0	4,986
Education		
No formal education	8.3	20,601
Primary	59.3	147,802
Secondary	29.6	73,795
Higher	2.8	7,021
District		
Lundazi	36.2	90,304
Nyimba	9.6	23,829
Chembe/Mansa	28.6	71,347
Kalomo/Zimba	25.6	63,739
Total women ages 12–49	100.0	249,219

Only 8 percent of women have not attended any formal education; about 60 percent of women have attended only primary school, and 30 percent have attended secondary school. By district, more than one-third of the women live in Lundazi, about one-quarter live in Chembe/Mansa and in Kalomo/Zimba, and 10 percent live in Nyimba.

2.3 Fertility

Information on fertility is used in the calculation of maternal mortality indicators, and levels of fertility are directly and positively associated with the magnitude of several of the indicators. This is explained by the fact that the incidence of pregnancy, and the risk inherent in pregnancy, exposes women to the possibility of death from maternal causes. These risks vary by age and other factors and can be standardised across different fertility scenarios by using an MMR, which expresses the risk of death per delivery instead of per woman.

In 2016, the TFR for the target areas (predominantly rural) was 5.3 births per woman (Table 2.2). In comparison, the national TFR was 5.3 in the 5-year period prior to the 2013-14 ZDHS (6.6 for rural areas), and the TFR from the 2010 Census was 5.9 (7.0 in rural areas). Figure 2.1 shows total fertility rates for the SMGL districts in 2016, which range from 4.7 in Chembe/Mansa to 6.2 in Kalomo/Zimba. See Appendix 2, Table 2.1 for fertility indicators by district.

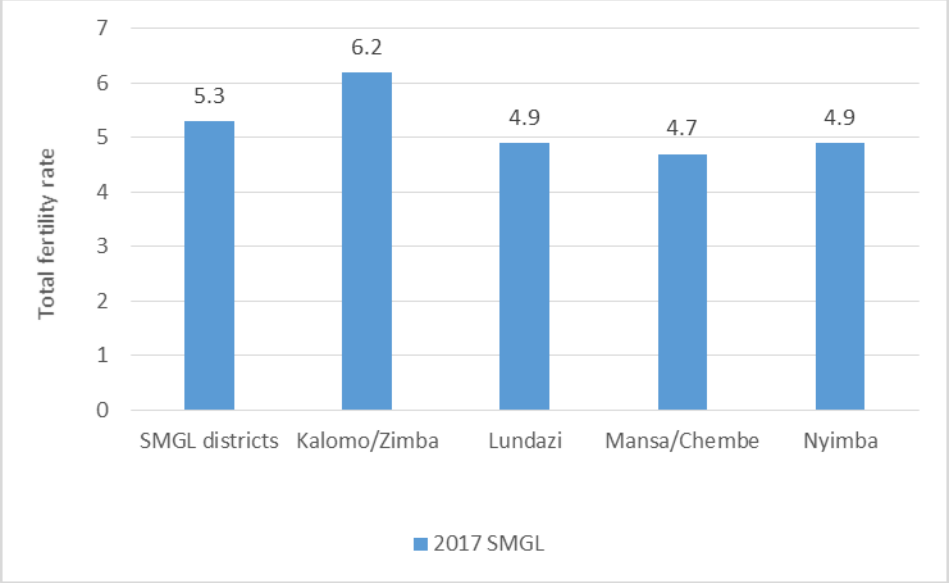
Table 2.2: Current fertility rates

Age-specific and total fertility rates, the general fertility rate, and the crude birth rate, 2016, Zambia SMGL 2017

	Number of live births	Number of women ages 15–49	Age-specific fertility rates per 1,000 women ages 15–49
Age group			
15–19	7,549	49,359	152.9
20–24	9,499	39,115	242.8
25–29	6,299	27,808	226.5
30–34	5,057	25,542	198.0
35–39	2,920	19,521	149.6
40–44	1,199	16,132	74.3
45–49	136	10,425	13.0
Total fertility rate (ages 15–49)			5.3
General fertility rate[a]			184.5
Crude birth rate			34.2

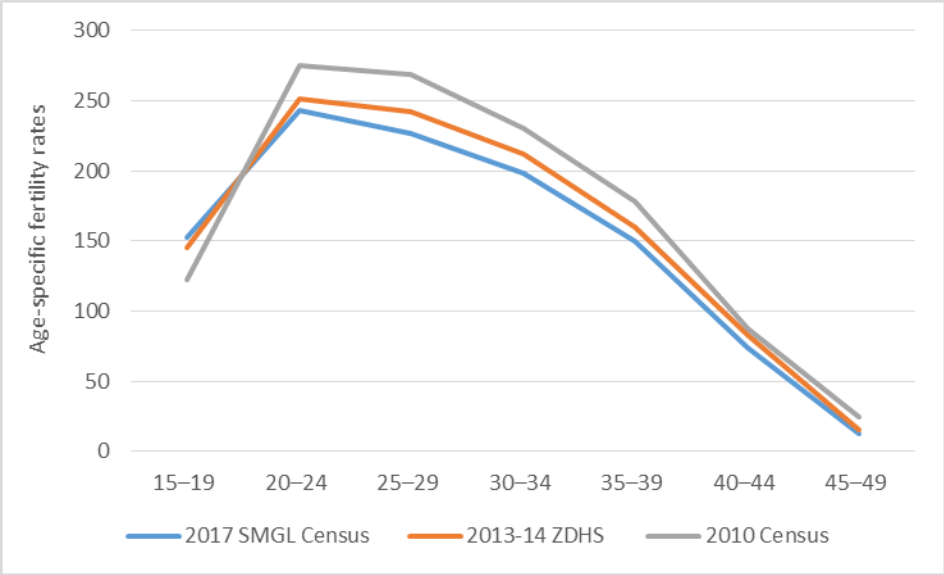
[a] Age-adjusted rate based on age distribution of respondents to the Woman's Questionnaire

Figure 2.1: Total fertility rates by SMGL districts, 2016, Zambia SMGL 2017



The peak fertility ages, evident in the highest ASFRs, are among women between ages 20 and 29. Figure 2.2 shows the pattern of age-specific fertility levels from the most recent ZDHS and from the 2010 Census (national level). The 2011/12 SMGL Census did not collect information on women's fertility.

Figure 2.2: Age-specific fertility rates for 2016, 2011–2014, and 2010, from selected sources, 2017 SMGL Census, 2013/14 ZDHS, and 2010 Census



2.4 Antenatal care

Using ANC services is an important factor in minimizing the risk of maternal morbidity and mortality. The 2017 SMGL Census collected data from women on the nature of their prenatal visits during their recent births, for 2014–2016, corresponding to SMGL endline period, and for 2009–2011, corresponding to SMGL baseline period.[12]

Antenatal care provider

Table 2.3 shows the percentage distribution of women in 2014–2016 by provider of ANC received during pregnancy, according to their age at birth, education level, and district of residence. Women were asked to report on all persons they saw for ANC for their last birth; however, if a woman saw more than one provider, only the provider with the highest qualifications was considered in the tabulation of results.

Ninety-two percent of mothers received ANC from a skilled provider (a doctor, nurse, midwife, or clinical officer). Six percent consulted someone who was not formally trained, and 2 percent saw no one for ANC. Across levels of education, women with higher education were more likely to consult a skilled attendant, with 99 percent of women with higher education consulting a skilled attendant, compared to 91 percent of women with no formal education.

[12] Data for ANC indicators are derived from the subsample of women interviewed. The number of cases are too few to present results for 2016 (endline) and 2011 (baseline), so results are combined over 3-year periods: 2014–2016 (endline period) and 2009–2011 (baseline period).

Table 2.3: Antenatal care 2014–2016

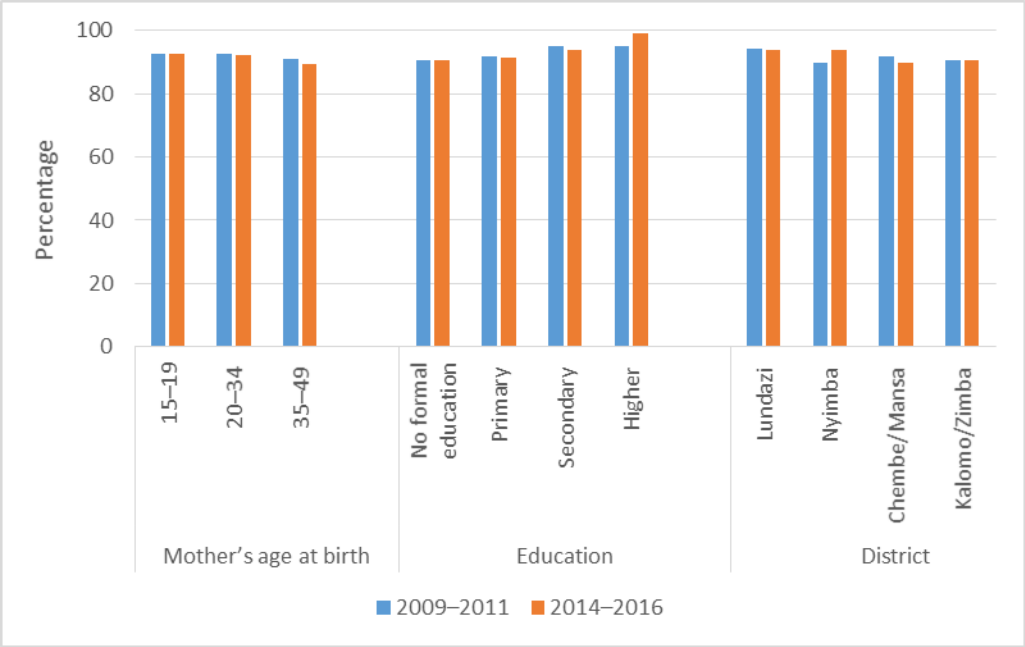
Percentage distribution of women ages 15–49 who had a live birth from 2014 to 2016, by ANC provider for the most recent birth, and the percentage receiving ANC from a skilled provider for the most recent birth, according to background characteristics, Zambia SMGL 2017

Background characteristic	Doctor	Nurse/midwife/ clinical officer	Traditional birth attendant	Other	No one	Total	Percentage from a skilled provider*	Number of women
Mother's age at birth								
15–19	8.8	83.8	1.8	3.9	1.6	100.0	92.7	1,538
20–34	7.0	85.3	2.1	3.9	1.6	100.0	92.3	3,602
35–49	8.5	81.0	3.5	4.6	2.4	100.0	89.5	659
Education								
No formal education	11.4	79.1	3.2	3.2	3.1	100.0	90.5	555
Primary	7.7	83.6	2.4	4.6	1.7	100.0	91.3	3,492
Secondary	6.0	87.8	1.6	3.2	1.3	100.0	93.9	1,654
Higher	12.2	86.7	0.0	1.0	0.0	100.0	99.0	98
District								
Lundazi	8.6	85.3	1.7	3.5	0.9	100.0	93.8	2,353
Nyimba	23.0	71.1	1.6	3.3	1.1	100.0	94.0	553
Chembe/Mansa	4.6	85.2	4.3	4.0	1.9	100.0	89.8	1,273
Kalomo/Zimba	3.5	87.1	1.4	5.0	3.0	100.0	90.6	1,620
Total	7.7	84.4	2.2	4.0	1.7	100.0	92.1	5,799

* Skilled provider includes doctor, nurse/midwife, and clinical officer

Figure 2.3 compares trends in ANC between 2014–2016 and 2009–2011. Overall, the same percentage of women received ANC from a skilled provider in both periods (92 percent). (See Appendix 2, Table 2.2 for more details on the period 2009–2011.)

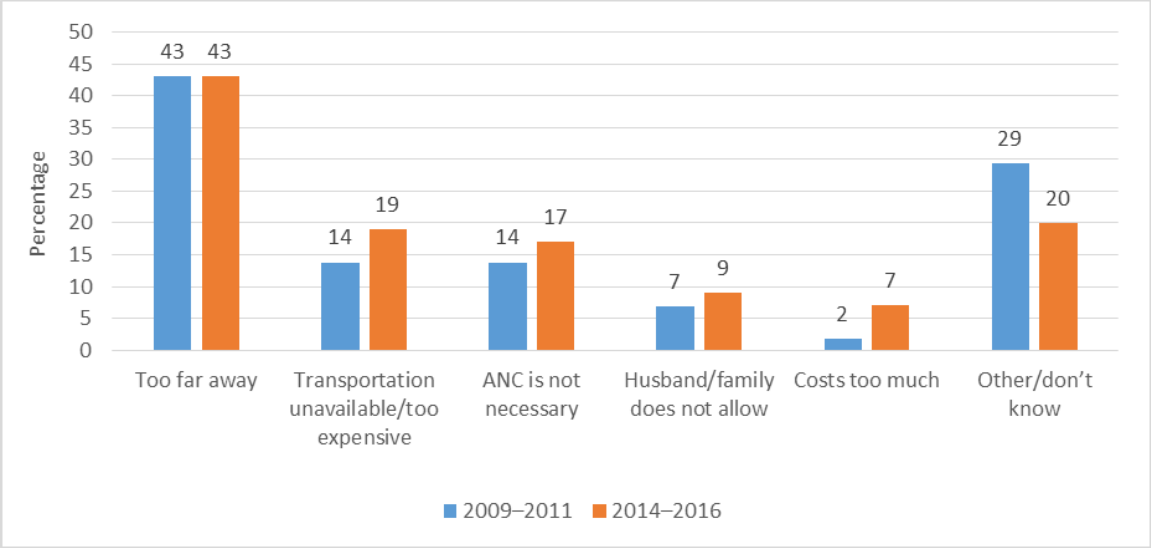
Figure 2.3: Percentage of women who received ANC from a skilled provider, among women who had a live birth in the periods 2009–2011 and 2014–2016, according to background characteristics, Zambia SMGL 2017



Reasons for not accessing ANC

For women who did not access ANC, more than half did not access services because they were too far away or transportation was not available or affordable (Figure 2.4). Less than 10 percent had a husband or family member who was not supportive. (See Appendix 2, Tables 2.3a and 2.3b, for more details).

Figure 2.4: Among women not seeking ANC, the percentage distribution of of women who received ANC from a skilled provider, among women who had a live birth in the periods 2009–2011 and 2014–2016, according to background characteristics, Zambia SMGL 2017



Number and timing of antenatal visits

WHO recommends that pregnant women seek ANC from a trained provider at least four times during a pregnancy. The earlier in pregnancy that these regular visits start, the more likely that complications can be avoided or successfully addressed at an early stage.

In 2014–2016, 95 percent of pregnant women had more than one ANC visit, and two-thirds had four or more visits (61 percent) (Table 2.4). Forty-two percent of these women made the first visit in the recommended first trimester (before the fourth month), and 88 percent made an ANC visit within the first 5 months of pregnancy.

Table 2.4: Number of ANC visits and timing of first visit

Percentage distribution of women ages 15–49 who had a live birth from 2014 to 2016 by number of ANC visits for the most recent live birth, and the timing of the first visit, and among women with ANC, median months pregnant at first visit, by residence, Zambia SMGL 2017

Number and timing of ANC visits	Rural	Urban	Total
Number of ANC visits			
None	1.8	1.4	1.7
1	1.1	2.7	1.3
2–3	33.9	40.5	34.6
4+	61.4	53.7	60.6
Don't know	1.8	1.6	1.7
Total	100.0	100.0	100.0
Number of months pregnant at time of first ANC visit			
No ANC	1.76	1.4	1.7
<4	43.4	26.1	41.5
4–5	45.4	54.6	46.2
6–7	7.9	16.3	8.8
8+	1.5	1.4	1.5
Total	100.0	100.0	100.0
Number of women	5,175	624	5,799
Median months pregnant at first visit (for those with ANC)	4.2	4.8	4.3
Number of women with ANC	5,084	615	5,699

Figures 2.5 and 2.6 show that trends are constant over the two periods for the average numbers of ANC visits women made and the timeliness of their accessing ANC. The proportion of women by number of ANC visits was about the same in 2009–2011 and 2014–2016; likewise, the median months pregnant at first visit was 4.3 for both periods. (See Appendix 2, Table 2.4, for more details on the period 2009–2011.)

Figure 2.5: Percentage of women with no antenatal visits and with one or more visits to a skilled provider, among women who had a live birth in the periods 2009–2011 and 2014–2016, according to residence, Zambia SMGL 2017

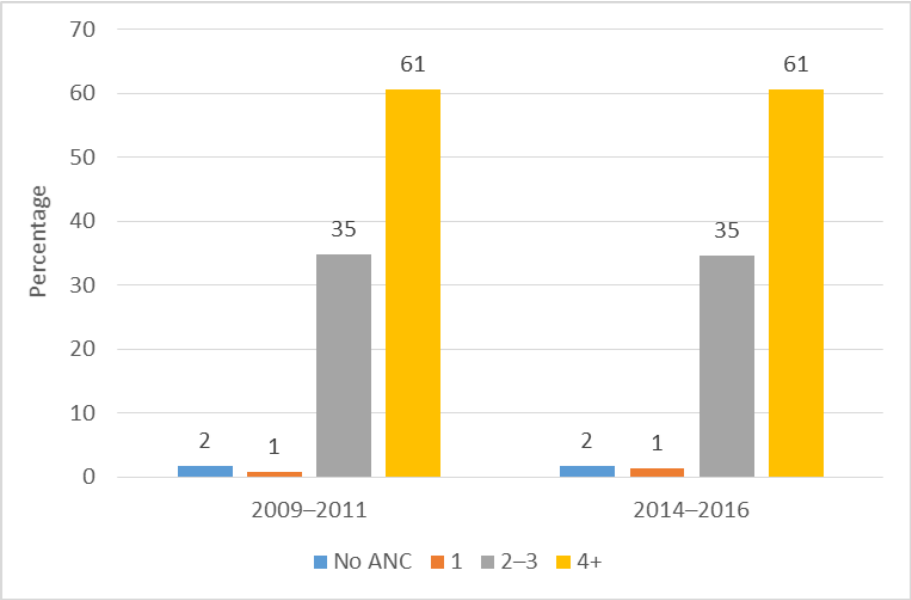
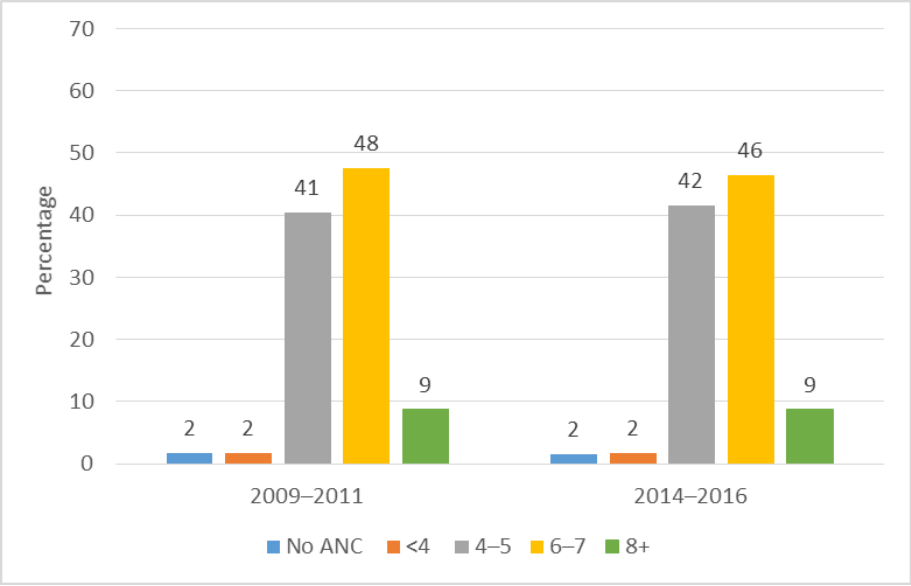


Figure 2.6: Percentage of women by the number of months pregnant at the time of first ANC visit, among women who had a live birth in the periods 2011–2014 and 2014–2016, according to residence, Zambia SMGL 2017



Place of antenatal care

Table 2.5 shows the percentage distribution of women ages 15–49 who had a live birth in 2014–2016 by place of ANC, for the most recent birth. The highest proportion of women received ANC at a health centre (67 percent), and the lowest proportion received ANC at a hospital (11 percent). Nyimba district had the highest proportion of women who received ANC from a hospital (29 percent). Mansa/Chembe had the highest proportion of women who accessed ANC from a health centre (88 percent) and the

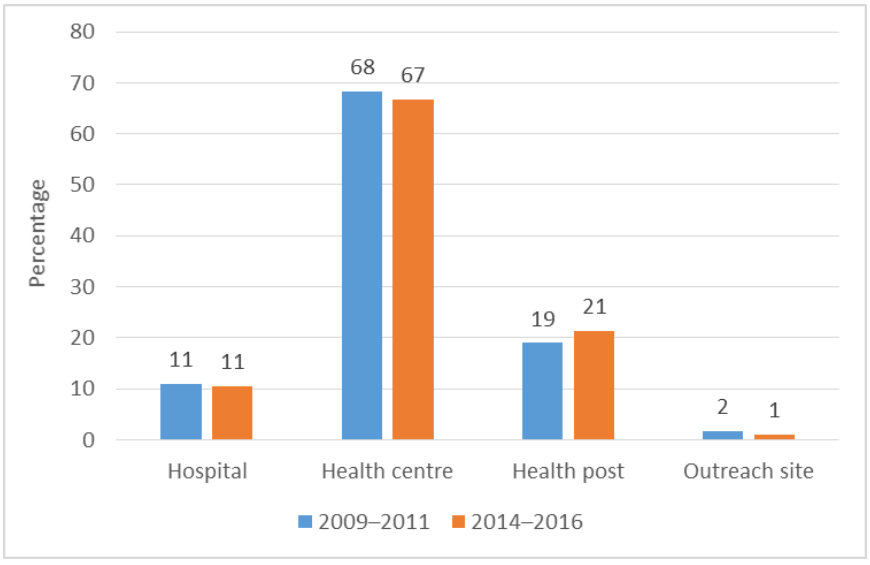
lowest proportion of women who accessed ANC from a hospital (4 percent), which points to primary care services being successfully provided at the proper level of care. Figure 2.7 shows virtually no change in the place where women received ANC services between 2009-2011 and 2014-16. (See Appendix 2, Table 2.5, for more details on the period 2009–2011.)

Table 2.5: Place where ANC was received in the period 2014–2016

Percentage distribution of women ages 15–49 who had a live birth from 2014 to 2016 by place of ANC for the most recent birth, according to background characteristics, Zambia SMGL 2017

Background characteristic	Hospital	Health centre	Health post	Outreach site	Other	Total	Number of women
Mother's age at birth							
15–19	9.9	66.3	22.9	0.6	0.3	100.0	1,513
20–34	10.8	67.2	20.8	1.0	0.2	100.0	3,543
35–49	10.7	66.3	21.0	1.7	0.3	100.0	643
Education							
No education/preschool only	7.1	67.1	23.8	2.0	0.0	100.0	538
Primary	9.0	66.6	23.1	1.0	0.2	100.0	3,431
Secondary	13.1	67.9	17.8	0.7	0.4	100.0	1,632
Higher	37.8	55.1	7.1	0.0	0.0	100.0	98
District							
Lundazi	8.5	59.8	30.0	1.3	0.3	100.0	2,331
Nyimba	29.3	62.2	7.9	0.4	0.4	100.0	547
Chembe/Mansa	4.4	87.9	7.4	0.2	0.0	100.0	1,249
Kalomo/Zimba	11.8	62.2	24.5	1.3	0.3	100.0	1,572
Total	10.5	66.8	21.4	1.0	0.2	100.0	5,699

Figure 2.7: Percentage of women by place of ANC, among women who had a live birth in the periods 2009–2011 and 2014–2016, Zambia SMGL 2017



2.5 Delivery care

Delivering in a safe, well-equipped, and adequately staffed health facility is another important factor in minimizing the risk of maternal morbidity and mortality of the mother and infant. If lower-level health facilities are lacking in these aspects, they should have referral procedures in place to refer the mother to the next level of care. The 2017 SMGL Census collected data from women to show trends on the place of delivery from the baseline period (2009–2011) to the endline period (2014–2016).

Place of delivery

Table 2.6 presents the percentage distribution of births for the period 2014–2016. Ninety percent of births take place in a health facility. The proportion of women delivering in a health facility is highest among women with secondary (94 percent) and higher education (100 percent). The percentage of hospital deliveries are highest among women who live in Nyimba (41 percent); births delivered at home are highest among women who live in Kalomo/Zimba (16 percent).

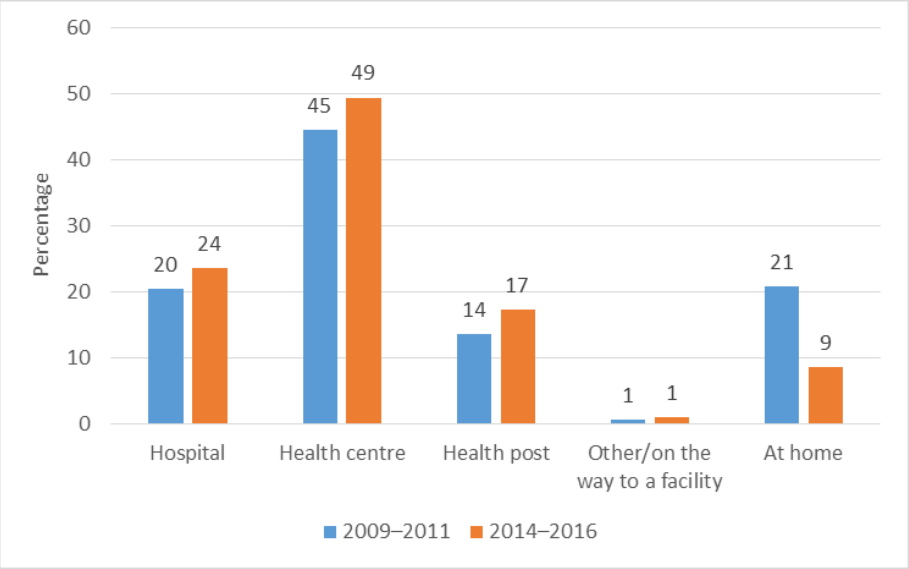
Table 2.6: Place of delivery

Percentage distribution of women ages 12–49 who had a live birth from 2014 to 2016, by place of delivery of their most recent birth, and percentage of most recent births delivered in a health facility, according to background characteristics, Zambia SMGL 2017

Background characteristic	Hospital	Health facility	Health post	Other/on the way to a facility	At home	Other	Total	Percentage delivered in a facility	Number of births
Mother's age at birth									
<20	23.5	49.9	19.2	0.8	6.6	0.1	100.0	92.5	1,538
20–34	23.2	50.3	17.1	0.6	8.6	0.2	100.0	90.6	3,602
35–49	25.5	43.7	14.4	2.9	13.2	0.3	100.0	83.6	659
Education									
No education/preschool only	17.5	49.5	18.9	2.0	11.9	0.2	100.0	85.9	555
Primary	19.3	50.6	19.0	0.9	9.9	0.2	100.0	88.9	3,492
Secondary	31.7	48.4	14.0	0.5	5.2	0.1	100.0	94.1	1,654
Higher	70.4	26.5	3.1	0.0	0.0	0.0	100.0	100.0	98
District									
Lundazi	18.3	49.6	26.4	1.0	4.4	0.3	100.0	94.3	2,353
Nyimba	40.9	47.6	5.6	0.9	5.1	0.0	100.0	94.0	553
Chembe/Mansa	26.1	57.8	6.4	0.6	9.0	0.2	100.0	90.3	1,273
Kalomo/Zimba	23.2	43.2	16.8	1.0	15.7	0.1	100.0	83.2	1,620
Total	23.5	49.4	17.3	0.9	8.6	0.2	100.0	90.3	5,799

Overall, institutional deliveries increased in SMGL target areas, from 79 percent in 2009–2011 to 90 percent in 2014–2016. (See Appendix 2, Table 2.6, for more details on the period 2009–2011.) The increase was about 11 percentage points across hospitals, health centres, and health posts (Figure 2.8). Consequently, the share of births at home decreased, from 21 percent to 9 percent over the same period.

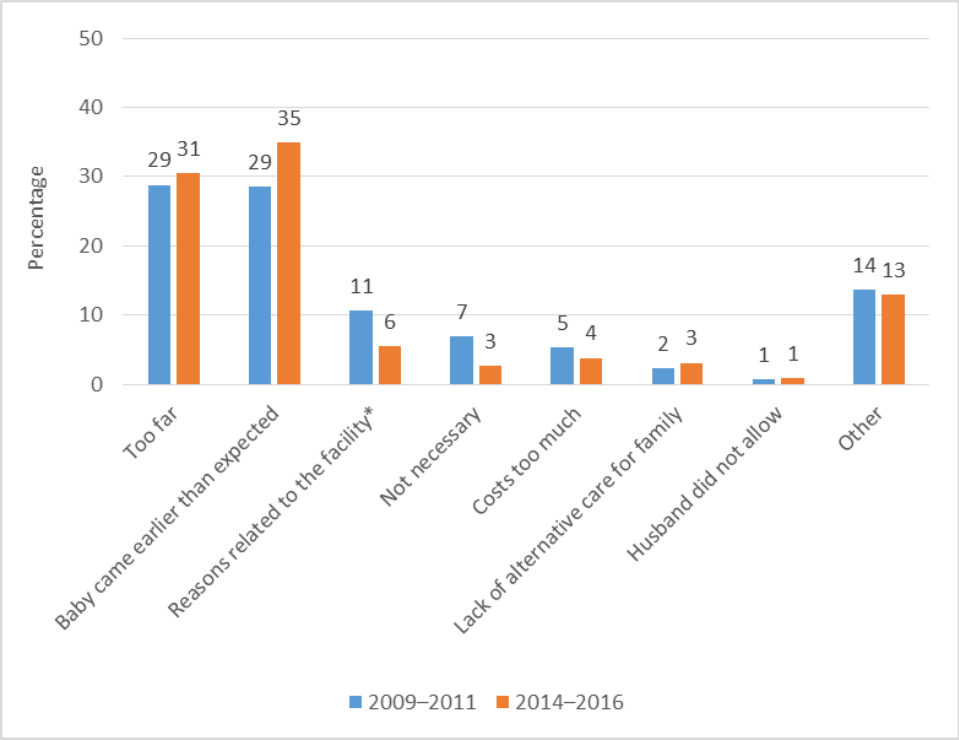
Figure 2.8: Percentage of women by place of delivery, among women who had a live birth in the periods 2009–2011 and 2014–2016, for the most recent birth, Zambia SMGL 2017



Reasons for not delivering in a health facility

The majority of births are delivered in a health facility, but among those that were not, the main reason in both periods was that the health facility was too far and transportation was not available or too expensive (Figure 2.9). The second most common reason was that the baby came earlier than expected. (See Appendix 2, Table 2.7a, for more details on the period 2009–2011, and Appendix 2, Table 2.7b, for more details on the period 2014–2016.)

Figure 2.9: Percentage of births for which women reported a reason for not delivering in a health facility, for periods 2009–2014 and 2014–2016, Zambia SMGL 2017



* Reasons related to the facility includes: doesn't trust the facility; facility not open; expects poor quality service; fear of abuse, disrespect; no female provider; no accommodations near facility

Assistance during delivery

The percentage of women who received assistance from a skilled birth provider during delivery in SMGL target areas is 80 percent in 2014–2016. Seventy percent received assistance a trained nurse or midwife, 11 percent received assistance from a doctor, and 12 percent received assistance from another health worker (Table 2.7). The percentage of women who received assistance from a skilled provider decreases with mothers' age and increases with level of education.

Table 2.7: Assistance during delivery

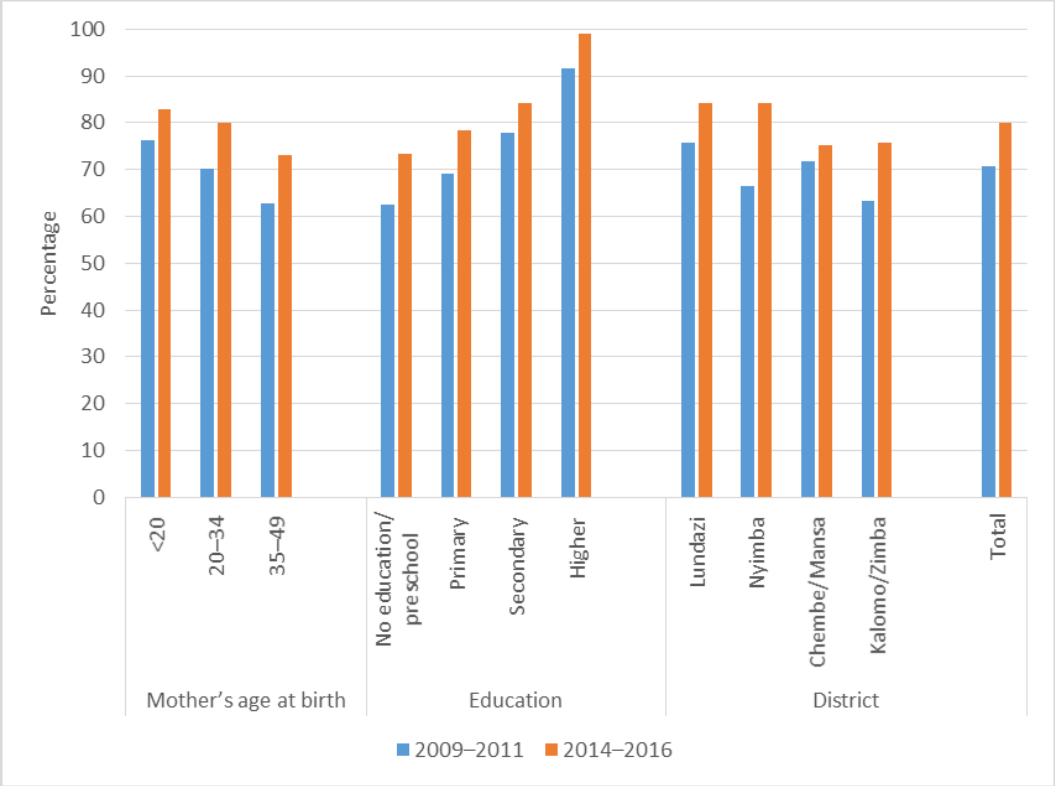
Percentage distribution of women ages 12–49 who had a live birth from 2014 to 2016 by person providing assistance during delivery of the most recent birth, and percentage of births assisted by a skilled provider, according to background characteristics, SMGL Zambia, 2017

Background characteristic	Doctor	Nurse/midwife	Other health worker	Other person	Don't know/missing	Total	Percentage assisted by a skilled provider*	Number of births
Mother's age at birth								
<20	11.90	71.00	11.12	5.59	0.39	100.00	82.90	1,538
20–34	10.41	69.46	11.63	8.25	0.25	100.00	79.87	3,602
35–49	10.02	62.97	13.20	13.66	0.15	100.00	72.99	659
Education								
No education/preschool only	11.89	61.44	14.23	12.07	0.36	100.00	73.33	555
Primary	9.97	68.33	12.17	9.25	0.29	100.00	78.29	3,492
Secondary	11.00	73.34	10.40	5.02	0.24	100.00	84.34	1,654
Higher	28.57	70.41	1.02	0.00	0.00	100.00	98.98	98
District								
Lundazi	9.99	74.20	11.05	4.55	0.21	100.00	84.19	2,353
Nyimba	23.69	60.58	11.93	3.44	0.36	100.00	84.27	553
Chembe/Mansa	10.84	64.34	16.50	7.70	0.63	100.00	75.18	1,273
Kalomo/Zimba	7.41	68.46	8.70	15.37	0.06	100.00	75.86	1,620
Total	10.76	69.13	11.67	8.16	0.28	100.00	79.89	5,799

* Skilled provider includes doctor and nurse/midwife

Overall, the percentage of women who delivered a birth with a skilled provider increased, from 71 percent in the period 2009–2011 to 80 percent in the period 2014–2016 (Figure 2.10). The increase is across all ages, education levels, and districts. (See Appendix 2, Table 2.8, for more details on the period 2009–2011.)

Figure 2.10: Percentage of women who delivered a birth with a skilled provider, according to background characteristics, for periods 2009–2011 and 2014–2016, Zambia SMGL 2017



2.6 Summary of maternal health

SMGL fertility measures in 2016 appear to have decreased, compared with national estimates of fertility from earlier periods (2011/12 SMGL Census did not collect fertility information). The use of ANC services remained high across the districts from baseline to endline periods. Levels of institutional delivery and attendance by a skilled provider have improved over the two periods. Distance from the facility remains a major reason among women who did not access ANC services or deliver in a facility.

Chapter 3. General mortality

3.1 Objectives

General mortality refers to deaths, regardless of the cause, that occurred during a specific period of time. This chapter presents levels of general mortality, by sex and age group, for 2016. Improvements in general mortality are likely to point to improvements in cause-specific mortality, namely, mortality caused by maternal conditions.

Key indicators

Key indicators of general mortality are as follows:

Crude death rate (CDR): The number of deaths occurring in the population during a given year, expressed per 1,000 population

Age-specific death rate: The number of deaths at an exact age, or in an exact age group, during a given year, expressed per 1,000 population at that age or in that age group

Life expectancy at birth: The average number of years that a new born is expected to live given the current mortality rates, expressed in years

Infant mortality: The probability of an infant born in a given year dying before reaching his or her first birthday, expressed per 1,000 live births

Under-5 mortality rate: The probability of a child born in a given year dying before reaching his or her fifth birthday, expressed per 1,000 live births

Adult mortality, ages 15–59: The probability that a 15-year old will die before reaching his or her 60th birthday, given the age-specific mortality rates for that year, expressed per 1,000 persons

Perinatal mortality: The number of stillbirths and deaths in the first week of life, expressed per 1,000 births 28+ weeks of gestation

The 2017 SMGL Census collected data on all recent deaths in the household since January 1, 2016, in the Household Questionnaire, and information on stillbirths and pregnancies in the Woman's Questionnaire. These data were used to compute the general mortality indicators for the SMGL study period, from January 1, 2016, to December 31, 2016.

3.2 Household deaths

Table 3.1 presents the age and sex distributions of the household population enumerated in the 2017 SMGL Census and deaths in the household in 2016. These data are used to compute the general mortality indicators for all SMGL districts combined, and Appendix 2, Table 3.1, presents the data used to compute indicators for the districts.

Table 3.1: Mortality by age and sex

Percentage distribution of household deaths by 5-year age groups, from January 1, 2016, through December 31, 2016, according to sex, Zambia SMGL 2017.

Age	Deaths	Household population	Age-specific mortality rate (per 1,000)
	Male		
< 1	644	15,440	41.7
1–4	402	61,969	6.5
5–9	174	78,934	2.2
10–14	127	70,856	1.8
15–19	124	55,549	2.2
20–24	173	40,216	4.3
25–29	124	28,758	4.3
30–34	177	23,523	7.5
35–39	164	21,603	7.6
40–44	184	17,808	10.3
45–49	139	14,926	9.3
50–54	133	10,160	13.1
55–59	104	7,922	13.1
60–64	97	5,662	17.1
65–69	94	4,481	21.0
70–74	116	2,979	38.9
75–79	91	2,401	37.9
80–84	92	1,236	74.4
85–89	69	844	81.8
90–94	33	237	139.2
95+	17	1,380	12.3
Total	3,278	466,884	7.0
	Female		
< 1	518	15,753	32.9
1–4	391	63,370	6.2
5–9	138	79,581	1.7
10–14	78	72,025	1.1
15–19	75	53,943	1.4
20–24	86	44,403	1.9
25–29	84	31,318	2.7
30–34	100	27,219	3.7
35–39	106	23,040	4.6
40–44	87	17,648	4.9
45–49	77	13,776	5.6
50–54	105	12,820	8.2
55–59	64	8,775	7.3
60–64	78	6,523	12.0
65–69	99	5,855	16.9
70–74	113	4,383	25.8
75–79	92	3,239	28.4
80–84	118	1,849	63.8
85–89	75	971	77.2
90–94	40	256	156.3
95+	15	1,119	13.4
Total	2,539	487,866	5.2

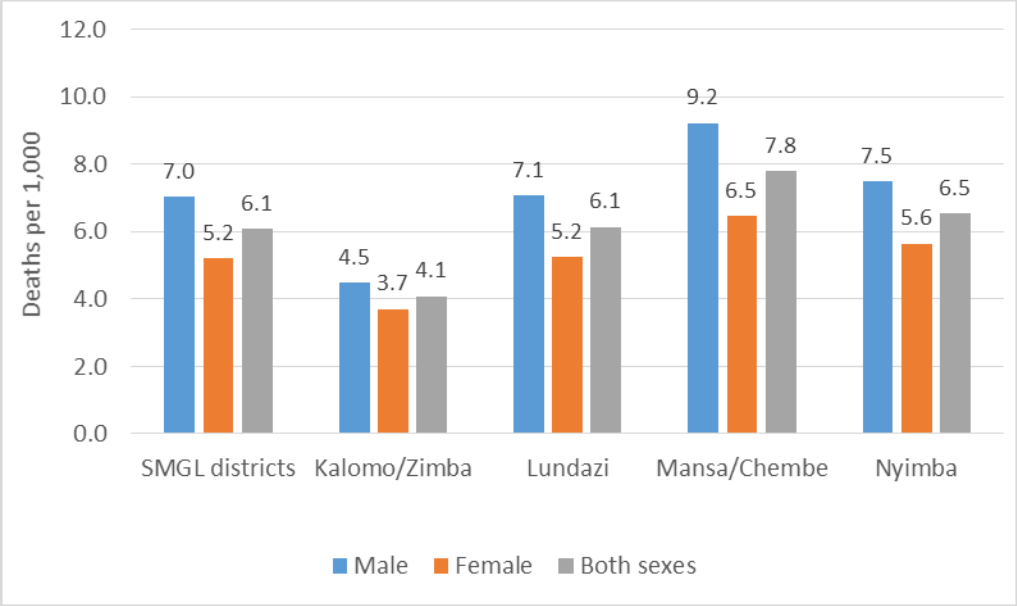
Crude death rate

The CDR is the most common summary measure of mortality. The CDR does not account for changing or different population age structures. We used the 2010 Zambia Census to standardise the 2017 SMGL male and female CDRs for 2016, thereby controlling for differences in age and sex structures across the districts. The standardisation did not reveal meaningful differences between the standardised death rates and CDRs, indicating that the population structure of the SMGL districts does not differ greatly from the national population structure in 2010 (see Appendix 2, Table 3.2). We refer to the CDRs in this section.

Figure 3.1 shows the CDRs in 2016 for SMGL districts, for males and females. Overall, the CDR is 6.1 for both sexes, 7.0 for males and 5.2 for females. The female CDRs are lower than male CDRs in every district. Kalomo/Zimba has the lowest rate for males (4.5), and Mansa/Chembe has the highest rate for males (9.2).

For comparison purposes, the national CDR for 2010 is 13.1 for both sexes; 14.3 for males, and 12.0 for females (CSO 2012). The 2011/12 SMGL Census measured a CDR of 10.1 for both sexes.

Figure 3.1: Crude death rates by sex for 2016, according to district, Zambia SMGL 2017



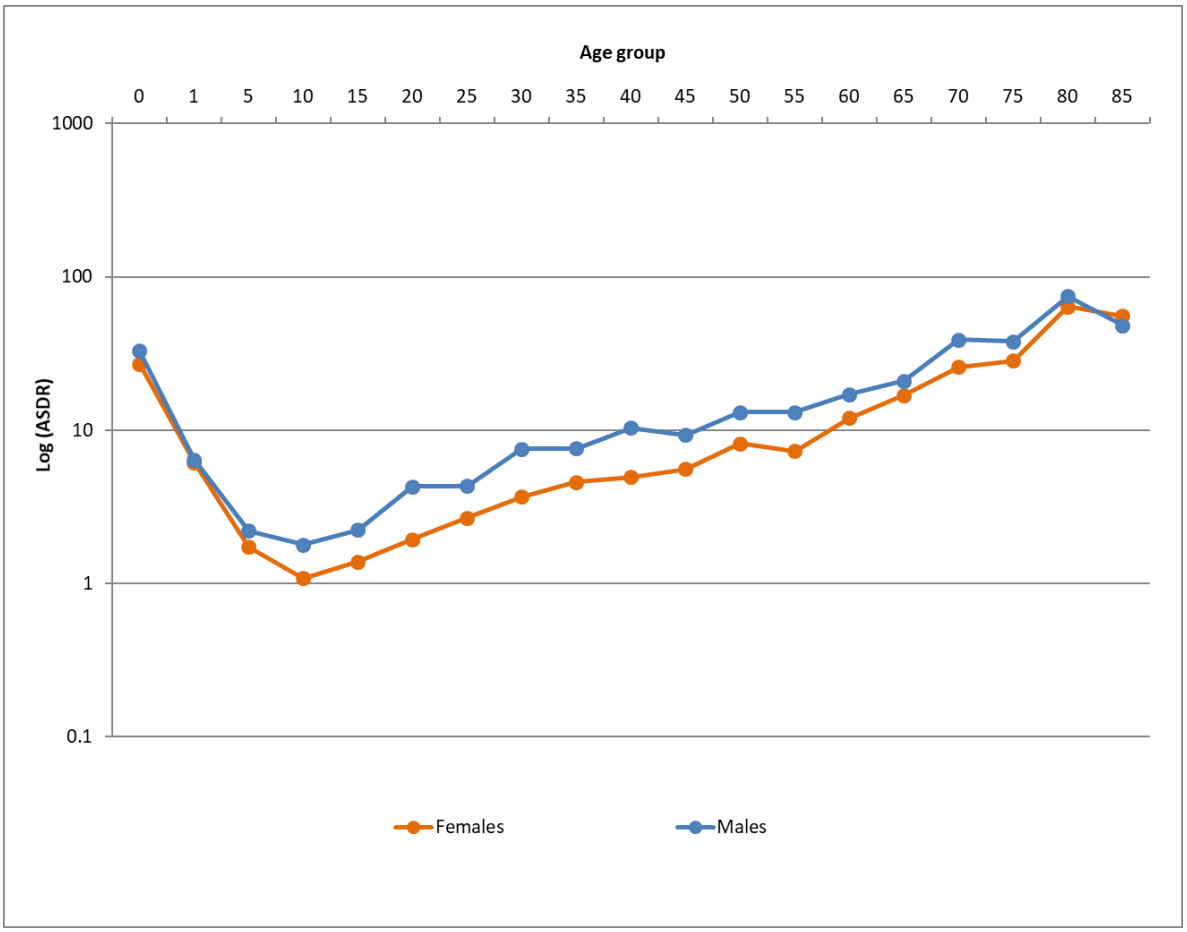
Age-specific death rates

Variations by age in risk of dying can be assessed by observing ASDRs. Plotting the natural logarithm of ASDRs on a log scale shows the relative variation of mortality rates across age groups more clearly than on a linear scale.[13]

The pattern of ASDRs for males and females in SMGL districts in 2016 shows a typical sharp decrease in death rates from age zero to age 10, and levels of childhood mortality that are similar for both sexes (Figure 3.2). The death rates for males are higher than those for females after age 10.

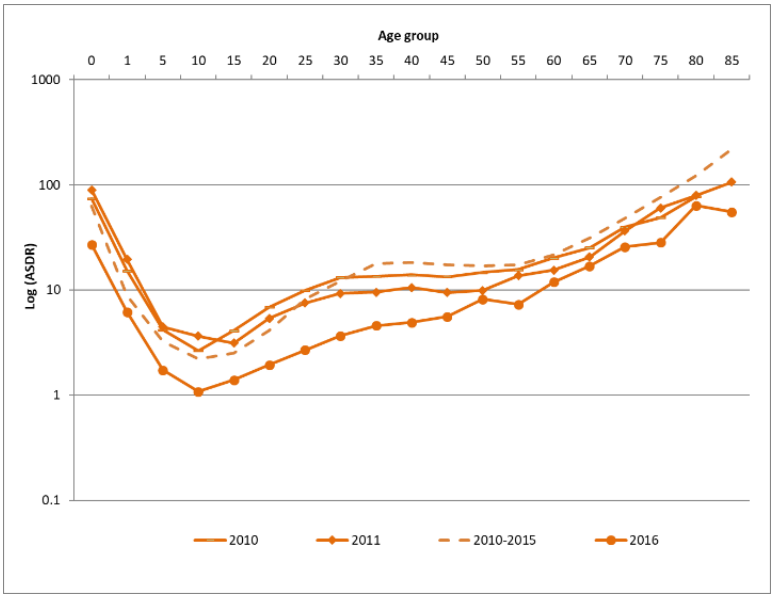
[13] A log scale shows percentage change between points. A linear scale is skewed towards points with larger values and therefore hides differences in points of greatest interest to us, namely, ASDRs of adults ages 15–59.

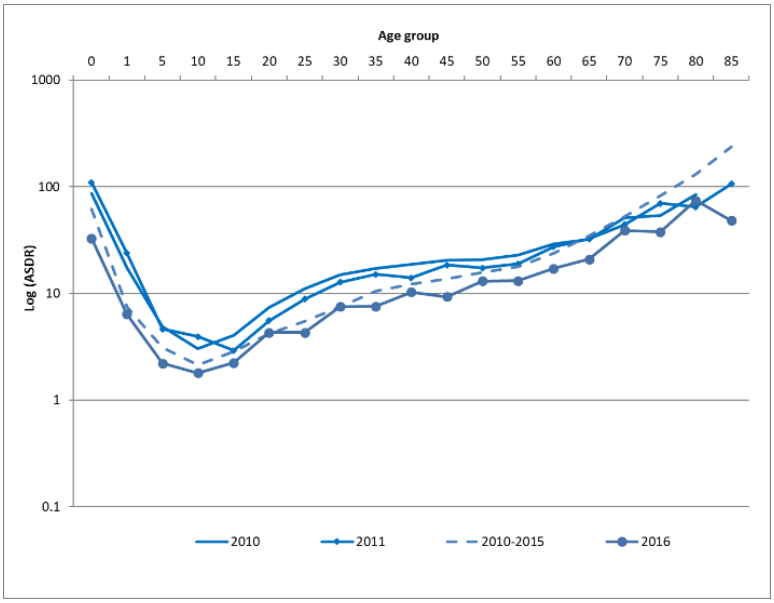
Figure 3.2: Log of ASDRs for 2016, by sex, Zambia SMGL 2017



The levels of mortality in SMGL districts in 2016 are lower than comparison levels of ASDRs in 2010, 2012, and 2010–2015, especially for females between ages 10 and 50 (Figure 3.3). The SMGL 2016 data do not show a "hump" in the age-specific death rate patterns for women and men during reproductive ages. For the comparison years, the elevated death rates throughout those ages reflect deaths (or assumptions about deaths, for the UN estimates) from leading causes of death, including HIV and tuberculosis, diarrhoea and lower respiratory infections, maternal disorders, and neoplasms (Institute for Health Metrics and Evaluation 2018).

Figure 3.3: Age-specific death rates for females and males, 2010, 2011, 2010–2015, and 2016, Zambia Census 2010, SMGL 2011/12, UN 2017, and Zambia SMGL 2017





Life expectancy at birth

Data from the 2017 SMGL Census estimate the average life expectancy at birth in 2016, for people in SMGL districts, to be 69 years (65 years for males and 73 years for females) (Table 3.2).

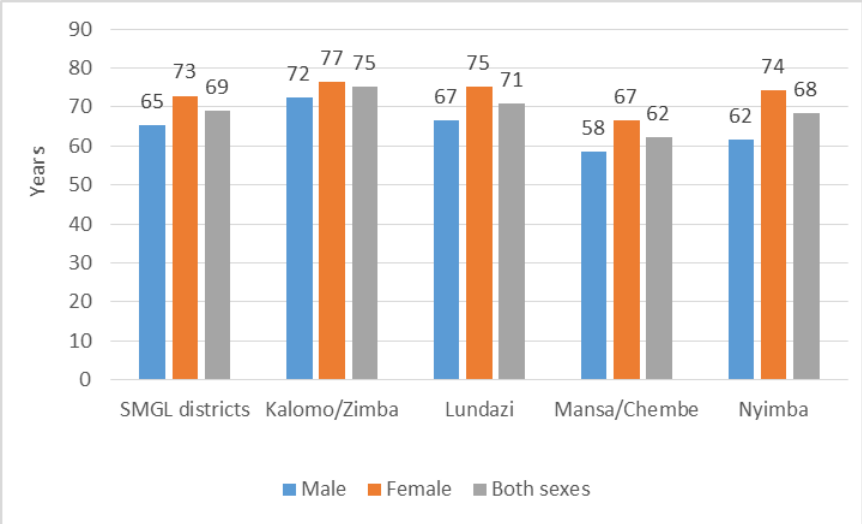
Males have a lower life expectancy than females in every district. On average, males live 8 years less than females (Figure 3.4). The gap in life expectancy is narrowest in Kalomo/Zimba (4 years) and widest in Nyimba (13 years).

In comparison, the UN estimated life expectancy at birth, for the period 2010–2015, is 60 years for both sexes (58 years for males and 62 years for females (UN 2017).

Table 3.2: Average life expectancy at birth for males and females in SMGL districts in 2016, Zambia SMGL 2017

	Male	Female	Both sexes
SMGL districts	65.3	72.9	69.1
Kalomo/Zimba	72.4	76.5	75.1
Lundazi	66.6	75.1	70.8
Mansa/Chembe	58.4	66.5	62.3
Nyimba	61.5	74.2	68.3

Figure 3.4: Average life expectancy at birth for people in SMGL districts in 2016, Zambia SMGL 2017

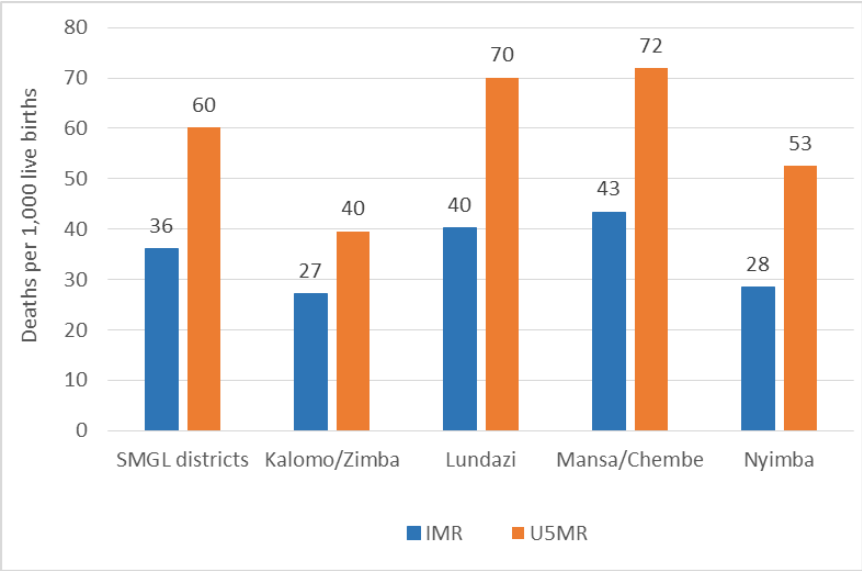


Infant and under-5 mortality

Infant mortality in SMGL districts in 2016 is 36 infant deaths per 1,000 live births (Figure 3.5). The global estimate of infant mortality for Zambia in 2016 is 44 infant deaths per 1,000 live births (UN Inter-agency Group for Child Mortality Estimation 2017). The ZDHS estimate for the period 2009–2013 is 49 infant deaths per 1,000 live births for rural areas (CSO et al. 2014). The 2011 estimate for SGML districts is higher than all of these estimates, at 87 infant deaths per 1,000 live births (2011/12 SMGL Census).

The ratio of under-5 mortality to infant mortality varies from 1.5 to 1.8 across the districts. This range is similar to the ratios for the estimates above: global estimate in 2016 (1.4) and the ZDHS estimate for the period 2009-2013 (1.7), indicating that there is not disproportionate underreporting of infant and child deaths.

Figure 3.5: Infant and under-5 mortality for 2016, by district, Zambia SMGL 2017

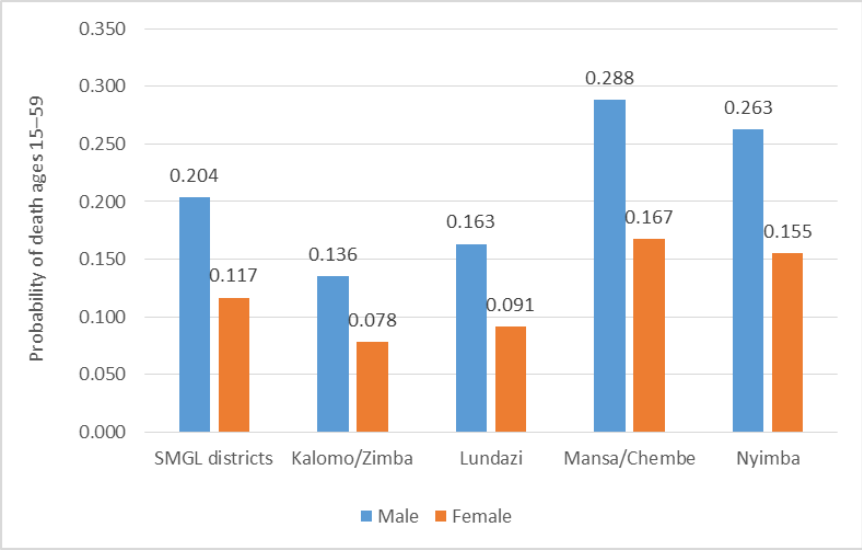


IMR=infant mortality rate, U5MR=under-5 mortality rate
Note: Infant mortality and under-5 child mortality are computed in an abridged life table (infant mortality: 1q0) and (under-5 child mortality: 5q0=(1- l5/l0) *1000).

Adult mortality

In 2016, adult mortality between ages 15 and 59 is higher for males than females in every district, by an average ratio of 1.7. Overall for the SMGL districts in 2016, about 200 men died per 1,000 men ages 15–59, and about 120 women died per 1,000 women ages 15–59 (Figure 3.6).

Figure 3.6: Probability of death between ages 15 and 59, for 2016, by district, Zambia SMGL 2017

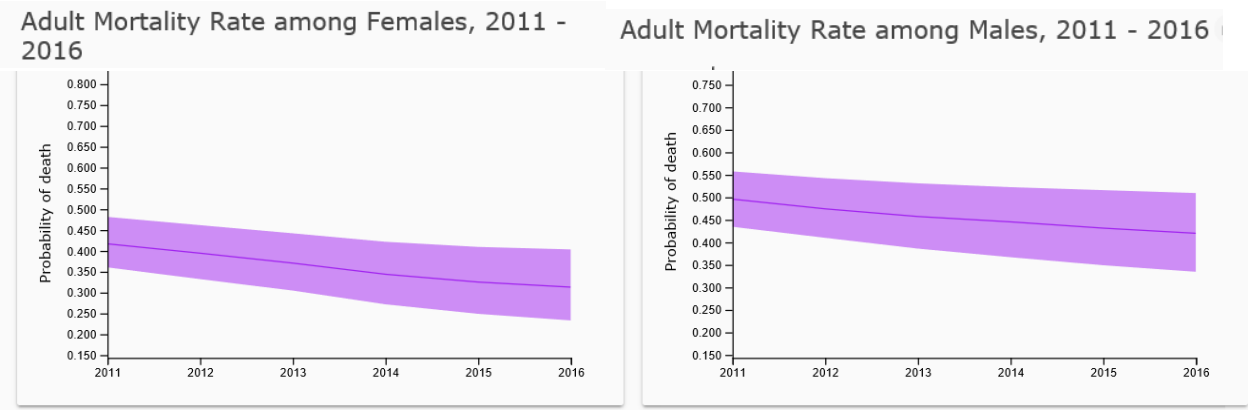


Note: Adult mortality estimates are computed from an abridged life table using this formula: 45q15=(1-l45/l15).

International estimates show a steady decrease in adult mortality between 2011 and 2016 at the national level (Figure 3.7) (IHME 2018). (The adult mortality estimates for the 2011/12 SMGL Census are not available to report trends in the districts.) The ratio of male to female death rates in 2016 at the

national level is 1.4, indicating a smaller gap between male and female levels of mortality at the national level than in SMGL districts, which have an average ratio of 1.7.

Figure 3.7: Probability of adult mortality by sex, 2011–2016, IHME estimates



Source: Global Burden of Disease estimates with 95 percent uncertainty intervals. Institute for Health Metrics and Evaluation. 2018. *Global Health Data Exchange, Global Burden of Disease Compare Data Visualizations.* Seattle, WA: University of Washington. http://www.healthdata.org/results/data-visualizations

3.3 Perinatal mortality

The measurement of perinatal mortality is one of the key outcomes of the 2017 SMGL Census. The estimates are derived from the Women's Pregnancy History Questionnaire that was administered to a subsample of women ages 15–49.

This section summarises perinatal mortality and its components, early neonatal mortality and stillbirths, for 2016, 2009–2011, and 2014–2016. The number of cases of perinatal deaths is low in 2016, and more stable estimates can be derived by pooling years in two periods: 2009–2011 (baseline) and 2014–2016 (endline). We refer to the pooled estimates only. (See Appendix 2, Tables 3.3a, 3.3b, and 3.3c, for more detailed tables of perinatal mortality for 2016,
2009–2011, and 2014–2016.)

The perinatal rate for 2009–2011 and 2014–2016 is 27 deaths per 1,000 pregnancies 28+ weeks duration (Table 3.3). There is virtually no change in the stillbirth rate between the baseline and endline period. The ratio of stillbirths to early neonatal deaths is 1.6 for both periods, which is greater than the ratio of 1.0 in 2011. This may indicate that survival of new-borns has improved. Further inquiry is required to determine whether this is a real improvement or whether it reflects uncertainty in the data because information on early deaths may be sensitive and not readily reported by the respondent.

For comparison purposes, the perinatal rate from the ZDHS 2013/14 was 31 for the period 2009–2013 (same for rural and urban districts) (CSO et al 2014). The perinatal rate from the 2011/12 SMGL Census was 57.6.

Table 3.3: Perinatal and early neonatal mortality, and stillbirth rate, for periods 2009–2011, and 2014–2016, Zambia SMGL 2017

	2009–2011	2014–2016
Perinatal mortality per 1,000 pregnancies 28+ weeks duration	(26.5)	27.3
Early neonatal mortality per 1,000 live births	(10.3)	10.5
Stillbirths per 1,000 pregnancies 28+ weeks duration	16.4	17.1

Note: The estimates in parentheses are based on a low number of cases, only 25–49 deaths of stillbirth and early neonatal deaths. They should be interpreted with caution because stability of the estimate may be compromised.

3.4 Summary of general mortality

For several indicators of general mortality in 2016, the levels are lower than national estimates for that period and lower than comparable estimates from the 2011/12 SMGL Census. These trends suggest improvements in mortality over the SMGL period, but some of the decrease may point to challenges in obtaining a complete enumeration of deaths. Results pertaining to perinatal mortality, on the other hand, indicate that the level has not changed from 2009–2011 to 2014–2016.

Chapter 4. Maternal mortality and causes of death

4.1 Objectives

This chapter reviews trends in maternal mortality in Zambia, including levels in the SMGL districts in 2011 (baseline) and 2016 (endline). It explores the circumstances of maternal death, including the causes of maternal disorders and the place of death. The results from previous chapters on population dynamics, fertility and use of maternal health services, and general mortality provide important insights that guide our expectations of decreased maternal mortality levels in the SMGL districts between 2011 and 2016.

Key indicators

The following terms and measures are widely accepted international definitions and indicators defined by WHO (WHO 2011b):

Pregnancy-related death: The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death (obstetric and non-obstetric)

Maternal death: The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes

Direct obstetric death: The death of a woman resulting from complications of the pregnant state (pregnancy, labour, and puerperium); from interventions, omissions, incorrect treatment; or from a chain of events resulting from any of the above

Indirect obstetric death: The death of a woman from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes but which was aggravated by physiologic effects of pregnancy

Late maternal death: The death of a woman from direct or indirect obstetric causes more than 42 days but less than 1 year after termination of pregnancy

Four commonly used indicators of maternal mortality are as follows:

Proportion of maternal deaths among all death of women of reproductive age: Expressed as a percentage of all deaths of women of reproductive age

Maternal mortality rate: The number of maternal deaths divided by the number of women of reproductive age, expressed as 1,000 women ages 15–49

Maternal mortality ratio: The number of maternal deaths per live birth, expressed as 100,000 live births

Lifetime risk of maternal death: The probability of a woman dying from maternal causes over the course of her reproductive lifespan

Verbal autopsy information

Information on the circumstances surrounding the deaths of women of reproductive age that occurred on or after January 1, 2016, until the enumeration, was collected by trained enumerators who administered a verbal autopsy instrument to a caretaker of the deceased or other respondent

knowledgeable about the woman's death. Enumerators conducted most verbal autopsy interviews during main data collection, from July through September 2017. They continued to conduct verbal autopsy interviews that were not able to be completed during the main data collection through December 2017.

Overall, the response rate for all verbal autopsy interviews was 88 percent (Table 1.3). The enumerators completed verbal autopsy interviews for 919 deceased women ages 12–49, of which 873 were women ages 15–49 (Table 4.1). From the latter, the period of interest for the endline results is January 1, 2016, to December 31, 2016, and the number of deceased women during this period is 539 (the remaining deaths occurred in 2017 up until the time of the enumeration).

Table 4.1: Number of deaths of women of reproductive age with a verbal autopsy interview, Zambia SMGL 2017

Reference period	Number
Deaths among women ages 12–49	
January 1, 2016, to July–December 2017 (until date of interview)	919
Deaths among women ages 15–49	
January 1, 2016, to July–December 2017 (until date of interview)	873
January 1, 2016–December 31, 2016	539

4.2 Levels and trends of maternal mortality

This section presents direct estimates of the four maternal mortality indicators for calendar year 2016. The direct method of estimation draws on the enumerated population and deaths presented in previous chapters. The method includes a correction for the number of births and the number of maternal deaths (Rutstein & Rojas 2006). Namely, the numbers of births are adjusted to account for unrecorded births due to women of reproductive age who did not respond to the interview, and the number of maternal deaths are adjusted to account for verbal autopsies that were not completed for deceased women of reproductive age.

In 2016, the MMR in the SMGL districts was 272 maternal deaths per 100,000 live births (Table 4.2). In 2011, the MMR in the SMGL districts was 505 (CDC 2014). This change represents an overall 46 percent decrease in MMR from 2011 to 2016; the average annual decrease over the 5-year period is 11.6 percent.[14] This decrease is steeper than the estimated national decrease between 1990 and 2015, which was an estimated 61.2 percent overall decrease over 25 years that translates into a 3.8 percent average annual decrease (WHO 2015). The corresponding lifetime risk of maternal death in 2016 is one woman dying of a maternal cause among 70 women ages 15–49.

[14] The MMR of 505 is an adjusted MMR. The adjustment methods are described in the SMGL Phase 1 Monitoring and Evaluation Report. Source: Centers for Disease Control and Prevention. 2014. S*aving Mothers, Giving Life: Maternal Mortality. Phase 1 Monitoring and Evaluation Report.* Atlanta, GA: Centers for Disease Control and Prevention, U.S. Department of Health and Human Services. https://www.savingmothersgivinglife.org/docs/Maternal_Mortality.pdf

Table 4.2: Direct estimates of maternal mortality indicators for 2016, Zambia SMGL 2017

	Proportion of women's deaths that are maternal	Number of maternal deaths[a]	Number of women	Maternal mortality rate (per 1,000 women)
15–19	0.218	16	53,943	0.303
20–24	0.224	19	44,403	0.434
25–29	0.188	16	31,318	0.505
30–34	0.200	20	27,219	0.735
35–39	0.167	18	23,040	0.767
40–44	0.139	12	17,648	0.685
45–49	0.067	5	13,776	0.373
15–49	0.172	106	211,347	0.502
General fertility rate[b]		184.5		
Maternal mortality ratio[c]		272		
Lifetime risk of maternal death per woman[d]		0.014	or, 1 out of 70	

Note: For the indicators of maternal mortality levels, we use the 2017 SMGL Endline Census data on 493 women who died between January 1, 2016, and December 31, 2016.

[a] Age-adjusted based on age distribution of deaths of women of reproductive age in the household

[b] Age-adjusted based on age distribution of women of reproductive age in the household

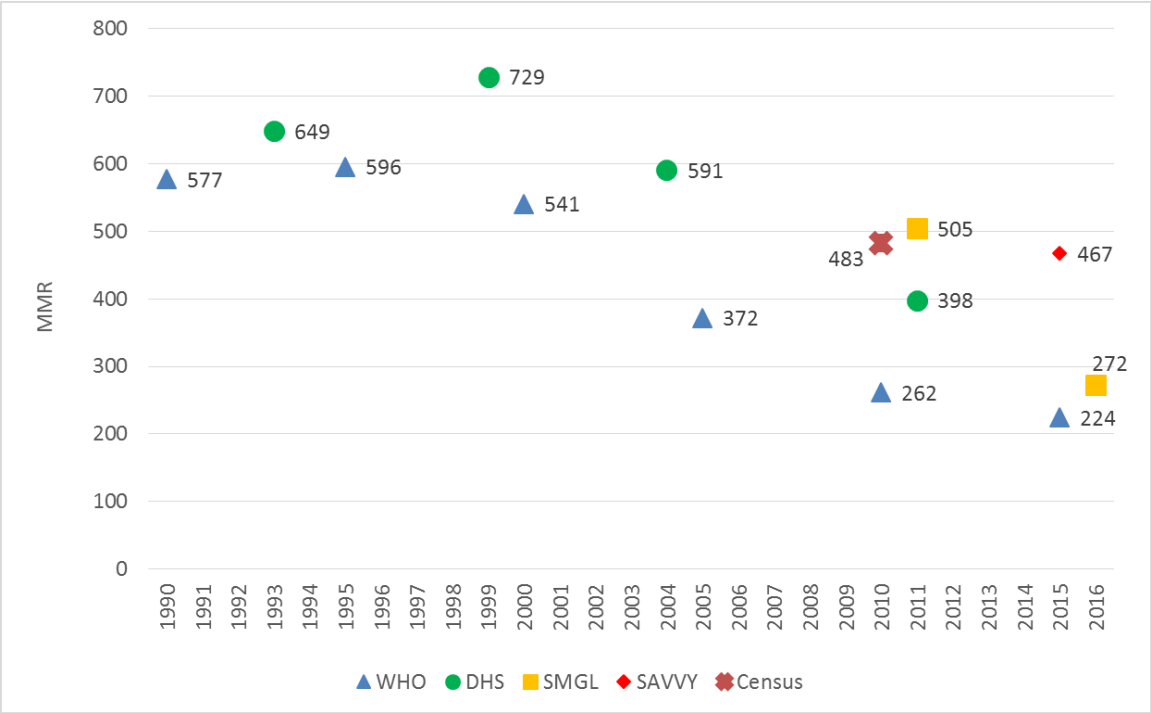
[c] Expressed as 100,000 live births; calculated as the age-adjusted maternal mortality rate divided by the age-adjusted general fertility rate

[d] Calculated as $1-(1-MMR)^{TFR}$

Figure 4.1 plots the trends in maternal mortality in Zambia and in the SMGL districts. The estimates come from various sources, with each applying a slightly different methodology to arrive at a level for a defined reference period. The trend in the 5-year estimates produced by the UN Maternal Mortality Estimation Inter-Agency Group (MMEIG), published by WHO, are lower than the Demographic and Health Survey (DHS) estimates but follow a similar decreasing trend since around 2000. The difference in levels is at least partially explained by the fact that the DHS estimates pregnancy-related mortality, and the MMEIG estimates maternal mortality.

The SMGL estimate in 2011 is higher than the national estimates around the same period, but the SMGL districts were selected based on their high mortality levels, so this is expected. In 2016, the SMGL estimate almost converges with the WHO estimate for 2015. The SMGL decrease is sharper than those measured by WHO or DHS estimates, and some part of the decrease may be attributed to the impact of targeted SMGL interventions.

Figure 4.1: Trends in maternal mortality ratios, from selected sources, 1990–2016



Sources: WHO 2015, 1996 ZDHS, 2006 ZDHS, 2013/14 ZDHS, 2011/12 Zambia SMGL Census, 2017 Zambia SMGL Census, and 2015-16 SAVVY (MHA et al. 2018)

4.3 Circumstances of maternal death

Causes of maternal death

According to international estimates, between 2011 and 2016, the number of deaths nationally from neoplasms overtook the number of maternal disorders as the third leading cause of death among women ages 15–49 (Figure 4.2) (IHME 2018).

Figure 4.2: Rankings of leading causes of death among women ages 15–49 in Zambia for 2011 and 2016, IHME 2018

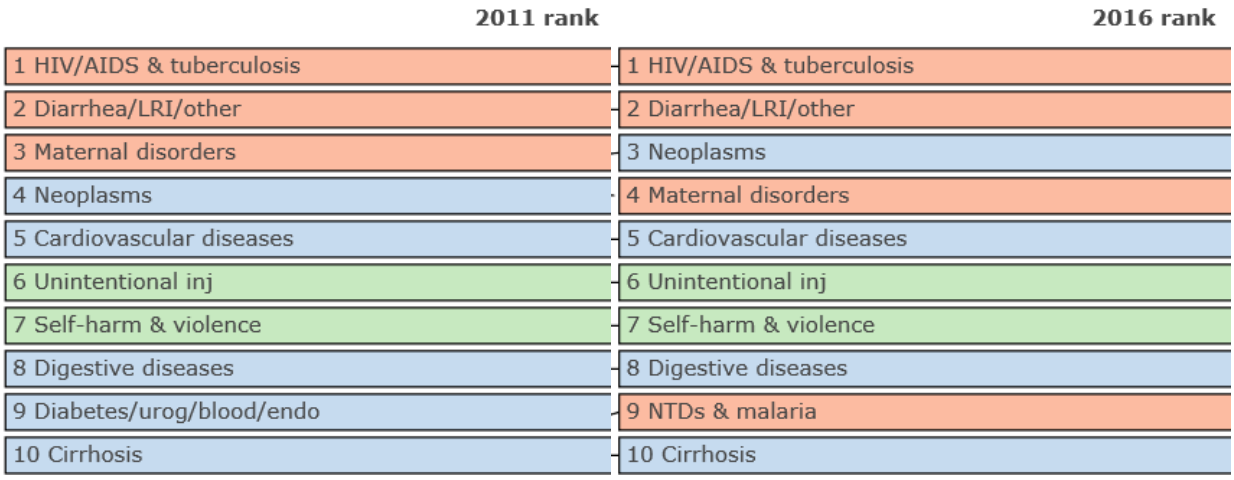


Table 4.3 summarises causes of death for all deceased women of reproductive age in SMGL districts for 2016. Maternal causes, including direct and indirect causes, account for 112 deaths. An additional 12 deaths are classified as late maternal deaths. Physician coders were not able to assign a cause of death to 21 of the deaths, either due to insufficient detail on the symptoms, or because the symptoms did not correspond to a defined cause in the list of ICD-10 causes.[15]

Table 4.3: Percentage distribution of causes of death among women ages 15–49 by main categories of causes, 2016, Zambia SMGL 2017

Cause of death	ICD-10 code	Number	Percentage
Direct maternal causes	O00-O95	89	16.5
Indirect maternal causes	O98-O99	23	4.3
Late maternal death	O96-O97	12	2.2
Other non-maternal causes		394	73.1
Ill-defined	R95-R99	21	3.9
Total		539	100.0

Table 4.4 shows the proportion of maternal deaths among all deaths of deceased women ages 15–49, and the distribution of maternal deaths by direct and indirect causes. The proportion of maternal deaths in 2016 (17 percent) is higher than the proportion of maternal deaths in 2012 (13 percent). The increase is counterintuitive and may reflect better quality information in the 2016 verbal autopsies or in the physicians' experience in reviewing the verbal autopsy information. The increase in direct maternal causes is explained in the Table 4.5.

Table 4.4: Proportion of maternal deaths among all deaths of women of reproductive age, and percentage distribution of direct and indirect causes of maternal mortality, 2011 and 2016, Zambia SMGL 2011/12 and Zambia SMGL 2017

	2011	2016
Proportion maternal deaths	**13.3**	**17.2**
Direct maternal causes	70.3	79.5
Indirect maternal causes	29.7	20.5
Total	100.0	100.0
Number	91	112

Table 4.5 shows the distribution of maternal deaths by cause in 2011 and 2016. The most notable differences are a decrease in haemorrhages (14 percentage point decrease from 2011 to 2016) and an increase in the category of abortions, miscarriages, and ectopic pregnancies (18 percentage point increase from 2011 to 2016. Further research is needed to explain the reasons behind these changes and to shed light on causes of death from other maternal conditions, which increased by 10 percentage points.

[15] Ill-defined causes are defined as "symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified" Source: World Health Organisation. 2011. *International Statistical Classification of Diseases and Related Health Problems.* 10th Revision. Volume 2. 2010 edition. Geneva, Switzerland: World Health Organisation. http://www.who.int/classifications/icd/ICD10Volume2_en_2010.pdf?ua=1

Table 4.5: Causes of death among women ages 15–49 by main categories of causes, 2016, Zambia SMGL 2017

	ICD-10 code	2011	2016
Direct maternal causes			
Maternal haemorrhage	O30-O48	27.5	14.3
Maternal sepsis and other maternal infections	O80-O84	9.9	10.7
Maternal hypertensive disorder	O10-O16	8.8	5.4
Maternal obstructive labour and uterine rupture	O60-O75	6.6	2.7
Maternal abortion, miscarriage, and ectopic pregnancy	O00-O08	5.5	24.1
Other maternal condition	O20-O29, O85-O92, O94-O95	12.1	22.3
Indirect maternal causes	O98-O99	29.7	20.5
Total		100.1	100.0
Number		91	112

Note: Causes of death are categorized by the List of International Classification of Diseases codes mapped to the Global Burden of Disease cause list.
Source: Institute for Health Metrics and Evaluation. 2015. *Global Burden of Disease Study 2015: Causes of Death and Nonfatal Causes Mapped to ICD Codes.* List of International Classification of Diseases codes mapped to the Global Burden of Disease cause list, Web table 3. Seattle, WA: University of Washington.
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Place of death

Table 4.6 shows that in 2016 about one-quarter of deceased women died at home, and more than half died in a hospital. These are both larger percentages than in 2011.

Table 4.6: Percentage distribution of maternal deaths by place of death, 2011 and 2016, 2011/12 and 2017 SMGL Censuses

	2011	2016
Home (own home or other home)	22.0	26.8
Hospital	50.5	55.4
Other health institution	19.8	14.3
Health centre		*6.3*
Health post		*2.7*
Faith-based facility		*5.4*
Other place or unknown place	7.7	3.6
Total	100.0	100.0
Number	91	112

Note: The numbers in italics comprise types of 'Other health institutions'.

4.4 Summary of maternal mortality and causes of death

This concluding chapter represents a culmination of information presented in the preceding chapters. Taken together, the information reveals lower fertility, higher use of delivery services, and lower general mortality in SMGL districts in 2016, compared to the baseline period of 2011, prior to the implementation of the SMGL interventions. By 2016, in line with expectations, the level of maternal mortality decreased. The extent of the decrease in maternal mortality measured from 2011 to 2016 is 46 percent. Comparing the causes of maternal death between the two periods, a significantly larger percentage is attributed to the category of abortions, miscarriages, and ectopic pregnancies in 2016.

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Appendix 1. List of staff

Central Statistical Office (CSO)
Management
Iven Sikanyiti
John Kalumbi
Frank Kakungu
Field Monitors/Trainers
Aaron Phiri
Bubala Moonga
Cade Kapayi
Chibesa Musamba
Chola Nakazwe
Edgar Phiri
Emma Phiri Shamalima
Emmanuel Sichilima
Harriet N. Zimbizi
Joshua Siuluta
Makoselo Bowa
Michelo Choongo
Moonga Choongo
Mubita Sikufele
Nchimunya Nkombo
Nene Bah
Palver Sikanyiti
Pius Kawesha
Regina Sinvula
Tisauke Mapalo Phiri
Information Technology Staff
Ben Mwale
Bertha Nachinga
Chanda Mutale
Tabo Simutanyi
Thandiwe Africa
Regional Statisticians
Alfeyo Chimpunga
Bornface Haachoongo
Richard Kaela

University of Zambia (UNZA) Department of Population Studies
Management
Musonda Lemba
Master Trainers/Field Monitors
Caroline Banda
Emmanuel Tembo
Andrew Banda
Audrey Mwape Kalindi
Maambo Nsanzya
Salaza Kunda
Chota Mutila
Susan Chima
Eric Malambo
Elizabeth Nyirenda
Information Technology Staff
Bained Nyirenda
Report Writing
Namuunda Mutombo
Chabila C. Mapoma
Million Phiri
Caroline Banda
Emmanuel Tembo
Andrew Banda
Audrey Mwape Kalindi
Maambo Nsanzya
Salaza Kunda
Elizabeth Nyirenda
Lemba Musonda

ICF
Management
Leo Ryan
Ani Hyslop
Technical Advisors
Fern Greenwell
Daniel Anson
Information Technology Staff
Juste Ntiema

U.S. Agency for International Development (USAID)
Management
Claudia Morrissey Conlon
Technical Advisor
Mona Mehta Steffen

Centers for Disease Control and Prevention Atlanta
Management
Tom Clark
Global Reproductive Health Evidence for Action Team
Diane Morof
Technical Advisors
Laura Kelly
Curtis Blanton
Paul Stupp

Centers for Disease Control and Prevention Zambia
Management
Mary Adetinuke Boyd
Technical Advisor
Maybin Mumba

Report Writing Workshop	
Nchimunya Nkombo	CSO
Chola Nakazwe	CSO
Elizabeth Nyirenda	UNZA
Nene M. Bah	CSO
Harriet N. Zimbizi	CSO
Chibesa Musamba	CSO
Makoselo Bowa	CSO
Namuunda Mutombo	UNZA
Million Phiri	UNZA
Caroline Banda	UNZA
Sikufele Mubita	CSO
Emmanuel Tembo	UNZA
Andrew Banda	UNZA
Ivan Sikanyiti	CSO
Audrey Mwape Kalindi	UNZA
Maambo Nsanzya	UNZA
Salaza Kunda	UNZA
Musonda Lemba	UNZA
Chabila C. Mapoma	UNZA
Palver Sikanyiti	CSO
Mona Mehta Steffen	USAID
Fern Greenwell	ICF

Appendix 2. Supplementary tables

Table 1.1: Household population by age and sex

Percentage distribution of the household population by 5-year age groups, according to sex, SMGL Zambia, 2017

	Lundazi			Nyimba			Chembe/Mansa			Kalomo/Zimba		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Age												
<5	16.2	16.1	16.2	15.9	15.6	15.8	15.7	15.1	15.4	18.3	17.7	18.0
5–9	16.3	15.9	16.1	16.2	15.4	15.8	16.4	15.9	16.1	18.5	17.7	18.1
10–14	15.0	14.6	14.8	15.5	14.5	15.0	15.2	14.9	15.0	15.3	15.0	15.2
15–19	11.8	10.9	11.4	12.2	10.5	11.4	12.1	11.7	11.9	11.6	10.8	11.2
20–24	8.9	9.2	9.1	8.6	9.4	9.0	8.3	9.4	8.9	8.5	8.5	8.5
25–29	6.1	6.2	6.2	6.4	6.9	6.7	6.4	6.8	6.6	5.9	6.1	6.0
30–34	5.1	5.6	5.3	5.1	5.6	5.4	5.2	5.8	5.5	4.7	5.3	5.0
35–39	4.5	4.6	4.6	4.8	4.9	4.8	4.8	4.8	4.8	4.5	4.8	4.6
40–44	3.8	3.7	3.7	3.8	3.6	3.7	4.0	3.7	3.8	3.6	3.5	3.6
45–49	3.4	3.0	3.2	3.2	3.0	3.1	3.4	2.7	3.0	2.8	2.6	2.7
50–54	2.3	2.9	2.6	2.1	2.6	2.3	2.3	2.6	2.5	1.8	2.3	2.1
55–59	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.8	1.8	1.5	1.8	1.6
60–64	1.3	1.5	1.4	1.2	1.4	1.3	1.4	1.4	1.4	0.9	1.0	1.0
65–69	1.1	1.3	1.2	0.9	1.3	1.1	1.1	1.3	1.2	0.7	0.9	0.8
70–74	0.7	1.0	0.8	0.6	1.2	0.9	0.7	0.9	0.8	0.5	0.7	0.6
75–79	0.6	0.7	0.7	0.6	1.0	0.8	0.5	0.5	0.5	0.4	0.6	0.5
80+	1.0	1.1	1.0	1.3	1.4	1.3	0.7	0.6	0.6	0.5	0.6	0.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number	171,194	178,121	349,315	44,622	46,100	90,722	128,240	134,488	262,728	122,828	129,157	251,985

Table 2.1: Current fertility by district

Age-specific and total fertility rates, general fertility rate, and crude birth rate for January 1, 2016, through December 31, 2016, SMGL Zambia, 2017

	Lundazi		Nyimba		Chembe/Mansa		Kalomo/Zimba	
	Number of live births to women ages 15–49	Number of women ages 15–49	Number of live births to women ages 15–49	Number of women ages 15–49	Number of live births to women ages 15–49	Number of women ages 15–49	Number of live births to women ages 15–49	Number of women ages 15–49
Age group								
15–19	3,021	18,318	711	4,505	1,623	14,010	2,194	12,526
20–24	3,622	14,434	854	3,852	2,369	11,216	2,654	9,613
25–29	2,232	10,111	565	2,866	1,630	7,792	1,872	7,039
30–34	1,805	9,370	436	2,481	1,353	7,302	1,463	6,389
35–39	980	7,058	285	1,890	722	5,300	933	5,273
40–44	411	6,181	100	1,587	271	4,212	417	4,152
45–49	52	4,092	14	1,065	39	2,757	31	2,511
Total fertility rate (ages 15–49)		5.2		4.9		4.7		6.2
General fertility rate		186.0		173.4		160.4		213.0
Crude birth rate		34.7		32.7		30.5		38.0

Table 2.2: Antenatal care 2009–2011

Percentage distribution of women ages 12–49 who had a live birth in the period 2009 through 2011, by antenatal care provider for the most recent birth and the percentage receiving antenatal care from a skilled provider for the most recent birth, according to background characteristics, SMGL Zambia, 2017

Background characteristic	Doctor	Nurse/midwife/ clinical officer	Traditional Birth Attendant	Other	No one	Total	Percentage from a skilled provider*	Number of women
Mother's age at birth								
15–19	6.9	85.6	1.4	4.4	1.7	100.0	92.5	813
20–34	7.6	85.1	2.1	3.4	1.8	100.0	92.6	1,957
35–49	7.4	83.6	2.5	4.6	1.8	100.0	91.0	434
Education								
No formal education	10.6	80.0	1.9	5.8	1.7	100.0	90.6	414
Primary	7.5	84.3	2.3	3.9	2.1	100.0	91.7	1,994
Secondary	5.8	89.1	1.1	2.7	1.2	100.0	95.0	736
Higher	0.0	95.0	1.7	3.3	0.0	100.0	95.0	60
District								
Lundazi	9.6	84.7	1.6	2.8	1.2	100.0	94.3	1,375
Nyimba	18.7	71.0	4.6	3.8	1.9	100.0	89.7	262
Chembe/Mansa	4.6	87.1	1.9	4.7	1.7	100.0	91.7	720
Kalomo/Zimba	2.6	88.1	1.8	4.7	2.8	100.0	90.7	847
Total	7.4	85.0	2.0	3.8	1.8	100.0	92.4	3,204

* Skilled provider includes doctor and nurse/midwife/clinical officer

Table 2.3a: Reasons for not seeking antenatal care 2009–2011

Percentage of women ages 15–49 who had a live birth in the period 2009 through 2011 but who did not see anyone for antenatal care for the most recent birth, by reason for not seeking antenatal care, according to background characteristics SMGL Zambia, 2017

Background characteristic	Costs too much	Too far away	Transportation unavailable/too expensive	Doesn't trust the provider/poor quality service	Husband/family does not allow	Other	Antenatal care is not necessary	Not customary/do not know/do not remember	Number of women
Mother's age at birth									
15–19	0.0	57.1	7.1	0.0	21.4	0.0	21.4	7.1	14
20–34	2.8	38.9	16.7	2.8	2.8	22.2	8.3	11.1	36
35–49	0.0	37.5	12.5	0.0	0.0	37.5	25.0	0.0	8
Education									
No formal education	0.0	57.1	28.6	0.0	14.3	0.0	14.3	0.0	7
Primary	2.4	40.5	11.9	0.0	7.1	19.0	14.3	11.9	42
Secondary	0.0	44.4	11.1	11.1	0.0	33.3	11.1	0.0	9
District									
Lundazi	0.0	23.5	11.8	0.0	17.6	35.3	11.8	11.8	17
Nyimba	0.0	20.0	40.0	0.0	0.0	20.0	0.0	20.0	5
Chembe/Mansa	8.3	41.7	8.3	0.0	0.0	25.0	25.0	0.0	12
Kalomo/Zimba	0.0	62.5	12.5	4.2	4.2	4.2	12.5	8.3	24
Total	1.7	43.1	13.8	1.7	6.9	19.0	13.8	8.6	58

Table 2.3b: Reasons for not seeking antenatal care 2014–2016

Percentage of women ages 15–49 who had a live birth in the period 2014 through 2016 but who did not see anyone for antenatal care for the most recent birth, by reason for not seeking antenatal care, according to background characteristics, SMGL Zambia, 2017

Background characteristic	Costs too much	Too far away	Transportation unavailable/too expensive	Husband/family does not allow	Other	Antenatal care is not necessary	Not customary/do not know/do not remember	Number of women
Mother's age at birth								
15–19	12.0	36.0	20.0	8.0	8.0	20.0	12.0	25
20–34	6.8	47.5	20.3	8.5	10.2	15.3	8.5	59
35–49	0.0	37.5	12.5	12.5	12.5	18.8	12.5	16
Education								
No formal education	5.9	47.1	5.9	17.6	23.5	23.5	0.0	17
Primary	9.8	37.7	19.7	8.2	6.6	18.0	11.5	61
Secondary	0.0	54.5	27.3	4.5	9.1	9.1	13.6	22
District								
Lundazi	4.5	18.2	22.7	9.1	18.2	31.8	13.6	22
Nyimba	33.3	16.7	33.3	16.7	0.0	0.0	16.7	6
Chembe/Mansa	4.2	41.7	0.0	16.7	12.5	25.0	12.5	24
Kalomo/Zimba	6.3	58.3	25.0	4.2	6.3	8.3	6.3	48
Total	7.0	43.0	19.0	9.0	10.0	17.0	10.0	100

Table 2.4: Number of antenatal care visits and timing of first visit (2009–2011)

Percentage distribution of women ages 15–49 who had a live birth in the period 2009 through 2011 by number of antenatal care (ANC) visits for the most recent live birth, and the timing of the first visit, and among women with ANC, median months pregnant at first visit, SMGL Zambia, 2017

Number and timing of ANC visits	Rural	Urban	Total
Number of ANC visits			
None	2.0	0.3	1.8
1	0.8	0.6	0.8
2–3	33.4	47.1	34.9
4+	61.9	50.4	60.6
Don't know	1.9	1.7	1.8
Total	100.0	100.0	100.0
Number of months pregnant at time of first ANC visit			
No ANC	2.0	0.3	1.8
<4	41.9	30.1	40.5
4–5	46.7	55.2	47.6
6–7	8.2	13.9	8.8
8+	1.3	0.6	1.2
Total	100.0	100.0	100.0
Number of women	2,845	359	3,204
Median months pregnant at first visit (for those with ANC)	4.2	4.6	4.3
Number of women with ANC	2,788	358	3,146

Table 2.5: Place where antenatal care was received 2009–2011

Percentage distribution of women ages 15–49 who had a live birth in the period 2009 through 2011 by place of delivery for the most recent birth, according to background characteristics, SMGL Zambia, 2017

Background characteristic	Hospital	Health centre	Health post	Outreach site	Other	Total	Number of women
Mother's age at birth							
15–19	11.3	67.7	19.3	1.8	0.0	100.0	799
20–34	10.9	67.8	19.4	1.7	0.1	100.0	1,921
35–49	10.1	71.4	16.2	2.3	0.0	100.0	426
Education							
No education/Preschool only	11.1	68.1	18.9	2.0	0.0	100.0	407
Primary	8.8	67.6	21.2	2.3	0.1	100.0	1,952
Secondary	15.1	70.4	13.8	0.7	0.0	100.0	727
Higher	28.3	63.3	8.3	0.0	0.0	100.0	60
District							
Lundazi	10.4	62.9	24.9	1.7	0.1	100.0	1,358
Nyimba	22.2	67.7	8.2	1.9	0.0	100.0	257
Chembe/Mansa	7.2	84.4	7.8	0.6	0.0	100.0	708
Kalomo/Zimba	11.4	63.3	22.1	3.0	0.1	100.0	823
Total	10.9	68.3	19.0	1.8	0.1	100.0	3,146

Table 2.6: Place of delivery

Percentage distribution of women ages 12–49 who had a live birth in the period 2009 through 2011 by place of delivery of their most recent birth and percentage of most recent births delivered in a health facility, according to background characteristics, SMGL Zambia, 2017

Background characteristic	Hospital	Health facility	Health post	Other/on the way to a facility	At home	Other	Total	Percentage delivered in a facility	Number of births
Mother's age at birth									
15–19	22.8	47.5	14.4	0.5	14.9	0.0	100.0	84.6	813
20–34	19.6	44.1	14.1	0.5	21.4	0.3	100.0	77.8	1,957
35–49	19.6	40.8	10.1	0.5	29.0	0.0	100.0	70.5	434
Education									
No education/preschool only	12.6	44.2	15.0	0.5	27.5	0.2	100.0	71.7	414
Primary	16.5	44.9	15.5	0.4	22.5	0.1	100.0	77.0	1,994
Secondary	32.5	44.4	8.4	0.7	13.6	0.4	100.0	85.3	736
Higher	56.7	35.0	3.3	0.0	5.0	0.0	100.0	95.0	60
District									
Lundazi	17.7	45.6	19.6	0.7	16.1	0.2	100.0	83.0	1,375
Nyimba	26.3	42.0	6.1	0.0	25.6	0.0	100.0	74.4	262
Chembe/Mansa	24.7	52.6	5.3	0.1	17.1	0.1	100.0	82.6	720
Kalomo/Zimba	19.2	36.7	13.2	0.6	30.0	0.2	100.0	69.2	847
Total	20.4	44.5	13.6	0.5	20.8	0.2	100.0	78.6	3,204

Table 2.7a: Reasons for not delivering in a health facility 2009-2011

Percentage of women ages 12–49 who had a live birth in the period 2009 through 2011 but who did not deliver in a facility for the most recent birth, by reason for not delivery in a facility, according to background characteristics, SMGL Zambia, 2017

Background characteristic	Costs too much	Not open away	Too far	Transportation unavailable /too expensive	Doesn't trust the facility	Expects poor quality service	Fear of abuse, disrespect	Lack of alternative care for family	No accommodations near facility	No female provider	Baby came earlier than expected	Husband did not allow	Not necessary	Other	Number of women
Mother's age at birth															
<20	4.0	2.4	30.4	28.8	0.0	0.0	0.8	2.4	1.6	2.4	31.2	1.6	4.0	12.8	125
20–34	5.6	5.4	29.4	33.6	1.2	0.7	0.2	2.1	3.5	0.9	28.3	0.5	7.7	13.1	428
35–49	5.5	3.9	25.0	35.9	0.0	0.8	0.8	3.1	3.1	0.8	27.3	0.8	7.0	16.4	128
Education															
No education/ preschool only	5.2	4.3	21.6	31.0	0.0	1.7	0.0	1.7	4.3	1.7	22.4	2.6	7.8	16.4	116
Primary	5.3	5.0	29.8	32.2	0.9	0.2	0.7	2.2	3.1	0.9	29.8	0.4	5.9	13.6	457
Secondary	5.7	2.9	33.3	40.0	1.0	1.0	0.0	3.8	1.9	1.9	31.4	0.0	10.5	9.5	105
Higher	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.7	3
District															
Lundazi	1.7	4.8	30.7	31.6	0.9	0.4	0.0	1.7	4.3	3.0	30.7	1.3	3.0	12.6	231
Nyimba	1.5	7.5	14.9	28.4	1.5	1.5	1.5	0.0	1.5	0.0	25.4	1.5	10.4	13.4	67
Chembe/Mansa	12.1	9.7	33.9	35.5	0.8	0.8	0.8	4.0	4.0	0.8	21.0	0.0	8.1	20.2	124
Kalomo/Zimba	6.2	1.2	28.2	34.7	0.4	0.4	0.4	2.7	1.9	0.0	31.3	0.4	8.9	11.6	259
Total	5.3	4.6	28.8	33.2	0.7	0.6	0.4	2.3	3.1	1.2	28.6	0.7	6.9	13.7	681

Source: Pregnancy History Questionnaire

Table 2.7b: Reasons for not delivering in a health facility 2014-2016

Percentage of women ages 12–49 who had a live birth in the period 2014 through 2016 but who did not deliver in a facility for the most recent birth, by reason for not delivery in a facility, according to background characteristics, SMGL Zambia, 2017

Background characteristic	Costs too much	Not open away	Too far	Transportation unavailable / too expensive	Doesn't trust the facility	Expects poor quality service	Fear of abuse, disrespect	Lack of alternative care for family	No accommodations near facility	No female provider	Baby came earlier than expected	Husband did not allow	Not necessary	Other	Number of women
Mother's age at birth															
<20	1.8	1.8	28.9	35.1	0.0	1.8	2.6	1.8	0.0	0.0	35.1	1.8	3.5	11.4	114
20–34	4.5	1.2	28.1	32.9	0.0	0.0	1.2	3.0	0.9	0.6	36.0	0.9	2.7	13.0	331
35–49	3.8	4.7	39.6	30.2	0.9	0.9	0.9	4.7	1.9	0.0	32.1	0.0	1.9	14.2	106
Education															
No education/ preschool only	5.2	2.6	31.2	28.6	0.0	0.0	1.3	6.5	1.3	1.3	32.5	2.6	1.3	11.7	77
Primary	2.9	2.4	31.1	31.4	0.3	0.8	1.3	2.9	1.1	0.3	35.4	0.5	3.4	14.0	379
Secondary	6.3	0.0	27.4	42.1	0.0	0.0	2.1	1.1	0.0	0.0	35.8	1.1	1.1	9.5	95
District															
Lundazi	1.6	2.4	32.5	27.8	0.0	0.0	0.8	4.0	0.8	0.8	34.1	1.6	3.2	11.9	126
Nyimba	6.1	6.1	21.2	45.5	0.0	0.0	0.0	0.0	3.0	0.0	30.3	3.0	0.0	6.1	33
Chembe/Mansa	3.3	2.5	32.0	37.7	0.0	0.8	2.5	4.1	1.6	0.8	26.2	0.8	2.5	15.6	122
Kalomo/Zimba	4.8	1.1	30.0	31.5	0.4	0.7	1.5	2.6	0.4	0.0	40.0	0.4	3.0	13.0	270
Total	3.8	2.0	30.5	32.8	0.2	0.5	1.5	3.1	0.9	0.4	35.0	0.9	2.7	12.9	551

Source: Pregnancy History Questionnaire

Table 2.8: Assistance during delivery 2009–2011

Percentage distribution of women ages 12–49 who had a live birth in the period 2009 through 2011, by person providing assistance during delivery of the most recent birth, and percentage of births assisted by a skilled provider, according to background characteristics, SMGL Zambia, 2017

Background characteristic	Doctor	Nurse/midwife	Other health worker	Other person	Don't know/missing	Total	Percentage delivered by a skilled provider*	Number of births
Mother's age at birth								
<20	8.98	67.28	11.32	11.93	0.49	100.00	76.26	813
20–34	8.38	61.88	14.21	14.97	0.56	100.00	70.26	1,957
35–49	7.60	55.07	16.82	19.59	0.92	100.00	62.67	434
Education								
No education/preschool only	7.73	54.83	18.36	18.60	0.48	100.00	62.56	414
Primary	7.97	61.18	14.49	15.85	0.50	100.00	69.16	1,994
Secondary	10.05	67.93	10.33	10.73	0.95	100.00	77.99	736
Higher	8.33	83.33	3.33	5.00	0.00	100.00	91.67	60
District								
Lundazi	9.02	66.62	12.36	11.56	0.44	100.00	75.64	1,375
Nyimba	15.27	51.15	23.66	9.16	0.76	100.00	66.41	262
Chembe/Mansa	8.75	62.92	15.14	11.81	1.39	100.00	71.67	720
Kalomo/Zimba	5.08	58.32	12.04	24.44	0.12	100.00	63.40	847
Total	8.43	62.33	13.83	14.83	0.59	100.00	70.76	3,204

* Skilled provider includes doctor and nurse/midwife

Table 3.1: Mortality by age and sex

Percentage distribution of household deaths by 5-year age groups, from January 1, 2016, through December 31, 2016, according to sex, SMGL Zambia, 2017

Age	Lundazi		Nyimba		Chembe/Mansa		Kalomo/Zimba	
	Deaths	Household population	Deaths	Household population	Deaths	Household population	Deaths	Household population
				Male				
< 1	289	5,824	44	1,371	181	3,694	130	4,551
1–4	176	21,902	29	5,732	140	16,432	57	17,903
5–9	59	27,974	15	7,210	65	21,053	35	22,697
10–14	45	25,626	14	6,901	49	19,545	19	18,784
15–19	47	20,269	10	5,442	42	15,534	25	14,304
20–24	43	15,225	26	3,859	78	10,705	26	10,427
25–29	32	10,515	15	2,836	60	8,189	17	7,218
30–34	56	8,707	22	2,288	75	6,724	24	5,804
35–39	36	7,760	21	2,126	77	6,180	30	5,537
40–44	59	6,501	25	1,681	72	5,161	28	4,465
45–49	42	5,755	18	1,420	56	4,313	23	3,438
50–54	53	4,008	12	915	47	2,967	21	2,270
55–59	34	3,138	15	771	43	2,190	12	1,823
60–64	33	2,290	12	517	40	1,739	12	1,116
65–69	41	1,830	11	406	33	1,407	9	838
70–74	46	1,198	13	273	39	946	18	562
75–79	36	999	7	282	31	620	17	500
80–84	32	538	12	119	29	318	19	261
85–89	26	370	9	112	15	180	19	182
90–94	19	110	4	30	8	43	2	54
95+	7	655	0	331	3	300	7	94
Total	1,211	171,194	334	44,622	1,183	128,240	550	122,828
				Female				
< 1	201	5,942	35	1,342	155	3,771	127	4,698
1–4	178	22,814	44	5,854	110	16,482	59	18,220
5–9	64	28,295	6	7,083	45	21,336	23	22,867
10–14	30	25,924	10	6,686	29	19,977	9	19,438
15–19	26	19,402	8	4,855	28	15,758	13	13,928
20–24	31	16,421	10	4,347	31	12,652	14	10,983
25–29	18	11,041	6	3,198	43	9,163	17	7,916
30–34	22	9,971	11	2,582	52	7,801	15	6,865
35–39	32	8,135	18	2,243	34	6,520	22	6,142
40–44	22	6,513	9	1,648	43	4,913	13	4,574
45–49	26	5,418	14	1,374	26	3,669	11	3,315
50–54	29	5,111	4	1,199	52	3,543	20	2,967
55–59	25	3,242	8	780	21	2,466	10	2,287
60–64	30	2,585	11	654	29	1,929	8	1,355
65–69	32	2,342	14	614	37	1,765	16	1,134
70–74	35	1,767	17	555	42	1,167	19	894
75–79	42	1,285	7	457	19	735	24	762
80–84	40	817	14	249	38	363	26	420
85–89	26	372	8	171	26	211	15	217
90–94	16	113	5	48	6	41	13	54
95+	8	611	1	161	2	226	4	121
Total	933	178,121	260	46,100	868	134,488	478	129,157

Table 3.2: Crude death rates and standardised death rates by sex, according to district, for 2016, Zambia SMGL 2017

	Crude death rate			Standardised death rate		
District	**Male**	**Female**	**Both sexes**	**Male**	**Female**	**Both sexes**
All districts	7.0	5.2	6.1	7.1	5.0	6.0
Kalomo/Zimba	4.5	3.7	4.1	4.8	3.7	4.2
Lundazi	7.1	5.2	6.1	7.1	4.9	5.9
Mansa/Chembe	9.2	6.5	7.8	9.4	6.5	7.9
Nyimba	7.5	5.6	6.5	7.5	5.2	6.3

Note: SMGL male death rates are standardised using the 2010 Zambia Census population for males, SMGL female death rates are standardised using the 2010 Zambia Census population for females, and SMGL death rates for both sexes are standardised using the 2010 Zambia Census population for both sexes.
Source: 2010 Census population distributions (Central Statistical Office 2012).

Table 3.3a: Perinatal mortality

Number of stillbirths and early neonatal deaths, and the perinatal mortality rate, from January 1, 2016, to December 31, 2016, by background characteristics, SMGL Zambia, 2017

Background characteristic	Number of stillbirths[a]	Number of early neonatal deaths[b]	Perinatal mortality rate (per 1,000 births)[c]	Number of pregnancies 28+ weeks duration[d]
Mother's age at birth				
15–19	10	15	*	640
20–34	26	12	*	1,529
35–49	8	0	*	273
Education				
No formal education	4	1	*	225
Primary	35	19	*	1,489
Secondary	5	7	*	693
Higher	0	0	*	35
District				
Lundazi	21	10	*	1,000
Nyimba	5	1	*	210
Chembe/Mansa	10	9	*	517
Kalomo/Zimba	8	7	*	715
Total	44	27	(29.1)	2,442

Notes: Figures in parentheses are based on 25-49 stillbirth or early neonatal deaths. An asterisk indicates that a figure is based on fewer than 25 stillbirths or early neonatal deaths and has been suppressed.

[a] Stillbirths are foetal deaths in pregnancies lasting 28 or more weeks.

[b] Early neonatal deaths are deaths of live-born infants within 0–6 days after birth.

[c] The sum of the number of stillbirths and early neonatal deaths divided by the number of pregnancies of 7 or more months' duration, expressed per 1,000

[d] Includes pregnancies that end with multiple births (live birth with stillbirth), stillbirth (single), multiple stillbirths

Table 3.3b: Perinatal mortality

Number of stillbirths and early neonatal deaths, and the perinatal mortality rate for pregnancies, during the period 2009–2011, by background characteristics, SMGL Zambia, 2017

Background characteristic	Number of stillbirths[a]	Number of early neonatal deaths[b]	Perinatal mortality rate (per 1,000 births)[c]	Number of pregnancies 28+ weeks duration[d]
Mother's age at birth				
15–19	18	10	*	822
20–34	28	19	*	2,173
35–49	11	6	*	476
Education				
No formal education	14	5	*	458
Primary	28	20	*	2,140
Secondary	14	9	*	810
Higher	1	1	*	63
District				
Lundazi	24	13	*	1,462
Nyimba	9	3	*	275
Chembe/Mansa	11	7	*	775
Kalomo/Zimba	13	12	*	959
Total	57	35	(26.5)	3,471

Notes: Figures in parentheses are based on 25-49 stillbirth or early neonatal deaths. An asterisk indicates that a figure is based on fewer than 25 stillbirths or early neonatal deaths and has been suppressed.

[a] Stillbirths are foetal deaths in pregnancies lasting 28 or more weeks.

[b] Early neonatal deaths are deaths of live-born infants within 0–6 days after birth.

[c] The sum of the number of stillbirths and early neonatal deaths divided by the number of pregnancies of 7 or more months' duration, expressed per 1,000

[d] Includes pregnancies that end with multiple births (live birth with stillbirth), stillbirth (single), multiple stillbirths

Table 3.3c: Perinatal mortality

Number of stillbirths and early neonatal deaths, and the perinatal mortality rate for pregnancies, during the period 2014–2016, by background characteristics, SMGL Zambia, 2017

Background characteristic	Number of stillbirths[a]	Number of early neonatal deaths[b]	Perinatal mortality rate (per 1,000 births)[c]	Number of pregnancies 28+ weeks duration[d]
Mother's age at birth				
15–19	31	28	(36.0)	1,638
20–34	62	29	(23.4)	3,888
35–49	13	7	*	691
Education				
No formal education	11	5	*	592
Primary	71	37	(28.6)	3,779
Secondary	21	19	*	1,746
Higher	3	3	*	100
District				
Lundazi	53	26	(31.7)	2,489
Nyimba	7	3	*	559
Chembe/Mansa	25	22	*	1,397
Kalomo/Zimba	21	13	*	1,772
Total	106	64	27.3	6,217

Note: Figures in parentheses are based on 25-49 stillbirth or early neonatal deaths. An asterisk indicates that a figure is based on fewer than 25 stillbirths or early neonatal deaths and has been suppressed.

[a] Stillbirths are foetal deaths in pregnancies lasting 28 or more weeks.

[b] Early neonatal deaths are deaths of live-born infants within 0–6 days after birth.

[c] The sum of the number of stillbirths and early neonatal deaths divided by the number of pregnancies of 7 or more months' duration, expressed per 1,000

[d] Includes pregnancies that end with multiple births (live birth with stillbirth), stillbirth (single), multiple stillbirths