Nigeria

2019 Verbal and Social Autopsy Study
Main Report

NATIONAL POPULATION COMMISSION

FEDERAL MINISTRY OF HEALTH

USAID
FROM THE AMERICAN PEOPLE

2019

A VERBAL AND SOCIAL AUTOPSY STUDY TO DETERMINE CAUSES AND DETERMINANTS OF DEATHS OF NEONATES AND CHILDREN UNDER-FIVE YEARS OF AGE IN NIGERIA

Main Report

National Population Commission

Abuja, Nigeria

CIRCLE, Social Solutions International, Inc.

Rockville, Maryland, USA

October, 2020

The 2019 Verbal and Social Autopsy (VASA) study was implemented by the National Population Commission (NPC) in collaboration with the Federal Ministry of Health, Nigeria. The funding for the 2019 VASA was provided by the United States Agency for International Development (USAID) through the Coordinating Implementation Research to Communicate Learning and Evidence (CIRCLE) Project led by Social Solutions International who also provided technical support.

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FOREWORD

The future of family, community or nation along with culture and tradition is bequeathed on their children. In line with the Sustainable Development Goals (SDGs), the Federal Government of Nigeria is making targeted efforts to improve neonatal and child health; hence the need for well-sourced information on the causes and determinants of under-five deaths, as critical to crafting evidence- based action.

The 2019 Verbal and social Autopsy Study, a follow up to 2018 NDHS, was conducted to estimate the causes and determinants of neonatal and child mortality. In this second edition of VASA in Nigeria, an in-depth qualitative component was added, to obtain a better understanding of social and cultural factors that influence child mortality.

Over the years, the National Population Commission has consistently carried out its responsibility of producing timely and reliable population-based health related data. This work shows the importance of participatory and collaborative approach in improving health service delivery and improving child health. My appreciation goes to the CIRCLE Project for their technical support, through the contract with United State Agency for International Development (USAID). The Federal Ministry of Health expresses her appreciation to the Technical Working Group (TWG) especially the Academia, Development Partners, Ministries, Departments and Agencies, Government at all levels and security agencies for their support, towards the success of this study.

It is with pleasure that I recommend this report to you. I believe the findings will be useful tools in the design of interventions that will reduce neonatal, infant and under-five mortality indices in Nigeria.

Dr. E. Osagie Ehanire, MD, FWACS
Honorable Minister of Health.

PREFACE

The 2019 Verbal and Social Autopsy (VASA) study is the second to be conducted in the country after the 2014 VASA which was the first of its kind in Nigeria. This specialized study revisits households with reported under-five deaths in the most recent 2018 Nigeria Demographic Health Survey (NDHS).

The 2018 NDHS shows under-five mortality to be 132 deaths per 1,000 live births. This implies that more than 1 in 8 children in Nigeria die before their 5th birthday. Although this is a reduction down from 157 deaths per 1,000 live births reported in the 2008 NDHS, the figure is still high for a government that is committed towards entrenching a healthy population.

There are various factors that contribute to under-five mortality in Nigeria. It is in a bid to ascertain these factors that the National Population Commission (NPC), in collaboration with the Federal Ministry of Health (FMOH) and the USAID-funded Coordinating Implementation Research to Communicate Learning and Evidence (CIRCLE) project, led by Social Solutions International, embarked on the 2019 VASA. As part of the methodology for the study, a qualitative component was added to the quantitative data collection for the first time to ensure that the sociocultural determinants of child death were properly captured.

I want to sincerely appreciate the Honourable Minister of Health, Dr. Osagie Ehanire, for providing the leadership and commitment as the Chairman of the 2019 VASA Steering Committee. I also wish to thank members of the Survey Steering Committee for their dedication to the successful implementation of the study.

Furthermore, I would like to thank the Planning and Research Committee of the National Population Commission under the chairmanship of Hon. Ejike Eze and all Federal Commissioners for their support during the implementation period and for providing excellent leadership and advocacy support in the states. I also wish to appreciate the technical guidance provided by Dr. Ghaji Ismaila Bello (Director-General), Mrs. Adenike 0. Ogunlewe (Director, Planning and Research), and all other Directors in the Commission.

In addition, I wish to express further appreciation to the 2019 VASA Survey Management led by the Project Directors, Mr. Osifo Tellson Ojogun and Mrs. Bintu Ibrahim Abba; and the Project Coordinator, Inuwa Bakari Jalingo, for managing the technical, administrative, and logistical phases of the study. My appreciation also goes to members of the Technical Working Group that were drawn from the Academia, Federal Ministry of Health, National Bureau of Statistics, the Federal Ministry of Women Affairs and National Population Commission. Still under this category, I must thank the field staff and data processing team for doing a marvelous job.

To our Partners, I appreciate the United States Agency for International Development (USAID) for funding the 2019 VASA study through the CIRCLE project which also provided technical assistance. In particular, we thank Dr. Ana C. Franca-Koh, Professor Robinson Wammanda, Dr. John Quinley, Dr. Michael Kunnuji, Rebekah King and the entire CIRCLE team for their dedication and commitment throughout the study period.

Finally, I want to express gratitude to the thousands of mothers and other caregivers, as well as community members and leaders who assisted with and participated in the study. They generously offered their time and insights in spite of the difficult task of reporting on the circumstances related to how their own children or children in their community died.

I sincerely hope the 2019 VASA report will serve as a useful tool to policy makers and programme implementers in our collective effort towards reducing infant and child mortality to the barest minimum in Nigeria.

Dr. Eyitayo Oyetunji
Ag. Chairman
National Population Commission

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ACRONYMS

ACT	Artemisinin-based Combination Therapy
AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care
CAPI	Computer-Aided Personal Interview
CHERG	Child Health Epidemiology Reference Group
CIRCLE	Coordinating Implementation Research to Communicate Learning and Evidence
CSPro	Census and Survey Processing System
DHS	Demographic and Health Survey
EAVA	Expert Algorithm Verbal Autopsy
EAs	Enumeration Areas
FCT	Federal Capital Territory
FGD	Focus Group Discussion
FMoH	Federal Ministry of Health
HIV	Human Immunodeficiency Virus
IMNCH	Integrated Maternal Newborn and Child Health
iCCM	Integrated Community Case Management
IMCI	Integrated Management of Childhood Illness
IPTp	Intermittent Preventive Treatment (for malaria) during pregnancy
IQR	Interquartile range
LGAs	Local Government Areas
MNCH	Maternal, Newborn and Child Health
NDHS	Nigeria Demographic and Health Survey
NGO	Non-Governmental Organisation
NHIS	National Health Insurance Scheme
NISONM	Nigerian Society of Neonatal Medicine
NPC	National Population Commission
ORS	Oral Rehydration Solution
PCVA	Physician-Coded Verbal Autopsy
PHC	Primary Health Centre
PMV	Patent Medicine Vendor
SA	Social Autopsy
TBA	Traditional Birth Attendant
TOI	Training of Interviewers
USAID	United States Agency for International Development
VASA	Verbal Autopsy and Social Autopsy

EXECUTIVE SUMMARY

BACKGROUND

Nigeria, with a population of over 200 million, has one of the largest health workforces in Africa but accounts for about 10% of the under-five deaths globally. Although under-five mortality declined by 48% between 1990 and 2015, the pace remains significantly slower than needed to achieve the Sustainable Development Goal (SDG) target of reducing under-five mortality to 25 deaths/1,000 live births by 2030. The 2018 Nigeria Demographic and Health Survey (NDHS) documented an under-five mortality rate of 132 per 1,000 live births, infant mortality rate of 67 per 1,000 live births and neonatal mortality rate of 39 per 1,000 live births.

As part of the country's effort to accelerate reductions in child mortality, the first Nigerian Verbal Autopsy and Social Autopsy (VASA) study, conducted in 2014, provided a primary estimate of the causes of under-five deaths, as well as information on socio-cultural barriers to caregivers accessing care for their sick children. While the 2014 VASA provided much-needed data on the causes and distribution of under-five deaths, gaps remained in information on health-seeking behaviours, health systems issues, as well as caregiver, community, and provider perspectives on child deaths. Using a mixed methods approach combined with extensive stakeholder engagement, the 2019 VASA study aimed to determine cause distributions of under-five deaths based on the 2018 NDHS, and to explore and document social and contextual factors contributing to child deaths in Nigeria. The 2019 VASA was implemented by the National Population Commission (NPC), in collaboration with the Federal Ministry of Health (FMoH), with technical support from the USAID-funded Coordinating Implementation Research to Communicate Learning and Evidence (CIRCLE) Project.

The objectives of the 2019 Nigeria VASA were to provide:

- National- and Zonal-level estimates of the major causes of under-five mortality in Nigeria in the 2013-2018 period.
- Data on National and Zonal patterns of care-seeking, social factors, and interventions related to deaths in children under-five, along with qualitative narratives of factors associated with these patterns.
- Further analysis and insights into the causes and social determinants of deaths among children to enable policy makers to make evidence-based decisions and adopt appropriate intervention programmes.

METHODOLOGY

The 2019 VASA employed a nationally representative, cross-sectional survey in all 36 states of Nigeria and the Federal Capital Territory (FCT) with mothers and/or caregivers aged 15-49 that: 1) reported an under-five child death in the last five years prior to the 2018 NDHS; and 2) volunteered to participate willingly and gave informed consent. Building on the multistage sampling procedures of the 2018 NDHS, 42,000 households were selected to be representative of the 36 states plus the FCT and urban/rural strata in Nigeria from which 4,096 under-five deaths in the last five years were identified. Of these, 3,993 gave approval for the follow-up VASA study. The VASA protocol only allowed one case per household to be surveyed, which excluded another 778, leaving a target sample of 3,215 households to be surveyed. The VASA teams attempted to visit all these households and were able to complete 3,075 surveys, representing a completion rate of 95.6%.

For the qualitative component, the study team conducted in-depth interviews with 69 mothers of under-five children who had died; in-depth interviews with 24 key informants knowledgeable about the local health systems and typical health-seeking behaviours of caregivers in communities with high child mortality; 48 focus group discussions (FGDs) with key male and female community members; and structured observations of 12 health facilities serving communities where high child mortality was documented in the 2018 NDHS. Three clusters with the highest cases of under-five deaths were selected from the two states with the highest cases of under-five deaths in each of the geopolitical zones. In each selected cluster, two caregivers who reported the most recent cases of child deaths were interviewed.

STUDY TOOLS

The 2019 VASA survey tool was developed by integrating the 2016 WHO Global Standard Verbal Autopsy Instrument with the 2014 VASA instrument. The survey questionnaire had a general information module for deceased neonates and children, followed by Verbal Autopsy and Social Autopsy questions for both neonates and children 1-59 months old. The VASA survey questionnaire was translated into Nigeria's three major languages of Yoruba, Igbo, and Hausa and later back translated into English. The final translations were inserted into a Census and Survey Processing System (CSPro) software application that was developed to enable direct, field-based Computer-Aided Personal Interview (CAPI) capture of the VASA interview data on a netbook computer.

The qualitative data collection involved the use of semi-structured interview and discussion guides and an observation checklist. The interview guides were designed to explore barriers to child care at the individual, family, community and health system levels.

DATA COLLECTION AND ANALYSIS

Coordinated by NPC, study data collection was conducted from October to December 2019 by 15 teams across the country, each consisting of a Coordinator, a Supervisor, three to four Interviewers and a Driver. Supervisors used field check tables generated by a CSPro programme on their netbooks concurrently with field work to monitor data quality. Members of the Technical sub-committee and others also accompanied some teams to monitor the work.

The verbal autopsy data were analysed using the Physician-Coded Verbal Autopsy (PCVA) and Expert Algorithm Verbal Autopsy (EAVA) to determine the cause distribution of deaths. Study questions were analysed using descriptive frequencies or cross-tabulations, usually accompanied by breakdowns by age of death group and geopolitical zone.

A team of 24 Field Researchers, six Zonal Coordinators and one National Coordinator collected the qualitative data between October and November 2019. Field researchers worked in pairs, with an interviewer/moderator and a note-taker. In all interviews and discussions, comprehensive notes were taken. In addition, the research team audio-recorded interviews and discussions when they were able to obtain consent. The research team transcribed these recordings and anonymised transcripts undertaking thematic coding using NVivo version 12. The team created a coding framework in line with the themes in the study tools and other themes that emerged after a preliminary review of transcripts.

KEY FINDINGS

The following are the key findings from the quantitative and qualitative data.

Demographics

- Analysis showed that **post-neonatal mortality (1-59 months) was much higher among families with no maternal or paternal education, high household poverty, and those living in rural areas and those that reside in the North West and North East zones**. Neonatal mortality shows this pattern to a lesser degree and **neonatal deaths remain high even in urban and higher income families**.

Causes of deaths

- Both methods of assessment found that the three leading **causes of neonatal deaths were sepsis, intrapartum-related injury, and pneumonia**.

- Both methods of assessment found that **malaria was the single largest cause of death in children 1-59 months of age, followed by diarrhoea**. The physician-coded verbal autopsy found 'other infections' as the third leading cause of death while pneumonia, was third leading cause of death by EAVA.

Pregnancy, labour and delivery

- Various complications or symptoms were commonly reported in pregnancy and during labour and delivery for mothers of children who died. **Complications were much higher in early neonatal deaths or stillbirths** compared to older infants. A larger percentage of women who had their newborn die reported labour and deliver complications or symptoms (55-63%) compared to 22% in those whose children died between 1-11 months of age.

- For all age of death groups, **women reporting labour and delivery complications were more likely to deliver in a facility** (25% complications in facility births vs 12% for home births for deaths up to 11 months of age). Although only 54% of women with labour and delivery complications reported seeking care, this is enough to make the risk level of patients in facilities much higher than women delivering in the community, especially in geopolitical zones where most women deliver at home. Even among deaths before one month of age, women with a perinatal death sought care at higher rates (60%) versus women with a late neonatal death (41%-46%).

- **Women experiencing labour and delivery complications tended to seek care at facilities regardless of where they initially chose to give birth, which explains the finding that facility births were higher in the youngest age of death groups:** 63% for stillbirths, 50% for those who died on the first day, 43% for those who lived for one day and 37% for those who died on days 2-6, and 33-34% for late neonatal and 1-11- month infant deaths.

- **Women face a variety of obstacles in accessing care for pregnancy and delivery.** These included **distance to facilities, difficulties with transport, especially at night, costs for transport or for facility care, and quality of care problems at facilities. Several cultural obstacles were found** including the difficulty of women who were secluded and unable to obtain permission or help when ill, and a preference in many cases for home deliveries and traditional attendants.

Routine care for newborns and infants

- The study elicited information about care around the time of birth, feeding, post-natal care, household smoke exposure, use of insecticidal nets and immunisation. Many of these showed gaps in optimal health practices. For example, while 75% of those who died in the newborn period were wiped and dried within a few minutes, only 15% were immediately placed on the mother's chest and 13% had skin-to-skin contact. While there were difficulties comparing deaths in the study with children who did not die (e.g., due to the illness itself in newborns, or lack of records for immunisations) the **gaps in routine and preventive care** that could be seen for all children in the DHS **clearly contributed to the high mortality rates in Nigeria**.

Care in the final illness

- Due in part to women with complications going to facilities, **43% of deaths in neonates occurred after a facility birth, and about half of these died before leaving the birth facility**. Improved prevention and timely management of maternal and neonate complications and improved quality of care in facilities may help to avert some of these deaths.

- **Among the 57% of neonatal deaths among babies born at home** (plus 22% who left their birth facility alive), **most (77%) died without receiving formal health care**. Many of these deaths occurred quickly (among all neonatal deaths, about 50% had an illness duration of less than one day and two-thirds were less than two days); traditional care or medicines from a drug shop were reported to have been given for some. The qualitative study found that caregivers often simultaneously used formal health care, traditional care and Patent Medicine Vendors (PMVs). **Most of the 23% of neonates who were taken to a health provider died at home after leaving the provider** (including 64% of those seen at a hospital).

- **For deaths in the 1-59-month age range, 12% died without any care and 18% died after receiving only medicine from a drug shop, home, or traditional care. Sixty-nine percent were taken to obtain care from a health provider, with some in extreme condition (4% died on the way, leaving 65% who reached a health provider).** Most providers were public hospitals and health centres. About 23% of all cases died at the health provider (whether the first or other provider), while 41% received treatment and died at home. A few children were reported to have been referred to another provider, either formally or informally, and referral was only partially predictive of whether families went to another provider. The qualitative study revealed the many factors influencing families' decisions on care-seeking.

- **Many facilities lacked personnel, equipment and drugs to provide good quality care. In those cases, caregivers typically were referred to higher-level facilities, requiring them to spend more money on transportation.** Unfortunately, many households could not afford this and other out-of-pocket health expenses.

- Home, traditional and drug shop treatment showed a mix of approaches, with many children receiving both modern and traditional medicines. The qualitative study further revealed **that nearly all respondents using this mix of traditional and modern approaches were heavily influenced by beliefs about causes and effective treatments.** Choices depended on beliefs about a particular set of symptoms, prior experience, advice from family members and the community, and

ease of access. While some families made use of formal health care readily, many others considered hospital care only for certain types of illness or for severe cases.

- **Caregivers who sought care from health providers for their sick under-five children sometimes left despite their children still being ill, only to have those children die shortly after. One reason for this was that caregivers, especially when they perceived no improvement, decided to 'try other alternatives' – traditional or spiritual care.** The suggestion to try traditional or spiritual care came from family/community members, and sometimes even from health care providers who shared beliefs that support this health-seeking behaviour.

- **The most commonly expressed concerns in accessing formal health providers included distance to care (21%), costs (18%), transportation (10%), and going at night (9%), with a smaller percentage complaining of problems with quality of care.** These concerns inhibited many families from accessing formal health care. Obstacles at the family and community levels included the belief that some types of illness require traditional or spiritual approaches, lack of autonomy for mothers in terms of permission or funds needed to go for formal care, and insecurity posed a risk to personal safety.

- In addition**, many caregivers, particularly in northern zones, lived in seclusion** and were prohibited from working outside the home or accessing care from facilities where health providers were men. **This practice reduced women's ability to contribute to health expenses, decision-making on child care, and their involvement in seeking care for their children in health care facilities.**

RECOMMENDATIONS

Recommendation 1: Accelerate implementation of key, existing intervention programmes for identification and management of newborn infections at community and first-level health facilities and case management of common childhood illness in the community.

- Scale up and strengthen implementation of the Community Health Influencers, Promoters and Services Programme (CHIPS).

- Improve implementation of the Integrated Management of Childhood Illness (IMCI) programme for primary-level facilities and Integrated Community Case Management (iCCM) strategy to bring accessible, affordable, and quality treatment of common childhood illnesses to the community and first-level/primary health care levels, with provision for referrals of severe cases to appropriately equipped facilities.

- Implement guidelines for the management of young infants with signs of possible severe bacterial infection when referral is not feasible.

- Expand existing community-based child health preventive services to cover all children at risk (e.g., immunisations, mosquito nets, Vitamin A supplementation) as well as Community Management of Acute Malnutrition.

Recommendation 2: Strengthen the implementation of programmes that promote care-seeking for pregnancy and labour/delivery associated complications and birth preparedness of health care facilities.

- Establish community programs to identify pregnant women, list, refer and link them to health facilities to receive quality antenatal care (ANC).
- Increase caregiver awareness and training on the importance of antenatal care.
- Engage community leaders, families and communities to support immediate access to care for women with pregnancy, labour and delivery complications.
- Train and produce enough community midwives and other skilled birth attendants to expand quality antenatal and delivery services, and ensure they are accessible in all communities such that facility-based skilled attendance at delivery becomes the norm throughout Nigeria.
- Improve the ability of all health facilities to handle the many complications and symptoms commonly indicating risk of stillbirths and early neonatal deaths.
- Equip and appropriately staff all health facilities to handle complications of pregnancy and delivery, to provide skilled neonatal care, and to receive or send referrals as needed for appropriate care.
- Establish mentorship, on-the-job training, and mentoring programmes for doctors, midwives, and community health extension workers to ensure the provision of quality pregnancy, delivery and newborn services in health facilities.
- Establish/strengthen and scale up quality improvement programmes in all health facilities.
- Strengthen maternal and perinatal (and child) death surveillance and response at all levels of care.

Recommendation 3: The government should prioritise the implementation of essential interventions around the time of birth as part of the integrated maternal, newborn and child health care package.

- Strengthen community-based essential newborn care packages for deliveries at home.
- Accelerate competency training for health care providers on essential newborn care packages, such as the Essential Newborn Care Course (ENCC).
- Train first-level health care workers on essential newborn care and resuscitation.

Recommendation 4: The government should broaden its focus beyond just health service provision and accelerate implementation of policies and programmes to increase accessibility to health facilities for maternal and child care.

- Enhance access to health care through provision and enhancement of infrastructure such as roads, safe drinking water, and sanitation and ensure security of lives and property.
- Remove or reduce financial barriers to child health care, including the cost of registration, laboratory tests, drugs, and other health care-related costs.

Recommendation 5: The government should improve the implementation of simple community-based behavioural change programmes to improve caregivers' knowledge of preventive care and their responsiveness in seeking care for children. Nigeria should also address the problems of low levels of education, poverty and the disadvantaged situation of women.

- Improve health education to address misconceptions about child health care and implement programmes to address personal and environmental hygiene practices through multiple channels, including the media and basic education curriculum.

- Enhance the implementation of programmes and interventions targeted at reducing poverty among women through skill acquisition programmes and increased access to capital. Such programmes will help to increase their involvement in child health care decision-making at the family level.

- Increase attention to basic education. This is a key factor in reducing child mortality, and Nigeria is far behind other countries in ensuring that both girls and boys all complete their education so they can better understand good home practices and access effective primary health care.

- Dispel common myths and misconceptions held by health care workers through behaviour change communication. Providers' health beliefs will impact the beliefs of caregivers because their position earns them trust and credibility.

CHAPTER 1: INTRODUCTION

1.1 Background

Nigeria is one of five countries that account for half of the under-five deaths globally, and according to the 2018 Demographic and Health Survey has an under-five mortality rate of 132 per 1,000 live births.[1] According to trend analysis, under-five mortality declined by 48% between 1990 and 2015.[2] However, the pace of decline remains significantly slower than needed to achieve the Sustainable Development Goal (SDG) 3 target of reducing under-five mortality to 25 deaths/1,000 live births by 2030.[3]

Like many sub-Saharan African countries, Nigeria has historically depended on data modelling by the Child Health Epidemiology Reference Group (CHERG), an indirect method of estimating causes of under-five deaths, to determine the cause distributions of deaths in neonates, infants and children. As part of the country's effort to accelerate reductions in child mortality, the first Nigerian Verbal Autopsy and Social Autopsy (VASA) was conducted in 2014 using households with histories of under-five deaths identified during the 2013 Nigeria Demographic and Health Survey (NDHS). The 2014 VASA provided a primary estimate of causes of under-five deaths as well as information on the sociocultural factors that might have been barriers to caregivers accessing care for their sick children.[4]

Verbal Autopsy of deaths uses retrospective interviews with family and caregivers to document and understand the symptoms and signs of the fatal illness. It is a useful tool to estimate the causes of deaths in a specific population with poor vital registration or medical certification of the causes of deaths.[5] Verbal Autopsy has been widely used in household surveys, demographic surveillance sites, vital registration systems and special studies. Social Autopsy builds on Verbal Autopsy by studying the setting and the sequence of decisions and events that led to death. Social Autopsy focuses on understanding the decision-making, care-seeking, and actual care that preceded death to provide insight into social determinants of death and how deaths might be prevented.[6]

While the 2014 VASA provided much needed data on the causes and distribution of under-five deaths, information gaps remained on health seeking behaviours and health systems issues, as well as caregiver, community, and provider perspectives on child deaths. Using a mixed methods approach combined with extensive stakeholder engagement, the 2019 VASA study aimed to determine cause distributions of under-five deaths based on the 2018 NDHS, and to explore and document social and contextual factors contributing to child deaths in Nigeria.

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1.2 Objectives of the 2019 VASA

The 2019 VASA was implemented by the National Population Commission (NPC), in collaboration with the Federal Ministry of Health (FMoH), with technical support from the USAID-funded Coordinating Implementation Research to Communicate Learning and Evidence (CIRCLE) Project. The objectives of the 2019 Nigeria VASA were to provide:

- National- and Zonal-level estimates of the major causes of under-five mortality in Nigeria in the 2013-2018 period.
- Data on National and Zonal patterns of care-seeking, social factors, and interventions related to deaths in children under-five, along with qualitative narratives of factors associated with these patterns.
- Further analysis and insights into the causes and social determinants of death among children to enable policy makers to make evidence-based decisions and to inform programmes to best improve health outcomes among under-five children.

1.3 Country Profile

1.3.1 GEOGRAPHY

The Federal Republic of Nigeria is located on the western coast of Africa, bordered by the Republics of Niger (north), Chad (northeast), Cameroon (east) and Benin (west). To the south, the country is bound by the Gulf of Guinea of the Atlantic Ocean. With a total area of 923,768 square kilometres, Nigeria is the fourteenth-largest country in Africa based on land mass. The majority (99%) of the country is covered by land (917,768 square kilometres), while the remaining area is water.[7]

Nigeria's topography is characterised by plains in the north and south, hills and plateaus in the central part of the country, as well lowlands and coastal areas, including the Niger River Delta in the south and the Lake Chad Basin area in the north. There are also mountainous areas along the southeastern border with Cameroon.[8]

Nigeria is located above the equator and generally has a tropical climate with both wet (April - September) and dry (October - March) seasons. However, the climate varies by region: arid in the north; tropical in the central region; and equatorial in the south. The *harmattan* season occurs between November and April is characterised by cold, dusty winds blown from the Sahara Desert. This season usually lasts longer in the north. Overall, across the country temperatures vary between 25° and 40° Celsius.[9]

1.3.2 ADMINISTRATIVE SYSTEM

Nigeria operates a three-tier federal system of governance comprising federal, 36 states and the Federal Capital Territory (FCT), and 774 local government areas (LGAs). States are often grouped into geopolitical

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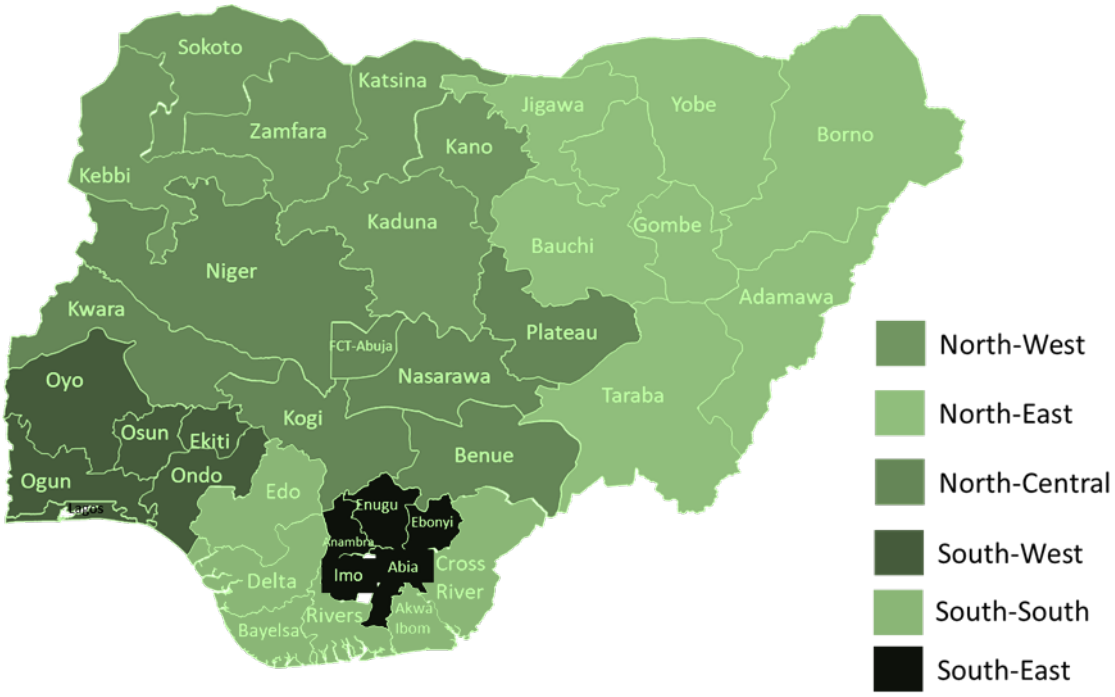
7 The World Factbook 2020. Washington, DC: Central Intelligence Agency, 2020. Accessed: https://www.cia.gov/library/publications/the-world-factbook/attachments/summaries/NI-summary.pdf

8 Falola, T.O., Hamilton, A., Kirk-Greene, M., Kenrick, R., Udo, J.F., Ajayi, Ade., Encyclopedia Britannica, 2020. Accessed: https://www.britannica.com/place/Nigeria

9 Ibid.

zones for analysis and administrative convenience: North West, North East, North Central, South West, South East, and South South, although these have no formal legal function. The LGAs are further divided into 9,565 political wards. These administrative units were further subdivided during the 2006 Population and Housing Census of the Federal Republic of Nigeria (NPHC) to create Census Enumeration Areas (EAs).[10] The EAs were used in sampling for the 2018 NDHS and the current VASA study.

Figure 1: Map of Nigeria showing the six geopolitical zones



1.3.3 POPULATION

Nigeria is the most populous country in Africa and ranked seventh most populous country in the world. According to estimates, the population increased to 201,135,262 by mid-2019.[11] The most populous states are Kano, Lagos and Kaduna. The population distribution by sex is relatively equal with about 51% male and 49% female.[12] Nigeria has a young population structure, as almost half of Nigerians (46%) are under 15 and children under-five make up 20%.[13] The estimated population density for 2018 was 215 people per square kilometre.[14] Nigeria's population is not evenly distributed across the country. States in the south (Lagos, Anambra, Imo, Abia, and Akwa Ibom) as well as Kano State in the north are densely populated, while other areas like the Chad Basin and Niger River Valley are sparsely populated.[15]

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[10] National Population Commission. A verbal/social autopsy study to improve estimates of the causes and determinants of neonatal and child mortality in Nigeria. Final report. March 2016. www.population.gov.ng

[11] National Bureau of Statistics. Population Estimates. 2019. Accessed: https://nigerianstat.gov.ng/elibrary

[12] National Population and Housing Census, 2006. Accessed: https://www.google.com/url?q=https://nigeria.opendataforafrica.org/ifpbxbd/state-population-2006&sa=D&ust=1588974123388000&usg=AFQjCNHRcTg1Vxwv87lVaNzJzDWxK4t2dw

[13] Ibid, 10.

[14] World Bank, 2018. Accessed: https://data.worldbank.org/indicator/EN.POP.DNST?locations=NG

[15] Ibid, 11.

Nigeria is home to over 250 ethnic groups; however, the majority of the population is Yoruba, Igbo, Hausa, Fulani, Ijaw, Kanuri, Ibibio, or Tiv. Nigerians are roughly split on religious affiliation with about half being Muslim and half being Christian, while a small percentage practice traditional religion.[16,17]

1.3.4 ECONOMY

Nigeria has the largest economy in sub-Saharan Africa. Before independence in the 1960s, the economy was dominated by agriculture; this shifted to petroleum exports after the discovery of oil. From the 1980s to present, oil and natural gas have remained key economic drivers and sources of revenue.[18,19] In an effort to diversify the economy, there has been expansion in some sectors including telecommunications and power,[20] supported in part by privatisation.[21] Nigeria experienced a recession in 2016-17 due to declines in oil prices, but the economy is recovering. As of 2018, Nigeria's Gross Domestic Product (GDP) was $397.3 billion, a 1.9% increase from the 2017.[22] However, in the same year (2018) unemployment (23%) and underemployment (20%) were still high due to limited job creation. Additionally, as of 2019, 40.1% of the Nigerian population (about 82 million) were classified as poor.[23]

1.3.5 HEALTH

1.3.5.1 Health care system

Nigeria operates a decentralised health care system comprising both public and private health sectors. The public health sector operates a three-tier health care system that has responsibility for tertiary, secondary, and primary health care. This three-tier system is operated through the FMoH, State Ministries of Health (SMoH) and the Local Government Primary Health Care Departments.[24] The FMoH provides oversight functions to all levels of care through development and implementation of policies and strategic documents that strengthen the health system. Tertiary-level health care, which is under the purview of the FMoH, provides highly specialised services focusing on curative, research and teaching through the University Teaching Hospitals and Federal Medical Centres. Some primary health care programmes are operationally supported through the federal level.

The State Ministries of Health provide secondary-level health care through general and specialist hospitals as well as comprehensive health centres. This level of care focuses on diagnostic, laboratory, and referral services as well as emergency health care services. They also provide regulatory and technical support for primary health care services.

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16 Ibid, 7.

17 Stonawski M, Potancokova M, Cantele M, Skirbekk V. The changing religious composition of Nigeria: causes and implications of demographic divergence. J. of Modern African Studies, 2016; 54(3): 1-27.

18 Ibid, 11.

19 Ibid, 7.

20 World Bank. Nigeria Overview. 2019. Accessed: https://www.worldbank.org/en/country/nigeria/overview

21 Ibid, 11.

22 World Bank. 'GDP Growth (Annual %), Nigeria'. World Development Indicators. Accessed: https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=NG

23 National Bureau of Statistics. 2019 Poverty and Inequality in Nigeria Executive Summary. 2019. Accessed: https://nigerianstat.gov.ng/elibrary

24 Integrated Maternal, Newborn and Child Health Strategy. Nigeria. 2010; Available at: http://www.who.int/pmnch/.activities/countries/nigeria/en/, 2011.

Primary health care services are the responsibilities of the LGAs where health services are provided through the primary health centres (PHCs) located within the political wards. This level of health care also includes dispensaries, health posts and maternity services. The services consist of health education, adequate nutrition, safe water and sanitation, reproductive health including family planning, immunisation services, provision of essential drugs and disease control.[25]

At the local government level, the PHC management and technical committee coordinates the activities of the PHCs while the ward development committee and the community/village development committees coordinate these activities at the ward/community level. However, in most cases, these committees are not functioning. A survey of 202 LGAs spread across the six Geopolitical Zones in 2001 showed that 89% had PHC management committees of which only 27% were functional, while 75% had PHC technical committees with only 44% functioning.[26]

The private health care sector has both for-profit and not-for-profit organisations that provide all levels of health care services, including pharmacies, Patent Medicine Vendors (PMVs), and drug sellers. The level of health care services varied from preventive services to specialised health care services.

The referral system operates as a two-way system, from the primary health care services to tertiary health care facilities. The first access point for health is the primary health care facility, which is available in every political ward. However, with some of these facilities being non-functional, the first access point is actually often the general outpatient department of the general hospitals, specialist hospitals, and the federal medical centres. The two-way referral system is weak and inadequate, making access to quality higher-level health care an enormous challenge in Nigeria.[27]

1.3.5.2 Human Resource for Health

In terms of numerical value, Nigeria has one of the largest health workforces in Africa. However, the number of health workers per capita is too low to effectively deliver the needed essential health care services. Available reports show that the average number of physicians per 1,000 population in Nigeria in 2013 was 0.38, [28] while the number of nurses, midwives and doctors together is reported to be 1.95 per 1,000 population.[29] This makes the patient-to-doctor ratio about 2,500:1, which is more than four times less than the WHO's recommendation of 600:1. It is also important to note that these figures are national averages and skewed towards the urban centres, leaving the rural areas, which are in the majority, with much lower health worker densities. The health workforce is concentrated in tertiary health care services in urban areas, and more workers are based in the southern than the northern regions of the country. Also, data on the total health workforce in Nigeria includes health workers in both the private and public health sectors, and, very likely, health professionals who are not practicing in the country or may not be practicing at all.

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25 National Human Resource for Health Strategic Plan 2008-2012. Federal Ministry of Health, Abuja 2007.

26 Adeniyi J.O, Ejembi J, Igbinosun C.L, Muhammed P et al. *Report of the National Health Care Needs Assessment Survey.* National Primary Health Care Development Agency. Abuja. 2001

27 Enabulele O, Enabulele JE. A look at the two–way referral system: experience and perception of its handling by medical consultants/specialists among private medical practitioners in Nigeria. Int J Fam Commun Med. 2018;2(3):126-132. DOI: 10.15406/ijfcm.2018.02.00054.

28 www.who.int/gho/health_workforce/physician_density/en/ assessed on 12/05/2020.

29 https://www.who.int/workforcealliance/countries/nga/en/ assessed on 12/05/2020.

1.3.5.3 National Health Policy

The National Health Policy, formulated in 1988 and revised in 2004 and 2016, outlines the goals, structure, strategy and policy direction for the country's health care delivery system.[30] The policy clearly describes the roles and responsibilities of the three tiers of government and non-governmental organisation (NGO) in health care delivery. The overall goal of National Health Policy is to strengthen Nigeria's health system, particularly the primary health care sub-system, to deliver quality effective, efficient, equitable, accessible, affordable, acceptable and comprehensive health care services to all Nigerians. The National Child Health Policy developed in 2006 provided a holistic and integrated vision for child health, bringing together in one document all key policy elements to promote child health and development. The policy articulated priorities, strategies and interventions necessary to overcome the challenges of child health care.[31]

1.3.5.4 Health Care Financing

The various sources of health care financing in Nigeria include tax-based public sector health financing, household out-of-pocket health expenditures, the private sector (donor funding), social health insurance, and external financing through grants and loans from donor agencies like the World Bank, the World Health Organisation (WHO), etc. In response to underinvestment in and poor performance of the country health system, the Nigerian government has policies and strategies that address health care financing which include the National Health Policy, Health Financing Policy and Strategy, National Health Act , National Health Insurance Scheme Act and National Strategic Health Development Plan (2018-2022), and National Health Account.[32] However, over the years, government expenditure on health as a percentage of the government general expenditure has been inadequate.

In 2001, member countries of African Union adopted the Abuja Declaration, which stipulated that at least 15% of their annual budget be spent on health; yet, the Nigerian government has repeatedly fallen short of this commitment. Since then, the highest budgetary allocation to health was 5.8% in 2012 and 2015. The out-of-pocket payment for health care at the point of services is reported to be about 70% of health care payment in Nigeria,[33] making this the largest single contributor to financial resources for health care.

The National Health Insurance Scheme (NHIS), launched in 2005, has both compulsory and voluntary contributory health insurance schemes targeted at both formal and informal sector workers. It aims to ensure accessibility to quality health care services, financial risk protection, reduction of rising cost of health care services, and efficiency in health care. Unfortunately, the NHIS covers just about 5% of Nigerians, mostly federal government employees. It is characterised by poor penetration, low acceptance, and narrow benefit packages, consequently contributing only about 2% of the overall health expenditure.[34,35]

As a whole, Nigeria's current health care financing system is characterised by high out-of-pocket expenses, low budget allocations and expenditures at all levels of government, and limited coverage through health

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30 Federal Ministry of Health (Nigeria), 2016. Revised national health policy Abuja, Nigeria. Federal Ministry of Health.

31 National Child Health Policy. Federal Ministry of Health, Nigeria Abuja 2006.

32 FMoH. National Health Financing Policy. Abuja, Nigeria: Federal Ministry of Health; 2006.

33 Uzochukwu B, Ughasoro MD, Etiaba E, Okwuosa C, Envuladu E, Onwujekwe OE. Health care financing in Nigeria: Implications for achieving universal health coverage. Niger J Clin Pract 2015; 18:437-44.

34 Lawan UM, Iliyasu Z, Daso AM. Challenges to the scale-up of the Nigerian National Health Insurance Scheme: Public knowledge and opinions in urban Kano, Nigeria. Ann Trop Med Public Health 2012.

35 Eboh A, Akpata GO, Akintoye E. Health care financing in Nigeria: An assessment of the National Health Insurance Scheme (NHIS). European Journal of Business and Management 2016; 8: 24-34.

insurance and other demand-side financing mechanisms, all of which hinder families from accessing appropriate health care.

1.3.5.5 Maternal and Child Health

Over the years, Nigeria's government has demonstrated commitment to reducing its high level of maternal, newborn, and child mortality rates through various policies, strategies, and programmes. In 2003, the government enacted the Child Rights Act as the overarching legal framework to guarantee the rights of the child in Nigeria. In 2005, the roadmap to accelerate achievement of Millennium Development Goals (MDGs) related to maternal and child health was developed in response to the World Health Assembly Resolution 58.31, to expedite actions towards improving maternal and child health by making necessary interventions widely available. Nigeria launched the Integrated Maternal, Newborn and Child Health Strategy (IMNCH) in 2007 and revised it in 2013. The Strategy includes specific objectives to improve access to good quality health services; strengthen the capacity of individuals, families and the community to take necessary MNCH actions at home and to recognise when to seek appropriate health care; establish a financing mechanism that ensures adequate funding, affordability, equity and efficient use of funds from various sources; and more.[36] Recently, the Nigeria Every Newborn Action Plan was launched in November 2016 with a vision to end preventable stillbirths and newborn deaths by accelerating progress and scaling up evidence-based high-impact and cost-effective interventions. There are strategies for specific diseases as well, including the recent National Integrated Pneumonia Control Strategy implementation plan launched in 2020.

Notwithstanding these commitments, policies, strategies, and programmes, Nigeria's maternal mortality ratio and under-five mortality rates are still unacceptably high, and the rate of reduction is slow. The 2018 NDHS reported a maternal mortality ratio of 512 per 100,000 live births, an under-five mortality of 132 per 1,000 live births, infant mortality rate of 67 per 1,000 live births, and neonatal mortality rate of 39 per 1,000 live births. These decreased by 61, 20 and 3 deaths per 1, 000 live births for under-five, infant, and neonatal mortality rates, respectively compared to the 1990 rates. The major causes of child mortality, based on global modeling studies, were estimated to be acute respiratory illness, diarrhoea, malaria and malnutrition,[37] while complications of preterm births, and intrapartum-related complications like asphyxia and neonatal infections, were the major cause of deaths within the neonatal period.[38] The utilisation and quality of health care services are still relatively very poor compared to other countries with the same level of resources. Health care services in Nigeria face many challenges such as distances to health care facilities, poor state of health facilities, poor quality of care, poor attitudes of health workers, fatigue of health workers (burn out syndrome), and inadequate implementation of standard guidelines; these factors combine to make the Nigerian health system weak and unable to fulfil its obligations.[39,40]

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36 Federal Ministry of Health, 2013. Integrated Maternal, Newborn and Child Health Strategy.

37 Morakinyo OM, Fagbamigbe AF (2017) Neonatal, infant and under-five mortalities in Nigeria: An examination of trends and drivers (2003-2013). PLoS ONE 12(8): e0182990. https://doi.org/10.1371/journal.pone.0182990.

38 UNICEF data. 2015 Maternal and Newborn health disparities Nigeria.

39 Service Delivery Indicators, 2014. Cited in Federal Ministry of Health 2016. National Health Policy 2016-2021.

40 Adeloye D, David RA, Olaogun AA, Auta A, Adesokan A, Gadanya M, Opele JK, Owagbemi O, Iseolorunkanmi A. Health workforce and governance: the crisis in Nigeria. Hum Resour Health. 2017 May 12;15(1):32. doi: 10.1186/s12960-017-0205-4.

CHAPTER 2: METHODOLOGY

This VASA study utilised a mixed methods approach to provide data on the causes and social determinants of under-five mortality at national and subnational levels. The following sections provide further detail of the study methodology, including stakeholder engagement activities.

2.1 Stakeholder Engagement

The study extensively engaged with relevant stakeholders for buy-in and support throughout the study. This was to ensure that the findings are used for planning and to design appropriate interventions to reduce under-five deaths. A Technical Sub-Committee on the 2019 VASA was formed under the National Population Commission/Federal Ministry of Health Steering Committee for the Nigeria 2018 Demographic and Health Survey (NDHS), which provided a platform to involve key stakeholders. Members included:

- Federal Ministry of Health including Departments and Programmes (Department of Planning, Research and Statistics, Department of Family Health; National Malaria Elimination Programme);
- National Primary Health Care Development Agency;
- National Population Commission (as the implementer);
- U.S. Agency for International Development (USAID) (as the funding and technical assistance partner, through the CIRCLE Project);
- Representatives of professional bodies (Paediatrics Association of Nigeria – PAN; Nigerian Society of Neonatal Medicine – NISONM; and the Society of Obstetrics and Gynaecology of Nigeria – SOGON);
- Representatives of five universities with strong academic medical programmes; and
- Other relevant ministries and bodies (National Bureau of Statistics, Ministry of Women and Social Development, Nigerian Governors' Forum Secretariat).

Through the Coordinating Implementation Research to Communicate Learning and Evidence (CIRCLE) Project, a Stakeholder Engagement Facilitator was appointed to work closely with the Sub-Committee to provide oversight for the study. The Sub-Committee met five times throughout the study implementation period to review the study design and data collection tools and plan, engage in preliminary data analysis, discuss findings, and provide guidance on the study process. In addition, an extended stakeholder group was involved through briefings and periodic e-mails. This group included representatives of government agencies (Nigerian Centre for Disease Control, Integrated Maternal Newborn and Child Health Secretariat), professional bodies (Nigerian Medical Association, National Association of Nigerian Nurses and Midwives, Association of Public Health Physicians of Nigeria, Society for Family Health Practitioners of Nigeria), and relevant NGO/projects working on health in Nigeria (MNCH2 Project, Health Strategy and Delivery Foundation, Clinton Health Access Initiative, Integrated Health Programme).

Given that these stakeholders are the primary audience for the VASA 2019 results and most likely to use results to inform action on policy and programmes, their participation, buy-in, and engagement in the study was essential.

2.2 Study Methodology

2.2.1 STUDY AREA

The study was carried out in all the 36 States of the Federation and the FCT in households already identified to have at least one under-five child death during the 2018 NDHS.

2.2.2 STUDY DESIGN, SAMPLING AND INTERVIEWS

The quantitative 2019 VASA study was a nationally representative, cross-sectional household survey with mothers and/or caregivers ages 15-49 that: 1) reported at least one under-five child death in the last five years prior to the 2018 NDHS; and 2) willingly volunteered to participate and gave their consent. The survey was based on the multistage sampling procedures of the 2018 NDHS.[41] In the initial stage of sampling, 1,400 sampling points (also known as enumeration areas) were selected to be representative of the 36 states plus the FCT and urban/rural strata in Nigeria. This included some oversampling in Kano and Lagos States due to their large population size. In the second stage, 30 households were selected from each cluster, resulting in a final sample of 42,000 households and 4,096 under-five deaths identified, of which 3,993 gave consent for a follow-up visit for the study. To reduce the burden of interview on individual women and households, only one death was randomly selected for interview per selected household with more than one under-five child death. This excluded 778 deaths, leaving a target sample of 3,215 households for interview.

The VASA teams completed 3,075 interviews, with 140 not completed, for a survey completion rate of 95.6%. The reasons for failure were categorised into nine groups. The most common problem was that the residence where the family had lived was empty at the time of the VASA study team visit, and the second most common was that, while the family could be located, the mother or other caretaker who knew about the case was not available to be interviewed. Fortunately, all reasons for non-completion were uncommon.

Table 1: Table 1: Sample size of neonatal or child (1-59 months) deaths required for various levels of precision

Parameters	Sample size for different precision levels		
P	0.5	0.5	0.5
Alpha	0.05	0.05	0.05
Z-alpha	1.96	1.96	1.96
Precision	0.05	0.07	0.10
Design effect	1.4	1.4	1.4
Non-response	0.1	0.1	0.1
Number of deaths	598	305	149

Table 2: 2019 VASA study sample frame as selected from 2018 DHS

	No.	%
Found in Nigeria DHS 2018 birth file	4,096	100.0
Received for use in the 2019 VASA study	3,993	97.5
Excluded to avoid more than one case per household	778	19.0
Final sample size for the 2019 VASA study	3,215	78.5

[41] National Population Commission – NPC/Nigeria and ICF. 2019. Nigeria Demographic and Health Survey 2018. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF

Table 3: Completed interviews and reasons for non-completion

	No.	%
Completed	3,075	95.6
Partially completed but failed to complete	1	0.0
Postponed but not able to complete	4	0.1
No eligible respondents at home	3	0.1
Refused interview	6	0.2
No eligible respondents available in household	34	1.1
No household members at home	8	0.2
Building empty	59	1.8
Child reported as dead is alive	7	0.2
Not visited (for security or other reasons)	18	0.6
Total	3,215	100

2.2.3 SURVEY TOOL

The 2019 VASA Survey Tool was adapted from the 2016 WHO Global Standard Verbal Autopsy Instrument and the 2014 VASA instruments. The 2014 VASA instrument was adapted from the Population Health Metrics Research Consortium Verbal Autopsy Questionnaire and the CHERG Social Autopsy questionnaire.

The Survey Tool began with a general information module for deceased neonates and children. The module included sections on the background of the deceased, the VASA interview attempts, consent to conduct the interview, and information about the respondent and other people present during the interview. The main survey consisted of the Verbal Autopsy and Social Autopsy questions for both neonates and children 1-59 months old. Questions focused on confirming the child's age at death, symptoms and signs of the illness, the caregiver's perception of the illness, actions taken and constraints to formal health care-seeking, care provided by formal facilities and providers, health records, and the family's social situation and access to social capital. In addition, for neonatal deaths and for some deaths for children younger than one, the interview elicited information on the maternal history, including the mother's antenatal care and care-seeking for her obstetric complications, as well as normal newborn care prior to the baby's illness. For children 1-59 months, the interviewer also asked about preventive care given to the child before onset of the fatal illness.

The VASA study questionnaire was translated into Nigeria's three major languages of Yoruba, Igbo and Hausa during a translation workshop in August, 2019 attended by NPC, select Sub-Technical Committee members, and CIRCLE. The final translations were inserted into a Census and Survey Processing System (CSPro) software application that was developed to enable direct, field-based CAPI (Computer-Aided Personal Interview) capture of the VASA interview data on a netbook computer.

2.2.4 TRAININGS FOR THE STUDY DATA COLLECTION

NPC recruited interviewers for the household study from among those who participated successfully in the 2018 NDHS, as they were already familiar with study methods and the populations being interviewed, had experience with field work and computer data entry, and could speak the local languages.

The NPC, in collaboration with the FMoH and with technical support from the CIRCLE Project, planned and facilitated a series of trainings for the study personnel on the 2019 VASA study instrument, including a supervisors' training or training of trainers, and a data collectors' training or training of interviewers (TOI). The initial training of trainers was held in mid-September 2019 in Abuja and covered general review of the

VASA study; activities, tasks, and responsibilities of the interviewer; and communication techniques for conducting the interview. It also covered instructions on use of the electronic device for data collection, assigning cases to interviewers and retrieving data from the electronic device by the supervisors.

The TOI, held in late September 2019 in Akwanga, Nasarawa State, brought together all field work personnel to ensure basic understanding of data collection through interviews and key concepts related to child deaths. The training also covered questionnaire content, instructions on how to complete each section of the questionnaire, interviewing procedures, tablet use, and field procedures. Finally, the training discussed the importance of confidentiality, informed consent, potential risks and benefits for participants, and how to support respondents experiencing painful memories from pregnancy-related complications and the loss of a child. The NPC also engaged members of the Technical Sub-Committee with expertise on maternal, neonatal, and child health to provide guidance on selected modules of the survey as required.

2.2.5 STUDY DATA COLLECTION

Coordinated by the NPC, the study data collection began in October 2019, immediately following the TOI, and was completed in December 2019.

The data collection was conducted by 15 teams across the country. Each team consisted of a Coordinator, a Supervisor, Interviewers, and a Driver. Each team had three to four interviewers, depending on the extent of field work to be covered. One team each conducted the study in Jigawa, Kaduna, Kano, Katsina and Niger States. Teams covered multiple states for Adamawa/Taraba, Bauchi/Gombe, Benue/Kogi/Kwara, Borno/Yobe, Plateau/Nasarawa/FCT, and Zamfara/Sokoto States, while one team each conducted the study in the three southern zones (South East, South South and South West).

Upon arrival in each LGA, the team moved together from one cluster to the other until all the households in each area were completed. The Supervisor assigned household(s) to each Interviewer the evening preceding field work. At the end of each day, the Supervisor compiled completed interviews, checking for completeness and/or inconsistencies. The Supervisor then backed up completed interview files to a pen drive and transferred these data to the Coordinator, who checked for completeness and inconsistencies. The Coordinator then transferred the completed interview data to the Data Manager.

Members of the Technical Sub-Committee, CIRCLE staff, and NPC Commissioners and the State Directors closely monitored all fieldwork activities to ensure the field team strictly followed recommended procedures. Any problems were detected quickly through regular reviews of the completed tools. A WhatsApp group for the State Coordinators and members of the Sub-Committee aided monitoring and troubleshooting. Supervision was intensified during the first and last weeks of the study.

Data quality was monitored through the field check tables generated by a CSPro programme on the Supervisor's netbooks which operated concurrently with field work. Through this process, the technical team was able to alert the field team of problems detected during the field work.

2.2.6 DATA MANAGEMENT

Data were captured using tablet PCs running Windows 8.1 with the software prepared for the study, the Census and Survey Processing System (CSPro). The programme presented each question in order in the required survey language, and only accepted valid responses. The programme automatically performed checks on ranges of values, skipped to the appropriate question according to the responses given, and

checked the consistency of the data collected. The Field Editor downloaded interview data on a daily basis to monitor progress and completeness.

Once data collection was completed in a cluster, the data files were electronically transferred to the NPC office via the internet or other modes of communication. The two Data Managers monitored the quality of the data received and downloaded completed files in their system as they visited the teams in the clusters that did not have access to the internet. The four Secondary Editors assisted in checking for inconsistencies and the secondary editing of the data captured. The CIRCLE Project provided the software (CSPro) and technical assistance in data management and processing.

2.2.7 STUDY ANALYSIS

2.2.7.1 Data analysis workshop

A data analysis workshop was organised in February 2020 and included staff from NPC, government and academic members of the Technical Sub-Committee, and CIRCLE Project team members. The study questionnaire with initial results tables were presented and reviewed alongside the preliminary physician diagnoses data. Workshop participants requested that the study analysis be disaggregated by age group and geopolitical zone where possible. This has been followed in this report.

Analysis workshop participants also noted that the VASA sample is taken from deaths recorded in the Nigerian DHS 2018, which includes some additional or complementary data on deaths versus children who did not die. They requested analysis tables from the DHS data if they provided information not available in the DHS report. Unlike other tables in this report, these allow comparison of children who died with those who did not.

2.2.7.2 Verbal Autopsy and Social Autopsy quantitative analyses

Two methods were employed for the analysis of the Verbal Autopsy data to determine the cause distribution of deaths. These were 'Physician-Coded Verbal Autopsy' (PCVA) and Expert Algorithm Verbal Autopsy (EAVA).

Physician-Coded Verbal Autopsy (PCVA): In this method, two in-country physicians who were trained to use guidelines for coding cause of death of Verbal Autopsy interviews based on the International Classification of Diseases 10 (ICD 10) were provided with minimum diagnostic criteria (see Annex 2) for ascribing the cause of death. Each physician reviewed the data separately for every neonatal and 1-59-month VASA interview using the guidelines in combination with their judgement to make a diagnosis and complete the International Standard Death Certificate for each case. They ascribed primary, underlying and contributing causes of death to the cases. They made other specific diagnoses not listed in the minimum criteria (e.g. sickle cell anaemia, cancer) based on the available supported data (text entries) in the VASA interview. After reviewing of all the cases, the two physicians met to compare notes, and discuss and reach a consensus on final diagnoses for all of the cases. A paediatrician further reviewed the physicians' submissions to confirm that they adopted the minimum criteria with clinical acumen to diagnose of causes of deaths. The primary/direct cause was selected as the final diagnosis for each death.

Expert Algorithm Verbal Autopsy (EAVA): Expert algorithm was developed as a computerised coding with all the causes of deaths arranged in a hierarchy to identify the primary cause of the neonatal and child deaths. The hierarchy was designed in line with the ICD 10 principle. Several expert algorithms have been

created and reviewed.[42] For the 2019 VASA EAVA diagnosis, the Niger published expert algorithm coding[43] was utilised to automate the primary causes of death for all the interviewed cases because it appears to be what was used in the 2014 Nigeria study, which did not publish its algorithm. It is expected that there would be minimal variation in the expert algorithm for both countries and the two Nigeria studies.

The expert algorithm chosen is hierarchical, which means that causes of death are considered in a set order. Once a case meets the criteria for one diagnosis, diagnoses that are further down in the order are not considered. Causes with the clearest symptoms (e.g., injuries, congenital abnormalities) tend to be placed high in the hierarchy while those that are more ambiguous (e.g., sepsis) tend to be placed lower. Some diagnoses are split, so that cases with a very clear diagnosis are selected first, and then those with more ambiguous symptoms are added towards the end if they have still not been assigned a cause. The exact rules can be found in Annex 3. The expert algorithm cannot include diagnoses that are not on its list. Any cases that do not meet any of the criteria for a diagnosis by the end of the hierarchy are classified as unspecified.

A descriptive quantitative analysis was carried for individual questions in the study with results presented as frequencies and cross-tabulations, usually with age of death group and zonal breakdowns. As requested in a few cases, analysis of deaths versus living children was conducted on variables available from the 2018 NDHS, which allows comparisons with children who did not die. This was done for demographic characteristics and aspects of care related to pregnancy, labour and delivery available in the NDHS.

2.3 Qualitative Methodology

2.3.1 QUALITATIVE DESIGN AND SAMPLING

The qualitative component of the 2019 VASA comprised in-depth interviews with 69 mothers of under-five children who had died; in-depth interviews with 24 key informants who were knowledgeable about the local health systems and typical health-seeking behaviour of caregivers in communities with high child mortality; 48 focus group discussions (FGDs) with key male and female community members; and structured observations of 12 health facilities serving communities where high child mortality was documented in the 2018 NDHS. To select study cases, we listed all 2018 NDHS respondents (3,215 women) who reported under-five deaths in the last five years preceding the study. In each geopolitical zone, the two states with the highest cases of under-five deaths were selected. In selected states, clusters were ranked by number of cases of child deaths. Three clusters with the highest cases of under-five deaths were selected and in each selected cluster, two caregivers who reported the most recent cases of child deaths were interviewed. In situations where clusters in the first three positions had equal numbers of child deaths, the most recent cases were selected in the affected clusters. A total of six caregivers were interviewed in each state.

In the two clusters with the highest number of child deaths, one informant was interviewed for each. Informants – health care workers, faith-based/traditional birth attendants – were selected purposively, based on their knowledge of the local health system. The most senior health care provider in the PHC was the first-choice informant. In the absence of a functional PHC, community leaders were asked to suggest persons knowledgeable about the local health system as an informant. In addition to the interviews, two FGDs were conducted for men and women separately, in the clusters with the highest number of cases of child deaths

[42] Kalter HD, Perin J, Black RE. Validating hierarchical verbal autopsy expert algorithms in a large data set with known causes of death. J Glob Health. 2016;6(1):010601. doi:10.7189/jogh.06.010601

[43] Kalter et al. Direct estimates of national neonatal and child cause–specific mortality proportions in Niger by expert algorithm and physician–coded analysis of verbal autopsy interviews. J Glob Health 2015;5: 010415 (Online supplemental material)

in each of the selected states. FGD participants who had lived in their communities for at least one year and were knowledgeable about local cultural practices were purposively selected. Health facilities that caregivers typically use were selected for structured observation in the clusters with the highest number of cases of child deaths in the 2018 NDHS. Locations with the highest reported cases of under-five deaths in the 2018 NDHS were selected to learn about the social contexts in places where the problem of child mortality is most severe in Nigeria. The most recent cases were selected to document current situations and reduce recall error that may be associated with older events.

2.3.2 SELECTION AND TRAINING OF THE QUALITATIVE DATA COLLECTORS

Highly qualified and experienced qualitative researchers, including 24 Field Researchers, six Zonal Coordinators, and one National Coordinator were recruited to collect the qualitative data. The qualitative team participated in a five-day training workshop which focused on the purpose of the 2019 VASA qualitative study, the study design, qualitative interviewing, data collection and transmission protocol, and ethical issues. The National Coordinator supervised the activities of all the Zonal Coordinators and ensured compliance with the research protocol.

2.3.3 QUALITATIVE DATA COLLECTION AND ANALYSIS

The qualitative data collection took place between October 22 and November 21, 2019. The average duration of interviews and group discussions was 45 minutes and 60 minutes, respectively. The research team conducted all interviews with caregivers outside earshot of third parties in the preferred language of the caregivers, including Hausa, Igbo, Yoruba, Efik/Ibibio or Pidgin English. Interviews with informants were conducted mostly in English. Data collection involved the use of semi-structured interview and discussion guides and an observation checklist. The guides were designed to explore barriers to child care at the individual, family, community and health systems levels. Caregivers were engaged in interviews that allowed them to speak freely about the events that led to the death of their children, while informants were engaged in interviews that allowed them to speak freely about typical health-seeking behaviour in their communities and barriers to uptake of child health care services in health facilities. Community leaders were engaged in discussions on community-level barriers to uptake of child health care services.

Field Researchers worked in pairs – an interviewer/moderator and a note-taker. In all interviews and discussions, comprehensive notes were taken. In addition, when the research team obtained consent, interviews and discussions were audio-recorded. After each interview/group discussion, field researchers developed interview notes from transcribed audio recordings and notes taken, translating transcripts to English in cases where other languages were used. The National Coordinator and the Zonal Coordinators supervised the data collection activities of Field Researchers.

Pseudonyms replaced all real names in the transcripts, and all other identifying information was removed to ensure anonymity. Twelve members of the research team created a coding frame from the themes in the study tools, and added themes that emerged during the initial reading of transcripts. For the themes and sub-themes in the coding frame, they created nodes and child nodes before thematically coding contents from transcripts using NVivo Version 12. The team created as cases individual study participants with sex, age, location (rural or urban), sex and age of deceased child (neonatal/infant/under-five) as attributes/variables. The analysis also involved fleshing out one mother's story from the accounts of a typical caregiver in each state. The findings of the qualitative study, supported by multiple sources of data, were categorised by individual and family-level factors in childcare; factors associated with health systems; community-level factors; and enabling factors in child health care. A summary of these findings is presented in this report.

2.4 Ethical Clearances

To satisfy both Nigerian and international research ethics regulations, the 2019 VASA study received ethical approval in Nigeria and the United States. The National Health Research Ethics Committee of the Federal Ministry of Health provided approval in March 2019. The Social Solutions International Inc. Institutional Review Board (IRB) of Rockville, Maryland, USA reviewed and approved the study in June 2019.

CHAPTER 3: RESULTS

3.1 Household Study

3.1.1 DEMOGRAPHICS AND BACKGROUND

Respondents (Table 4). Ninety-six percent of respondents were the child's mother, while most of the remainder were members of the family. Nearly all (99%) had been living with the child at the time of the final illness.

About 95-96% of respondents were at the same address as where the child was born and died, so information about their locality is relevant to the case.

Table 4: Respondent information

	No.	%
Relationship to deceased		
Mother	2,877	95.7
Father	68	2.2
Other family members	109	3.5
Others	19	0.6
Lived with deceased during final illness	3,054	99.4
Study location same as when child died	2,933	95.4
Study location same as when child was born	2,962	96.4
Total	3,073	100.0

Note: Respondent information is missing in two cases

Demographic characteristics and mortality (Tables 5 and 6)**.**

Demographic data were available in the original DHS, so this was not collected as part of the VASA study. For the demographic analysis, deaths were divided into neonatal and 1-59-month child deaths. Percentages are by row and grouped by neonatal deaths, 1-59-month deaths, and living children. Figures were weighted using the standard DHS weights to represent the Nigerian population. The figures for neonates are roughly comparable to neonatal mortality rates (expressed as percentage rather than per 1,000).

Sex of the child. The sexes of children in both age of death groups showed slightly higher rates in males than females. Overall, there were slightly more male than female births since 2014 as reported in the 2018 DHS.

Mothers age at time of birth. The rates of mortality were higher for neonates for both the youngest (20 years) and oldest (>40 years) mothers. A similar pattern was seen for deaths in children aged 1-59 months,

Level of education. The mortality rate in children in the 1-59-month age of death group was much lower for women with more than secondary education (2.2%) compared to 12.4% for those with no education (who represent slightly less than half of all mothers). However, this correlation for neonatal deaths was much weaker, with 4.0% mortality among those with no education compared to 3.4% in those with the highest education level. For women who had completed secondary school, this meant that over half of all deaths occurred in the neonatal period, compared to only 24% of all deaths in the neonatal period for those with no education. Figures for the father's education were similar to the mother's.

Occupation. Children of men whose main work was farming had the highest mortality rates, while children of those with clerical or professional employment had the lowest death rates. Children of women who were unemployed or worked in sales/services had the highest mortality rates.

Table 5: Demographic characteristics of respondents and partners for children who died or were alive during the period covered by the 2018 DHS (weighted)

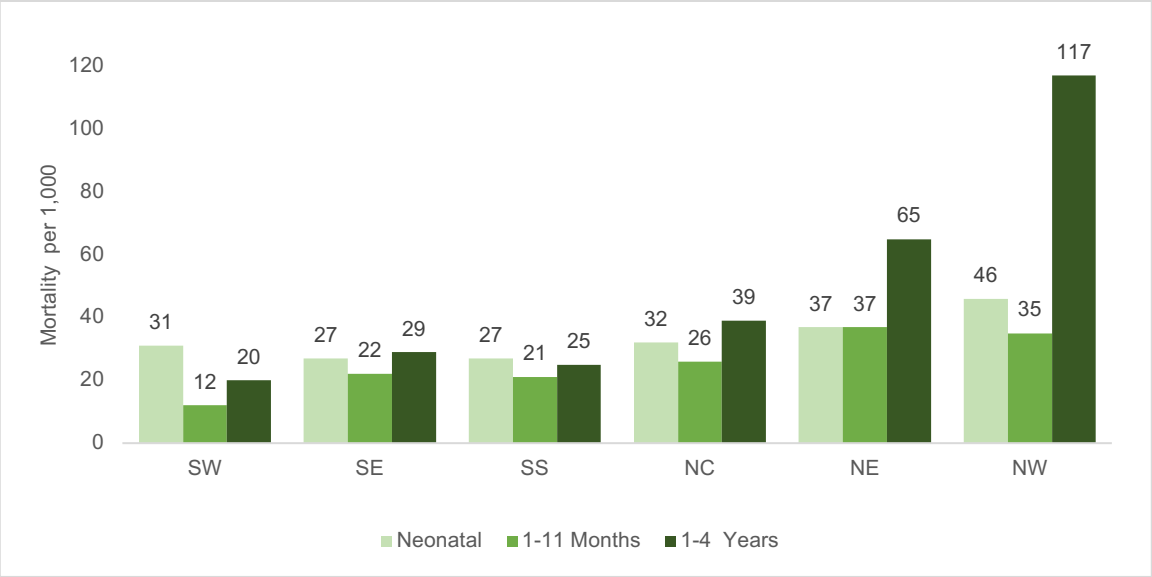
	Neonatal death		1-59-month child death		Living child <5 years old		Total	
	No.	%	No.	%	No.	%	No.	%
Sex of child								
Male	716	4.0	1,535	8.6	15,674	87.4	17,924	100
Female	613	3.6	1,421	8.2	15,208	88.2	17,242	100
Mother's age at time of birth (years)								
<20	242	5.6	433	10.1	3,607	84.2	4,282	100
20-24	314	3.5	848	9.4	7,826	87.1	8,988	100
25-29	289	3.1	663	7.1	8,371	89.8	9,323	100
30-34	243	3.5	555	8.1	6,067	88.4	6,864	100
35-39	157	3.9	288	7.2	3,556	88.9	4,002	100
40+	85	5.0	169	9.9	1,454	85.2	1,707	100
Mother's highest level of education								
No education	661	4.0	2,048	12.4	13,867	83.7	16,576	100
Incomplete primary	62	3.7	161	9.6	1,451	86.7	1,674	100
Complete primary	144	4.0	255	7.2	3,168	88.8	3,567	100
Incomplete secondary	123	3.4	196	5.3	3,358	91.3	3,677	100
Complete secondary	243	3.5	233	3.4	6,375	93.1	6,850	100
Higher than secondary	95	3.4	62	2.2	2,664	94.4	2,821	100
Mother's employment and occupation if employed								
Not employed in last 12 months	370	3.7	975	9.7	8,749	86.7	10,094	100
Agriculture	172	3.4	315	6.2	4,619	90.5	5,106	100
Sales and services	671	4.0	1,503	9.0	14,489	87.0	16,663	100
Manual (skilled and unskilled)	44	3.4	61	4.8	1,173	91.7	1,279	100
Professional and clerical	72	3.6	96	4.9	1,809	91.5	1,978	100
Husband/partner's highest education								
No education	512	4.1	1,615	12.9	10,433	83.1	12,560	100
Incomplete primary	25	4.2	60	10.2	504	85.6	589	100
Complete primary	190	4.7	342	8.4	3,539	86.9	4,071	100
Incomplete secondary	46	2.9	100	6.3	1,452	90.9	1,598	100
Complete secondary	322	3.4	483	5.1	8,599	91.4	9,403	100
Higher than secondary	155	3.2	141	3.0	4,481	93.8	4,777	100
Husband/partner's occupation if has been employed								
Agriculture	431	3.5	1,349	10.9	10,635	85.7	12,415	100
Sales and services	373	3.9	797	8.2	8,496	87.9	9,666	100
Manual (skilled and unskilled)	252	4.1	368	6.0	5,491	89.9	6,111	100
Professional and clerical	175	4.3	188	4.6	3,709	91.1	4,072	100
Total	1,329	3.8	2,956	8.4	30,881	87.8	35,166	100

Note: Numbers of deaths are different from prior figures due to weighting.

Geopolitical zones and urban/rural. In general, rural areas showed higher mortality than urban. The North West Zone showed the highest mortalities for both neonates and 1-59-month old child mortality groups, and the North East was high for the children, although not for neonates in this study. Other geopolitical zones had lower mortality rates. Due to its large population and high birth and death rates, over half (56%) of all deaths in 1-59-month old children in Nigeria occur in the North West Zone, with the North East accounting for another 19%. Together they made up 75% of these deaths.

Neonatal deaths were distributed more evenly, although there is still a somewhat higher rate in the north (see Figure 2). Children ages 1-4 had the largest difference between the highest mortality geopolitical zone (North West) and lowest mortality (South West) Zones, with the former almost six times higher, while for 1-11- month old it is almost three times higher.

Figure 2: Neonatal, 1-11 months and 1-4 years mortality by geopolitical zone – DHS 2018



As expected, households without electricity, an improved water supply, or improved sanitation, as well as those who used traditional cooking fuel, had higher mortality although this is seen more for 1-59-month mortality than in neonates. Wealth quintiles predicted 1-59-month mortality strongly, with the poorest showing a death rate of 12.3%, almost six times the rate of the wealthiest fifth of the population (2.1%). However, for neonatal deaths, while the wealthiest quintile did show the lowest rate (3.2%), this was not far below the average of 3.8% and not much different from the rate for the poorest quintiles.

Table 6: Demographic characteristics of households for children who died or were alive during the period covered by the 2018 DHS (weighted)

	Neonatal death		1-59-month child death		Living child <5 years old		Total	
	No.	Row %	No.	Row %	No.	Row %	No.	Row %
Residence								
Rural	859	3.9	2,259	10.4	18,666	85.7	21,784	100
Urban	470	3.5	697	5.2	12,215	91.3	13,382	100
Geopolitical Zone								
North West	584	4.4	1,699	12.9	10,883	82.7	13,166	100
North East	237	3.7	558	8.7	5,598	87.6	6,392	100
North Central	177	3.8	267	5.7	4,255	90.6	4,699	100
South East	101	2.9	154	4.4	3,205	92.6	3,460	100
South South	79	2.6	135	4.5	2,787	92.9	3,001	100
South West	151	3.4	143	3.2	4,153	93.4	4,447	100
Household has electricity								
No	642	3.8	1,834	10.9	14,365	85.3	16,841	100
Yes	681	3.8	1,096	6.1	16,167	90.1	17,943	100
Household has improved water supply								
No	509	4.0	1,215	9.5	11,127	86.6	12,851	100
Yes	813	3.7	1,715	7.8	19,405	88.5	21,933	100
Household has improved sanitation								
No	654	3.8	1,788	10.3	14,893	85.9	17,334	100
Yes	669	3.8	1,142	6.5	15,639	89.6	17,450	100
Household uses clean cooking fuel								
Uses solid fuel	1,110	3.9	2,760	9.7	24,642	86.4	28,512	100
Uses kerosene	100	3.2	84	2.7	2,920	94.1	3,104	100
Uses clean fuel (electric, gas)	112	3.6	85	2.7	2,963	93.8	3,160	100
Wealth index								
Poorest	296	3.7	975	12.3	6,625	83.9	7,896	100
Poorer	319	3.9	968	11.9	6,816	84.1	8,103	100
Middle	315	4.4	557	7.7	6,364	87.9	7,237	100
Richer	221	3.5	337	5.3	5,816	91.2	6,374	100
Richest	177	3.2	119	2.1	5,260	94.7	5,557	100
Total	1,329	3.8	2,956	8.4	30,881	87.8	35,166	100

Note: Numbers of deaths are different from prior figures due to weighting.

Time for households to access routine sources of care (Table 7 and Figure 3). One important factor in receiving health care is physical access to different sources of care. For all respondents, the study asked about travel time to four sources of care: a drug shop, outpatient care, labour and delivery services, and a hospital with inpatient care. Respondents were also asked what type of transport they would use, with nearly all saying that they would either walk or use some sort of motorised transport. While this provided good information for families of children who died, there was no comparison group representing all families available. It was clear that most families of children who died had good access to drug shops. Eighty four percent said these were within 30 minutes of their home, and only 5% said they were over one hour away. Eighty one percent said they would walk to go there. Other sources of care were less accessible. Fifty three percent said they would usually walk to an outpatient clinic and 67% said they were within 30 minutes of

one. However, only 28% of respondents said that they could access a place for labour and delivery within 30 minutes of home and only 34% said it was in walking distance. Hospitals were the least accessible, being at least an hour away for 44% of respondents and only 10% of families reporting these were within walking distance. For poor families, paying for motorised transport may be difficult; and both deliveries and medical emergencies could occur at any time both day and night, making physical access an issue. This is discussed in more detail below, in the sections on labour and delivery and care for the child in the final illness.

Figure 3: Time needed and whether respondents walk to access sources of care

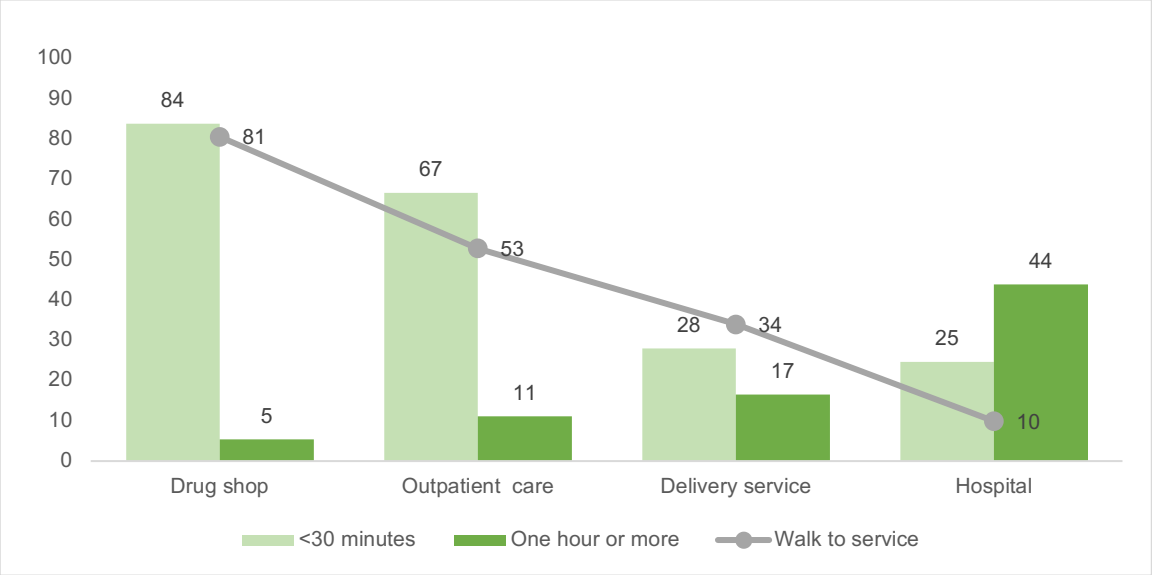


Table 7: Time needed and means of transport to access sources of care

	Place to buy drugs			Place for outpatient services			Place for delivery services			Place for inpatient care/hospital			Total respon-dents
	<30 minutes	One hour or more	% Who Walk	<30 minutes	One hour or more	% Who Walk	<30 minutes	One hour or more	% Who Walk	<30 minutes	One hour or more	% Who Walk	
	%	%	%	%	%	%	%	%	%	%	%	%	No.
Zone													
NC	80.1	9.2	83.5	53.6	18.4	52.3	29.7	21.3	45.2	23.2	43.1	19.2	478
NE	79.7	8.1	81.7	58.0	17.0	55.8	27.3	21.7	45.0	19.9	57.7	10.5	704
NW	88.2	2.2	80.7	75.9	5.1	52.7	30.0	12.6	20.7	23.7	41.3	3.3	1,370
SE	75.8	10.0	75.8	60.3	15.1	53.0	23.3	18.3	50.7	46.6	25.1	33.3	219
SS	82.2	3.8	75.2	60.5	12.7	39.5	26.1	19.1	29.9	24.8	40.8	6.4	157
SW	89.0	4.8	77.2	80.0	6.2	55.2	14.5	6.2	49.7	29.0	35.2	6.2	145
Total	83.8	5.4	80.5	66.6	11.1	52.8	27.9	16.5	34.0	24.7	43.8	9.9	3,073

3.1.2 ESTIMATED CAUSE OF DEATH AND DISCUSSIONS FOR NEONATAL (0-27 DAYS) AND CHILD (1-59 MONTHS) DEATHS

This report gives the results of two methods of assigning cause of death for both neonates and for 1-59 month child deaths: the physician-coded verbal autopsy, and the expert algorithm approach. These were also used in the VASA 2014 study and this section occasionally refers to the respective findings of the VASA 2014 study when such a comparison is useful.

Verbal autopsy is not an exact method, and researchers use a variety of approaches to assign cause of death based on the data collected. With no actual medical autopsies or laboratory tests documenting these deaths, there is no 'gold standard' of confirmed diagnoses against which to determine whether one method that this report includes is superior to the other. While each has its own limitations, they together help to understand the broad picture of cause of mortality. The purpose of a verbal autopsy study is not to give exact measurements of causes of mortality, but to show the overall patterns of mortality that the society and health system must respond to.

3.1.2.1 Neonatal causes of death

Figure 4 below shows causes of deaths for 722 neonates in the VASA, weighted to represent all neonatal deaths in Nigeria. Both the physician-coded VA and expert algorithms agree that common serious infections in neonates are the largest cause, making up 44% of deaths, although each method apportions them into sepsis, pneumonia and meningitis somewhat differently. Both agree that intrapartum-related injury (formerly called 'birth asphyxia/birth trauma') is the second major cause of neonatal death, although by differing degrees of magnitude (18% of neonatal deaths by physician coding and 27% in the expert algorithm). The physician coding finds jaundice and preterm birth as important causes of death (9-10% of cases each), but these are uncommon in the expert algorithm (1% each). Both methods find that congenital abnormalities, diarrhoea, injuries, and neonatal tetanus, while present, cause only a few percent of deaths in neonates. Details for each diagnosis are provided below.

Figure 4: Physician-coded and expert algorithm verbal autopsy for causes of 722 neonatal (0-27 days) deaths in Nigeria, 2013-2018 (weighted data)

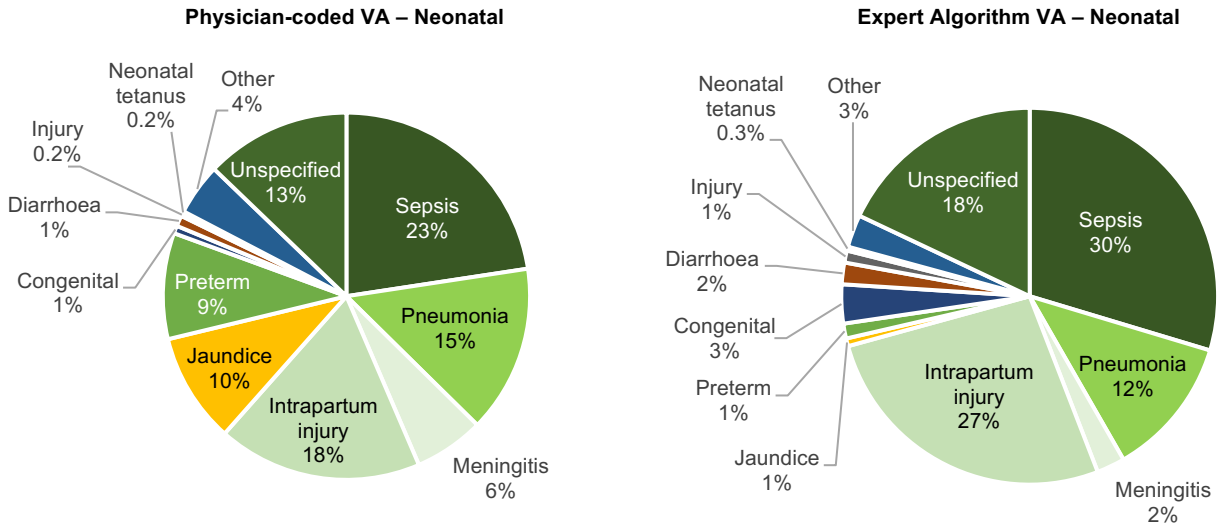


Table 8: Neonatal cause of death findings – weighted

Neonatal cases	Physician-Coded		Expert Algorithm	
Diagnoses	Weighted number	Weighted percent	Weighted number	Weighted percent
Sepsis	224	22.6	295	29.7
Pneumonia	147	14.8	120	12.1
Meningitis	61	6.2	24	2.4
Intrapartum-related injury	179	18	264	26.6
Jaundice	96	9.7	7	0.7
Preterm birth	93	9.3	13	1.3
Congenital abnormalities	7	0.7	33	3.3
Diarrhoea	9	0.9	18	1.8
Birth injury (birth trauma)	2	0.2	10	1.0
Neonatal tetanus	2	0.2	3	0.3
Others	45	4.5	28	2.8
Unspecified	129	12.9	178	17.9
Total	993	100	993	100

Note: 'Others' include cases of sudden neonatal deaths, haemorrhagic disease and skin infections. Numbers are different from the survey due to weighting.

3.1.2.1.1 Severe infections in neonates. This category includes sepsis, pneumonia and meningitis. Considering the difficulties in distinguishing the three major infections in neonates and the similarities of their management, they can be considered as a group. In the VASA 2019 study, the physician diagnosis puts 44% of all neonatal deaths in this severe infection category and the expert algorithm puts 42%, nearly the same proportion. The VASA 2014 study puts 52% and 53% in this group respectively, again almost the same. Taken together, these neonatal infections were the largest causes of neonatal mortality.

3.1.2.1.2 Sepsis. The physician-coded diagnosis found 23% of deaths were due to sepsis and the expert algorithm found 30%. The data for the various criteria are shown in Tables A8 (stopped crying), A16 (fever), A19 (chest in-drawing, grunting) A22 (vomiting), A30 (convulsions, cold to touch, lethargic, unconsciousness), and A41 (not suckling): see 'Additional Tables' following the end of this report. The VASA 2014 study found sepsis by the physician-coded diagnosis in 18% of deaths, and by expert algorithm in 31.5% of deaths.

3.1.2.1.3 Pneumonia. The physician-coded diagnosis found 15% of newborns with pneumonia versus 12% by expert algorithm. About 14% of neonatal cases reported fast breathing and 20% difficulty breathing, which are key diagnostic criteria. Chest indrawing was found in 6% and grunting in 2%, both with a median duration of one day (Table A19). The VASA 2014 study found higher rates of pneumonia with the physician-coded diagnosis at 30% and expert algorithm at 20%.

3.1.2.1.4 Meningitis. The physician-coded diagnosis found 6% meningitis as cause of death versus only 2% in the expert algorithm. Fever was uncommon in newborns who died the first day or two but was found in about half of later neonatal deaths (Table A16). Diagnostic criteria for meningitis under the expert algorithm was either a bulging fontanelle, which was reported in only 3-4% of neonates (Table A42), or convulsions, with a similar rate (Table A30). The same table shows that lethargy (35%) and unconsciousness (11%) were common symptoms that contributed to the diagnosis. The 2014 VASA study found neonatal meningitis in 4% of physician-coded and 1.2% of expert algorithm cases.

3.1.2.1.5 Intrapartum-related injury (also known as birth asphyxia). Intrapartum-related injury was one of the most common causes of neonatal death. The physician-coded diagnosis found that 18% of all neonatal deaths were due to this condition, of which 5% were in the previously used sub-category of birth trauma. The expert algorithm found 27% of all deaths fit into this criterion. The major indicators identified were breathing and crying status at time of birth (Tables A6, A7, A9), signs of birth injury (Table A10), problems with suckling (Table A41), and convulsions and lethargy (Table A30). In the VASA 2014 study, the physician-coded diagnosis found 20% deaths from intrapartum injury and the expert algorithm documented 22%, similar to the findings in the 2019 VASA study.

3.1.2.1.6 Jaundice. The physician-coded diagnosis found jaundice to be a primary cause in 10% of neonatal deaths versus only 1% in the expert algorithm. Looking at the survey data, 9.8% of neonates had yellow skin, 16.3% yellow eyes (Table A31), and 19% had one or the other, so some degree of jaundice was frequently reported in neonates who died. About half of newborns had a fever after the first two days (Table A16) and 14% were cold to touch (Table A30). The survey found neonates not able to suckle normally (varied from 9-93% by age of death) (Table A41), lethargic (35%), or unconscious (11%) (Table A30). Given the expert algorithm criteria and excluding any prior diagnosis (such as sepsis), nearly all the neonatal death cases with yellow skin or eyes were reclassified into other diagnostic groups. The physician coder was free to assign jaundice as a diagnosis to any case with yellow skin or eyes and ended up doing so for a bit more than a third of such cases. This accounts for the difference in the results between the two methods. The VASA 2014 study did not give separate figures for neonatal jaundice, but included them in 'other' diagnoses, which were 8.2% for the physician and 4.7% for the expert algorithm.

3.1.2.1.7 Preterm delivery. The physician-coded diagnosis attributed 9% of newborn deaths to prematurity compared to only 1% in the expert algorithm. Looking at pregnancy duration (Table A43) 9.7% of neonates had a reported gestation of fewer than eight months and another 3.2% of eight months for a total of 12.9% for preterm delivery. The physician-coded diagnosis gave most of the deliveries prior to eight months of pregnancy a primary diagnosis of preterm birth, while the expert algorithm redistributed nearly all of these to other diagnoses, since preterm delivery was at the bottom of the expert algorithm hierarchy. In the VASA 2014 study, preterm delivery was low in both the physician-coded diagnosis (3.9%) and expert algorithm (1.9%).

3.1.2.1.8 Congenital abnormalities. In the weighted physician-coded diagnosis for neonates, the percentage of all cases with congenital abnormality was only 0.7% while in the expert algorithm it was 3.3%. The difference between the two is likely because congenital abnormalities in the expert algorithm are near the top of the hierarchy so other diagnoses are not considered, while the physician-coded diagnosis considers the entire history and thus may find that even for cases reporting a congenital abnormality, there may be a different primary cause of death. Thirty-three cases of obvious congenital abnormalities were reported in the survey (Table A45), about 3% of which were in neonates and stillbirths and 1.6% in the 1-11 months age of death group. In neonates, this would correspond to a rate of about one per 1,000 live births. Among all congenital defects, 23% had either a defect in the back or a small head, possibly indicating a neural tube defect. For children 1-59 months, any cases of congenital abnormality are part of the 'others' group for physician-coded diagnosis. The expert algorithm did not include congenital abnormality in this age group, so they either received another diagnosis or were left unassigned. In the VASA 2014 study, physician-coded (1.1%) and expert algorithm (1.0%) were nearly identical and within the range found in 2019.

3.1.2.1.9 Diarrhoea. See discussion in child (1-59 months) section. Diarrhoea is uncommon as a cause of death in neonates (1-2% of the total in the VASA 2019 and 2.4-2.8% in VASA 2014).

3.1.2.1.10 Injury. See this discussion in the child (1-59 months) section. Injury was not part of the original expert algorithm, but the criteria for deaths at 1-59 months was extended for the VASA 2019 study.

3.1.2.1.11 Neonatal tetanus. Small numbers of neonatal deaths indicated either 'body stiff and arching backwards' or 'convulsions more than 24 hours after birth' (Table A30), and most of these did not meet the other criteria, leaving only two or three cases by the physician-coded diagnosis or expert algorithm criteria (0.2-0.3% of neonatal deaths). This corresponds to about 0.1 cases per 1,000 live births. In the VASA 2014 study, neonatal tetanus as a percentage of neonatal deaths was 0.3% in the physician-coded diagnosis and 1.2% in the expert algorithm.

3.1.2.1.12 Other causes and unspecified. Not all neonatal deaths have clear causes. The respondents may not have observed the symptoms clearly or may not remember or report them at the time of the interview. In some cases, respondents say that the newborn was not ill and simply died suddenly with no symptoms. There were also several other, uncommon conditions in neonates that were not included in either method, either because they were not expected to be common or because the mother's recall of symptoms may not adequate enough to assign a reliable diagnosis. These deaths were placed in the 'other' and 'unspecified' categories. The physician-coded verbal autopsy found 4% with 'other' and 13% unspecified. The expert algorithm found 3% with 'other' and 18% unspecified. Among 'others', the most common cases were newborns who were described as dying without any noticeable symptoms. Cases suggestive of haemorrhagic disease and skin infection were also included in this category. In the VASA 2014 study, the physician-coded and expert algorithm gave 12% and 13% unspecified respectively, similar to the VASA 2019 study. The VASA 2014 study included sudden deaths, jaundice, and haemorrhagic disease in its 'other' category.

3.1.2.1.13 Stillbirth. This was not a cause of death in the VASA 2019 study but was found commonly and is of interest to the health community. The VASA 2019 study asked whether the baby ever cried, breathed or moved. If the answer to all three was 'no', the respondent was asked if the case was a stillbirth; if 'yes', they were categorised as stillbirth. This identified 194 cases by study criteria. In the physician-coded diagnosis, the remainder of the VASA questionnaire was also reviewed to see if a case was a stillbirth. It was found that 32 cases where respondents said 'no' when asked if the case was a stillbirth (after no report of crying, breathing or moving) actually were stillbirths when looking at the rest of the survey, including the text responses; therefore, for the cause of death analysis these were considered stillbirths. These stillbirths comprised about 24% of what the NDHS 2018 had classified as neonatal deaths (226 out of 948 neonates selected from the DHS). Of 194 stillbirths identified by the VASA 2019 study criteria, 29 (15%) were reported to have signs of maceration (soft body, pulpy, discoloured and/or skin peeling). These would represent foetuses who died in utero some time prior to labour and delivery. The VASA 2014 study found 18% of cases initially classified as deaths as neonates (164 of 887) to be stillbirths.

3.1.2.2 Children (1-59 months) Causes of Death

Figure 5 below shows causes of deaths for 2,127 cases who died between 1 and 59 months of age, weighted to represent all 1-59 months deaths in Nigeria. Infectious diseases dominated the causes of death. Malaria (22% physician-coded and 35% expert algorithm) and diarrhoea/dysentery (22% physician-coded and 28% expert algorithm) were the top two causes. Pneumonia (10% physician-coded and 12% expert algorithm) and meningitis (10% physician-coded and 4% expert algorithm) were also major causes. The physician-coded causes of death had a large proportion (13%) coded as 'other infection' which was uncommon in the 2014 VASA study report and with the expert algorithm. These represent febrile illnesses that the physician coders could not classify as another condition. See the discussion for this diagnosis below. Measles was found by both methods (3% physician-coded

and 4% expert algorithm) as was pertussis (2% physician-coded and 0.5% expert algorithm), which, along with some of the pneumonia and meningitis cases, were vaccine-preventable diseases (as will be some diarrhea when Nigeria introduces rotavirus vaccine). Malnutrition as a primary cause was not very common (2% physician-coded and 3% expert algorithm), although it can be a common underlying condition. Injuries were found in a small proportion (2% by both methods) as was AIDS (1% physician-coded and 2% expert algorithm). 'Other causes' (10% physician-coded and 2% expert algorithm) are more common in the physician coding, which was not limited to a fixed list of diagnoses as the expert algorithm was. Conversely, 'unspecified' (3% physician-coded and 8% expert algorithm) was more common with the expert algorithm. Details on each diagnosis are provided below.

Figure 5: Physician-coded and expert algorithm verbal autopsy for underlying causes of 2,127 child (1-59 months) deaths in Nigeria, 2013-2018 (weighted data)

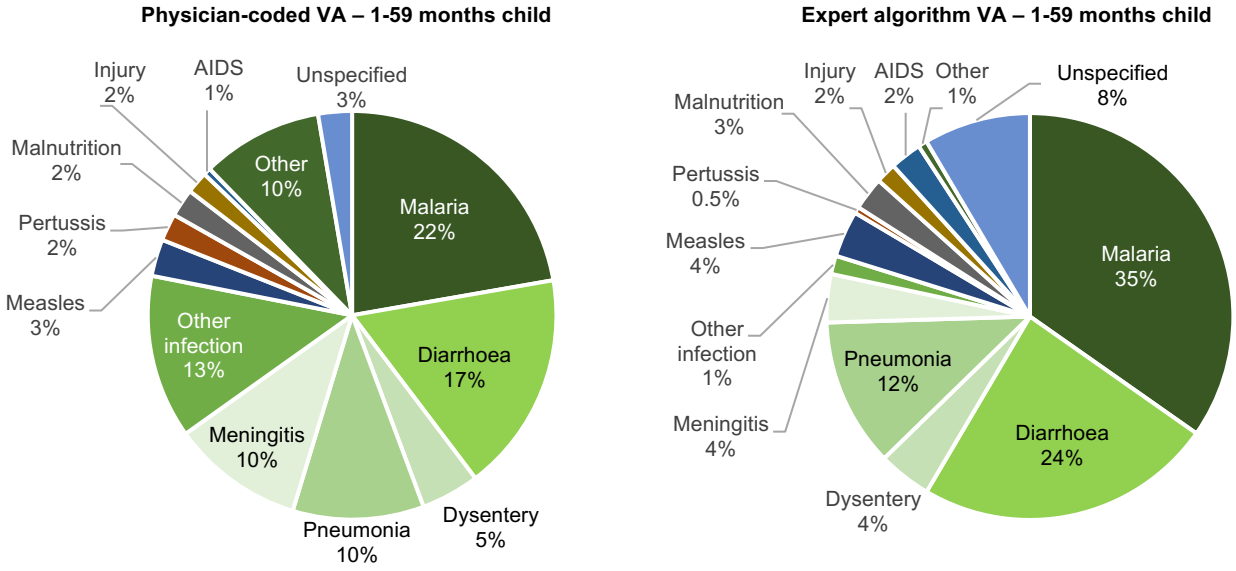
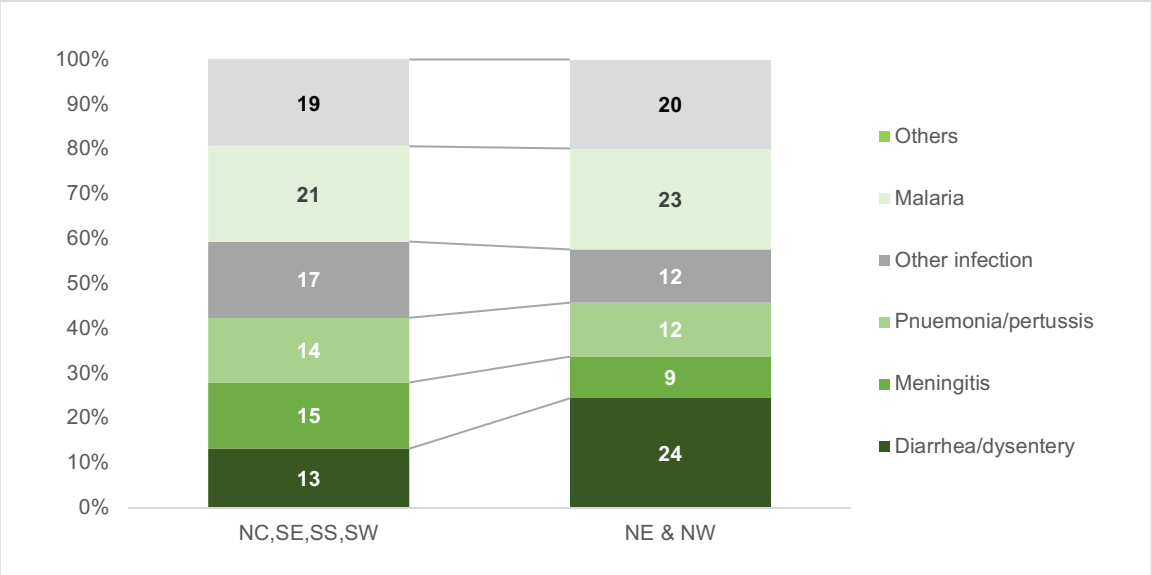


Table 9: Child 1-59 months cause of death findings – weighted

	Physician-coded		Expert algorithm	
Diagnosis	Weighted Number	Weighted Percent	Weighted Number	Weighted Percent
Malaria	602	22.2	942	34.7
Diarrhoea	472	17.4	643	23.7
Dysentery	125	4.6	115	4.2
Pneumonia	281	10.4	320	11.8
Meningitis	283	10.5	104	3.8
Measles	79	2.9	100	3.7
Pertussis	58	2.2	14	0.5
Malnutrition	60	2.2	71	2.6
Injury	47	1.7	44	1.6
AIDS	16	0.6	68	2.5
Other infection	351	13.0	40	1.5
Other	260	9.6	19	0.7
Unspecified	72	2.7	230	8.5
Total	2,708	100.0	2,710	100.0

Note: 'Other' for 1-59 months by physician coding includes anaemia, unexplained sudden death, haemorrhagic fever, sickle cell anaemia and 21 other diagnoses. For the expert algorithm, it includes haemorrhagic fever. Numbers are different from those of the survey due to weighting.

Figure 6: Distribution of major categories of deaths for children aged 1-59 months by physician coding in lower versus higher mortality geopolitical zones



3.1.2.2.1 Malaria. The physician-coded diagnosis found 22% of deaths to be due to malaria, compared to 35% in the expert algorithm. In both methods, malaria was the single largest cause of death in children 1-59 months of age. Fever was found in 82% of childhood deaths, with 59% stating this was severe and 50% that it was on and off (Table A17). In the VASA 2014 study, malaria constituted 24% of the physician-coded diagnoses and 36% of the expert algorithm diagnoses, which was close to the VASA 2019 figures.

The VASA 2019 study asked whether children aged 1-59 months who died and had a fever received either a positive or negative malaria test result during the final illness. The results are shown in Table A13 for the 1,744 cases by places of treatment. Overall, 47% were reported to have received a malaria test result. Of these, the highest rates were at government hospitals (63%) and lowest were among those who were reported not to have seen any health provider (18%). Of the 47% of children tested, 33% had a positive result, 6% negative, and 8% had both positive and negative results. The last finding, along with the tests results in those that did not see a health provider, suggests some respondents may have misunderstood the question and reported on malaria tests occurring at various times prior to the final illness as well as during the final illness. The number of children with a fever who had a diagnostic blood test for malaria by a provider in the 2018 Nigeria DHS is shown in Table A14. The table shows that among children who visited a formal provider (government hospital, health centre or private hospital/clinic) 33-39% were reported to have had a malaria diagnostic blood test compared to 6% for those who received care at a PMV/pharmacy and 4% for those who received no treatment.

3.1.2.2.2 Diarrhoea and dysentery. In the VASA 2019 study, diarrhoea was the second most common cause of death in children 1-59 months by both the physician-coded diagnosis (17%) and expert algorithm (24%). If dysentery was combined with diarrhoea, the rate of death from diarrhoeal disease overall was 23% and 28%, respectively. Thirty-nine percent of children had some report of loose stools in the final illness, and 6% had blood in the stools (Table A23). However, not all had stools with enough frequency or duration of illness for diarrhoea to qualify as the most likely cause of death. The VASA 2019 study also asked about children with sunken eyes or who drank more than usual as signs of dehydration (Table A37), and 28% and 36% of children had these symptoms, respectively. This was not part of the expert algorithm criteria for diagnosis of a diarrhoeal death but could be considered for the physician-coded diagnosis. The VASA 2014

study presented diarrhoea and dysentery combined, and both physician-coded diagnosis and expert algorithm found this as the cause for 26% of deaths.

Diarrhoea, including dysentery, followed malaria as the second major cause of death in children 1-59 months in Nigeria. Figure 6 shows that in NE and NW Nigeria, it edged out malaria to become the number one cause of death in this age group (24% vs 23% of all deaths). Some uses of Oral Rehydration Solution (ORS) and zinc were reported in the VASA study (see Table 56 for use in home care, Table 57 at PMVs and Table 63 at health providers), but use had not been analysed by diagnosis. Table 6 shows that households with unimproved water supply and sanitation had higher deaths in children 1-59 months.

3.1.2.2.3 Pneumonia. The physician-coded diagnosis found 10% and the expert algorithm 12% of age 1-59 months deaths to be from pneumonia. Of these deaths, 16% of the cases reported difficult breathing and 18% reported fast breathing (Table A20). Twenty percent had cough, of which 59% were severe (Table A18). Stridor, grunting, and wheezing were found in 6%, 2%, and 4% of cases, respectively (Table A21). A substantial proportion of children with these symptoms were found to have pneumonia. The VASA 2014 study found 20% of cases to be pneumonia by physician-coded diagnosis and 16% by expert algorithm, which, especially for the physician-coded diagnosis, was substantially higher than the finding in the VASA 2019 study.

3.1.2.2.4 Meningitis. The physician-coded diagnosis found 10% of deaths in children 1-59 months to be caused by meningitis compared with 4% documented by the expert algorithm. Fever was a common symptom in childhood deaths (83%) (Table A16). A bulging fontanelle was reported in 3.6% of children who died at 1-11 months (Table A42) and a stiff neck was reported in 4.6% of children 1-59 months (Table A27). Convulsions were reported in 16% of children aged 1-59 months, 84% of which were generalised (Table A49). The inclusion of some of the children with convulsions appears to be the reason why the physician-coded diagnosis of meningitis was substantially higher than the expert algorithm's. In the VASA 2014 study, the physician-coded diagnosis found 8.9% of children aged 1-59 months had meningitis compared with 5.6% diagnosed by the expert algorithm.

3.1.2.2.5 Other infections. The physician-coded diagnosis found 13% of all deaths to be due to 'other infections' while for the expert algorithm this was 1%. The physician-coded diagnosis' minimum criteria for 'other infection' was the presence of a fever; this was also the minimum criteria for malaria with distinction between these left to the physician coders. In the expert algorithm, 'other infection' requires additional symptoms and is low in the hierarchy (see Annex 3). Another key difference may be that in the 2019 VASA study, a question was asked about whether the child received a malaria diagnostic test and its results. This was not part of the 2014 VASA study and was not considered in the expert algorithm in the 2019 VASA study, but was taken into account in the physician coding in 2019. Children with fever with a reported negative malaria test may help account for the comparatively large number of 'other infection' cases found by physician coding in 2019.

The 2014 VASA study used the same physician minimum criteria as the 2019 VASA study but because the number of cases were few, they were combined into the 'other' category in the report and formed 2.2% of cases. 'Other infection' was also uncommon in the expert algorithm in 2014 VASA study and was also combined into 'other' and constituted 3.0% of the total.

3.1.2.2.6 Measles. The physician-coded diagnosis classified 3% of children aged 1-59 months as dying from measles compared to 4% by the expert algorithm. Fever was common, with 83% of children aged 1-59 months being reported to have had a fever with a median duration of five days (Table A16). However, only 7% of this age group reported a rash, with about 80% of these being on the face or 'everywhere' with a

median duration of seven days (Table A33). Not all rashes would have been in children over four months of age, explaining the 4% rate in the expert algorithm. The physician-coded diagnosis, accounting for all the symptoms, determined that fewer had measles as the primary cause of death.

The VASA study directly asked respondents if a child aged 1-59 months had a diagnosis of measles in the final illness, but answers in this section were contaminated by a small percentage who said 'yes' to almost all conditions. If we removed caregivers who responded affirmatively to more than four items, and in children aged less than nine months, there were 99 cases in which the respondents reported measles. Thirty-four also mentioned measles in the text (including six new ones) for a total of 105. This is 4.9% of all deaths in children aged 1-59 months, which is roughly compatible with what was found by the two cause of death methods used in the VASA 2019.

The VASA 2014 study reported measles as being responsible for 4.4% (physician-coded) and 2% (expert algorithm diagnosis) of deaths among all children aged 1-59 months.

3.1.2.2.7 Pertussis. The physician-coded diagnosis reported 2% of deaths in children aged 1-59 months to be due to pertussis compared to 1% reported by the expert algorithm. This compares to the 5% by physician-coded diagnosis and 0.5% by expert algorithm for pertussis reported in the 2014 VASA study.

3.1.2.2.8 Malnutrition. The physician-coded diagnosis reported 2% of deaths in children aged 1-59 months as being due to malnutrition while the expert algorithm reported it as 3%. Additionally, the VASA 2019 study classified 19% of children 1-59 months as being severely thin or wasted (Table A36), and 9% had swollen legs or feet (Table A38). However, the expert algorithm did account for these features if they were not the first symptoms. Furthermore, the physician-coded diagnosis reported most of these children as having other causes of death that appeared to be primary. In the VASA 2014 study, malnutrition was the cause of 4.1% deaths of children aged 1-59 months using the physician-coded diagnosis compared to 0.6% by the expert algorithm.

The VASA 2019 study had several additional questions that explored malnutrition. For example, a 'change in hair colour to red or yellow' was reported by 6% of respondents, mostly in the North West and North East, which is a sign of kwashiorkor, a very serious form of malnutrition. A 'whitish rash in the mouth' which could be an oral infection related to malnutrition was reported by 16%. Caregivers reported noticeable weight loss in 49% of children, although it was not clear if this was due to the illness or contributed to it (Table A36). A protruding abdomen was reported in 9% of children, although some developed quickly, where as a sign of malnutrition it should be more chronic (Table A26). The 2018 DHS also found that malnutrition was common in living children, reporting in 2018 acute malnutrition (low weight for height) in 1.8% of children under-five at a severe level, 8.6% at a moderate/severe level, with rates peaking at 18% or more in children 9-18 months of age. The rates were about twice as high in the North West and North East as in other geopolitical zones, which corresponds with their high rates of child mortality. Chronic malnutrition as evidenced by stunting was found in 37% of children nationally. Moderate and severe malnutrition was common in Nigeria, especially in the high child mortality geopolitical zones. This is consistent with malnutrition as a contributing cause of death, even if it was not a common primary cause.

3.1.2.2.9 Injury. Both physician-coded diagnosis and expert algorithm found injury as the cause of death in 2% children aged 1-59 months (and 0.2-1% in neonates). Fifty-five injury cases in children 1-59 months and 6 in neonates were reported with most of them diagnosing this as the cause of death. The VASA 2014 study found injury in 2.8% deaths in children aged 1-59 months by both methods.

Data on injuries in the VASA 2019 study are found in Tables A11 and A12. The proportion of deaths due to injuries increased with the ages at death, being highest in ages 1-4 years and appeared slightly higher in the low child mortality geopolitical zones compared to the North West and North East. Traffic accidents (19 cases) and drowning (13 cases) were the most common causes but there were a variety of others. The health system interventions that could greatly reduce other causes of death in children may have difficulty in preventing injury-related deaths, which means that injuries could eventually account for a larger proportion of deaths if other types of child mortality can be reduced.

3.1.2.2.10 HIV/AIDS. The physician-coded diagnosis assigned 1% of deaths to AIDS as a cause and the expert algorithm assigned 2%. Only 18 mothers (0.6%) reported being diagnosed with HIV and only 41% reported having ever received an HIV test (Table A15). Only six of these mothers reported that their children were HIV-positive, and just two reported being told by a health worker that the child died from HIV. These together account for less than 1% of the deaths. Swelling/lumps of any sort were only reported in 1.6% of children aged 1-59 months and of these, only 12% were reported from the armpit, so this was a very uncommon sign (Table A39). A 'whitish mouth rash' representing oral thrush was reported in 16%, and while this is characteristic of AIDS, it may also be seen in malnutrition (Table A36). The remaining symptoms that were in the diagnostic criteria range from those that were common in many illnesses (e.g. fast breathing) to those that were uncommon (more than 30 days of loose stools or fever/skin rash). The VASA 2014 study found only 0.1% (physician-coded) and 0.8% (expert algorithm) of child deaths aged 1-59 months to be due to AIDS. Because children with HIV can be expected to present with other severe illnesses, verbal autopsy may not capture many deaths due to AIDS.

3.1.2.2.11 Sickle cell anaemia. This condition was not part of the VASA 2014 study questionnaire, but a question as to whether the child had a health worker diagnosis of sickle cell anaemia was included in the VASA 2019 study. This complemented the 2018 DHS that for the first time provided a national measure of sickle cell disease and trait in under-five children in Nigeria. The physician-coded diagnosis assigned 10 deaths in children 1-59 months to sickle cell, which was 0.5% of the unweighted deaths. Sickle cell anaemia was not shown separately in the figure but was combined with 'others'. The question on sickle cell anaemia in the study had a problem in that a small number of respondents answered yes to all or most of a list of 11 chronic conditions. If cases that answered yes to more than four conditions are set aside as being potentially inaccurate, 59 cases with reported sickle cell anaemia remain. Respondents may also have mentioned sickle cell in text responses. This was found in 25 cases, all of whom were among the 59. The 59 cases represent 2.8% of childhood deaths (1-59 months) in the study.

3.1.2.2.12 Other and unspecified. Children can die from a wide variety of other causes than the ones shown in the summary tables and figures. In addition, some respondents were not able to give a clear history of the illness, or the symptoms themselves may not have clearly pointed to a particular illness.

The physician coding guide allows for other diagnoses beyond those in the table or minimum criteria if the data from the study is suggestive. Cases where no diagnosis can be made are categorised as 'unspecified'. For the expert algorithm cases, meeting the criteria for 'other infection' and 'haemorrhagic fever' was uncommon, and so these are combined in 'other', as was done in the 2014 study. Any case that reaches the end of the hierarchy without a diagnosis was categorised as 'unspecified'.

The physician-coded diagnosis method ended up with 10% 'other' and 3% 'unspecified'. The largest groups of 'others' were severe anaemia (without a specific disease cause), sickle cell anaemia, haemorrhagic fever, and unexplained sudden death (which may include sudden infant death syndrome). About 20 other infectious and non-communicable diseases had from one to four cases each (mostly one). The expert

algorithm had only 2% under 'other' and 'unspecified' increased to 8%. The difference between the two methods is understandable because the expert algorithm only had criteria for two conditions under 'other,' with all remaining cases categorised as 'unspecified', while the physician coding could assign as many diagnoses as could be determined from the data, leaving relatively few unspecified. The VASA 2014 physician-coded diagnosis had 2.2% under 'other' and 2.5% in 'unspecified', while the expert algorithm had 3.5% and 5.8%, respectively.

3.1.3 COMPLICATIONS AND CARE DURING PREGNANCY AND DELIVERY

As part of the social autopsy, the 2019 VASA included a section on symptoms and care during pregnancy, labour, and delivery for the mothers of stillbirth and neonatal death cases. A few of these questions were also asked for mothers of children who died at 1-11 months of age, or even for those 1-4 years of age at death. Complications or symptoms during pregnancy, labour and delivery can increase the risk of death, but this can be prevented or managed by health services.

3.1.3.1 Antenatal care

Coverage of antenatal care (ANC) services among women with a stillbirth or neonatal death is 74% overall, with the highest rates for women with the earliest deaths (stillbirth or neonatal death within 48 hours after delivery). Rates also vary by geopolitical zone, with rates highest in South West (95%) and lowest in the North West (63%). The average number of visits was high, at 6.4 per woman, with 87-94% getting a blood pressure measurement and urine and blood tests during their visits. Somewhat fewer get educational messages. Few were found to be taking measures to prevent contracting malaria, with 42% of women reporting that they had used of an insecticide-treated net and 64% reporting that they had taken Intermittent Preventive Treatment during pregnancy (IPTp). (Tables 10 and 11)

Table 10: Provider of antenatal care and number of visits

	Anyone seen for ANC care	Provider for ANC care		ANC from health provider			Cases
		Health provider	TBA/ religious provider	Visits (mean and % with four or more)		Last visit <9 months	
	%	%	%	No.	%	%	No.
Age at death							
Stillbirth	82.5	80.9	3.6	6.8	80.9	29.4	194
0 day	79.0	78.3	1.1	6.0	79.0	36.2	276
1 day	69.4	66.7	1.9	5.3	77.8	25	108
2-6 days	70.2	70.2	1.5	5.8	73.4	37.4	198
7-27 days	63.4	62.2	1.2	6.3	75.7	36.1	172
Zone							
NC	80.0	78.3	2.3	5.7	80.3	33.7	175
NE	72.0	71.6	0.9	4.6	72.7	37.8	225
NW	63.0	63.0	0.0	5.3	73.4	33.3	330
SE	88.9	88.9	0.0	12.7	87.3	27.2	81
SS	75.4	73.7	10.5	7.2	76.2	26.3	57
SW	95.0	88.8	6.3	7.8	87.3	36.3	80
Total	74.0	72.9	1.8	6.4	77.6	33.8	948

Note: 0.2% of respondents went to relative, neighbour, friend or others for ANC.

Table 11: Antenatal care services received

	ANC services from a health provider						Malaria prevention		Cases
	Blood pressure measured	Urine test	Blood test	Food advice	Danger signs advice	Where to go with problem	Slept under insecticide-treated net	Took IPTp	
	%	%	%	%	%	%	%	%	No.
Ages at death									
Stillbirth	96.2	89.2	93	82.8	84.7	80.9	37.1	66.0	194
0 day	91.7	85.7	82.9	80.6	74.1	75.9	39.1	69.9	276
1 day	97.2	86.1	88.9	81.9	80.6	83.3	45.4	63.0	108
2-6 days	96.4	88.5	87.1	79.9	78.4	74.8	43.4	62.1	198
7-27 days	91.6	87.9	84.1	83.2	73.8	73.8	47.7	55.8	172
Zone									
NC	97.1	92	93.4	78.8	82.5	81.8	41.7	56.0	175
NE	98.8	85.7	85.7	82	85.7	86.3	45.8	63.6	225
NW	93.3	86.5	84.6	81.7	77.4	80.8	50.0	59.4	330
SE	91.7	84.7	87.5	66.7	54.2	38.9	18.5	86.4	81
SS	71.4	76.2	66.7	90.5	71.4	71.4	31.6	71.9	57
SW	97.2	94.4	94.4	94.4	81.7	80.3	28.8	75.0	80
Total	94.2	87.4	86.8	81.5	78	77.3	41.9	64.1	948

The DHS included many questions about antenatal care for both women with a neonatal death and those whose infants survived the neonatal period (Table 12). These are only asked for the most recent birth in the study and so have fewer numbers of neonates than the 2019 VASA study. The DHS findings show is that basic ANC coverage is nearly identical between women with neonatal deaths and those without, running up to 2-3% lower for cases who died. The only exception is for IPTp, but even here the gap is only 5%. One issue with interpreting these findings is that women who go on to have neonatal deaths have higher rates of complications or symptoms in pregnancy, and some start ANC for this reason (see below). The finding that women with neonatal deaths have similar ANC care as women without these deaths may be partly due to such women seeking out ANC.

Table 12: Provider and content of antenatal care for pregnancies of women with or without subsequent neonatal death – DHS 2018 weighted

	Anyone seen for ANC care	Provider for ANC care		ANC from health provider		Content of ANC from a health provider				Cases
		Health provider	TBA	Visits (mean and % with four or more)		Blood pressure measured	Urine test	Blood test	Took IPTp	
	%	%	%	No.	%	%	%	%	%	No.
Not a neonatal death	75.7	73.7	1.2	6.2	76.8	93.9	86.4	87.6	63.3	21,304
Neonatal death	73.1	71.0	1.0	6.3	75.6	93.6	85.8	86.9	58.3	607
Total	75.6	73.6	1.2	6.2	76.8	93.9	86.4	87.6	63.1	21,911

Women were asked about their knowledge of complications in pregnancy. Most were able to mention one or more complications with the most common being vaginal bleeding, severe abdominal pain, or severe headache with blurred vision (Table 13).

Table 13: Knowledge of danger signs in pregnancy

	Respondent's list of danger signs in pregnancy for which one should seek care immediately									
	Vaginal bleeding	Convul-sions	Severe headache with blurred vision	Fever and too weak to get out of bed	Severe abdominal pain	Fast or difficult breathing	Painful contractions every 20 minutes or less for 12 hours or more	Broken water more than 12 hours	Bloody, sticky vaginal discharge 12 hours or more	
	%	%	%	%	%	%	%	%	%	No.
Zone										
NC	66.3	5.1	30.3	32	44.6	10.9	19.4	28	22.3	175
NE	79.6	25.3	50.2	31.6	60	21.8	16.4	27.1	16.9	225
NW	46.4	17	33.3	33	49.7	3.6	13	9.7	7.6	330
SE	43.2	4.9	9.9	28.4	35.8	3.7	13.6	12.4	14.8	81
SS	43.9	3.5	40.4	38.6	33.3	19.3	5.3	12.3	10.5	57
SW	50	8.8	23.8	33.8	58.8	3.8	42.5	42.5	33.8	80
Total	57.8	14.2	34.39	32.5	49.8	10.2	17.1	20.4	15.5	948

Women who reported stillbirths and neonatal deaths were asked about pre-existing medical conditions before their index pregnancies (Table 14). There was no comparison group of other women available, but even within this group it was seen that higher rates of high blood pressure were recorded for women with stillbirths and deaths in the first two days (about 15% had pre-existing high blood pressure) compared to those whose babies had late neonatal deaths (about 5%). Only 1-3% of women reported having heart disease, diabetes and epilepsy. Seven percent reported 'others' for their pre-existing condition(s) but on examination, many of these were symptoms or complications that occurred during pregnancy and were discovered later.

Table 14: Pregnancy care – Pre-existing conditions

	Maternal chronic medical conditions before pregnancy					
	Hypertension	Heart disease	Diabetes	Epilepsy	Others	
	%	%	%	%	%	No.
Ages at death						
Stillbirth	16.0	2.1	0.5	1.0	5.2	194
0 day	14.9	2.5	0.4	1.1	9.1	276
1 day	14.0	7.4	2.8	1.9	11.1	108
2-6 days	8.1	3.0	0.5	1.0	4.6	198
7-27 days	5.2	1.2	0.6	1.2	5.8	172
Zone						
NC	12.6	1.1	1.1	1.1	4.6	175
NE	18.2	8.0	0.4	0.4	8.4	225
NW	9.4	1.8	0.0	1.8	8.2	330
SE	4.9	1.2	2.5	0.0	11.1	81
SS	12.3	0.0	3.5	3.5	0.0	57
SW	8.8	0.0	0.0	0.0	3.8	80
Total	11.8	2.9	0.7	1.2	7.0	948

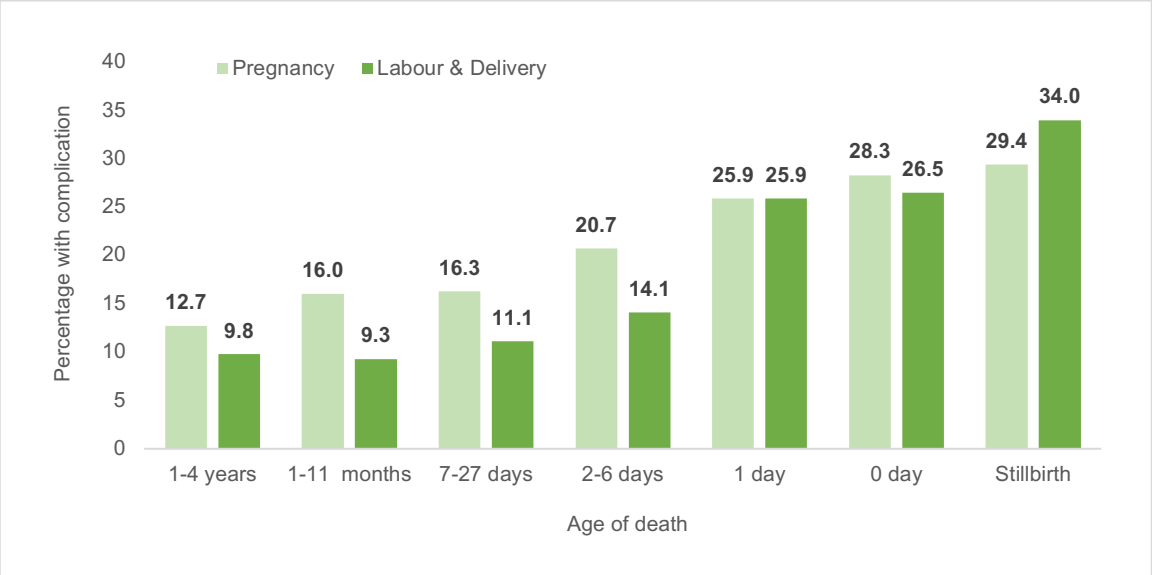
3.1.3.2 Symptoms and complications in pregnancy

All VASA respondents were asked about complications during pregnancy, labour and delivery for the children. Although there was no comparison group of women whose children did not die, it was possible to analyse the answers by age of death group and assume that complications leading to the death of the child were more likely to lead to earlier deaths in the neonatal period and less likely in the 1-11 months and 1-4 year deaths: see Table 15 and Figure 6. Only 13% of women with a child death (1-4 years) reported having a pregnancy complication, but this increased to 16% for late neonatal deaths, and up to 28-29% for deaths on the first day or for stillbirths. The earliest neonatal deaths had much higher rates of reported pregnancy complications (labour complications were considered later).

Table 15: Overall rates of pregnancy and labour/delivery complications by ages at the death of the children and geopolitical zones

	Complications in the last three months of pregnancy	Complications in labour and delivery	Number of cases
	%	%	#
Ages at death			
Stillbirth	29.4	34.0	194
0 day	28.3	26.5	276
1 day	25.9	25.9	108
2-6 days	20.7	14.1	198
7-27 days	16.3	11.1	172
1-11 months	16.0	9.3	676
1-4 years	12.7	9.8	1,451
Zone			
NC	11.5	9.0	477
NE	26.8	17.5	704
NW	14.1	13.5	1,371
SE	10.5	8.7	219
SS	14.6	7.6	157
SW	28.5	25.7	144
Total	17.1	13.6	3,075

Figure 7: Pregnancy or labour and delivery complication rates by age at death group



After asking about complications in general, mothers/caregivers of children who died up to 11 months of age were asked about 13 specific symptoms and complications during the index child's pregnancy (and 'any other') (Table 16). With these as prompts, the rate of reported complications (including symptoms) almost doubled compared to when they were not prompted. The positive response rate increased from 29% to 59% for mothers/caregivers who reported stillbirths, and from 16% to 37% in those with deaths of children in the 1-11 month age range. The commonly reported pregnancy complications were severe weakness (18%) ('too weak to get out of bed'), severe headache (16%), fever (13%), and severe abdominal pain (13%) (not labour pains). Most of the individual complications showed a pattern of being more commonly reported in women whose children died at the earliest age and lowest in late neonatal and 1-11- month age of death groups.

Table 16: Complications that the mother suffered during the last three months of pregnancy

	Convulsions	High Blood Pressure	Severe anaemia	Diabetes	Severe headache	Blurred vision	Too weak to get out of bed	Severe abdominal pain	Fast or difficult breathing	Puffy face	Vaginal bleeding	Fever	Smelly vaginal discharge	Other	Any symptom	Cases
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	No.
Ages at death																
Stillbirth	0.5	12.4	8.8	0.0	20.6	7.2	23.2	18.0	6.2	4.6	6.2	19.1	18.0	3.6	58.8	194
0 day	1.1	11.2	9.1	0.4	21.4	8.0	22.5	17.4	6.2	12.0	6.5	22.5	12.7	2.5	59.8	276
1 day	1.9	12.0	5.6	0.0	21.3	9.3	20.4	19.4	5.6	10.2	6.5	13.9	14.8	4.6	58.3	108
2-6 days	0.5	6.1	8.1	0.5	20.7	6.6	19.2	11.1	6.1	11.6	2.5	17.7	8.1	4.0	48.0	198
7-27 days	1.2	5.2	2.9	0.6	11.6	1.7	17.4	13.4	2.9	2.9	4.1	11.1	9.9	0.6	41.3	172
1-11 mo.	0.3	3.1	4.1	0.0	13.2	4.7	15.4	9.8	3.9	4.4	0.9	8.9	7.5	2.4	37.0	676
Total	0.7	6.8	6.0	0.2	16.8	5.8	18.5	13.2	4.8	6.8	3.4	14.0	10.5	2.7	46.7	1,624

Women who reported stillbirths and neonatal deaths were asked a series of questions about care-seeking for their complications/symptoms (Table 17). About half (264 of 507) reported seeking any care for these. Among those not already attending ANC who had complications or symptoms (158), 54 started ANC because of the problem (29%) and 13 sought other care (not ANC) (8%), while the remaining 63% did not seek any care. Even among those who were already using ANC prior to the complication/symptoms, those who sought care and those who did not were about the same (171 versus 178). Overall care-seeking for pregnancy-related symptoms,

though it did occur, was limited, both for women already attending ANC and those not attending. Women who reported starting ANC because of complications increased the overall ANC rate from 68% to 73%.

Table 17: Complications (including symptoms) during pregnancy, care-seeking and antenatal care

	No.	%
Attended ANC at health provider prior to complications	645	68.0
Attended ANC at health provider including due to complications	691	72.9
Any complications reported during pregnancy	507	53.5
Sought care for complications during pregnancy	264	28.0
Already attending ANC and no pregnancy complications	296	31.2
Already attending ANC, had complications and did not seek care	171	18.0
Already attending ANC, had complications and sought care for them	197	20.8
Started ANC because of pregnancy complications	54	5.7
Had complications and sought care, but not ANC	21	2.2
Had complications, did not seek care and not attending ANC	99	10.4
Did not attend ANC and no complications	145	15.3
Total	948	100.0

Among the 264 women with complications (including any symptoms) during their pregnancy who sought care, 88% went to a health provider. Most of those seeking care had already been attending ANC prior to the symptom, but 20% reported that they started ANC because of the symptoms (Table 18). Among the 221 women who went to a health provider, 86% went to only one, 4% to two or three, and 5% reported being referred between providers (Table 19). When asked about the interventions suggested by the provider, medications such as antibiotics, antimalarials, and those for anaemia and high blood pressure were reported by only 1-8% of women. More commonly recommended was bedrest (15%) and returning for a follow up visit (33%) or if the condition worsened (6%).

Table 18: Pregnancy complications (including symptoms) and care-seeking

	Any pregnancy complication	Sought care for pregnancy complications		Place sought care								Started ANC because of complications	Number of cases
				Hospital	Health centre	Private	Community health worker	Any health provider	TBA/ non-formal	Relative, neighbour	Other		
	%	%	#	%	%	%	%	%	%	%	%	%	#
Ages at death													
Stillbirth	58.8	59.7	68	48.5	26.5	17.7	4.4	97.1	1.5	1.5	0	19.1	114
0 day	59.8	55.2	91	39.6	18.7	22	5.5	85.7	4.4	3.3	6.6	19.2	165
1 day	58.3	46	29	37.9	20.7	17.2	0	75.9	13.8	6.9	3.5	19.1	63
2-6 days	48	48.4	46	56.5	23.9	2.2	2.2	84.8	2.2	2.2	10.9	20.5	95
7-27 days	40.7	42.9	30	36.7	26.7	23.3	6.7	93.3	3.3	0	3.3	28.6	70
Zone													
NC	50.9	58.4	52	36.5	11.5	38.5	1.9	88.5	3.9	0	7.7	19.2	89
NE	63.6	46.2	66	37.9	42.4	7.6	0	87.9	1.5	7.6	3	16.1	143
NW	54.6	47.2	85	50.6	16.5	10.6	10.6	88.2	4.7	1.2	5.9	32.6	180
SE	25.9	85.7	18	38.9	27.8	22.2	0	88.9	5.6	5.6	0	6.7	21
SS	52.6	50	15	33.3	20	26.7	6.7	86.7	13.3	0	0	15.4	30
SW	55	63.6	28	64.3	14.3	10.7	0	89.3	3.6	0	7.1	12	44
Total	53.5	52.1	264	44.3	22.7	17.1	4.2	88.3	4.2	2.7	4.9	20.5	507

Table 19: Referrals and suggestions for home care for women with pregnancy complications who sought care

	Providers seen		Referred between provides	Interventions suggested by the health provider									Able to follow all the advice?	Number
	One	Two or Three		Anti-biotic	Anti-malarial	Blood pressure medicine	Anaemia medicine	Rest	Return for follow-up	Referral / return if get worse	Other	Nothing		
	%	%	%	%	%	%	%	%	%	%	%	%	%	#
Ages at death														
Stillbirth	83.6	16.4	9	3	9	3	3	17.9	35.8	4.5	13.4	10.5	96.7	60
0 day	89.7	10.3	2.6	0	6.4	3.9	11.5	10.3	32.1	7.7	21.8	6.4	95.9	73
1 day	79.2	20.8	8.3	0	17.4	0	8.7	21.7	34.8	4.4	8.7	4.4	100	22
2-6 days	89.7	10.3	7.7	2.6	5.1	2.6	15.4	10.3	30.8	5.1	23.1	5.1	97.3	37
7-27 days	79.3	20.7	0	0	3.5	10.3	3.5	24.1	31	10.3	17.2	0	89.7	29
Zone														
NC	75	25	4.2	4.3	8.5	2.1	4.3	12.8	27.7	12.8	21.3	6.4	95.5	44
NE	94.9	5.1	3.4	1.7	8.5	1.7	3.4	13.6	47.5	5.1	15.3	3.4	96.5	57
NW	81.6	18.4	7.9	0	4	5.3	18.4	13.2	34.2	6.6	13.2	5.3	98.6	72
SE	87.5	12.5	6.3	0	25	12.5	6.3	6.3	6.3	6.3	18.8	18.3	100	13
SS	92.3	7.7	7.7	0	15.4	0	7.7	30.8	0	0	23.1	23.1	70	10
SW	92	8	4	0	0	4	0	28	40	0	28	0	96	25
Total	85.7	14.4	5.5	1.3	7.6	3.8	8.5	15.3	33.1	6.4	17.8	6.4	95.9	221

3.1.3.3 Labour and delivery care and complications

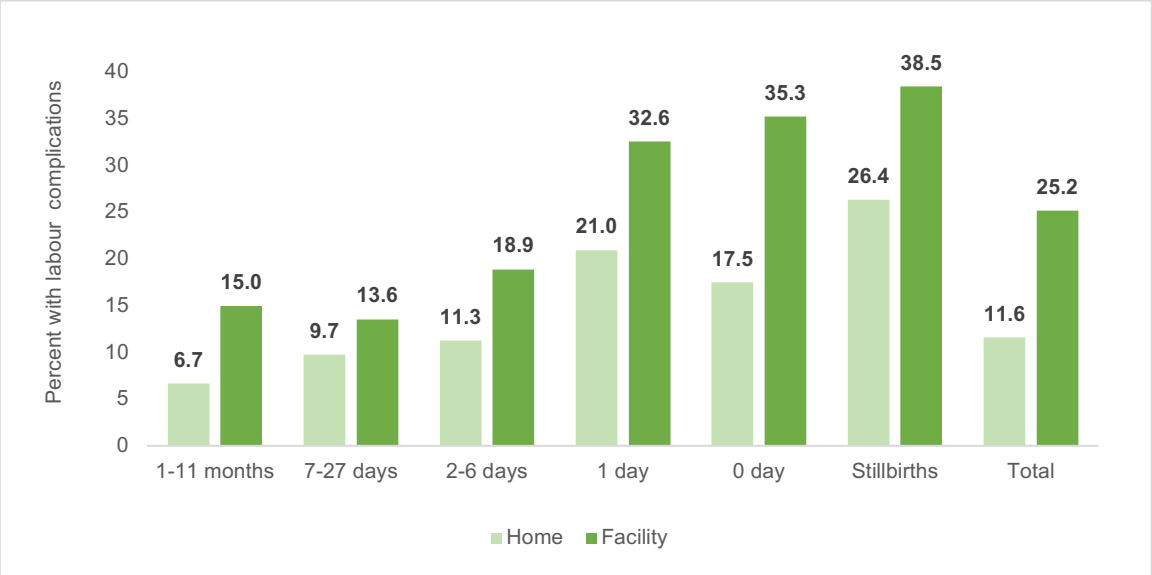
Overall self-reported complications. As with pregnancy complications, all VASA study respondents were asked if they had complications in labour and delivery (Table 15 and Figure 7). The rates of reported complications during labour and delivery were higher in mothers whose children died at younger ages than the rates of reported complications during pregnancy, being highest for stillbirths (34%) and deaths in the first day (26%), and lowest in deaths after the neonatal period (10%).

Table 20 and Figure 8 show that facility births also had higher rates of complications. This was the case among children at all ages of death groups, not just the youngest. Overall, the rate of reported complications in facility births was about twice as high as in-home births. Though this finding may initially seem counterintuitive, this pattern is likely due to women seeking care outside the facilities because of complications during pregnancy or on an emergency basis for complications that started at home during labour.

Table 20: Percent of deliveries with complications by place of delivery and ages at the death children

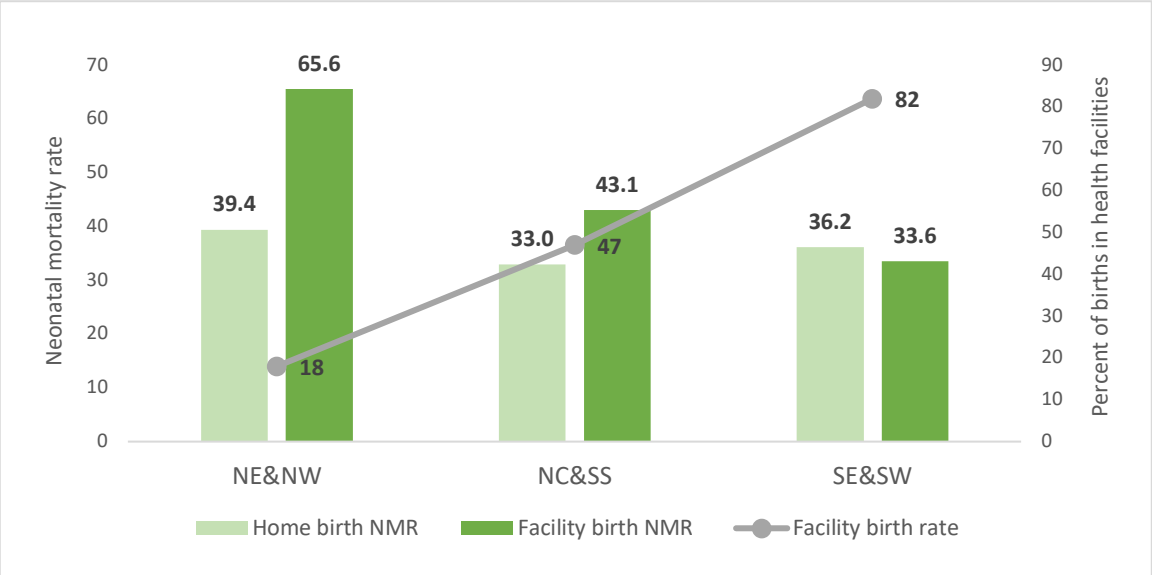
	Home/other	Facility	Total deliveries
	%	%	#
Ages at death			
Stillbirths	26.4	38.5	194
0 day	17.5	35.3	276
1 day	21.0	32.6	108
2-6 days	11.3	18.9	198
7-27 days	9.7	13.6	172
1-11 months	6.7	15.0	671
Total	11.6	25.2	1,619

Figure 8: Rate of labour and delivery complications by age of death and places of birth



The result of this shift of women with complications to facilities can be seen in Figure 9, which depicts NDHS 2018 data on the rate of neonatal death among facility versus home (non-facility) births. It was divided into three groups of geopolitical zones. The North West and North East Zones had low overall rates of facility delivery (average 18%), and neonatal mortality was much higher in facility births than at home. In geopolitical zones with moderate facility delivery coverage (average 47%), facilities still showed a higher mortality rate than home deliveries. Finally, in the South East and South West, with high rates of facility delivery (82%), newborns were slightly less likely to die if delivered in the facility.

Figure 9: Facility versus home births and neonatal mortality (NDHS 2018)



From the VASA 2019 study we can see that, among children that died, facility births hade twice the labour and delivery complication rate as home births. Women with complications were more likely to go to a facility for delivery either as planned or on an emergency basis. Assuming the rate of complications was similar in all geopolitical zones, then the impact on the risk profile in facilities would be largest in the North West and

North East because they had relatively few normal deliveries already in the facility. This increased facility risk profile could lead to the observed higher mortality in facility versus home births. While the facilities do not cause neonatal mortality to increase, they were not able to provide life-saving services at a rate enough to make up for the high-risk profile of women who opted to deliver there.

In the high facility birth geopolitical zones (SE and SW), most women, including those with complications, were already in facilities. Relatively few came in as emergencies, so that while the facility risk profile was higher than at home, this may not be as extreme as in the NE and NW. The facilities were able to save some newborns and as a result, the neonatal mortality rate in facility births finally fell below that from home births. However, due to limited capacity to manage complications, the neonatal mortality rate was still high compared to some countries with stronger services.

Details of symptoms and complications in labour and delivery. After asking about labour and delivery symptoms and complications in general, women were asked about 12 specific symptoms (Table 21). As with pregnancy symptoms, this prompted list of symptoms doubled the overall rate of reported problems compared to the initial question without prompts. Women reporting any symptoms or complication reached 22% among deaths at 1-11 months, and this went up to just over 60% for stillbirths and deaths in the first one or two days. This very high rate of symptoms and complications in the earliest death cases was the same as found with an unprompted complication rate. Fever and excessive bleeding during labour and delivery were the most commonly reported symptoms, followed by severe weakness, severe headache, smelly vaginal discharge, a puffy face, severe anaemia, and fast/difficult breathing. Some symptoms were not common but point to serious problems, such as blurred vision, high blood pressure, and convulsions as symptoms of pre-eclampsia and eclampsia.

Table 21: Labour and delivery symptoms

	Convulsions	High blood pressure	Severe anaemia	Diabetes	Severe headache	Blurred vision	Too weak to get out of bed	Fast or difficult breathing	Puffy face	Excessive bleeding in L&D	Fever	Smelly vaginal discharge	Other	Any L&D symptom	Cases
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	#
Ages at death															
Stillbirth	1.0	6.7	4.6	0.0	10.3	4.1	9.8	4.6	2.6	14.4	17.0	10.3	1.0	61.9	194
0 day	1.1	5.8	7.3	0.4	10.1	2.9	8.0	2.9	5.8	13.8	17.0	8.7	0.4	62.7	276
1 day	0.0	4.6	3.7	0.0	10.2	4.6	9.3	5.6	5.6	18.5	13.9	7.4	4.6	63.0	108
2-6 days	1.0	2.5	4.0	0.5	7.1	1.5	10.1	3.0	9.1	8.1	12.1	5.6	1.0	54.6	198
7-27 days	0.0	2.3	1.2	0.0	3.5	0.0	5.8	0.6	0.6	9.3	5.8	7.6	0.0	44.2	172
1-11 months	0.4	1.3	1.3	0.0	3.7	1.6	6.1	1.3	2.2	5.9	5.0	3.9	0.7	22.3	676
Total	0.6	3.2	3.2	0.1	6.4	2.2	7.5	2.4	3.8	9.7	10.0	6.3	0.3	42.9	1,624

Other complications that could occur during labour and delivery were also asked for the stillbirths, neonatal and infant deaths. Prolonged labour (defined as 24 hours or longer in this study) was reported by mothers of 5% of children who died at ages 1-11 months, but was higher for those with neonatal deaths, and reached a peak of 14-19% for the stillbirths and deaths in the first two days of life (see Table 22). Instrumental delivery (using forceps or vacuum) was not commonly reported but occurred in about 1% of births in all age of death groups. Caesarean sections (C-sections) were reported to have been used in only 2.4% of age 1-11- month deaths and increased to 8-10% in stillbirths and deaths in the first day. In the DHS survey, C-section rates were 2.7%. C-section was a major intervention to save foetuses that were in distress before delivery. The

higher C-section rate seen with early neonatal deaths in this study represents unsuccessful attempts to save the newborn's life, not deaths caused by the procedure itself.

Table 22: Labour and delivery issues – Prior births, duration of labour and type of delivery

	Total births prior to this one (including stillbirths)		Hours in labour			Type of delivery			Total Cases
			<12 hours	12-24 hours	>=24 hours	Normal vaginal	Forceps or vacuum	C-section	
	Mean	IQR	%	%	%	%	%	%	#
Ages at death									
Stillbirth	2	1-4	76.9	14	9.1	85.1	2.1	9.8	194
0 day	3	1 - 5	74.8	17.6	7.6	86.6	1.8	8.0	276
1 day	3	2 - 5.5	81.6	13.6	4.9	91.7	0.9	1.9	108
2-6 days	3	1 - 5	84.3	11.4	4.3	93.9	1.5	2.0	198
7-27 days	4	1 - 5.5	89.4	9.4	1.3	95.4	0.0	2.3	172
1-11 months	3	2 - 5	86.2	4.7	4.7	90.4	1.3	2.4	676
Total	3	1 - 5	82.7	11.5	5.8	90.2	1.4	4.1	1,624

Breaking of the 'water' or fluid in the amniotic sac occurs in all labours, but a long delay between breakage and delivery can result in maternal and newborn infections (Table 23). In the VASA study, a delay of at least 12 hours between breakage and delivery was found in 4.6% of deliveries of children who died at age 1-11 months, and in 7-10% of stillbirths and first day deaths. Another sign of problems was if the liquor (amniotic fluid) was malodourous or had a green or dark colour, either of which could signal infection or foetal distress. The rate of these issues was 8% and 7%, respectively, in the deliveries of children who died at ages 1-11 months compared to 14-22% in stillbirths and deaths in the first two days.

Table 23: Labour and delivery issues: Water breaking

	Hours before delivery that water broke			Liquor was foul-smelling	Colour of the liquor				Total Cases
	<12 hours	12-24 hours	>=25 hours		Green or brown	Clear (norma l)	Other	Don't know	
	%	%	%	%	#	%	%	%	#
Ages at death									
Stillbirth	89.1	5.2	5.2	22.2	16.5	57.2	4.6	21.6	194
0 day	92.5	4.6	2.9	15.6	14.1	65.9	1.8	18.1	276
1 day	97.0	3.0	0.0	16.7	13.9	70.4	1.9	13.9	108
2-6 days	96.7	1.1	2.2	13.6	14.7	72.2	0.5	12.6	198
7-27 days	97.4	1.3	1.3	7.0	9.9	77.9	1.2	11.1	172
1-11 months	95.4	1.7	2.9	8.1	6.7	81.1	1.8	10.4	676
Total	94.7	2.5	2.7	12.2	10.9	73.5	1.9	13.6	1,621

Foetal movements and presentation at birth were asked only of neonatal deaths: see Table 24. Women can generally feel the baby move periodically in the womb during late pregnancy, and this continues until labour. Loss of movement can indicate a death in utero or other foetal problems. In the VASA study, this was asked two different ways: first, whether the baby moved in the days prior to birth; and then if the baby moved before labour started. For stillbirths and neonatal deaths, 96% reported movement in the last few days, and 87% reported movement before labour. However, this varied greatly by age of death. Stillbirths, in particular, had high rates of no movements in the days before labour (19%) or just before labour (42%), which may indicate either in-utero death prior to labour or foetal distress.

Table 24: Foetal movements and malpresentation

	Baby moved in days before birth	Baby stopped moving before labour started		Stopped moving			Bottom, foot or hand come out first	Umbilical cord more than twice around head	Umbilical cord delivered first	Baby blue colour at birth	
				Median	IQR	> 24 hours					
	%	%	#	Hours	Hours	%	%	%	%	%	No.
Ages at death											
Stillbirth	80.9	42.3	82	8	1 - 48	37.8	14.3	16.6	4.0	6.7	194
0 day	93.1	16.7	46	0	0 - 3	37.8	6.5	11.6	1.8	4.7	276
1 day	98.2	15.7	17	0	0 - 2	19.6	9.3	13.0	0.0	3.7	108
2-6 days	97.0	9.1	18	0	0 - 0	5.9	5.6	8.1	1.5	1.0	198
7-27 days	97.7	8.1	14	0	0 - 0.5	11.0	3.5	3.5	0.6	1.2	172
Zone											
NC	98.3	19.0	22	1	0 - 6	17.4	4.3	9.5	1.7	2.6	116
NE	95.8	10.4	20	3	0 - 48	28.6	2.1	7.8	0.0	1.6	192
NW	97.3	12.5	37	0	0 - 12	22.0	8.1	9.1	0.7	5.1	296
SE	93.3	8.3	5	15	1 - 84	58.3	6.7	6.7	5.0	0.0	60
SS	92.3	5.8	3	38.5	3.5 - 120	50.0	9.6	17.3	1.9	0.0	52
SW	86.8	21.1	8	0.5	0 - 2.5	21.7	7.9	5.3	2.6	0.0	38
Total	92.8	18.7	177	1	0 - 24	25.4	7.8	10.8	1.8	3.6	948

Deliveries that were other than head first (breech) were also at higher risk. This was found in only 3.5% of late neonatal deaths, but in 6-14% of stillbirths and deaths in the first two days. Having the umbilical cord wrapped more than twice around the head or having it delivered first could lead to the asphyxia of the baby during birth. These were seldom reported in late neonatal deaths (3.5% and 0.6%) but were much more common for stillbirths and deaths in the first two days (6-24% and 0-4%). Being blue in colour at birth was a sign of lack of oxygen and was reported in 1% of deaths after two days versus 3-7% of stillbirths and deaths in the first two days.

3.1.3.4 Care-seeking for complications in labour and delivery

Tables 25 and 26 are specific to 543 mothers of stillbirths and neonatal cases who reported complications, and the 298 who sought care for these complications. Only 55% of those who reported a symptom or complication reported seeking care for it. Those who had a stillbirth or death in the first two days sought care at a slightly higher rate of about 60% vs. 41-46% of later neonatal deaths. Of those that sought care, 83% went first to a health provider, most often a hospital (48%). Considering those who took more than one action, 95% eventually went to a health provider.

Table 25: Care-seeking for women with complications in labour

	Any L&D symptoms?		Sought care?		First thing done/tried to do for symptoms								Ever went to health provider?					Sought care
					Home	Hospital	Clinic	Private	Community	PMV/ pharmacy	TBA/Non-formal	Other	Hospital	Clinic	Private	Community	Any health provider	
	%	No.	%	No.	%	%	%	%	%	%	%	%	%	%	%	%	%	No.
Ages at death																		
Stillbirth	61.3	119	60.5	72	2.8	45.8	16.7	15.3	9.7	0	4.2	5.6	45.8	16.7	16.7	11.1	97.2	72
0 day	62.7	173	60.7	105	4.8	51.4	14.3	13.3	4.8	0	8.6	2.9	51.4	14.3	14.3	11.4	99.1	105
1 day	63	68	58.8	40	5	42.5	10	20	10	5	5	2.5	45	10	20	12.5	92.5	40
2-6 days	54.6	108	46.3	50	10	52	8	6	12	0	6	6	54	8	8	12	92	50
7-27 days	43.6	75	41.3	31	12.9	45.2	12.9	12.9	6.5	3.2	3.2	3.2	48.4	12.9	12.9	6.5	83.9	31
Zone																		
NC	51.4	90	60	54	3.7	40.7	18.5	22.2	7.4	0	5.6	1.9	40.7	18.5	25.9	7.4	98.2	54
NE	64.4	145	38.6	56	5.4	44.6	30.4	14.3	1.8	0	3.6	0	44.6	30.4	14.3	3.6	96.4	56
NW	57.9	191	47.1	90	8.9	52.2	3.3	4.4	16.7	2.2	6.7	5.7	54.4	3.3	5.6	21.1	91.1	90
SE	39.5	32	93.8	30	6.7	43.3	16.7	20	3.3	0	3.3	6.8	43.3	16.7	20	5.7	100	30
SS	59.7	34	61.8	21	14.3	28.6	4.8	19.1	4.8	4.8	14.3	9.5	28.6	4.8	19.1	9.5	81	21
SW	63.8	51	92.2	47	0	66	6.4	12.8	4.3	0	6.4	4.3	68.1	6.4	12.8	8.5	100	47
Total	57.3	543	54.9	298	6	48.3	13.1	13.4	8.1	1	6	4	49.3	13.1	14.4	11.1	95	298

Among the 298 women who sought care, 55% of the time the decision to seek care was taken by the woman herself, 40% by her husband, and 5% by other family members, although this varied greatly by geopolitical zone (Table 26).

Table 26: Decision-maker for care of women with complications in labour

	Decision-maker			Sought care
	Mother	Husband	Other family	
Age of death	%	%	%	No.
Stillbirth	52.9	41.4	5.7	72
0 days	56.9	38.2	4.9	105
1 day	52.6	42.1	5.3	40
2-6 days	57.1	38.8	4.1	50
7-27 days	50	40	10	31
Zone				
NC	34	66	0	54
NE	35.7	60.7	3.6	56
NW	47.7	38.4	14	90
SE	89.7	10.3	0	30
SS	90	10	0	21
SW	77.8	17.8	4.4	47
Total	54.7	39.8	5.5	298

3.1.3.5 Labour and delivery among women with and without complications

Focusing only on women with complications can be misleading in looking at care. Some of these women may already have been in a health facility when the complication started and so did not report seeking care for it. Tables 27 and 28 looked at those with and without complications by place and who attended the birth. In terms of place of birth (for stillbirths, neonatal and infant deaths), those with complications had almost a 10% higher rate of delivery at government hospitals and health centres and a 10% lower rate of delivery at home (with no change for private or other locations). With respect to birth attendant (for stillbirths and neonatal deaths), those with complications had a 11.5% increase in rate of delivery by a doctor or other health worker.

Table 27: Place of delivery for stillbirths, neonatal and 1-11 month deaths

	Public/Government		Private hospital/ clinic	Home		On route to facility	Case number
	Hospital	Heath Centre/ other		Mother's	Other's home		
	%	%	%	%	%	%	No.
Labour symptoms							
Yes	21.0	12.5	16.9	42.9	4.1	0.4	534
No	14.3	9.9	16.8	53.1	4.0	0.5	405
Ages at death							
Stillbirth	22.6	16.0	24.7	32.6	2.1	1.1	194
0 day	21.3	11.6	17.8	43.0	5.9	0.0	276
1 day	15.1	9.3	18.5	49.1	7.6	0.0	108
2-6 days	16.1	11.6	10.1	58.6	3.1	0.0	198
7-27 days	14.2	7.0	13.4	61.5	2.4	1.2	172
1-11 months	14.4	10.1	8.5	63.3	3.2	0.2	673
Zone							
NC	21.6	7.8	24.8	43.8	1.7	0.0	294
NE	14.6	13.9	2.8	68.0	0.8	0.0	397
NW	15.8	4.3	2.3	73.9	3.3	0.4	575
SE	10.9	30.3	39.3	10.1	4.4	1.5	145
SS	22.6	6.3	22.5	22.6	19.4	1.1	111
SW	20.2	22.2	38.4	7.5	8.5	0.0	99
Total	16.8	10.9	13.4	54.4	3.7	0.3	1621

Table 28: Birth attendants and decision-maker for stillbirths and neonatal deaths

	Birth attendant					Decision-maker for birth place/attendant				Case numbers
	Doctor	Other health worker	TBA	Relative, friend, other	Self	Mother	Husband	Other family	Other	
	%	%	%	%	%	%	%	%	%	No.
Labour symptoms										
Yes	16	42.4	9.8	15.5	16.4	54.7	32.8	4.8	7.6	543
No	9.9	37	11.1	20.2	21.5	61	28.6	4.2	5.7	405
Ages at death										
Stillbirth	23.2	46.4	5.7	13.4	11.3	50	38.1	3.1	8.3	194
0 day	16.7	43.5	8.3	15.2	16.3	57.3	32.3	2.9	7.6	276
1 day	10.2	39.8	17.6	13.0	19.4	58.3	28.7	6.5	6.5	108
2-6 days	7.6	36.9	13.1	21.2	21.2	58.6	29.8	7.1	4	198
7-27 days	5.8	31.4	11.1	24.4	26.7	64	23.8	4.7	7	172
Zone										
NC	20.6	45.7	6.9	14.3	12.0	33.1	52	4.6	9.7	175
NE	5.4	32.9	10.2	29.3	22.2	56.9	34.7	4	4.4	225
NW	5.2	34.2	11.2	20.6	28.8	59.1	25.5	7.3	7.6	330
SE	24.7	65.4	2.5	3.7	3.7	85.2	11.1	0	3.7	81
SS	17.5	36.8	35.1	5.3	5.3	75.4	17.5	0	7	57
SW	40.0	48.8	5.0	1.3	5.0	63.8	27.5	2.5	6	80
Total	13.4	40.1	10.3	17.5	18.6	57.4	31	4.5	6.8	948

A limitation of these findings is that they only include women who eventually had a stillbirth, neonatal or infant death. Tables 29 and 30 show data on the most recent birth from the NDHS. That survey did not collect the same information on complications as the VASA, but it did consider births leading to a neonatal death versus survivors. This showed that neonatal deaths were slightly more common in births in government and private hospitals and clinics and lower for births at home and government health centres. The same pattern was seen with birth attendants. Doctors and health workers hade slightly higher rates of neonatal mortalities than births by TBAs, relatives or friends, or even alone. For both facilities and birth attendants, this can be explained by high-risk women shifting to health providers upon experiencing complications and the difficulty these providers had in bringing the mortality down in view of their higher risk profile.

Table 29: Place of delivery of women with neonatal deaths vs all others – DHS 2018 weighted

	Public/Government		Private hospital/ clinic	Home		DHS most recent births
	Hospital	Heath Centre/ other		Mother's	Other's home	
	%	%	%	%	%	No.
Not a neonatal death	13.0	13.3	13.0	54.1	5.0	32,853
Neonatal death	16.5	11.2	14.3	51.4	4.8	1,340
Total	13.1	13.2	13.0	54.0	5.0	34,193

Note: Neonatal deaths overlap with but are not all the same as in the VASA 2019 study.

Table 30: Birth attendant for neonatal deaths vs all others – DHS 2018 weighted

	Birth attendant					DHS most recent births
	Doctor	Other health worker	TBA	Relative, friend, other	Self	
	%	%	%	%	%	No.
Not a neonatal death	9.0	36.9	20.5	22.3	11.2	32,853
Neonatal death	11.7	37.1	18.6	21.8	10.9	1,340
Total	9.1	36.9	20.4	22.3	11.2	34,193

Timing of birth attendance and hygiene (Tables 31 and 32). This looks at 772 women who had a birth attendant (i.e., did not deliver alone) and without reference to complication status. Median time from start of labour to seeing the birth attendant was only one hour. Six percent of women noticed the attendant used a pictorial graph to track the labour (although not all women might notice this), which should be a routine procedure, at least among health providers. Sixty-one percent reported the attendant used gloves and 23% said that they washed their hands, so 90% took some measure for sanitation. Table 32 shows that 46% of women delivered on a labour bed and 45% on a solid floor, usually with a cover or washed. Only 5% delivered on an unwashed floor and 2.6% on a dirty or straw floor.

Table 31: Birth attendant practices

	Time from labour to attendant coming		Used pictorial graph to follow labour?	Used soap or wore surgical gloves			Number of cases
	Median	IQR		Yes – Washed	Yes – Gloves	Neither	
	hours	hours	%	%	%	%	No.
Ages at death							
Stillbirth	0	0 - 2	10.3	15.4	79.6	4.9	172
0 day	1	0 - 2	4.6	20.5	70.9	8.6	231
1 day	0	0 - 2	5.0	32.9	54.9	12.2	87
2-6 days	0	0 - 2	6.3	28.4	58.1	13.5	145
7-27 days	0	0 - 2	8.2	32.4	52.3	15.3	126
Zone							
NC	0	0 - 2	13.1	13.5	77.7	8.8	154
NE	1	0 - 2	2.4	48.2	42.3	9.5	175
NW	1	0 - 2	5.0	28.6	52.9	18.4	235
SE	0	0 - 0	5.2	6.5	90.9	2.6	78
SS	0	0 - 2	0.0	13.5	76.9	9.6	54
SW	1	0 - 1	20.8	4.2	95.8	0.0	76
Total	0	0 - 2	6.8	24.2	65.6	10.2	772

Note: Responses of 'don't know' ranged from 6-9% and are excluded in analysis

Table 32: Surface for delivery

	Labour bed	Solid floor with cover	Solid floor washed	Solid floor unwashed	Dirty/straw floor	Other	Number of cases
	%	%	%	%	%	%	No.
Ages at death							
Stillbirth	61.9	23.7	6.2	3.6	0.0	4.1	194
0 day	48.9	27.9	10.9	3.6	2.2	6.2	276
1 day	40.7	21.3	18.5	8.3	1.9	9.3	108
2-6 days	39.4	25.3	21.7	5.1	3.5	5.1	198
7-27 days	32.6	24.4	23.3	7.6	5.8	5.8	172
Zone							
NC	56.0	24.6	8.6	2.9	0.0	7.4	175
NE	32.0	38.7	19.6	4.9	3.1	1.8	225
NW	26.7	26.1	24.8	9.1	4.8	8.5	330
SE	88.9	2.5	1.2	1.2	1.2	4.9	81
SS	57.9	24.6	5.3	3.5	1.8	7.0	57
SW	87.5	7.5	0.0	0.0	0.0	2.5	80
Total	45.7	25.1	15.3	5.2	2.6	5.8	948

Services from health providers for women in labour and delivery. For the 2019 VASA, interviewers asked 467 women about different services they received during labour and delivery at a health facility, presenting them with 17 different options. Table 33 below depicts their responses. Women most commonly reported that she was admitted (51%), received an intra-muscular injection (46%), an IV drip (40%) uterine massage (31%), or medicine to strengthen labour (22%). C-sections and blood transfusions were especially common for women going to a second provider (38% and 14% respectively) compared to those at a first provider (8% and 7%), and accessing these services may have been the reason for some women to transfer. Many of the less common services would need to be looked at in comparison with women with specific complications.

Table 33: Services provided at health providers for labour and delivery symptoms and/or complications

	What did this provider do for the L&D symptoms and/or complications																			
		Medicines given by mouth				Medicines for labour and delivery														
	Gave Oxygen	Antibiotic	Antimalarial	BP/ hypertension	Other	Stop bleeding	Stop convulsions	Strengthen labour	Stop labour	For lungs	IM drug	IV fluids/ medicine	Blood transfusion	Told to buy outside medicine	Uterine massage	C- section	Admitted	Other action	Nothing done	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	No.
Sequence of care																				
First	1.3	6.4	6.4	4.1	7.7	9.9	0.9	22.1	1.5	0.6	48.2	40.5	6.6	6.6	32.3	8.1	53.1	4.5	1.5	467
Last	3.4	13.8	3.4	10.3	6.9	0.0	0.0	27.6	6.9	0.0	44.8	51.7	13.8	6.9	6.9	37.9	55.2	10.3	6.9	29
L&D complications																				
Yes	1.2	8.6	8.6	5.5	8.6	13.2	0.9	24.3	1.2	0.6	45.8	43.1	9.5	7.4	30.2	11.1	49.2	5.2	2.8	325
No	1.8	3.5	1.8	1.2	4.7	1.8	0.6	18.7	1.8	0.6	47.4	31.6	2.3	5.3	32.2	7.6	53.8	1.8	0.0	171
Age of death																				
Stillbirth	0.7	2.2	7.5	3.0	7.5	9.0	0.7	22.4	1.5	0.0	50.7	44.0	9.7	3.7	33.6	14.2	62.7	5.2	1.5	134
0 days	2.5	9.9	5.6	5.0	5.0	10.6	1.2	25.5	1.9	0.6	50.3	41.6	8.7	11.2	29.2	12.4	47.8	4.3	1.9	161
1 day	0.0	9.3	7.4	3.7	11.1	13.0	0.0	27.8	0.0	0.0	37.0	44.4	5.6	3.7	18.5	3.7	51.9	7.4	1.9	54
2-6 days	1.1	5.7	5.7	3.4	5.7	5.7	1.1	19.5	2.3	2.3	49.4	35.6	2.3	5.7	34.5	4.6	42.5	1.1	2.3	87
7-27 days	1.7	8.3	5.0	5.0	11.7	8.3	0.0	13.3	0.0	0.0	30.0	21.7	5.0	5.0	35.0	6.7	43.3	1.7	1.7	60
Zone																				
NC	2.9	4.9	3.9	2.9	8.7	9.7	0.0	31.1	0.0	0.0	60.2	49.5	10.7	3.9	23.3	10.7	68.9	6.8	1.0	103
NE	0.0	9.6	4.8	8.4	6.0	9.6	0.0	24.1	0.0	0.0	43.4	33.7	7.2	9.6	41.0	8.4	45.8	0.0	1.2	83
NW	0.0	13.8	12.1	5.2	9.5	14.7	2.6	28.4	3.4	1.7	45.7	45.7	12.1	15.5	36.2	9.5	44.8	3.4	4.3	116
SE	2.6	6.6	3.9	2.6	6.6	6.6	1.3	7.9	2.6	1.3	34.2	26.3	1.3	2.6	22.4	11.8	53.9	7.9	1.3	76
SS	5.4	0.0	2.7	5.4	0.0	0.0	0.0	18.9	0.0	0.0	18.9	16.2	0.0	2.7	5.4	0.0	27.0	2.7	2.7	37
SW	0.0	0.0	6.2	0.0	7.4	7.4	0.0	16.0	1.2	0.0	56.8	44.4	3.7	0.0	42.0	13.6	49.4	2.5	0.0	81
Total	1.4	6.9	6.3	4.4	7.7	9.3	0.8	22.4	1.4	0.6	46.4	41.1	7.1	6.7	30.8	9.9	50.8	4.0	1.8	496

Note: Three women had 'other operation' at first provider.

Time needed to get to a provider for labour and delivery (Table 34). The first time interval represents time between the onset of labour or complications start and deciding to go for care. The median time was 30 minutes for the first provider, with an interquartile range [IQR] of 0-120 minutes. The second interval represents the time between the decision to go and actually leaving the house. This shows a median time of 15 minutes with IQR of 0-60 minutes for the first provider. If the woman was going to a second provider then the median time taken was longer at 162 minutes with IQR 114-720 minutes. The final time interval represents travel time to the provider. This was a median of 15 minutes for the first provider (IQR 10-30) and 30 minutes for the second provider (IQR 20-45 minutes). The final column shows the number of women who actually arrived at the provider. Those who decided to go but did not arrive are somewhat more, but this is not shown.

Table 34: Labour and delivery – time taken and delays in accessing care

	Time from labour start or symptoms to decision to go to provider		Time from decision to go and actually going		Travel time to the provider		Number (those who reached provider)
	Median	IQR	Median	IQR	Median	IQR	
	minutes	minutes	minutes	minutes	minutes	minutes	No.
Sequence of care							
First provider	30	0 - 120	15	0 - 60	15	10 -- 30	467
Last provider	na	na	162	114 - 720	30	20 - 45	29
Ages at death (first provider only)							
Stillbirth	30	0 - 120	15	0 – 35	20	10 -- 30	125
0 day	35	0 - 180	15	0 – 60	15	10 - 37.5	148
1 day	60	5 - 120	20	2.5 – 60	20	10 - 30	50
2-6 days	60	10 - 300	15	7 – 45	20	10 - 30	85
7-27 days	18	0 - 60	5	0 – 30	15	10 - 30	59
Zone (first provider only)							
NC	30	5 - 180	20	5 – 40	30	10 - 40	97
NE	60	10 - 300	20	10 – 60	15	10 - 35	81
NW	120	30 - 240	30	6 – 60	20	10 - 30	109
SE	0	0 - 10	0	0 – 5	15	5 - 45	74
SS	5	0 - 120	0	0 – 5	20	5 - 60	34
SW	20	10 - 60	10	5 – 30	10	5 - 20	74

Note: No total row since this would be identical to the 'first provider' row

Transport method used for getting to a health provider for labour and delivery (Table 35). About 22% of women report that they walked to their provider for labour and delivery while the others used motorised transport. The most popular method of transport was motorcycle, used by 39%. Private cars, taxis/paid cars, public transport, and tri-wheelers were used by 16%, 9%, 7%, and 7%, respectively. Only 0.2% used an ambulance. For women who went to a second/last provider the proportion who walked dropped from 22% to 12%.

Table 35: Transport used to access care at providers for labour and delivery

	Transport method(s) were used to go to the provider for delivery								Women going to facility for delivery (sought care)
	Walking	Ambulance	Motorcycle	Private car	Taxi/ paid driver	Bus/ Public transport	Three wheeler	Boat with motor	
	%	%	%	%	%	%	%	%	#
Sequence of care									
First provider	22.4	0.0	40.6	15.7	8.5	6.7	6.5	0.4	508
Last provider	12.5	2.1	27.1	14.6	18.8	12.5	8.3	0.0	48
L&D complications									
Yes	17.5	0.3	34.2	13.4	7.9	6.3	6.3	0.5	365
No	24.1	0.0	36.6	14.7	8.9	6.8	4.2	0.0	191
Ages at death									
Stillbirth	18.7	0.0	36.7	12.7	8.0	9.3	5.3	0.0	150
0 day	22.0	0.0	33.5	12.7	8.1	5.2	4.6	0.0	173
1 day	10.8	0.0	33.8	16.9	7.7	6.2	7.7	0.0	65
2-6 days	25.3	0.0	38.9	14.7	10.5	4.2	4.2	2.1	95
7-27 days	17.8	0.0	31.5	15.1	6.8	6.8	8.2	0.0	73
Zone									
NC	11.0	0.0	44.1	13.6	3.4	6.8	9.3	0.8	118
NE	23.3	0.0	35.6	12.2	10.0	1.1	11.1	0.0	90
NW	10.4	0.0	31.3	18.1	13.2	5.6	3.5	0.0	144
SE	41.3	0.0	22.5	13.8	2.5	10.0	3.8	0.0	80
SS	9.5	0.0	47.6	7.1	11.9	0.0	0.0	2.4	42
SW	29.3	1.2	34.1	12.2	8.5	13.4	2.4	0.0	82
Total	19.8	0.2	35.1	13.8	8.3	6.5	5.6	0.4	556

Costs for services and transport for health provider for labour and delivery (Table 36). For the 2019 VASA study, caregivers were asked about transportation and health care expenses associated with their labour and delivery experience, and how money was raised for these. Nearly everyone reported that they either had money available (90-94%) or borrowed money (12-14%). Only a few talked about selling assets, getting help from relatives, or other sources. When asked specifically about costs of treatment, for the 74% who had costs at the first provider, the median cost was 8,000 Naira. Only about half had any costs at the second provider visit, but the median cost increased to 30,000 Naira. Women with complications actually were more likely to have no provider costs (29%) compared to those without complications (20%), as well as lower costs of care (6,000 Naira for women with complications vs. 10,000 naira for women without complications). Reported costs of care was substantially lower in the North West and North East (about 4,000 Naira) versus other geopolitical zones (10,000-15,000 Naira)

Because the period of time that the interviewed women had their deliveries spans six years, between 2012 and 2018, costs may have varied over time and with inflation, median current costs may now be higher. Also, this analysis can only show the situation for patients who went for services. Any families who avoided going to health providers or chose to limit care-seeking from providers due to expected costs are not reflected in this table. Finally, the number who said they had no cost decreased between when they were asked overall (first column) and when they were asked specifically (last columns), showing that information provided can vary depending on how a question is asked.

Table 36: Cost of care for transport or health provider care for labour and delivery

	Any cost for this provider or transport	Sources for funds to pay expenses				Cost of transport			Cost of care at provider			Number who sought care
		Had available	Borrowed	Sold Assets	Help from relatives	% with no cost	Number with costs	Median cost	% with no cost	Number with costs	Median cost	
	%	%	%	%	%	%	No.	Naira	%	No.	Naira	No.
Sequence of care												
First provider	65.5	90.1	12.2	1.2	1.5	45.1	279	200	26.0	376	8,000	508
Last provider	72.5	94.3	14.3	0.0	2.9	35.3	33	400	52.9	24	30,000	51
L&D complications						(first provider only)			(first provider only)			
Yes	69.3	90.8	13.1	1.2	1.6	44.3	180	200	29.1	229	6,000	323
No	67.0	89.8	10.9	0.8	1.6	46.5	99	200	20.5	147	10,000	185
Ages at death						(first provider only)			(first provider only)			
Stillbirth	67.3	86.1	13.9	1.0	3.0	40.4	81	200	22.8	105	10,000	136
0 day	73.4	93.7	12.7	1.6	1.6	47.8	82	200	22.3	122	7,650	157
1 day	66.2	88.4	14.0	0.0	0.0	36.8	36	200	24.6	43	5,000	57
2-6 days	68.4	92.2	12.5	0.0	0.0	47.3	48	200	29.7	64	7,000	91
7-27 days	61.6	91.1	6.7	2.2	2.2	52.2	32	275	37.3	42	6,500	67
Zone						(first provider only)			(first provider only)			
NC	78.8	89.2	12.9	0.0	0.0	33.0	71	200	16.0	89	10,500	106
NE	67.8	91.8	8.2	1.6	0.0	44.7	47	250	20.0	68	4,000	85
NW	66.0	86.3	11.6	2.1	0.0	52.3	62	350	46.2	70	4,250	130
SE	52.5	97.5	25.0	2.5	0.0	66.7	25	300	17.3	62	15,000	75
SS	71.4	96.7	3.3	0.0	0.0	27.0	27	100	35.1	24	10,000	37
SW	73.2	90.0	13.3	0.0	10.0	37.3	47	100	16.0	63	10,000	75

Note: Costs by complication, age of death and geopolitical zone is based on first provider only. There is no total row since this would be same as 'first provider' row.

Source of funds also include community funds 0%, government scheme 0.3%, other 0.8% not shown.

Concerns related to labour and delivery services (Table 37). All respondents for the 2019 VASA study who experienced either stillbirth or neonatal deaths were asked about 13 specific areas of concern they may have had in accessing care during pregnancy or the delivery of the child. Overall, 39% expressed at least one concern. The most common concerns were around distance to care (18%), costs (16%), transport to get to care (9%), and going at night to seek care (9%). These four concerns are sometimes related to each other. Families with lack of means cannot access transport, especially if the facility is distant or it is night.

Concerns about the health facilities themselves were expressed as perceived problems with quality of care in the facility (3.2%), health worker attitudes (3%), and a problem of only having male providers in the facility (1%). The next set of concerns had to do with family issues including trouble getting permission to go (4%), needing someone to go with them (0.7%), needing to try traditional remedies first (0.6%), and having too many duties at home to go (0.2%). Finally, some women said they were not sick enough to need health facility care (4%) or were too sick to go (0.8%).

Table 37: Concerns or problems during the pregnancy or delivery of this child

	Distance	Transport	Costs of care	Need to obtain permission	Finding someone to go with	Going when late at night	Quality of care in facility	Health worker attitudes	Only male providers in facility	Not sick enough	Too many duties at home	Need traditional /spiritual care	Too sick to travel for care	Others	Any concern expressed	Number
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	#
Pregnancy complications																
Yes	20.1	11.2	21.1	4.5	1.2	10.5	3.9	4.3	1.0	5.3	0.4	1.0	1.2	2.6	45.4	507
No	15.6	6.8	9.5	2.7	0.2	8.4	2.3	1.8	0.9	2.7	0.0	0.2	0.5	1.8	32.0	441
L&D complications																
Yes	20.1	10.7	19.0	4.1	1.3	9.8	4.2	3.9	1.3	3.5	0.2	0.9	0.9	2.4	42.4	543
No	15.6	7.2	11.4	3.2	0.0	9.1	1.7	2.2	0.5	4.9	0.2	0.2	0.7	2.0	34.8	405
Ages at death																
Stillbirth	18.6	11.3	18.0	4.6	0.5	7.7	5.7	3.1	1.0	4.1	0.0	1.0	0.0	2.6	39.2	194
0 day	17.8	8.3	14.1	2.9	1.4	10.5	4.0	4.0	0.7	2.5	0.4	0.4	2.5	1.8	40.2	276
1 day	17.6	13.0	20.4	3.7	0.9	12.0	1.9	5.6	0.0	4.6	0.0	1.9	0.0	3.7	40.7	108
2-6 days	19.2	7.1	17.2	4.0	0.0	6.6	1.0	2.5	1.0	6.6	0.5	0.5	0.0	1.5	40.4	198
7-27 days	16.9	8.1	11.0	3.5	0.6	11.6	2.3	1.2	1.7	3.5	0.0	0.0	0.6	2.3	34.9	172
Zone																
NC	17.7	14.3	21.7	4.0	1.7	8.0	2.9	2.9	1.1	4.0	0.6	0.6	1.7	0.6	37.1	175
NE	26.7	16.0	16.4	3.6	0.9	15.6	1.3	3.1	0.9	4.0	0.4	1.3	0.9	0.9	47.6	225
NW	17.3	3.6	11.5	5.5	0.3	8.2	0.3	2.4	1.2	6.4	0.0	0.0	0.3	4.8	38.2	330
SE	18.5	7.4	17.3	0.0	0.0	4.9	12.3	2.5	1.2	1.2	0.0	0.0	1.2	0.0	38.3	81
SS	5.3	5.3	10.5	1.8	0.0	3.5	1.8	3.5	0.0	0.0	0.0	3.5	1.8	1.8	21.1	57
SW	6.3	6.3	20.0	1.3	1.3	10.0	12.5	7.5	0.0	1.3	0.0	0.0	0.0	1.3	37.5	80
Total	18.0	9.2	15.7	3.7	0.7	9.5	3.2	3.2	0.9	4.1	0.2	0.6	0.8	2.2	39.1	948

3.1.4 ROUTINE CARE FOR NEWBORNS AND CHILDREN (1-59 MONTHS)

As part of the social autopsy portion of the 2019 VASA, respondents were asked about routine newborn and child care. Good care at time of birth, good home care practices for all children, and preventive services for children can all reduce the chance of their developing illnesses and dying.

3.1.4.1 Newborn routine care

The 2016 Nigeria Every Newborn Action Plan articulates certain essential care meant for every baby in all settings. This includes 'hygienic practices, temperature maintenance, early skin-to-skin contact after birth, cord and eye care, early exclusive breastfeeding as well as early quality postnatal care'.[44] It also promotes the scale-up of 4% chlorhexidine gel for cord care to reduce the chance of neonatal infection.

Questions regarding a number of essential newborn care actions were asked in the 2019 VASA study. Seventy-five percent of those who died in the newborn period were wiped dry within a few minutes, but only 15% were immediately placed on the mother's chest and just 13% had skin-to-skin contact. Bathing was delayed at least 24 hours in only 4% (Table 38). Using a clean device for cutting and tying the cord was reported by 75-80% of respondents (Table 39). Seventeen percent put chlorhexidine on the cord stump as is currently recommended, while 15% applied another antiseptic and 41% did not apply anything (the prior

[44] Federal Ministry of Health. Nigeria Every Newborn Action Plan: A plan to end preventable newborn deaths in Nigeria. Abuja: Federal Ministry of Health; 2016.

recommendation). More dangerous items were seldom applied (Table 40). The most common of these was toothpaste, reportedly used by 6% of respondents. The median time between birth and breastfeeding was 21 hours, with an inter-quartile range of 1 hour (which is early and recommended) to 48 hours (which is delayed and not recommended). Water or juices in addition to breastfeeding was reported by 11% (Table 41).

These figures all need to be interpreted carefully as many of them are influenced, sometimes heavily, by newborns who died in the first one or two days. Most of these newborns may have suffered from asphyxia and so did not receive the same care as other newborns because of their condition. Newborns who died on the first day (0 day) were less likely to receive appropriate thermal care, and most of them were 'never bathed' before death. However, even setting these cases aside, the recommended delayed bathing was uncommon. Cord cutting was similar for all age of death groups, but the earliest cases were much more likely to have nothing put on the umbilical stump. Application of substances other than antiseptics becomes more common in the neonates who died later. A very high percentage of early neonatal deaths was never breastfed before death, which distorted the picture of other feeding types/sources. Removing these cases raises the percentage who received water or other juices to nearly 20%, which is not recommended.

Table 38: Immediate newborn care

	Immediately placed on chest	Skin to skin contact	Wiped dry within a few minutes	Timing of first bath after birth					Number of cases
				Never bathed	< 1 hour	1-23 hours	1-3 days	>3 days	
	%	%	%	%	%	%	%	%	No.
Ages at death									
0 day	9.4	8.7	65.6	63.0	21.0	14.1	0.0	0.0	276
1 day	21.3	19.4	80.6	25.9	35.2	33.3	1.9	0.0	108
2-6 days	15.7	12.6	84.8	8.6	38.4	43.4	8.6	0.0	198
7-27 days	19.8	16.9	75.0	3.5	44.2	42.4	6.4	0.6	172
Zone									
NC	9.5	8.6	61.2	40.5	31.0	25.9	0.9	0.0	116
NE	16.7	16.1	82.3	23.4	38.0	33.9	4.2	0.0	192
NW	16.6	14.5	74.0	20.3	39.5	35.5	2.0	0.3	296
SE	6.7	5.0	80.0	51.7	5.0	26.7	8.3	0.0	60
SS	15.4	3.8	67.3	46.2	34.6	11.5	5.8	0.0	52
SW	26.3	26.3	89.5	47.4	2.6	31.6	18.4	0.0	38
Total	15.1	13.1	74.9	29.8	32.9	31.0	4.0	0.1	754

Note: Some rows do not add to 100% because 'don't know' answers are not shown.

Table 39: Cord care for newborns: cutting and tying cord

	Tool used for cutting cord				Material for tying cord				Number of cases
	New/clean razor	Scissors	Old razor blade	Other	New/clean thread	Cord clamp	Old unclean thread	Other	
	%	%	%	%	%	%	%	%	No.
Ages at death									
0 day	64.9	21.0	1.8	9.1	48.2	22.1	7.2	14.9	276
1 day	71.3	18.5	3.7	2.8	52.8	26.9	10.2	6.5	108
2-6 days	73.2	15.2	3.5	6.1	58.6	20.2	8.1	11.1	198
7-27 days	80.2	11.6	0.6	5.8	59.3	15.1	9.9	14.0	172
Zone									
NC	66.4	16.4	1.7	12.9	62.1	22.4	1.7	8.6	116
NE	83.3	10.4	2.1	3.6	56.3	22.4	13.5	6.8	192
NW	76.4	13.2	3.0	6.8	49.7	17.6	10.5	18.2	296
SE	68.3	16.7	0.0	6.7	68.3	6.7	1.7	16.7	60
SS	67.3	19.2	0.0	7.7	67.3	11.5	3.8	13.5	52
SW	0.0	78.9	5.3	0.0	13.2	65.8	5.3	0.0	38
Total	71.5	17.0	2.3	6.6	54.1	20.7	8.5	12.5	754

Note: Some rows do not add to 100% because 'don't know' answers are not shown.

Table 40: Cord care for newborns – Substances put on cord stump

	Substance applied to the cord stump									Number of cases
	Nothing	Chlorhexidine	Other antiseptic (alcohol, Dettol)	Antibiotic cream or ointment	Cooking oil	Ash	Animal dung	Turmeric	Other	
	%	%	%	%	%	%	%	%	%	No.
Ages at death										
0 day	52.2	14.5	15.9	0.4	0.0	1.4	0.0	0.0	4.7	276
1 day	41.7	18.5	15.7	0.0	1.9	0.9	0.0	0.9	9.3	108
2-6 days	34.3	21.7	12.6	1.5	5.1	3.5	0.5	0.0	15.2	198
7-27 days	29.7	16.9	16.9	2.3	5.2	3.5	0.0	0.6	18.0	172
Zone										
NC	17.2	36.2	23.3	0.9	1.7	0.0	0.0	0.0	13.8	116
NE	55.2	10.4	5.2	1.6	3.1	4.7	0.5	1.0	14.6	192
NW	54.7	13.2	5.1	0.7	3.4	2.4	0.0	0.0	12.2	296
SE	11.7	18.3	56.7	0.0	1.7	0.0	0.0	0.0	0.0	60
SS	15.4	15.4	48.1	3.8	0.0	3.8	0.0	0.0	7.7	52
SW	13.2	31.6	10.5	0.0	5.3	0.0	0.0	0.0	0.0	38
Total	40.8	17.5	15.3	1.1	2.8	2.4	0.1	0.3	11.1	754

Note: 60% of 'Other' was toothpaste while the remainder were various oils and other materials. Rows do not add to 100% because 'don't know' answers are not shown.

Table 41: Newborn feeding

	Ever breastfed (BF)	First BF timing after birth		Breastfed at time of final illness	Feeding given at start of final illness						Number of cases
		Median	IQR		Nothing given	Only breastmilk	Other milk	Powdered formula	Water, juice	Solid or semi-solid	
	%	Hours	hours	%	%	%	%	%	%	%	No.
Ages at death											
0 day	12.7	1	1-21	9.1	86.2	11.2	0.4	0.0	1.8	0.0	276
1 day	39.8	21	1-31	36.1	47.2	32.4	4.6	2.8	15.7	0.0	108
2-6 days	73.7	21	1-51	64.7	17.7	64.6	2.0	2.0	14.6	0.0	198
7-27 days	89.0	21	11-61	83.1	7.0	75.6	1.2	2.3	16.9	2.9	172
Zone											
NC	56.0	11	1-21	51.7	44.0	47.4	2.6	2.6	5.2	0.9	116
NE	56.8	21	1-31	46.9	35.9	51.0	1.6	1.6	18.8	0.0	192
NW	45.6	31	21-141	43.2	45.9	39.9	0.7	1.0	10.1	1.0	296
SE	40.0	11	1-26	35.0	56.7	33.3	5.0	1.7	5.0	0.0	60
SS	48.1	21	1-48	36.5	53.8	38.5	0.0	1.9	3.8	1.9	52
SW	50.0	1	1-11	44.7	47.4	34.2	2.6	0.0	7.9	0.0	38
Total	50.0	21	1-48	44.4	44.6	43.0	1.6	1.5	10.6	0.7	754

Ages at death for neonates and infants vary by place of birth. Because some women with complications seek out facilities before birth, it could reasonably be expected that facility births represent a higher risk group, and this pattern would likely show up more strongly in the earliest deaths. Table 42 presents the percentage of facility and home births by age of death, ranging from stillbirths to age 1-11 months. Facility births were most prevalent for the youngest age of death groups, peaking at 63% for stillbirths and then gradually declining to 50% for those who died on the first day, 43% for those who lived for one day and 37% for those who died on days 2-6, before dropping to a steady rate of facility births of 33-34% for late neonatal and 1-11- month infant deaths.

Table 42: Age of death for neonates and infants by place of birth

	Health facility	Home/other	% born in facility
Stillbirth	122	72	62.9
0 day	139	137	50.4
1 Day	46	62	42.6
2-6 Days	74	124	37.4
7-27 Days	59	113	34.3
1-11 Months	220	453	32.7
Total	660	961	40.7

Deaths in facility before discharge among facility births. Looking at all newborn cases for the 2019 VASA study, 43% were reported to have been delivered in a health facility, but only about half (47%) of those deaths occurred prior to discharge. Discharge tended to be early, in less than six hours after delivery for 55%, compared to only 31% for births in the DHS 2018. About three quarters of those discharged were said to be healthy at the time of discharge, so their illness may have started later, but a quarter appear to have been discharged despite clearly being ill (Table 43). Health facilities are not expected to increase mortality, so this pattern of high facility-based mortality and increasing proportions in the earliest deaths show the impact of complicated and emergency maternal cases coming to health facilities, and the limited ability of an average health facility to prevent these deaths (Table 44).

Table 43: Deaths in birth facility

	No.	%
Place of birth		
Health facility	326	43.4
Home, other	427	56.6
Total	754	100.0
Left facility alive or died before discharge		
Left alive	166	50.8
Died	155	47.4
Total	326	100.0
Healthy when left facility?		
Healthy	124	74.7
Sick	37	22.3
Total	166	100.0
Time after birth left facility (if newborn left alive)		
< 6 hours	91	54.8
6-23 hours	26	15.7
1-7 days	39	23.6
Not specified ('0 days' or '99')	10	6.0
Total	166	100.0

Note: some cases do not add to totals or 100% because of 'don't know' answers that are not shown.

Table 44: In-facility postnatal care for neonates leaving birth facility alive

	Examined prior to discharge	Mother counselled prior to discharge	Newborns born in facility and left alive
	%	%	No.
Ages at death			
0 day	81.0	52.4	21
1 day	53.3	30.0	30
2-6 days	80.7	54.8	62
7-27 days	84.9	64.2	53
Zone			
NC	90.9	57.6	33
NE	70.3	56.8	37
NW	63.8	31.9	47
SE	85.0	70.0	20
SS	80.0	30.0	10
SW	89.5	84.2	19
Total	77.1	53.0	166

Note: Counselling topics included breastfeeding (77%), immunisation (70%), returning for post-natal care (32%) and danger signs for newborns (35%).

Post-natal care and home-based Kangaroo Mother Care. Among the 166 cases that were discharged alive after a facility birth, most reported getting a post-natal check-up before leaving (77%), and 53% of

mothers report being counselled (Table 44). Post-natal care after discharge for the 599 neonatal cases who were born at home or went home was reported in the community for 13% and at a health facility by 14% (Table 45). Among 70 cases at home where the respondent said the child was a preterm birth, only 9 (13%) reported receiving instruction on Kangaroo Mother Care (Table 46). The 2019 VASA study did not ask about Kangaroo Mother Care in health facilities.

Table 45: Post-natal visits for newborns born at home or who went home

	No.	%
Seen in community by health worker prior to final illness		
Yes	83	14.0
No	510	86.0
Total	593	100.0
Seen in a health facility prior to final illness		
Yes	76	12.8
No	517	87.2
Total	593	100.0

Table 46: Kangaroo Mother Care instruction for home care

	No.	%
Mother received home Kangaroo Mother Care instruction		
Yes	9	12.9
No	61	87.1
Total	70	100
Premature births (deaths in facility where the baby was born were excluded)		
Yes	70	11.8
No	521	87.9
Total	593	100

Note: Figures may not add to total due to 'don't know' answers.

3.1.4.2 Child (1-59 month) routine care

Smoke exposure is expected to increase the chance of pneumonia in children, and the most common exposure is from cooking fires. In the 2019 VASA study, 57% of women said the child tended to be with them when they were cooking, which took place in the house for 30%, in a structure outside the house for 22%, or outside not in a structure for 48% (Table 47). From the demographics (Table 6) we can see that in 93% of deaths in the 1-59 months of age, the cooking fuel used was solid (versus 80% of living children). This is consistent with other studies that link risk of death with smoke exposure.

Table 47: Cooking arrangements and breastfeeding for child deaths 1-59 months

	Cooking place			Child with mother when cooking	Ever breastfed	Breastfed at time of final illness	Number of cases
	Inside house	Outside house	Structure outside house				
	%	%	%	%	%	%	No.
Age at death							
1 - 11 mos	32.1	43.9	24.0	56.7	95.6	90.7	676
1-4 years	28.7	49.4	21.8	57.3	97.1	27.2	1,451
Zone							
NC	8.3	48.8	42.9	57.4	99.3	55.4	303
NE	50.7	34.9	14.4	50.3	98.7	48.2	479
NW	27.4	58.3	14.4	67.9	95.0	44.5	1,042
SE	20.3	26.8	52.9	34.8	94.9	42.8	138
SS	30.0	26.0	44.0	27.0	96.0	53.0	100
SW	35.4	44.6	20.0	27.7	98.5	49.2	65
Total	29.8	47.7	22.5	57.1	96.6	47.3	2,127

Breastfeeding and child feeding practices (Tables 47 and 48). Almost 97% of cases who died at age 1-59 months were ever breastfed, and 47% were being breastfed at the time the fatal illness began. Fifty-five percent of children who died at age 1-11 months were reported to be exclusively breastfed, but deaths are most common in the first months so it is not immediately apparent if this is similar to children who lived. Forty-six percent of 1-11-month infants were receiving water or juices and 39% solid foods. About 9% of all children were said to have been receiving powdered formula, which appears to be more common in the South South and South East Zones. A more precise matching of age categories and comparison of children who did not die would be needed to more clearly see if poorer feeding practices are seen in cases who die, but is beyond the scope of this report.

Table 48: Feeding prior to final illness for child deaths 1-59 months

	Only breastmilk	Water or juice	Other milk	Powdered formula	Solid or semi-solid foods	Cases
	%	%	%	%	%	No.
Age of death						
1 - 11 months	55.5	45.9	8.6	9.8	39.5	676
1-4 years	9.8	65.9	11.0	8.3	89.7	1,451
Zone						
NC	30.4	53.1	11.6	7.3	64.7	303
NE	22.8	82.5	10.9	6.7	69.7	479
NW	25.1	51.7	6.9	6.8	81.1	1,042
SE	16.7	42.8	29.7	25.4	58.0	138
SS	24.0	68.0	13.0	22.0	60.0	100
SW	10.8	67.7	7.7	6.2	83.1	65
Total	24.3	59.5	10.2	8.7	73.8	2,127

Other childhood preventive care services: Respondents were asked about use of bed nets and childhood immunisations, but again it was difficult to interpret the answers (Table 49). Bed net use was divided between those who always or usually slept under a bed net versus those who sometimes did so, with 43% and 41% coverage respectively. Bed net use in the DHS was not asked this way so it is difficult to compare

coverage with children who did not die. Sixty-three percent of respondents said the child had received at least some immunisation, but only 10% per age group were able to present immunisation records. Because this subset of respondents is not likely to represent all children immunised and expected vaccines vary by age, this small group was not further analysed. Verbal reports of immunisation history were not part of the recommended WHO 2016 Verbal Autopsy instrument that served as the basis for this study.

Table 49: Bed net use and immunisation coverage for child deaths 1-59 months

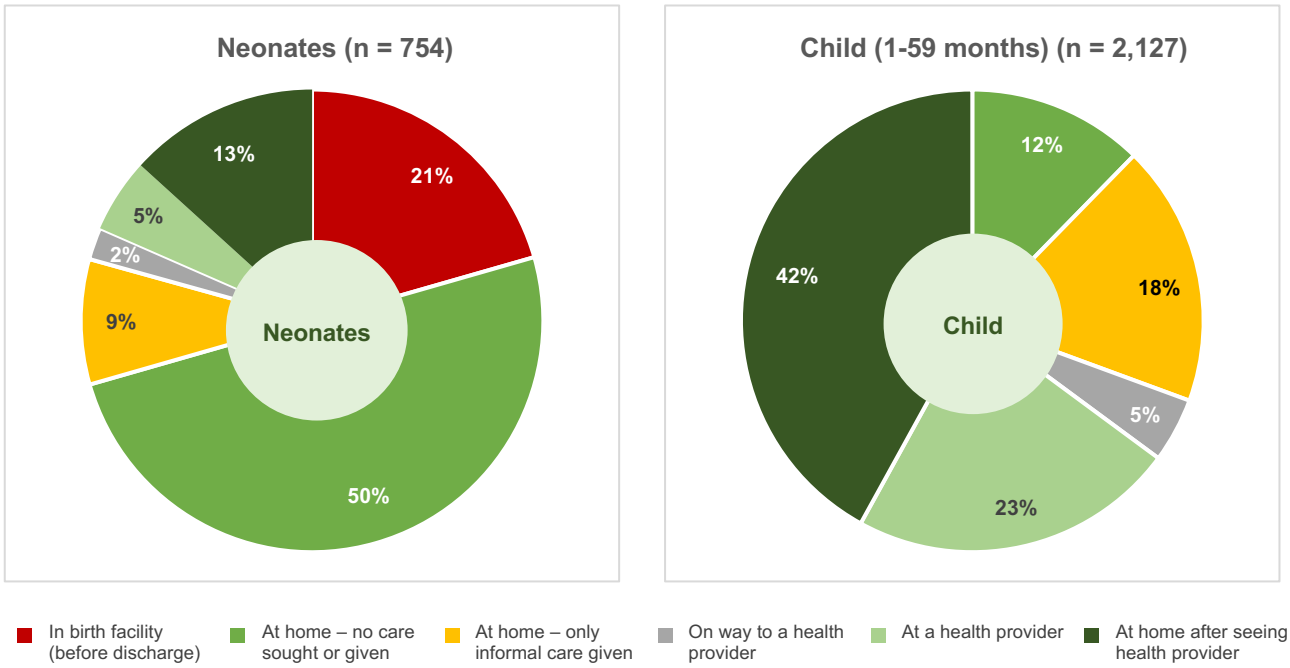
	Child slept inside insecticide-treated net		Child reported to have received at least one immunisation		Among Immunised Vaccination card seen	Number of cases
	Always/ usually	Sometimes				
	%	%	%	No.	%	No.
Ages at death						
1 - 11 months	45.3	48.4	62.6	423	10.9	676
1-4 years	42.2	60.6	63.3	919	9.0	1,451
Zone						
NC	47.9	29.7	81.9	248	6.5	303
NE	38.2	43.2	59.5	285	18.6	479
NW	46.7	42.3	50.9	530	7.5	1,042
SE	30.4	39.9	94.9	131	6.1	138
SS	38.0	49.0	85.0	85	7.1	100
SW	35.4	35.4	96.9	63	9.5	65
Total	43.2	40.7	63.1	1,342	9.6	2,127

Note: The VASA did not ask for verbal history of specific immunisations. Only 10% of children who received immunisation had a record seen, so antigen specific coverage rates were not calculated.

3.1.5 CARE DURING THE FINAL ILLNESS FOR NEWBORNS AND CHILDREN (1-59 MONTHS)

As part of the Social Autopsy, interviewers asked about the final illness for all neonatal and children 1-59-month deaths. Questions covered all the actions the family took for the care of the child and their characteristics, starting from when the illness was first noticed. Figures are shown for neonates and for children 1-59 months of the sequential pathway of care from first identifying the illness until death. It is important in interpreting these figures to remember that the data only reflect cases that led to death. Care of newborns or children who survived is not available from a VASA study. The place of death in the pathways is summarized for neonates and children 1-59 months in figure 10.

Figure 10: Where do Nigerian children die?



The pathway of care for 754 children who died in the neonatal period is depicted in Figure 11. This figure summarises the actions taken for care of the children who died as neonates.

Among neonatal deaths, 43.4% were born in health facilities. The 2019 VASA study found that women who had neonatal deaths had higher rates of labour and delivery complications. This likely explains the relatively high number of neonatal deaths in facilities, which women may have sought to obtain higher level care upon realising they were contending with problems, as explained earlier. Almost half of newborn deaths among those born in a facility occurred before the newborn left the facility (155 of 327), which is 20% of the overall neonatal death group. Efforts to reduce this mortality have to focus on prevention, complication management, or care in existing health facilities. Among those discharged alive, only 22% were reported to be noticeably ill when they left (Table 43).

A high proportion of newborns who were either born at home (427) or who left a birth facility alive (172) died at home suddenly (230) or without seeking care (142). This makes up 50% of the entire neonatal death group. Any form of care-seeking for neonates who became sick at home only applied to the (222) 29.4% who remained at this point. Even among these, 66 (8.6%) died after home care or care from traditional practitioners or PMVs only. Formal health care was sought for only 156 neonates (20.7% of the original total), and 18 died before reaching a provider, leaving only 18.4% (139). Of these 139, about half (47%) went to a hospital (66), and 40% to another health facility (56) while the remainder received care in the community from a health worker or a pharmacy/PMV that acted as a health provider (i.e. examined the child), although it is not known if the provider was qualified or not.

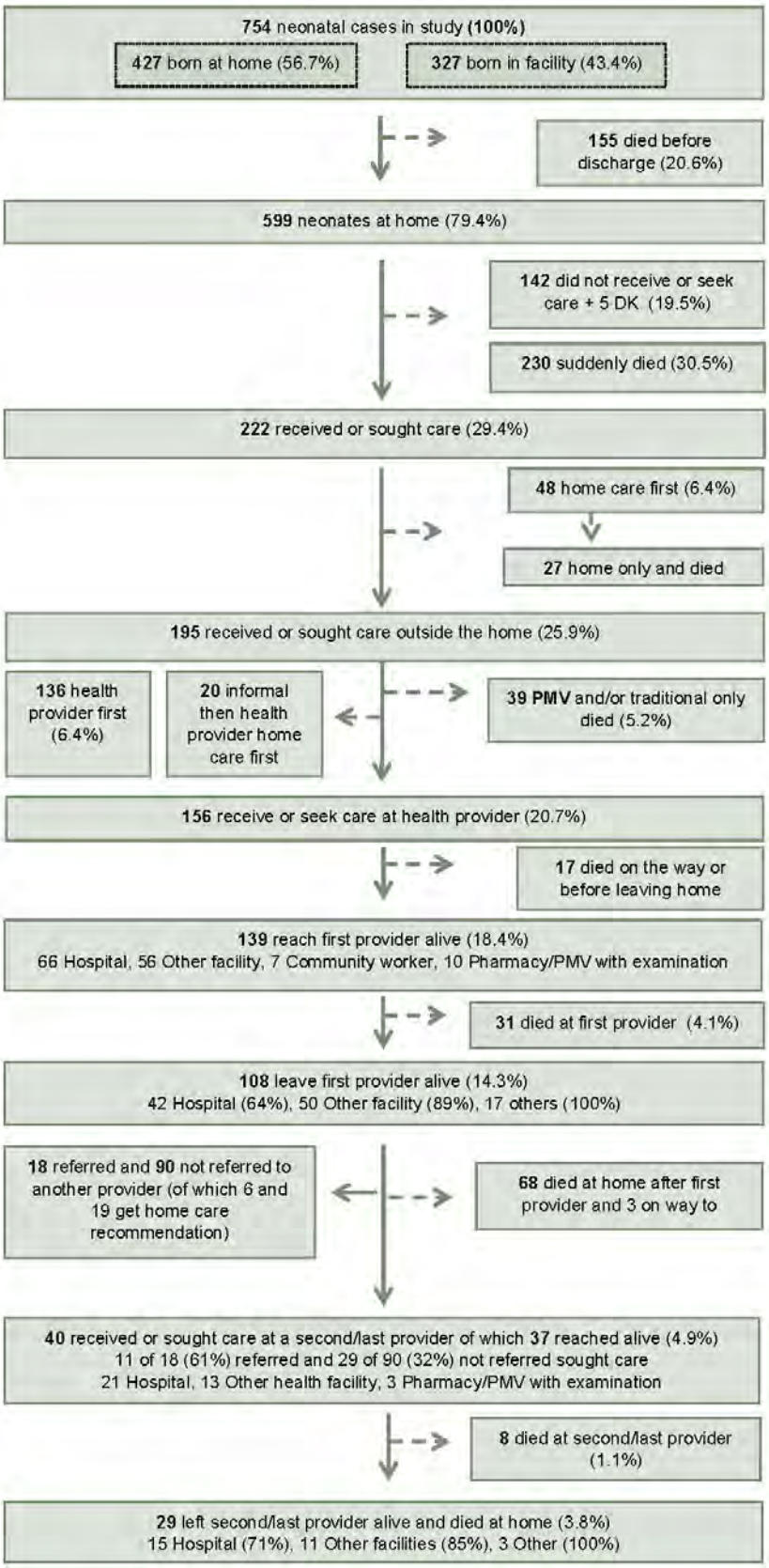
Relatively few of the newborns died at the first provider (22% of those who arrived), with most deaths occurring in a hospital (because they are able to admit patients) rather than other facilities. Surprisingly, among those who left a first provider alive (108), most were reportedly not referred to another provider, despite the newborn having what would prove to be a fatal illness (only 17% were referred). Additionally, only 61% of those referred went to a second provider, while 32% of those not referred went. It appears that

referrals are limited, and while referral influenced whether families sought care from a second provider, it was clearly only one factor in their decision-making process.

Over half the newborns who left a first provider alive died at home or on the way to a second provider (71 of 108), leaving only 37 who reached a second (or in a few cases more than a second) provider. This is only 4.9% of the original group of newborns. Again, most did not die at the second (or last) provider, and those who died mostly died at hospitals. The remaining 29 cases returned home and died there.

In summary, among 754 neonatal death in the study, 20% died in their birth facility before going home, 61% at home before accessing formal health care, 5% at a hospital or other facility while being treated, and 13% at home after receiving some sort of health care. This does not show patterns of care for all newborns with illness, only for those that died and so may be skewed to less treatment. It does show that most deaths in neonates did not present to health facilities.

Figure 11: Pathway of care for deaths in neonates



Note: DK= don't know; PMV= Patent medicine vendor

The pathway of care for 2,127 children who died between the ages of 1-59 months is depicted in Figure 12. It is important in interpreting this figure to remember that there are no data on children who survived illnesses, whether they received formal or informal care. Only those cases that led to death were examined in the 2019 VASA study.

About 12% of deaths were reported to have occurred suddenly or no care was sought for the children (264). Nearly a quarter of cases (517, or 24.3%) were reported to have received home care before any other care, and for 90 of these home care was all that was provided before death. Another 690 (32%) reported seeking care from a traditional provider or PMV/pharmacy before seeking any formal health care and of these, 299 (43%) died before seeking any formal care while the other 391 went on to seek formal care. About half of all cases (1,085, or 51%) reported going first to formal care before these informal choices.

Among the 1,476 who sought formal care, 96 died before reaching the first provider, leaving 1,380 who reached a provider alive (about 65% of all children with final illnesses). Most of these providers were hospitals (39%) or other health facilities (47%). Thirteen percent were community-based providers, either health workers in the community or PMVs/pharmacies that acted as providers by performing a physical examination of the child; however, the qualifications of these providers could not be ascertained.

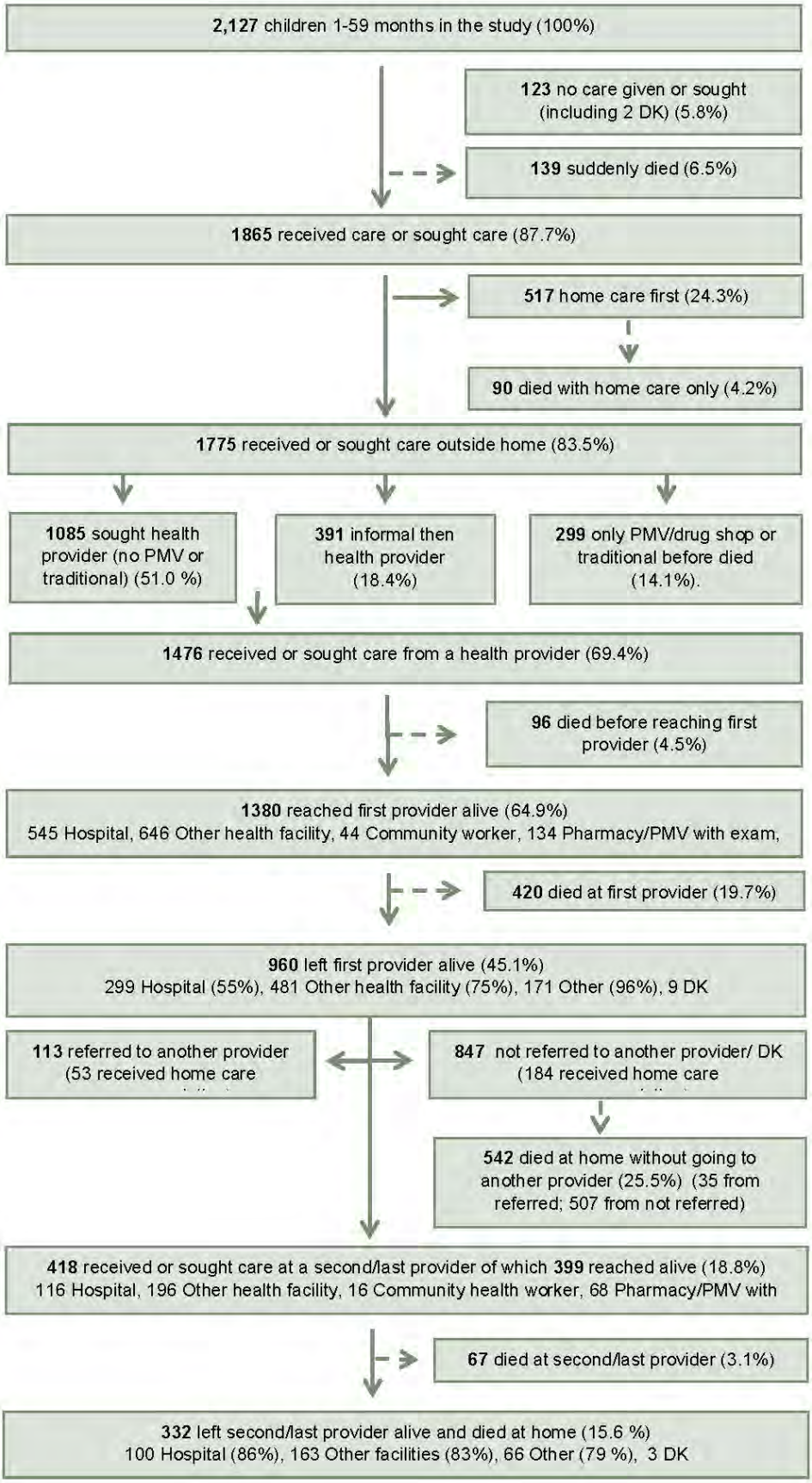
About 30% of those reaching a provider died there (420 of 1,380). Death rates were highest for those who reached hospitals, lower for other facilities and rare for community sources. Hospitals may have the highest death rates in a study of deaths even if they provide the best care, as they (and some other health facilities) have the ability to admit children for care and to provide treatment until death. Community sources of care and other health facilities, on the other hand, usually do not have inpatient care and provide treatment with a referral, or the patient is sent home. It is interesting that respondents report that only 12% of those leaving the first provider received a formal or informal referral to a second provider. Many (69%) of those referred tried to go to a second provider (78 or 113), versus 40% of those not referred (340 of 847). While being referred does increase the chance of going to another provider, families take many other factors into account in seeking care.

Over half (56%) of cases that left the first provider died at home without seeking care from a second provider (or last provider if the child went to more than two) (542 of 960).

A total of 399, or 188%, of children reached a second/last provider, and again, the provider was mostly hospitals and other health facilities, with community services being in the minority. There is no pattern of shifting to higher-level facilities (i.e. hospitals) compared to the first provider. Continued care-seeking is not limited to higher-level facilities but can be other forms of care as well. Only 17% of cases at a second (or subsequent) provider died there, and the remaining 332 (15.6% of the total) returned home and died there.

Overall, 35% of deaths (749) occurred before any formal health provider was reached, 23% while at a health provider (487), and 41% at home after seeing one or more health providers (864). Unlike in neonatal deaths, most deaths at age 1-59 months do come in contact with the formal health system before death.

Figure 12: Pathway of care for deaths in children (1-59 months)



Initial illness and care. The respondent or a member of the family was the first person to notice the illness in most cases (Table 50). For newborn death born in a facility, a health worker was the first to notice in 24% of cases.

Table 50: Person who first noticed the child was ill

	Respondent	Relative, neighbour or friend	Health worker in community	Health worker at facility	Others	Number
	%	%	%	%	%	
Neonate born in facility	63.3	4.9	5.8	22.9	3.1	327
Neonate not born in facility	79.4	13.1	2.1	0.5	4.9	427
Children age 1-59 months	93.9	3.7	0.0	0.1	2.3	2,127
Total	88.3	5.2	1.0	2.8	2.7	2,881

Severity at the start of illness (Table 51). Respondents were asked about the child's feeding, alertness and activity to assess perceived severity of illness. The three measures were divided among normal behaviour, showing mild-moderate symptoms, and showing severe symptoms (i.e., no feeding, unconscious or not moving). For neonates dying at age zero or one day, some respondents said they did not know the child's status, presumably because others in a health facility (or possibly at home) were caring for the newborn before death. The early neonatal groups also had a higher percentage of those categorised as showing severe symptoms, especially failure to feed. Among the older age groups, three quarters had poor activity levels, over half had poor or absent feeding, and 40-50% were lethargic (low alertness level). A substantial minority were said to be normal especially in terms of alertness.

Table 51: Illness severity at the start of illness

	Feeding				Alertness				Activity				Total
	Normal	Poor	Not feeding	Don't know	Alert	Drowsy	Uncon-scious	Don't know	Normal	Poor	Not moving	Don't know	
	%	%		%	%	%		%	%	%	%	%	No.
Ages at death													
0 day	4.7	8.7	77.9	8.7	25.0	39.9	14.1	21.0	13.0	53.6	21.7	11.6	276
1 day	12.0	29.6	56.5	1.9	26.9	60.2	7.4	5.6	9.3	80.6	5.6	4.6	108
2-6 days	31.8	41.4	26.8	0.0	45.5	48.0	4.5	2.0	24.2	69.2	4.0	2.5	198
7-27 days	39.0	50.0	9.9	1.2	48.8	46.5	2.3	2.3	32.6	62.8	3.5	1.2	172
1 - 11 months	39.6	55.2	4.9	0.3	49.3	48.4	1.9	0.4	23.1	75.7	0.7	0.4	676
1 – 4 years	35.0	59.9	4.8	0.3	55.6	41.9	2.1	0.5	21.7	76.8	1.2	0.3	1,450
Zone													
NC	28.9	53.2	15.0	2.9	32.9	53.5	4.5	9.1	21.2	68.5	4.3	6.0	419
NE	21.9	62.4	15.1	0.6	27.1	69.3	2.2	1.3	18.0	78.8	2.5	0.6	671
NW	37.0	47.7	14.5	0.7	64.5	31.6	2.5	1.3	21.8	74.2	3.1	0.9	1,337
SE	27.3	48.0	23.2	1.5	48.0	36.9	12.1	3.0	28.3	64.1	5.6	2.0	198
SS	46.1	33.6	19.1	1.3	35.5	55.9	4.6	3.9	19.1	72.4	5.9	2.6	152
SW	43.7	37.9	15.5	2.9	77.7	13.6	3.9	4.9	33.0	58.3	5.8	2.9	103
Total	32.4	50.9	15.6	1.2	49.0	44.6	3.6	2.8	21.6	73.1	3.5	1.8	2880

Note: One case is missing.

Whether care was sought for the illness. Respondents were asked if care was sought for the illness and if not, whether the child died suddenly/immediately or if no care was needed, given or sought. Table 52 shows the responses by the ages at death groups and, for neonates, by place of birth and death.

Table 52: Whether care was sought for the final illness

	Yes	No, care not was considered needed, given or sought	No, died immediately	No of children
	%	%	%	No.
Care and birth facility				
Died in birth facility	33.5	5.2	59.4	155
Left birth facility sick	70.3	8.1	21.6	37
Left birth facility well	38.5	16.3	44.4	135
Born outside facility	33.7	27.4	37.9	427
Ages at death				
0 day	14.9	14.5	69.2	276
1 day	32.4	23.1	42.6	108
2-6 days	48.5	25.8	25.3	198
7-27 days	59.3	19.8	20.3	172
1-11 months	85.4	7.2	7.4	676
1-4 years	88.8	5.0	6.1	1,450
Zone				
NC	73.7	5.5	20.0	419
NE	67.7	17.6	14.8	671
NW	78.6	7.2	13.8	1,337
SE	76.8	2.0	20.7	198
SS	61.2	19.1	19.7	152
SW	76.7	1.0	21.4	103
Total	74.2	9.4	16.0	2,880

Note: One case is missing. 10 cases that answered 'don't know' were not included so percentages do not all add to 100%)

For the 155 newborns who died in the facilities where they were born, most respondents reported that they died immediately or in spite of care. A few said that no care was sought, but this may be partly due to the newborn dying quickly. For newborns who left the facility of birth or were born at home the picture was mixed, with about 40% of respondents saying the death was sudden/immediate, one-third saying they sought care for the illness, and a quarter saying no care was sought. Looking at care-seeking by age group, the percentage of respondents seeking care was very low in the early neonatal period but increased to about 85-90% in the post-neonatal age group. Sudden deaths were common among the earliest deaths (69% for deaths on the first day of life) but dropped to 6-7% after the neonatal period. Those who did not seek care represented 15-25% of the neonatal period, dropping to 5-7% among those who died at age 1-59 months.

There were 121 children aged 1-59 months for whom care was not given or sought. Respondents were asked what happened and answers were recorded as short texts. These were reviewed to understand underlying causes. For 37% of children, caregivers reported a specific barrier to care. In over half of these the problem was lack of money, while the remainder had problems with the family (usually getting permission or funds from the husband), or access or transport to a health facility. Seventeen percent reported home, traditional, or attempts to go for formal care in the text responses but had not reported these when asked about actions, and these were therefore classified as no care. Eighteen percent said they thought the illness was not severe and needed no care and another 10% explained that the death was immediate or an injury (which could have been classified as immediate). Others (17%) did not give a response or just described the illness symptoms.

There were 139 children with age of death 1-59 months for whom the respondents said the death was sudden or immediate. These respondents also were asked what had happened and gave text responses. Seventeen percent of these were injuries with immediate death. In another 46%, death was immediate or within 24 hours of symptoms. In 34% of cases, however, the illness lasted one, two or even more days (and others had no information). In some of these longer illnesses, the respondent recognised the child was ill but thought the illness was not serious and then reported they died 'suddenly'. In addition, some respondents reported seeking but not reaching care. While sudden deaths did occur in this age group, not all who were reported in this category died immediately or within 24 hours of illness and not did not seek care.

Actions taken for care of the sick child. For the 2,136 cases in which some actions were taken, respondents were asked to identify the type of care given from a list that included non-formal care (home treatment, PMV/pharmacy or traditional/spiritual) and formal care (hospital, other government facility, private clinic, health worker in community, or PMV/pharmacy acting as a provider, meaning that the respondent reported the child was examined there). A choice was available that allowed respondents to specify that the first action was in the facility where the child was born before ever going home. However only 18 of the 52 cases where this appears to have happened used this choice, and instead they just said the action was at a hospital or another health facility. The proportion of neonates among those for whom action was taken dropped from 26.2% (754 out of 2,881) to 8.6% (183 out of 2,136), due to the large numbers of neonates who died suddenly or for whom no care was sought.

Summary of the actions taken (Table 53). As a first action, about half the respondents reported informal care and half formal care as follows: Home care 26%, PMV/pharmacy 14%, traditional 10%, hospital 26%, government non-hospital 11%, private clinic 4%, health worker in community 2%, and PMV/pharmacy acting as a provider 5%. Respondents could indicate other actions taken for a total of up to 10 actions, with an average of 2.3. Thirty-two percent had only one action, 34% two actions, 18% three, and 16% four or more actions up to the maximum of ten. Looking at total actions, the proportion that involved hospitals increased to 34% while the proportion at home or seeking care from a PMV/pharmacy dropped.

Table 53: Summary of actions taken to care for the sick child

	First Action		Total Actions	
	%	No.	%	No.
Home care	26.5	566	22.6	1,133
Pharmacy/PMV	14.4	307	9.7	486
Traditional, non-formal or spiritual	10.1	216	11.7	587
Pharmacy/PMV (examined the child)	5.4	116	4.3	217
Trained community health worker	2.4	51	2.0	102
Private doctor/clinic	4.1	87	4.1	204
Government facility (not hospital)	10.6	226	10.6	531
Hospital (public or private)	25.7	549	34.4	1,722
Facility of birth	0.8	18	0.6	29
Total	100.0	2,136	100.0	5,011

Decision-maker for care (Table 54). The reported decision-maker for the first action was almost evenly split between the mother (48%) and the father (42%), with other family members making up 6% and those outside the family only 2%.

Table 54: Decision-maker for first action for sick child

	First Action	
	%	No.
Mother	48.3	1,028
Father	44.2	941
Grandmother	4.5	95
Other family	1.4	30
Other	1.6	34
Total	100.0	2,128

Note: Eight cases have missing data

Impact of care on household payments. A question was asked whether the cost of care for the child had a negative impact on other household payments (Table 55). Overall, 26% of respondents said that it did; among them, 32% went to a hospital and only 12% only provided care at home.

Table 55: Caregivers who indicated that cost of care had a negative impact on other household payments

	Yes	Cases
	%	No.
Type of action taken		
Home care only	11.9	118
Any health provider	29.6	1,675
Hospital care	31.6	1,041
Ages at death		
0 day	27.5	40
1 day	17.1	35
2-6 days	18.9	95
7-27 days	11.0	100
1-11 months	27.9	577
1-4 years	27.0	1,281
Zone		
NC	38.2	309
NE	34.4	454
NW	12.8	1,047
SE	37.0	146
SS	60.2	93
SW	44.3	79
Total	26.0	2,128

Note: Eight cases have missing data

Home care (Table 56). The content and cost of home care was examined for 611 children who were reported to have received home care before going to any health provider. As expected, 44% reported providing homemade treatments, while 33% said they purchased traditional treatments. In terms of modern medicines, 40% gave medicines that were already in the house and 60% purchased them. Combined, 79% of children were reported to have received modern medicine at home. Twenty-five percent were reported to have been given ORS, including 49% of children 1-59 months treated at home with a report of loose stools.

Overall, it became apparent that what is called 'home care' usually included both modern medicines and traditional treatments (whether made at home or purchased). In effect, the distinction among home care, PMV/pharmacy care, and traditional care was often loose. Households reported spending a median of 500 naira on home care, though the range was wide, from near zero for the bottom 25% and up to 1,500 and over for the top 25%.

Table 56: Home care type and costs

	Homemade treatment	Traditional medicine from outside	Modern treatment available at home	Modern medicine purchased from outside	ORS	Others	Amount spent on home care		Number of children
	%	%	%	%	%	%	Naira	IQR (naira)	No.
Ages at death									
Neonate	35.3	29.4	17.6	45.1	2	15.7	500	100-1350	51
1-59 months	44.5	33.9	41.2	63.2	27.5	5	500	2-2,500	560
Zone									
NC	57.1	27.1	54.3	61.4	25.7	2.9	1,250	150-4,250	78
NE	34.0	29.1	36.9	62.1	29.6	9.7	500	1-1,000	211
NW	53.6	44.1	38.4	62.1	25.1	2.8	300	2-1,500	238
SE	16.2	13.5	40.5	62.2	8.1	2.7	500	1-2,500	39
SS	75.0	62.5	37.5	43.8	2.5	0.0	2,000	500-5,000	19
SW	30.8	0.0	42.3	26.9	7.7	26.9	50	0-500	26
Total	43.9	33.0	40.1	59.9	24.6	6.4	500	2-1,500	611

Care at PMVs/pharmacies. The second type of informal care asked about was at PMVs or pharmacies (Tables 57 and 58). The study only asked these questions for 181 families who went to a PMV/pharmacy before a health provider, which is only a subset of the total who went to PMV/pharmacies overall (e.g., 307 went as their first action). The first question asked was whether they went just to buy a drug or also got advice on what to buy (without the child being examined). Sixty percent reported getting advice on what to buy, showing that PMV/pharmacies are a common source of information for how to care for sick children and on medicines. When asked what kind of drugs were purchased (Table 57), by far the most common was medicine for fever (79%), followed by any antimalarial (39%), any antibiotic (27%), a diarrhoea treatment (22%), and ORS (21%). However, artemisinin-based combination therapy (ACT) was rarely mentioned for treatment of malaria (only 2%). Zinc was almost half as common as ORS (9% vs. 21%). Some other anti-diarrhoeals which are not recommended for children were mentioned as often as ORS. The median cost for care from the PMV/pharmacy was 825 naira, with an inter-quartile range of 500-1,700.

Table 57: Treatments purchased at the patent medicine vendor/pharmacy

	%	#
Fever drugs	79%	142
ACT	2%	3
Any antimalarial	39%	69
Antibiotic	27%	49
ORS	21%	37
Zinc	9%	17
Diarrhoea treatment	22%	39
Other	20%	35
Total purchases		391

Table 58: Expenses for care from patent medicine vendor/pharmacy

	%	#
Yes had expenses	87.3	158
No expenses	0	0
Don't know what was spent	12.7	23
Median cost (naira) (if had expenses)	825	
IQR (naira)	500-1,700	

Traditional/spiritual care (Tables 59 and 60). Finally, 297 respondents reported visits to traditional or spiritual providers prior to seeking out any health provider. Most received traditional medicine (87%) or prayers (18%) although some (16%) also received modern medicines. The median cost of traditional provider visits was 1,000 Naira, with one-quarter below 300 Naira and one-quarter over 2,200 Naira.

Table 59: Services provided at a traditional, informal or spiritual providers' place

	%	#
Traditional medicine	86.9	258
Modern medicine	16.5	49
Prayers	18.2	54
Other services	3.4	10

Table 60: Expenses for care at traditional, informal or spiritual providers' place

	%	#
Yes, had expenses	69	205
No expenses	13.5	40
Do not know what spent	17.5	52
Median cost (naira) (if had expenses)	1,000	
IQR (naira)	300-2,200	

A total of 455 children were reported to have died having received only home, PMV/pharmacy or traditional/spiritual care. For these children, respondents were invited to give a brief explanation of what happened, and this was recorded as short texts. As the pathway figure and tables have shown, many families used both modern medicines and traditional treatments, whether already available, made at home, or purchased from outside. Some respondents complained about lack of access to care from health providers (whether this was due to distance, lack of drugs in facilities, or lack of money to access care), and a few mentioned family issues preventing access to formal health care (e.g., absence of the husband or opposition to formal care). Some mentioned that they had planned to go for formal health care, with some having the child die on the way, but they had not put this in the list of actions taken. It was difficult to quantify these findings because the text responses did not specifically prompt for different areas. A more in-depth understanding of how families think about and access care is provided in the qualitative study.

Care at health providers

Obstacles to receiving care. Respondents who reported going to or trying to go to a health provider (1,528) were asked questions about their care experience at the facility (Table 61). About 10% reported

trouble with gaining admission, 4.5% were unhappy with how they were treated at the facility, and 4.4% said they had problems getting medications or diagnostic tests. While rates varied somewhat by age of death and geopolitical zone, no consistent pattern emerged.

Table 61: Obstacles to care for children for whom care was sought from health providers

	Had issues obtaining admission	Had issues with treatment at facility	Had problems getting medications/diagnostic tests	Sought care
	%	%	%	No.
Ages at death				
0 day	8.8	14.7	8.8	34
1 day	21.4	17.9	14.3	28
2-6 days	10.5	5.3	5.3	57
7-27 days	4.7	6.3	1.6	64
1-11 months	8.2	3.6	4.1	413
1-4 years	10.6	4.0	4.2	932
Zone				
NC	8.9	2.8	2.4	247
NE	9.4	4.2	6.7	330
NW	11.4	3.7	2.7	705
SE	3.5	5.3	8.8	114
SS	8.6	15.7	10.0	70
SW	12.9	8.1	4.8	62
Total	9.9	4.5	4.4	1,528

The VASA study included specific questions about the first and last health provider visited. These questions are reviewed for both providers together in the remaining Tables.

Health providers where care was sought. Table 62 shows the type of health providers visited and whether the child was able to reach the provider alive. There were 1,675 children for whom the caregivers attempted to visit a health provider, and 456 who visited a 'last' provider (being the second or subsequent providers among all visited). The public sector dominated the health providers visited. For first providers, this was 35% government hospitals and 35% health centres or health posts. Seventeen percent visited a private provider (hospital or clinic), and only 3.5% each visited a community-based health worker or a PMV/pharmacy acting as a provider. For the last visit, there was a slight shift towards government hospitals (which increased to 44% of the total and small declines in most other categories). Private providers made up only 17% overall and were especially uncommon in the North West (5.5%) and North East (12.5%), but were much more popular in other geopolitical zones (North Central 32%, South South 27%, South West 37% and South East 56%). PMV/pharmacies (that acted as providers) were not common overall but constituted 13% of providers in the North West. Most children who were taken to a health provider arrived alive (only about 6% died en route, before leaving home or for some other reason but with the intention to go).

Table 62: Health provider where care was sought or received

	Type of health provider								Able to reach this provider				Cases
	Government/Public			Private/NGO									
	Hospital	Health Centre	Health Post	Hospital	Clinic (formal)	Clinic (informal)	Community nurse/ midwife	Pharmacy or PMV that sees patients	Yes reached	No, died before going	No, died en route	No, other	
	%	%	%	%	%	%	%	%	%	%	%	%	No.
Sequence of care													
First provider	34.8	30.0	5.0	6.9	8.8	1.4	3.5	3.5	93.2	1.4	1.9	3.3	1675
Last provider	44.3	29.4	4.4	6.1	5.7	1.8	2.2	2.2	95.6	0.9	2.6	0.7	456
Ages at death													
0 day	50.0	15.8	0.0	21.1	5.3	2.6	5.3	0.0	89.5	2.6	5.3	0.0	38
1 day	43.2	13.5	2.7	16.2	13.5	2.7	2.7	2.7	94.6	5.4	0.0	0.0	37
2-6 days	48.7	26.3	2.6	5.3	5.3	1.3	6.6	3.9	90.8	1.3	2.6	5.3	76
7-27 days	34.8	28.3	4.3	9.8	7.6	2.2	2.2	10.9	91.3	2.2	2.2	4.3	92
1 - 11 months	36.3	32.4	3.7	8.3	8.7	1.6	2.5	6.0	94.3	1.2	1.8	2.5	565
1 – 4 years	35.9	29.9	5.7	5.3	8.1	1.4	3.3	9.9	93.9	1.1	2.1	2.8	1323
Zone													
NC	36.3	23.2	2.5	6.4	25.8	0.0	1.9	3.5	96.2	1.6	1.9	0.3	314
NE	34.3	42.0	2.8	3.0	6.7	2.8	1.5	6.7	94.3	0.4	1.3	3.9	460
NW	41.6	28.3	7.9	1.3	3.1	1.1	3.5	12.7	92.3	1.7	2.2	3.7	1037
SE	10.0	25.7	0.7	42.9	11.4	1.4	7.1	0.7	97.1	0.0	2.1	0.0	140
SS	38.8	26.5	0.0	19.4	6.1	2.0	3.1	2.0	93.9	2.0	2.0	1.0	98
SW	35.4	18.3	0.0	22.0	9.8	4.9	7.3	2.4	92.7	1.2	4.9	1.2	82
Total	36.8	29.8	4.9	6.8	8.2	1.5	3.2	3.2	93.7	1.3	2.1	2.8	2131

Care provided at health providers. Table 63 lists 19 services that might have been provided to the child. The most common were injections (53%), intravenous treatment (45%), oral antimalarials (43%), antibiotics (35%), ORS (27%), and zinc (17%). Admission to the facility was reported for 29%, and 11% reported a blood transfusion. Some treatments were more common in the early neonates (e.g., oxygen, bag and mask or face mask treatment) while others are more common after the neonatal period. Further analysis would be needed to see how treatments match up with symptoms of major diseases or by type of provider.

Table 63: Care provided for the sick child at health providers

	Oxygen	Breathe with bag or mask	Treatment with a face mask	Treatment given by mouth							Naso-gastric tube	IM (injection)	Intravenous	Gave blood	Advised to buy drugs outside	Operation	Admit-ted	Other	Nothing	Number who reached
				Fluid	Antibiotic	Antimalaria	ORS	Zinc	ARV	Other										
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	No.
Sequence of care																				
First provider	4.0	3.1	1.5	30.8	33.5	42.0	26.8	16.4	1.1	37.6	1.0	51.8	44.9	11.2	16.2	0.1	36.5	6.9	2.9	1570
Last provider	3.4	1.6	0.5	39.4	38.8	45.6	28.7	21.3	0.2	43.3	0.9	57.6	44.7	11.5	16.3	na	na	na	na	436
Ages at death																				
0 day	14.3	25.7	11.4	8.6	5.7	2.9	2.9	2.9	2.9	2.9	0.0	20.0	5.7	0.0	8.6	0.0	28.6	5.7	11.4	35
1 day	14.3	25.7	2.9	17.1	8.6	0.0	0.0	0.0	0.0	11.4	2.9	14.3	8.6	2.9	17.1	0.0	22.9	14.3	5.7	35
2-6 days	14.3	5.7	4.3	27.1	24.3	14.3	4.3	2.9	4.3	25.7	0.0	27.1	20.0	0.0	11.4	0.0	22.9	11.4	5.7	70
7-27 days	5.8	1.2	1.2	29.1	23.3	31.4	9.3	1.2	0.0	33.7	2.3	36.0	20.9	1.2	17.4	1.2	17.4	7.0	4.7	86
1-11 months	6.2	3.0	1.5	36.6	37.0	42.6	24.8	14.4	1.3	37.1	1.3	50.5	42.6	11.4	14.6	0.0	29.5	5.6	1.9	533
1-4 years	1.6	1.4	0.6	32.6	36.6	47.6	32.2	21.6	0.6	42.5	0.7	58.9	51.0	13.1	17.2	0.1	29.4	4.6	1.8	1247
Zone																				
NC	9.3	7.3	3.0	33.1	37.1	45.7	26.8	14.9	0.7	34.1	0.7	69.2	58.6	19.9	16.2	0.3	51.7	7.9	2.3	302
NE	1.2	0.7	0.5	32.7	39.6	51.8	30.4	23.7	0.0	39.4	0.2	52.3	39.2	10.4	17.3	0.0	28.6	3.0	1.8	434
NW	1.6	1.7	0.9	35.0	37.3	46.5	29.3	19.1	0.1	46.3	1.1	48.1	44.0	9.1	17.2	0.1	19.7	4.0	2.5	960
SE	12.0	6.3	2.1	32.4	27.5	21.8	21.1	10.6	10.6	19.0	1.4	61.3	45.1	14.1	7.7	0.0	47.9	14.8	2.1	142
SS	4.3	3.3	1.1	31.5	13.0	12.0	14.1	0.0	0.0	17.4	2.2	45.7	39.1	9.8	17.4	0.0	20.7	4.3	0.0	92
SW	11.8	3.9	1.3	2.6	2.6	9.2	11.8	5.3	0.0	25.0	1.3	50.0	40.8	6.6	11.8	0.0	22.4	10.5	5.3	76
Total	3.9	2.8	1.2	32.7	34.6	42.8	27.2	17.4	0.9	38.9	0.9	53.1	44.9	11.3	16.2	0.1	28.6	5.4	2.3	2006

Delays in seeking care. Table 64 summarises the delays in going to health providers. The longest delay was between the start of symptoms and the decision to go to a provider, with a median time of one day. For the upper quartile of cases, this delay was three days or more. In the text entries, respondents sometimes explained that delays occurred because the disease did not appear serious, or because other treatments were being tried or money had to be collected. For some children, it was clear that the decision to seek care was made only when the child was near death, which may account for those who died en route. Once the decision to go was made, most respondents said that the delay in actually setting out was only 30 minutes (60 minutes for the last provider), and travel time was a median of only 20 minutes (30 minutes for the last provider). The most delayed quartile would take two to three hours or more to leave and 40-50 minutes or more to travel. Delays were shorter for the earliest neonatal deaths.

Table 64: Delays in going to health providers

	Time between first symptoms and decision to go to a provider		Time between deciding to go or being referred and leaving for provider		Time for travel to the provider		Number going to a health provider
	Median	IQR	Median	IQR	Median	IQR	
	Days	days	minutes	minutes	minutes	minutes	No.
Sequence of care							
First health provider	1	0.83-3	30	10-120	20	10-40	1,675
Last health provider	Na	na	60	10-180	30	15-50	465
Ages at death (first provider only)							
0 day	0	0	0	0-7	15	10-30	36
1 day	0	0-0.83	0	0-50	10	1-30	29
2-6 days	0.125	0-1	20	0-120	20	7-30	65
7-27 days	1	0.125-3	25	0-120	20	8-60	73
1-11 months	1	0.125-3	30	10-120	20	10-40	446
1-4 years	1	0.167-3	60	15-120	20	10-40	1026
Zone (first provider only)							
NC	1	0.04-2	40	10-120	30	15-60	261
NE	1	0.04-2	50	20-120	25	10-45	351
NW	1	0.5-3	60	15-120	20	10-30	803
SE	1	0-2	0	0-0	20	10-45	121
SS	2	.19-3	10	0-120	30	10-60	72
SW	0.25	0.01-1	30	5-120	15	10-25	66

Note: No total row because this was the same a first provider.

Transport to health providers (Table 65). Motorcycles were by far the most common means of transport (53%), followed by walking (26%). Most of the rest were private cars, taxis, 3-wheelers, or bus/public transport. Ambulances were very rarely used (0.2%), and only 1.5% travelled by boat (which rose to 5.1% in the South South).

Table 65: Transport used to access care at health providers

		Transport used to go to provider (more than one allowed)							Number going to a provider
	Ambulance	Walking/ carried	Motorcycle	Private car	Taxi/ paid driver	Three wheeler	Public transport/ bus	Boat	
	%	%	%	%	%	%	%	%	No.
Sequence of care									
First health provider	0.2	27.9	51.5	5.0	6.6	6.0	6.9	1.7	1,675
Last health provider	0.5	19.0	61.0	3.4	10.8	7.8	9.6	1.1	456
Ages at death									
0 day	0.0	13.2	44.7	13.2	2.6	2.6	5.3	0.0	38
1 day	5.4	16.2	29.7	21.6	8.1	10.8	5.4	0.0	37
2-6 days	0.0	21.1	40.8	5.3	11.8	9.2	9.2	2.6	76
7-27 days	1.1	41.3	35.9	8.7	8.7	8.7	1.1	1.1	92
1-11 months	0.2	25.1	55.9	4.4	7.1	6.2	7.4	1.2	565
1-4 years	0.1	25.9	54.5	3.6	7.3	6.0	7.8	1.7	1323
Zone									
NC	0.6	19.1	56.1	4.8	4.5	12.7	8.3	1.3	314
NE	0.2	29.8	47.0	3.9	9.1	8.9	1.7	0.7	460
NW	0.2	27.4	54.6	3.5	8.4	4.1	8.0	1.7	1037
SE	0.0	20.0	47.9	14.3	2.9	3.6	19.3	1.4	140
SS	0.0	9.2	72.4	1.0	7.1	3.1	0.0	5.1	98
SW	0.0	39.0	40.2	9.8	4.9	2.4	15.9	1.2	82
Total	0.2	25.8	53.0	4.6	7.4	6.3	7.4	1.5	2131

Note: In addition to the above, 0.05% used a bicycle. Boat (1.5%) was 1.0% without a motor and 0.5% with a motor.

Rows may be less than 100% if no answer was given.

Costs of care and costs of transport (Table 66). When asked if they spent any money on going to health providers, 70% of respondents said they had costs, although later when asked specifically about the provider this rose to 93%, which seems more realistic. Most (78%) said they used available funds for the payments, while 24% reported they had to borrow money, 8% had to sell assets to raise money, and 4% got help from relatives. The need to find outside support ranged from 19-34% across the geopolitical zones. Thirty-five percent said they paid nothing for transport, the majority likely walked to the provider. Of those who had to pay, the median cost was 300 Naira.

Only 7.4% said they paid nothing at the health provider, and the median cost there was 4,000 Naira (4,500 naira at the last provider). Median costs at providers were lower in the North West (2,000 Naira) and North East (3,000 Naira) and were over 10,000 Naira in the NC, SS and SE Zones. This may be due to the higher percentage of private providers used in these geopolitical zones, as well as higher poverty in the NE and NW, leading to less ability to pay.

Table 66: Costs of care at health providers

	Had costs	Arrangements for money to pay expenses					Cost of transport			Cost of care at provider			Number going to a provider
		Had available	Bor-rowed	Sold Assets	Help from relatives	Any costs	No cost	Had costs	Median cost	No cost	Had costs	Median cost	
	%	%	%	%	%	No.	%	No.	Naira	%	No.	Naira	No.
Sequence of care													
First provider	68.5	79.2	21.6	7.6	4.0	1147	35.4	1022	300	7.4	1258	4,000	1645
Last provider	75.9	72.3	30.3	7.5	4.9	346	28.9	324	400	6.7	350	4,500	456
Ages at death							(first provider only)			(first provider only)			
0 day	50.0	94.7	5.3	0.0	0.0	19	52.9	16	200	23.3	23	10,000	38
1 day	48.6	83.3	27.8	0.0	0.0	18	55.6	12	500	33.3	16	4,250	37
2-6 days	65.8	76.0	20.0	0.0	6.0	50	39.7	35	200	27.1	35	3,000	76
7-27 days	56.5	84.6	17.3	5.8	1.9	52	50.8	32	300	14.5	47	3,000	92
1-11 months	72.4	80.4	20.3	7.8	4.2	409	33.9	281	300	6.0	346	4,000	565
1-4 years	71.4	75.6	25.9	8.3	4.4	945	52.1	300	646	5.2	791	3,500	1323
Zone													
NC	72.6	73.2	32.9	5.7	2.2	228	29.0	179	360	4.4	217	10,000	314
NE	70.2	71.8	20.1	13.6	4.6	323	39.4	211	200	5.5	292	3,000	460
NW	67.7	78.8	21.8	7.7	4.8	702	35.5	471	300	7.0	555	2,000	1037
SE	65.0	87.9	34.1	1.1	2.2	91	45.7	63	350	12.1	94	11,500	140
SS	87.8	81.4	19.8	0.0	2.3	86	17.4	57	400	8.2	56	10,000	98
SW	76.8	88.9	19.0	1.6	7.9	63	37.9	41	150	24.1	44	4,500	82
Total	70.1	77.6	23.6	7.6	4.2	1493	35.4	1022	300	7.4	1258	4,000	2131

Survival at and referral from provider (Table 67). Thirty-two percent of children going to the first provider died there, compared to 17% at the last provider. Children in the North West and North East were much less likely to die at a provider than at other geopolitical zones (20-25% vs. 38-49%). It was not clear if this was due to fewer children being admitted for treatment or fewer going to a provider who could admit the child, or other reasons. Only about 10% of children leaving a provider alive were referred to another provider, either formally or informally. This appears somewhat less common in the North West and North East and more common in other geopolitical zones.

Table 67: Survival at and referral from health providers

	Reached provider	Died at provider	Number leaving provider alive	Referral to another provider		
				Yes, formal referral	Yes, suggested going	No referral
	No.	%	No.	%	%	%
Sequence of care						
First provider	1,570	32.0	1,068	3.7	8.6	87.5
Last provider	436	17.2	361	1.4	3.9	93.4
Ages at death						
0 day	35	80.0	7	0.0	0.0	100.0
1 day	70	48.6	18	16.7	27.8	55.6
2-6 days	86	31.4	48	6.3	8.3	83.3
7-27 days	533	25.6	64	3.1	4.7	92.2
1-11 months	1,247	27.6	386	3.1	4.1	92.2
1-4 years	2,006	27.3	906	2.6	8.6	88.3
Zone						
NC	302	48.7	155	6.5	7.1	85.2
NE	434	25.1	325	1.2	7.1	91.7
NW	960	19.9	769	2.5	6.5	90.5
SE	142	41.5	83	3.6	15.7	80.7
SS	92	38.0	57	5.3	10.5	82.5
SW	76	47.4	40	12.5	7.5	80.0
Total	2,006	28.8	1,429	3.1	7.4	89.0

Home care recommendations. Table 68 reviews home care recommendations for those leaving health providers alive. Of the 1,429 children who left a health provider, just 23% of caregivers recalled being given any advice on home care. The most common advice appears to have been to return for follow up (35%) or if the condition got worse (13%), or to complete a referral given (13%). Other advice had to do with feeding or giving medications. Figure 13 summarizes the limited amount of referral and home care instructions for children leaving the first provider.

Figure 13: Discontinuity of care in the final illness children leaving the first health provider

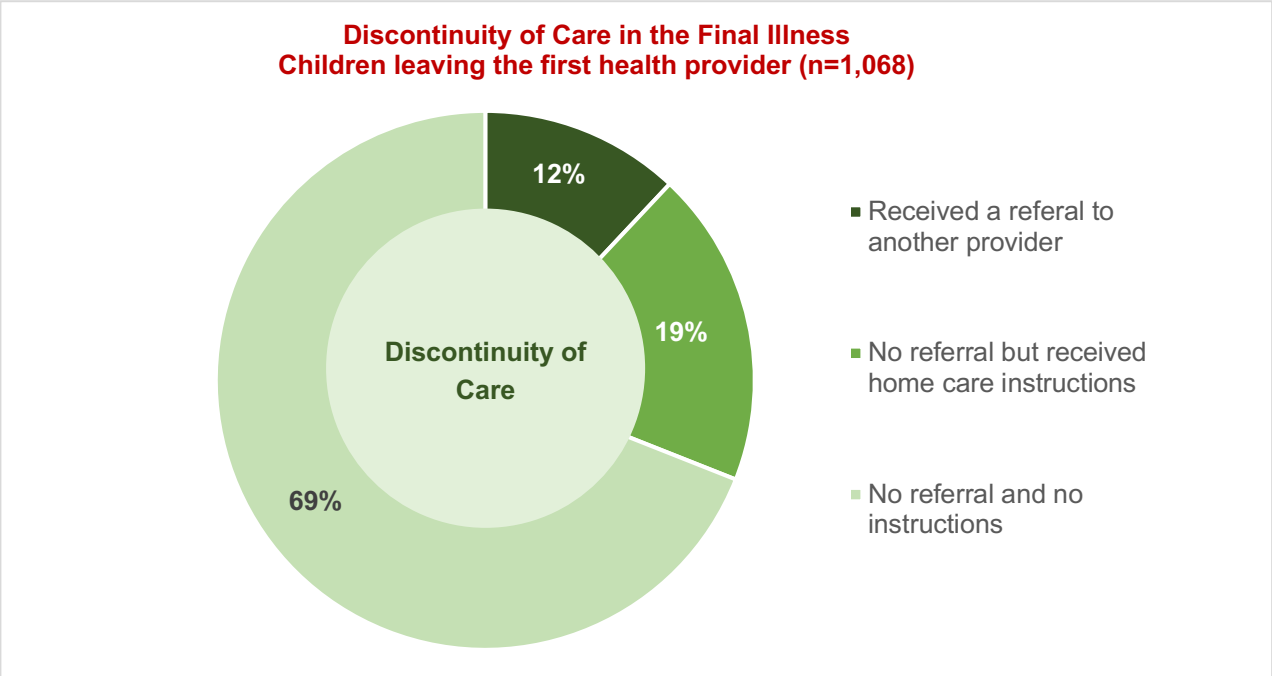


Table 68: Home care suggestions by health providers

	Left provider alive	Provider suggested home care		Home care suggested											Able to follow the advice
				Continue breastfeeding	More fluids	More feeding	ORS	Give antibiotic	Give antimalarial	Vit A	Return for follow-up	Return/refer if worse	Complete referral given	Other	
	No.	%	No.	%	%	%	%	%	%	%	%	%	%	%	%
Sequence of care															
First provider	1,068	24.6	263	11.0	8.4	25.9	20.2	20.2	24.3	0.4	33.5	12.2	14.1	25.5	85.6
Last provider	361	19.7	71	2.8	5.6	19.7	21.1	15.5	15.5	1.4	39.4	18.3	7.0	21.1	81.7
Ages at death															
0 day	7	14.3	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0
1 day	18	22.2	4	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0
2-6 days	48	25.0	12	25.0	8.3	8.3	8.3	0.0	0.0	0.0	25.0	25.0	16.7	25.0	83.3
7-27 days	64	23.4	15	20.0	0.0	20.0	0.0	6.7	13.3	0.0	33.3	13.3	6.7	40.0	93.3
1-11 months	386	26.4	102	15.7	0.0	18.6	19.6	21.6	18.6	0.0	43.1	10.8	10.8	27.5	85.3
1-4 years	906	22.1	200	4.5	12.5	29.0	23.5	20.5	27.0	1.0	32.0	14.0	13.0	21.5	83.5
Zone															
NC	155	29.0	45	13.3	0.0	20.0	15.6	15.6	15.6	0.0	31.1	11.1	24.4	33.3	88.9
NE	325	22.5	73	16.4	8.2	38.4	37.0	32.9	41.1	2.7	42.5	9.6	5.5	9.6	87.7
NW	769	19.1	147	6.1	11.6	21.1	19.0	19.0	19.0	0.0	38.8	17.7	10.2	17.0	76.9
SE	83	28.9	24	0.0	0.0	16.7	0.0	0.0	4.2	0.0	0.0	12.5	29.2	70.8	100.0
SS	57	38.6	22	4.5	4.5	0.0	0.0	13.6	9.1	0.0	4.5	9.1	13.6	50.0	86.4
SW	40	57.5	23	13.0	8.7	43.5	26.1	8.7	30.4	0.0	56.5	8.7	8.7	30.4	100.0
Total	1,429	23.4	334	9.3	7.8	24.6	20.4	19.2	22.5	0.6	34.7	13.5	12.6	24.6	84.7

Severity of illness over course of care (Table 69). An illness severity question asked about the child's feeding, alertness and activity levels at various stages in the illness. It was first asked referring to the time when the child was first noticed to be ill. Depending on the number of health providers a child was admitted to or discharged from the same question was repeated up to four times. In order to compare answers for the same children to each other, they are divided into six groups in the table. At the top is the group that received "no care'. They were asked about severity only once and they reported the most severe mix of symptoms. This group was made up mostly of in neonates as well and some older children who had sudden deaths. Because this included many newborns who died near time of birth, it makes sense that it shows more 'don't know' responses.

Those treated only by informal providers (home, traditional, PMV/pharmacy) also only had the severity question asked once, but mostly reported their child having moderate symptoms with very few severe. Caregivers whose children made it to the first provider but died there had two severity scores taken, from the time the illness started and the time the baby was taken to the provider. This showed a small but definite shift to more moderate and severe symptoms at the time they went to the provider compared to start of illness and a decline in 'normal' reports of feeding, alertness or activity.

Those discharged from the first provider (but who then died at home) were asked how severe the illness was at time of discharge. This mostly showed a slight improvement compared to just before admission, with the exception of feeding, where failure to eat had increased. While the children were slightly better at discharge from the first provider, they were still sicker than at the start of the illness.

Only 95 children died at a second/last provider and had another severity measure related to the time of the decision to go there. These children showed a steady decline from the first to the fourth measure, with smaller 'normal' and growing 'severe' status across all three measures.

Finally, children discharged from a second/last provider had a final measure at time of discharge, or five in total. These children showed a steady deterioration from initial illness through admission and discharge from the first provider and admission to the second. They showed a small improvement on discharge from the last provider, though this was not enough to bring them up even to the level they were at discharge from the first provider.

The patterns seen make sense, especially considering that all of these were fatal illnesses, and any improvement was temporary before death. Small improvements were seen comparing discharge from versus entry to a provider, but this did not change the overall downward trend.

Table 69: Illness severity over the course of illness

Illness care group	Timing of severity questions	Feeding				Alertness				Activity				Cases
		Normal	Poor	Not feeding	DK	Alert	Drowsy	Uncon-scious	DK	Normal	Poor	Not moving	DK	
		%	%	%	%	%	%	%	%	%	%	%	%	No.
No care	Start of illness	30.2	26.4	39.5	3.9	42.9	39.6	8.0	9.6	27.4	55.7	11.1	5.9	742
No health provider	Start of illness	32.5	60.9	6.3	0.2	48.3	49.6	2.0	0.2	17.9	81.4	0.4	0.2	458
Died at 1st provider	Start of illness	32.2	54.6	13.1	0.2	47.1	48.2	3.4	1.3	17.3	79.9	2.1	0.7	612
	Going to 1st	20.6	61.4	18.0	0.0	32.4	61.3	6.4	0.0	8.2	88.4	3.4	0.0	612
Died at home after 1st provider	Start of illness	33.7	61.8	4.2	0.3	55.2	43.3	1.3	0.2	20.9	78.4	0.5	0.2	612
	Going to 1st	19.3	72.8	7.9	0.0	43.8	52.6	3.6	0.0	9.1	88.8	2.1	0.0	607
	Leaving 1st	20.8	68.6	10.6	0.0	46.7	50.3	2.9	0.0	10.6	87.7	1.6	0.0	612
Died at a second/last provider	Start of illness	44.2	48.4	7.4	0.0	64.2	30.5	4.2	1.1	26.3	71.6	1.1	1.1	95
	Going to 1st	32.6	57.9	9.5	0.0	52.6	44.2	3.2	0.0	15.8	82.1	2.1	0.0	95
	Leaving 1st	29.5	57.9	12.6	0.0	50.5	45.3	4.2	0.0	14.7	83.2	2.1	0.0	95
	Going to last	10.5	67.4	22.1	0.0	29.5	62.1	8.4	0.0	3.2	91.6	5.3	0.0	95
Left second provider alive and died at home	Start of illness	31.6	64.3	3.9	0.3	51.2	48.2	0.6	0.0	21.3	78.1	0.3	0.3	361
	Going to 1st	22.7	71.2	6.1	0.0	40.7	57.9	1.4	0.0	13.0	85.6	1.4	0.0	361
	Leaving 1st	21.1	70.6	8.3	0.0	38.8	59.8	1.4	0.0	12.2	87.0	0.8	0.0	361
	Going to last	15.2	74.8	10.0	0.0	33.8	64.0	2.2	0.0	8.0	89.2	2.8	0.0	361
	Leaving last	19.4	70.4	10.2	0.0	36.3	60.7	3.0	0.0	11.1	86.7	2.2	0.0	361

Concerns or problems in seeking care for the child (Table 70). The caregivers of all 2,881 children with neonatal and child deaths were asked about 12 specific areas of concern they had in caring for the child who died. Overall 42.5% reported at least one area of concern. The common ones were distance to care (21%), costs (18%), transportation (10%), and going at night (9%). These four were all related to each other. Less common concerns were that the child needed traditional or spiritual care (6%), getting permission to go (3%), feeling that the child was not sick enough to need care (3%), or too sick to travel (1%). A few caregivers expressed concerns about the quality of care in the facility (3%) or health workers' attitudes (2%).

Table 70: Concerns or problems in seeking care for the child

	Distance	Transport	Costs of care	Permission	Finding someone to go with	Going when late at night	Quality of care in facility	Health worker attitudes	Not sick enough to need care	Too many duties at home	Need traditional/ spiritual care	Too sick to travel	Others	Any concern expressed	Number of cases
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	No.
Ages at death															
0 day	15.9	5.4	10.9	3.6	0.0	9.4	2.5	3.6	1.8	0.0	1.1	1.1	1.4	33.0	276
1 day	22.2	9.3	17.6	2.8	0.0	10.2	2.8	6.5	5.6	0.0	1.9	0.0	0.9	38.9	108
2-6 days	21.7	7.1	13.1	2.5	0.0	6.6	2.5	1.5	5.6	0.5	4.0	0.5	2.5	37.4	198
7-27 days	16.9	8.7	12.2	4.1	0.0	9.9	1.2	0.6	2.9	0.0	2.3	0.6	1.2	33.1	172
1 - 11 mos	22.3	10.5	18.8	3.1	0.6	9.5	3.7	2.2	3.1	0.6	6.5	0.3	1.5	42.8	676
1-4 years	22.5	10.4	19.7	3.8	0.4	9.2	3.2	2.3	3.5	0.9	7.9	1.0	1.4	46.2	1,449
Zone															
NC	20.8	15.8	19.8	3.3	0.7	7.4	3.6	2.6	1.9	0.2	8.8	1.0	0.7	38.9	419
NE	26.1	13.1	16.8	3.6	0.3	16.7	2.1	2.5	2.1	0.9	3.1	0.6	1.0	46.1	671
NW	21.0	6.4	16.9	4.3	0.1	6.1	1.7	1.7	4.9	0.6	6.8	0.7	2.0	41.5	1,336
SE	19.2	6.1	16.7	0.5	0.0	7.6	11.1	2.5	0.5	0.0	3.5	1.0	1.5	43.9	198
SS	13.8	9.2	19.7	1.3	2.0	4.6	6.6	6.6	3.3	2.0	6.6	0.7	0.0	35.5	152
SW	15.5	8.7	22.3	2.9	0.0	18.4	3.9	2.9	5.8	0.0	8.7	1.0	2.9	54.4	103
Total	21.4	9.6	17.6	3.5	0.3	9.2	3.1	2.4	3.4	0.6	6.1	0.7	1.5	42.5	2879

Note: Two cases have missing data.

3.1.6 SOCIAL CAPITAL

Social capital refers to institutions, relations, and norms which shape the quality and quantity of social interactions inside the community. To capture the degree of solidarity (social capital) of the Nigerian communities which experienced an under-five death, the respondent was asked about issues that the respondent's community had worked on together over the last three years prior to the interview; whether the respondent or the mother had requested help from any group or any organisation within the community during the pregnancy or during the fatal illness of the child, and to whom he/she turned to ask for this help; and finally, whether any particular community service had ever been refused to her/him or the family. This module was asked of 3,074 respondents in the study, including those with stillbirths.

The proportion reporting community joint work on issues affecting the community varied by both topic area and geopolitical zone. The common types of joint works reported were for religious institutions (67%), conflict resolution (66%), agriculture (56%), and mutual security (50%). Averaging all 13 topics, the North Central Zone stood out as having the highest rates of joint work (average 56%) and the South South Zone the lowest (17%).

Table 71: Community joint work on issues affecting the community

Work together in past three years	NC	NE	NW	SE	SS	SW	Nigeria
	%	%	%	%	%	%	%
Education/schools	63.2	25.7	43.9	47.0	7.6	24.8	40.2
Health services/clinics	47.7	19.5	34.3	35.6	5.1	29.7	31.4
Paid job opportunities	24.7	7.7	10.9	5.9	1.3	11.0	11.5
Credit/finance	20.7	10.4	14.6	5.5	1.3	27.6	13.9
Roads	56.7	32.1	32.8	30.1	7.0	16.6	34.1
Public Transport	34.9	1.4	7.4	16.9	0.0	15.9	11.0
Water distribution	60.9	21.2	43.0	32.9	7.6	30.3	37.6
Sanitation services	69.2	16.3	40.4	75.8	70.1	43.4	43.6
Agriculture	71.8	48.3	62.9	32.0	26.1	43.4	56.0
Justice/conflict resolution	88.3	50.6	70.2	57.5	63.1	43.4	66.0
Security/police services	73.8	38.2	50.3	56.6	27.4	38.6	49.9
Mosque/church/temple	93.7	58.2	77.2	33.8	3.8	46.2	67.1
Other (specify)	19.2	0.1	4.2	1.4	0.0	1.4	5.1
Average of 13 items	55.8	25.4	37.9	33.2	17.0	28.6	35.9
Number	478	704	1,371	219	157	145	3,074

The second question was whether the mother/respondent was able to turn to any persons or community groups for help in the final illness. Overall, only 27% said they were able to do so, but when prompted with specific sources of help, more said they were able to access help. By far the most common source was family (45%), with neighbours (17%) and friends (15%) being less frequently mentioned. Religious leaders were only involved in 3.5% of cases, although this was more common in the South South (17%).

Table 72: Sources of help in final illness

	NC	NE	NW	SE	SS	SW	Nigeria
	%	%	%	%	%	%	%
Able to turn to others	50.8	24.3	19.1	28.3	29.9	31.7	27.0
Turned to:							
Family	54.4	45.3	43.6	37.0	43.3	40.7	45.1
Neighbour	27.8	21.4	10.9	16.4	19.1	18.6	17.1
Friends	21.5	17.2	9.3	18.3	18.5	19.3	14.6
Religious leader or group	5.9	1.6	2.0	3.7	17.2	4.1	3.5
Community leader	2.1	0.4	1.0	0.9	1.9	2.8	1.2
Police	0.2	0.4	0.1	0.9	0.0	0.7	0.3
Patron/employer/benefactor	0.0	0.0	0.1	0.5	0.0	0.0	0.1
Political leader	0.2	0.0	0.1	0.5	0.6	0.0	0.2
Mutual group member	3.1	1.7	0.2	8.2	1.9	2.8	1.8
Assistance organisation (not as a member)	1.3	0.1	0.1	4.1	0.6	0.0	0.6
Other (specify)	0.4	0.1	0.1	0.9	0.0	0.7	0.2
Average	14.0	9.4	7.2	10.0	11.1	10.1	9.3
If turned to any, is this was same source you would usually turn to for help?	84.0	72.7	84.4	76.4	79.5	73.5	80.2
Number	478	704	1371	219	157	145	3,074

Only 14% of respondents (215 of 1,529) report their family had been denied one or more community services. This averaged only 3.6% over 11 services.

Table 73: Whether family was ever denied community services

Ever denied any of the following	NC	NE	NW	SE	SS	SW	Nigeria
	%	%	%	%	%	%	%
Education/schools	4.0	6.3	6.6	0.0	2.4	14.7	5.8
Health services/clinic	0.4	3.6	4.1	0.0	1.2	10.3	3.1
Paid job opportunities	0.7	5.5	5.8	1.9	2.4	35.3	5.7
Credit/finance	1.8	8.3	10.7	0.0	0.0	35.3	8.3
Transportation	1.1	4.4	4.3	0.0	0.0	11.8	3.5
Water distribution	0.7	5.2	2.1	0.0	0.0	20.6	3.1
Sanitation services	0.7	3.0	3.2	0.0	1.2	22.1	3.2
Agriculture	0.4	5.2	1.4	0.0	0.0	2.9	2.0
Justice/conflict resolution	0.0	1.9	1.4	0.0	0.0	14.7	1.7
Security/police services	0.4	4.7	3.5	0.0	0.0	16.2	3.3
Other (specify)	0.0	0.6	0.2	0.0	0.0	0.0	0.2
Average	0.9	4.4	3.9	0.2	0.7	16.7	3.6
Number	275	363	634	106	83	68	1,529

3.2 Qualitative study[45]

3.2.1 INDIVIDUAL AND FAMILY LEVEL FACTORS

Health beliefs

The study documented several health beliefs with strong implications for child health care choices and outcomes. Health beliefs that are widespread within communities may influence the decision of caregivers. Sometimes, community members offered counsel on 'appropriate' health care practices which caregivers may not be able to reject even if they had reservations about them. For instance, a common belief in all three Northern Zones, South East and the South West was that God determined whether a child survived or died, irrespective of the care given. This fatalistic belief created a feeling of helplessness in caregivers and kept them from taking steps that may have saved their children. The assertion below sums up this belief.

Everything is in God's hand. If God decides to save anybody, he will save the person. If God says my baby will be alive, if I give him any medicine, he will be fine but if not so, even when you are around, the baby will still die
(Female caregiver, 30 years, Achacha, Izzi LGA, Ebonyi State, South East).

Related to this is the belief that child deaths were caused by supernatural powers. In Akwa Ibom (South South), the South East and the North West communities where this belief was common, caregivers opted for healing provided by spiritualists that had different names in different contexts. In addition, the study documented widespread beliefs in the efficacy of traditional medicine to treat some diseases which could not be cured by orthodox medicine. In communities where this belief was widespread, caregivers were encouraged, and sometimes pressured, to use traditional medicine when extended family members,

[45] This main report provides a summary of the qualitative results, for all the qualitative results, please see the VASA Qualitative Component Report (nationalpopulation.gov.ng)

especially mothers-in-law of caregivers, held the view that traditional medicine was the only hope to cure the child's illness. The belief in the efficacy of traditional medicine was summarised in the words of this study participant.

I believe in traditional medicine and it does work for us. Even this child, some days back, he was having serious fever and shivering. I took him to one traditional medicine vendor and he gave him herbs which he directed me to use for three days. I paid 100 naira and he is now getting better…. So in essence, this traditional way of healing the sick person in this community is very common. It is very acceptable and almost everyone uses it
(Female caregiver, 25 years, Kabawa, Yamaltu-Deba LGA, Gombe State, North East).

A similar health belief with an interesting twist is health care syncretism, the belief that the best health care outcome is obtained from a combination of traditional and orthodox medicines. In parts of the South East, where this belief was common, traditional medicine was considered more suitable for diagnosis, while orthodox medicine was suitable for curative purposes. A mother shared this belief in these words:

If the child has so many diseases in the body, the traditional medicine will bring out all the diseases in their body, then you will use orthodox medicine to treat all the sicknesses
(Female caregiver, 30 years, Achacha, Izzi LGA, Ebonyi State, South East).

A similar view was expressed in another community in the state:

What I know is that it is wrong to start the treatment of any illness with orthodox medicine because it can make the child die. I have had an experience, when I started treating a baby with orthodox medicine without knowing that orthodox medicine is not the right medicine for that particular sickness, then the child died
(Female caregiver, 40 years, Ezeakataka, Izzi LGA, Ebonyi, South East).

Health-seeking behaviour

The study documented varied health-seeking behaviours among caregivers. A common care giving practice involved combining traditional and orthodox medicines. Typically, caregivers began with traditional medicine which may involve the use of herbs, and proceeded to orthodox treatment only if the former failed. Sometimes, both traditional and orthodox treatments were used simultaneously. Procurement of drugs from proprietary and patent medicine vendors without any medical examination of a sick child was also common. A caregiver stated:

The main reason for choosing the methods [other than orthodox medicine] is because it's part of the norm in this community for one to use the chemist store as the first step for health care, then mixing it with the traditional method, that is, dried herbs for curing minor sicknesses. So, it's normal…
(Female caregiver, 31 years, Madugu-Yarima, Funakaye LGA, Gombe State, North East).

Some caregivers in the South South and South East sought care for their under-fives from health care providers (serving or retired) who provided services in their private homes. In the South West, caregivers often chose private health facilities because of poor public perception on the quality of care and health care providers' attitudes in public health facilities. They believed that if a patient was willing to pay for quality service, it was available in private health facilities which was affordable for many caregivers. Because of the belief in spiritual attacks as a major cause of illness and death in children, caregivers also sought care for their under-fives from spiritualists, who were popular as providers of child delivery services in Akwa Ibom, South South Zone. Spiritual healers had different names in different parts of the country. These included

dibias (spiritual medicine men) in the South East and *boka* (spiritual medicine men) in the North West. Spiritual healers offered amulets, holy water, and special prayers; some recommended different rituals for the protection of children. This was usually the preferred treatment choice when caregivers perceived that their child's illness or imminent death was due to spiritual attack.

A caregiver explained 'how to deal' with an illness perceived to be a result of a spiritual attack:

You will go to a prophet, he will give you two or three days of midnight prayer to do, then it will be back to sender
(Female caregiver, 40 years, Ezeakataka, Izzi, Ebonyi State, South East).

In some situations, caregivers chose health facilities as first-line treatment for their children but went on to receive counsel from health care providers, neighbours, or random community members to seek alternative care for their children. One caregiver shared this experience:

My first baby was seven months old and was expected to be walking, but he suffered delay due to sickness. We took him to the hospital for treatment but after the doctor's examination, we were advised to take the child and treat him using traditional medicine. The health personnel told us that they suspected that the baby was poisoned or maybe someone has given him bad water to drink. We left the hospital and went straight to a traditionalist who gave us herbs, which we administered to the baby before he died
(Female caregiver, 29 years, Ogbu Edda, Afikpo South, Ebonyi, South East).

Poverty

Poor households were the worst hit by child deaths. Many fathers were peasant farmers and many mothers were in seclusion, meaning that they could not work outside the home to contribute to the family economy. Consequently, caregivers and their husbands lacked the resources to provide adequate nutrition and quality care for their under-fives. Often, caregivers were required to pay to register and to access care in health facilities before their children were treated. Where caregivers could not afford to make this down payment, they looked for cheaper alternatives such as herbal medicine, spiritual healing/faith-based care, Traditional Birth Attendants (TBAs), PMVs, or health care providers offering health care services informally in their private homes where flexible payment options were available.

… if you do not have money, even when you get to the hospital, they will ask you to take your child home, and before you know it, you have lost your baby
(Female FGD participant, Tungan Gero, Mashegu LGA, Niger, North Central).

Family-level decision-making

Decision-making on where and how to provide care for a sick child was the preserve of husbands and their parents, or male siblings if the husbands were not available. Because of the restrictions on women, husbands and their own mothers often had the responsibility of taking their sick children to health facilities. Unfortunately, men's involvement in other economic activities outside the home often prevented them from doing this. Sometimes, the time it took mothers to obtain permission to go to the health facility or for the father to be available to do it himself was enough to make a simple health problem become complicated in children. As a caregiver said:

You will have to wait for the permission of your husband to go out, the time during which you are waiting, if he is not around, is the only problem
(Female caregiver, 29 years, Tungan Gero, Mashegu, Niger State, North Central).

3.2.2 ACCESSING SERVICES IN HEALTH CARE FACILITIES

Barriers to health care services in facilities abound in all study locations. Many of the PHCs in the study communities, most of which are rural, were ill-equipped and non-functional. Some PHCs were found in a state of dilapidation, with broken windows, roofs and doors. Some were found locked and were not operational. Other PHCs were poorly staffed, lacked drugs, hospital beds or diagnostic equipment, did not offer round-the-clock services, and could not provide curative care in many cases. Due to the state of the PHCs, caregivers and children were often referred to secondary-level facilities, mostly located in towns or cities. A general challenge to accessing health care services in these facilities was related to distance, poor state of roads and the cost of transportation. Roads connecting rural communities to towns and cities were typically not motorable, especially during the rainy season. Caregivers referred to hospitals in towns and cities consequently had to contend with long hours of travel; the physical stress of trekking if by foot, or extremely bumpy rides on motorbikes, bicycles or travel by camels in some northern states; and the cost of travelling, which many households could not afford. On top of this was the additional cost of accessing care in hospitals. Caregivers had to pay to register their children in health facilities, and for laboratory tests, drugs, and other bills if their children were admitted. These barriers often led caregivers to seek alternative care which they may find easier to access, cheaper, and with more flexible payment options; for example, they did not have to pay before their children were treated, as was required with many health facilities.

In addition to these barriers, many caregivers perceived unfriendly attitudes in health care providers. They said that service providers were hostile if they believed that the caregivers delayed seeking treatment or were negligent in caring for their children. Service providers' assessment of timeliness of seeking care for children was often taken without careful consideration of the contextual barriers caregivers faced. In addition, many caregivers perceived poor quality of care in the PHCs and other public health facilities in their communities. In the view of many community members and caregivers, service providers in public facilities had corrupt tendencies (such as diversion of drugs provided for users to their private businesses) and overall poor quality service.

Describing how corruption in the public health sector affected the quality of care, a study participant stated:

Because [government health workers] have private hospitals that belong to them, we don't know where all the drugs at the public hospitals disappear to. They tell patients to meet them at their own hospitals for better treatment. All the drugs from the government don't get to us. They don't do what they should do for us at the general hospital. They ask us to pick numbers at the general hospital [to determine the order in which patients will be attended to]; we will queue from morning till 12:00 noon or 1:00 pm [and] the next thing is that they give us only paracetamol and ferrous for a sick child….
(Male FGD, Ikirun, Ifelodun LGA, Osun State, South West).

Due to perceived poor quality of service in nearby public health facilities, caregivers often decided to access care in private health facilities, though they usually had limited capacity for providing care. This was typical in the South West. A study respondent explains:

They [caregivers] prefer private [hospitals] because health workers don't attend to them on time [in government hospitals]. The first thing they should give, they won't give. They will be asking questions about whether or not they [caregivers] have [registration] card with them, instead of first giving the child oxygen if

that is what the child requires. The case is not the same in private hospitals. They [private hospital workers] will first give first aid to the child. There is no time we get to a private hospital and do not meet doctors and staff
(Male FGD, Ikirun Ifelodun LGA, Osun State, South West).

In the oil producing regions of the South South and the South East, insecurity was reported as a major factor limiting access to child health care, although insecurity is an issue in other parts of Nigeria as well. These communities contended with the proliferation of arms, cult wars, inter-communal wars, oil bunkering, kidnapping, armed robbery, banditry, rape, and other forms of criminality which created a strong sense of insecurity in caregivers and health care providers, some of whom resided outside the communities where they worked. For fear of being victims of crime, caregivers refrained from visiting some health facilities, especially during evenings and at night, which they considered unsafe. Accounts abound of PHCs where health care providers were resident until the rise of insecurity. The implication is that in such facilities, emergency services could no longer be provided round the clock. In some communities, health care providers worked only a couple of hours. The influence of the state of insecurity on health care providers was summed up in these words:

I don't know what is disturbing the [health care] workers. They don't come to work as expected [i.e., regularly] …. They are complaining of insecurity, but we have organised vigilante in this village, yet they still don't want to stay
(Male FGD, Umuoko, Omumma, Rivers State, South South).

Caregivers were also affected as the quote below suggests:

…when there is robbery or kidnapping and there is also police shoot-out with armed robbers on major roads, it will be difficult for anybody to take a pregnant woman to the health facility … Sometimes it happens at midnight and if a woman wants to go to the hospital, she may encounter some [cult] groups …
(Male FGD, Umuoko, Omumma LGA, Rivers State, South South).

In affected communities, many health care providers go to work late and close early to avoid being caught in the crossfire of gang/inter-communal wars or being victims of other forms of criminality. Even in communities where the problem of insecurity was not as pronounced, some caregivers saw accessing health care services at night as a major barrier. Ambulance services were never available for emergencies, many of which occurred at night, often leaving caregivers stranded for hours.

When caregivers' efforts to access health care services in health centres failed, they switched to other alternatives, as this study participant explained:

… the nurses in this hospital giving treatment, when they don't come in good time, people who bring sick people who have waited and are tired [of waiting] will go to the chemist
(Male FGD, Edok, Orue-Offong/Oruko, Akwa Ibom, South South).

3.2.3 COMMUNITY-LEVEL FACTORS

Socio-cultural context

The practice of seclusion of women was found to influence child health care in the North West, North East and parts of the North Central Zones. This practice prohibits women in seclusion from going out of their homes without the permission of their husbands. It also prohibits men other than husbands of women in

seclusion from having physical access to them. This explains why husbands were reluctant to permit their wives to visit health facilities (where many of the service providers were men) to seek care for themselves or their children. A female caregiver summed up the restrictiveness of the practice:

You know, we are always at home. We do not interact much with people outside our compound
(Female caregiver, 35 years, Zoma, Magama LGA, Niger State, North Central).

Explaining why men may not permit their wives to access services in health facilities, a study participant said:

Some men don't allow their wives because the doctor in the health care centre is a man. Some don't even allow their wives to go for antenatal care for the same reason
(Male FGD participant, Danjema, Gwandu LGA, Kebbi State, North West).

In support of the observation that the sex of service providers may be a barrier to accessing health care services by caregivers, another community member said:

We need female doctors to attend to our wives and children because we are not really comfortable with male doctors examining them
(Male FGD participant, Danjema, Gwandu LGA, Kebbi State, North West).

The socio-cultural context, especially in the northern parts of the country, exclude women, who were often the caregivers, from decision-making on child health care, placing the responsibility of care on men who were often not physically present to perform this role and disempowering women and households economically. This context influenced the timeliness of care-seeking for children, choice of treatment among available options, and availability of funds for care, all of which influenced child health care outcomes.

Environmental hygiene

A major community-level factor that affected child health outcomes, especially in the Northern Zones, was community hygiene practices which may compromise the health of under-fives. In many communities, people and livestock shared the same water source. Where wells were used, there was no adequate arrangement for ensuring good water quality. In addition, open defecation was common and household waste was poorly managed. These environmental hygiene factors contributed to child morbidity.

3.2.4 ENABLING FACTORS

Several efforts to promote child health were documented across the states included in the study. The government's basic immunisation and awareness campaign outreach programmes increased caregivers' awareness of existing child health intervention programmes and access to preventive care in many of the study communities. In some communities, caregivers mentioned the distribution of insecticide-treated nets as an incentive to mothers who complied with recommended basic immunisations for children. In addition to government efforts to improve child health and reduce child mortality, NGOs were involved in building the capacities of health facilities to improve child health outcomes through the provision of equipment and facility upgrades. Scaling up such initiatives to ensure wider coverage is essential for significantly reducing child mortality in Nigeria.

Table 74 presents an overview of key contextual factors influencing child health and mortality in specific locations (states and regions) in Nigeria.

Table 74: Key contextual issues in under-five mortality by state/geopolitical zone

Zone/State	Poverty	Rural life	Health beliefs	Family-level decision-making	Insecurity	Poor access to health facilities	Cultural practices
North Central							
Niger	✓	✓	-	✓	-	✓	
Plateau	✓	✓	-	-	-	✓	
North East							
Bauchi	✓	✓	-	✓	-	✓	✓
Gombe	✓	✓	-	✓	-	✓	✓
North West							
Jigawa	✓	✓	✓	✓	-	✓	
Kebbi	✓	✓	✓	✓	-	✓	
South East							
Ebonyi	✓	✓	✓	-	✓	✓	
Imo	✓	✓	✓	-	✓	✓	
South South							
Akwa Ibom	✓	-	✓	-	✓	-	
Rivers	✓	✓	-	-	✓	-	
South West							
Ekiti	✓	✓	-	-	-	✓	
Osun	✓	✓	✓	-	-	✓	

CHAPTER 4: CONCLUSIONS AND RECOMMENDATIONS

The 2019 Verbal Autopsy and Social Autopsy study, using a mixed methods approach, explored the cause distributions of under-five deaths and documented social and contextual factors contributing to under-five child deaths in Nigeria from 2013 and 2018.

MAJOR CAUSES OF UNDER-FIVE MORTALITY

Infectious disease dominated the cause of death of children under-five overall in the country as well as across the various geopolitical zones of the country.

- In the neonates, infections (sepsis, pneumonia, and meningitis), which made up 44% of deaths, were the leading causes of deaths, closely followed by intrapartum injuries (birth asphyxia/birth trauma) and jaundice/prematurity.

- In children aged 1-59 months, malaria and diarrhoea were the top two causes of death, while pneumonia and meningitis were other major causes.

- The bulk of care and treatment among the children who died occurred in the community and at the primary care level of the health system. Effective approaches to these conditions must reach these levels.

- Care for under-five children is negatively influenced by poverty, poor knowledge of helpful childcare practices, health beliefs and practices that undermine child survival, insecurity, socio-cultural contexts that disempower women and exclude them from child health care decision-making, poorly equipped/staffed facilities, and perceived poor quality of care in health facilities.

Common infectious diseases represent most of the 'unfinished agenda' of child survival. Evidence-based cost-effective interventions exist, but they were not applied in Nigeria with the scale and consistency needed to achieve the level of mortality reduction that other developing countries have reached.

Recommendation 1: Accelerate implementation of key existing intervention programmes to identify and manage newborn infections at community- and first-level health facilities and ensure case management of common childhood illness in the community.

- Improve the implementation of the Integrated Management of Child Illness (IMCI) programme for primary-level facilities and the Integrated Community Case Management (iCCM) strategy to bring accessible, affordable, and quality treatment of common childhood illnesses to the community and primary health care levels.

- Implement guidelines for the management of young infants with signs of possible severe bacterial infection when referral is not possible.

- Expand existing community-based child health preventive services to cover all children at risk (e.g., immunisations, bed nets, Vitamin A supplementation)

The IMCI strategy is proven to improve the clinical skills of first-level health workers in assessment and management of childhood illness. Implementing IMCI holistically involves three components: improving health workers' skills, strengthening health facility support, and improving community practices. iCCM builds

capacity of community health workers to assess, classify, and treat under-five children who have malaria, pneumonia, and diarrhoea and to identify children with malnutrition in the community.

Sepsis, pneumonia, and meningitis in the newborn period are often difficult to distinguish and are referred to as a 'possible severe bacterial infection' when seen in the community or at first-level health facilities. Given the rapid progress and high death rates of these illnesses, immediate assessment and antibiotic treatment is needed to reduce mortality. Health facilities must be able to recognise and manage these conditions when encountering them. The WHO guideline: Managing possible serious bacterial infection in young infants when referral is not feasible[46] is a strategy for community-based assessment and management which has been demonstrated in Nigeria. It provides an affordable method for improving management and outcomes for these conditions in the community or near their home.

People in communities recognised preventive programmes, such as immunisation and bed nets, as measures that could both reduce the incidence of disease, and also help overcome traditional attitudes which may undermine health outcomes to become accepted and appreciated.

PREGNANCY, LABOUR AND DELIVERY

The coverage of antenatal services has been steadily increasing in Nigeria, and this was reflected in the VASA 2019 study, with about three-quarters of women with stillbirths and neonatal deaths reporting having received antennal services. The rates varied among the regions, with the highest coverage rate of 95% in the South West Zone and lowest (63%) in the North West region. The gap for skilled birth attendance or facility delivery is much larger. The South East and the South West have a high rate of facility births (over 80%) compared to the other regions (only 15% the North East and North West).

Complications and symptoms were commonly reported in both pregnancy and labour and delivery. The rate of complications was double for those who had a stillbirth or early neonatal death compared to those with a later death, suggesting that these complications may contribute substantially to these deaths. Overall care-seeking for both pregnancy and labour and delivery related symptoms was limited. The current study did find that women with complications shifted somewhat towards starting antenatal care, or using health facilities and skilled attendants for delivery, however 42% of women whose children died under age one who had labour complications still delivered at home. Those with the earliest deaths shifted mostly to having a facility birth. Having even a portion of women with a symptom or complications in labour and delivery going to a facility for birth caused the mix of high-risk women to shift heavily to facilities, and such births had twice the labour and delivery complication rate as home births (25% vs 12%).

Recommendation 2: Strengthen the implementation of programmes that promote care-seeking for pregnancy and labour/delivery-associated complications and birth preparedness of health care facilities.

- Increase caregiver awareness and training on the importance of antenatal care.
- Engage community leaders, families, and communities to support immediate access to care for women with pregnancy and labour/delivery complications.

[46] Guideline: Managing possible serious bacterial infection in young infants when referral is not feasible. World Health Organization. 2015 52p ISBN 978 92 4 150926 8

- Train enough community midwives and other skilled birth attendants to expand quality antenatal and delivery services, and ensure these services are accessible in all communities such that facility-based skilled attendance at delivery becomes the norm throughout Nigeria.

- Improve the ability of all health facilities to handle the many complications and symptoms common in stillbirths and early neonatal deaths.

If the evidenced-based maternal and child health intervention programmes being implemented in the country are to have significant effect on maternal and child deaths, a strong public health platform, both within and outside of the health facilities, will be necessary to reach a large proportion of the target population. Primary health care is an important route for improving access to skilled birth attendants. Regular training on communication skills of health workers should be stepped up to increase quality of information regarding benefits of antenatal care. The 2009 Communication for Behaviour and Social Change on IMNCH guideline provides guidance to implement communication for behaviour and social change for IMNCH in the areas of health education, community engagement, advocacy, and service improvement at both national and sub-national levels.

The Nigerian Midwives Service Scheme was introduced in 2010 to address lack of sufficient professional staff in maternal health care primary health care centres. Since then, many northern states with the biggest gaps in maternal care have increased training of community midwives and other cadres and have worked to improve staffing at the primary level. This is beginning to show results, but a great deal more is needed in most states to achieve universal coverage.

To address the remarkably high rates of complications associated with stillbirths and early neonatal deaths, facilities providing delivery services also need to be able to handle emergency cases, and to rapidly assess and manage or refer common serious problems. The quality and capacity of maternal care services to address complications are as important to preventing perinatal deaths as expanding service coverage.

NEWBORN RESUSCITATION AND ESSENTIAL NEWBORN CARE COVERAGE

Intrapartum injury is a major cause of death in neonates. Most of the effort to reduce this needs to come from improved care in pregnancy, labour and delivery discussed above, but many newborns with difficulty in breathing can be saved by prompt resuscitation, which can be done at low cost.

Improved coverage of essential care is critical to improve newborn survival rates. Responses to questions about care around the time of birth and feeding revealed many gaps in optimal coverage of essential newborn overall in the country. For example:

- Only 15% of those who died in the newborn period were placed immediately on the mother's chest.

- Only 13% had skin-to-skin contact.

- Only 17% had chlorhexidine applied on the cord stump.

- Bathing was delayed for at least 24 hours in only 4%.

- 20% of neonates who were fed at all received water or juices, which are not recommended.

- Even among preterm births in facilities, few women were instructed in home Kangaroo Mother Care.

Gaps in essential newborn care are especially dangerous to high-risk (e.g. small or preterm) newborns and frequently lead to later complications and death.

Recommendation 3: The government should prioritise the implementation of essential interventions around the time of birth as part of the integrated maternal newborn and child health care package.

- Strengthen community-based newborn care packages for deliveries at home.
- Accelerate competency training for health care providers on essential newborn care packages, such as the Essential Newborn Care Course.
- Train frontline level health care workers on essential newborn care and resuscitation.

The community newborn care package, 'Caring for Newborns at Home', teaches the community health worker how to conduct home visits to pregnant women to promote antenatal care and planning for skilled birth, as well as home visits for newborns and mothers to advise on appropriate home care for the newborn and mothers at homes.

The 2016 Nigerian Every Newborn Action Plan's essential care for newborns includes 'hygienic practices, temperature maintenance, early skin-to-skin contact after birth, cord and eye care, early exclusive breastfeeding, and early quality postnatal care'. It also promotes the scale-up of the use of 4% chlorhexidine gel to reduce the chance of neonatal infection.

Skilled birth attendants need to know how to resuscitate newborns (as is included in training packages such as 'Helping Newborns Breathe') and be able to provide this immediately after birth in all delivery locations.

BARRIERS TO CARE FOR NEWBORNS AND INFANTS

About 50% of caregivers of neonatal deaths did not seek care for the fatal illness. Even for deaths in the 1-59-month age group, only 65% were ever seen by a health provider. Considerations such as the cost implication of seeking care for the sick child, family problems such as the need for women to obtain permission to leave the home, transportation to health facilities, and inability to travel at night due to insecurity were commonly identified obstacles to accessing health care. The 2019 VASA study revealed repeated cases where caregivers experienced difficulty accessing modern health facilities because of these barriers, leading to a preference for local sources of informal or home care for their children who eventually died.

Fatalistic beliefs leading to feelings of helplessness may have been influenced by the overwhelming barriers to care that caregivers faced. When health care facilities are so far away from the people and/or out of their reach because of their poverty, they may seek psychological support from the belief that God decided whether a child lived or died.

Recommendation 4: The government should not focus only on health service provision but should also accelerate implementation of policies and programmes to increase accessibility to health facilities for maternal and child care.

- Enhance access to health care through provision and enhancement of infrastructure such as roads, safe drinking water, and sanitation and ensure security of lives and property.

- Remove or reduce financial barriers to child health care, including the cost of registration, laboratory tests, drugs, and other health care related costs.

Most state governments in Nigeria claimed they offer free maternal and child health services. However, the study showed that such services were not free, as essential medicines and supplies were generally out of stock and families had to pay for them. The health centres also lacked basic facilities such as test kits, and the health workers were often not motivated. An effective 'free' programme requires sufficient and reliable government funding to be free in practice, and all levels of government in Nigeria need to increase their financial support for primary health care.

CONTEXTUAL FACTORS FOR HEALTH BELIEFS AND DECISION-MAKING

The way caregivers handled child illness was determined by a variety of community-level factors (e.g., prevailing health beliefs and family-level decision-making), all of which are important for understanding the context of child health care. Another relevant cultural factor can be pressure from mothers-in-law and other community members to choose health care paths that may lead to the death of their children.

What caregivers did when their children fell ill also depended on their perceptions on ease of access to or barriers to accessing health care services. Their perceptions were often influenced by previous personal experiences or the experiences of others around them. When caregivers perceived barriers like distance, cost of accessing care, inability to get permission to visit the health facility, poor quality of care, etc., as too onerous, they often chose alternatives such as procuring drugs without medical examination or using herbal medicine.

Recommendation 5: The government should improve the implementation of simple community-based behavioural change programmes to improve caregivers' knowledge of preventive care and their responsiveness in seeking care for children. Nigeria should also address the problems of poverty and the disadvantaged situation of women.

- Improve health education to address misconceptions about child health care, and implement programmes to address personal and environmental hygiene practices through multiple channels, including the media and basic education curriculum.

- Enhance the implementation of programmes and interventions targeted at reducing poverty among women through skills acquisition programmes and increased access to capital. Such programmes will help to increase their involvement in child health care decision-making.

- Behaviour change communication should be targeted to health workers to ensure improved service provision and reduce misguided advice for caregivers. Health care workers, like other community members, who hold some health beliefs with negative implications for childcare and survival should also be targeted. Health care workers volunteer such beliefs to caregivers, and their position of assumed expertise makes it easy for caregivers to believe them and accept their suggestions. If they recommend sound health practices, on the other hand, caregivers will likewise consider such reliable information.

ADDITIONAL TABLES

Table A1: Ages at death distribution in the full 2019 VASA sample

	No.	%
Ages at death – groups		
0-6 days	804	13.1
7-27 Days	170	12.4
1-11 Months	763	23.7
1-4 Years	1,388	46.0
Ages at death – years of age		
<1	1,737	54.0
1	528	16.0
2	539	17.0
3	259	8.0
4	152	5.0
Total	3,215	100

Table A2: Year of death in the full 2019 VASA sample

	No.	%
Year of death		
2018	617	19.2
2017	701	21.8
2016	697	21.7
2015	642	20.0
2014	558	17.4
Total	3,215	100

Table A3: Duration of final illness, behaviour prior to illness and sudden death in neonates

	Duration of illness				Behaving normally prior to illness	Died 'Suddenly' (<24 hours)	Total
	<1 day	1 day	2-6 days	1-4 weeks			
	%	%	%	%	%	%	No.
Ages at death							
0 Day	99.3	na	na	na	35.1	na	276
1 Day	41.7	56.5	na	na	43.5	67.6	108
2-6 Days	25.3	19.2	55.6	na	64.6	40.4	198
7-27 Days	15.1	11.0	47.1	26.2	85.5	34.3	172
Total	52.4	15.6	25.7	6.0	55.6	44.4	754

na = not applicable

Table A4: Age when fatal illness started in neonates

	Age when final illness started				Total cases
	First day	Day 1	Days 2-6	Days 7-27	
	%	%	%	%	No.
Ages at death					
0 Day	98.9	na	na	na	276
1 Day	54.6	45.4	na	na	108
2-6 Days	20.7	15.2	64.1	na	198
7-27 Days	8.7	2.9	22.1	66.3	172
Total	51.5	11.1	22.1	15.1	754

na = not applicable

Table A5: Duration of final illness, growth prior to illness and sudden death in children 1-59 months

	Duration of illness					Growing normally before final illness	Died 'Suddenly' (<24 hours)	Total
	<1 day	1 day	2-6 days	1-4 weeks	1+ months			
	%	%	%	%	%	%	%	No.
Ages at death								
1-11 months	7.0	7.0	37.6	35.1	13.0	90.5	16.4	676
1-4 years	6.8	8.2	37.0	35.2	12.5	93.5	17.2	1,451
Zone								
NC	7.3	7.3	45.2	30.7	9.2	92.7	12.9	303
NE	5.2	7.3	40.5	34.4	12.7	93.1	15.7	479
NW	6.5	8.3	32.4	39.6	13.0	91.3	19.8	1,042
SE	10.1	7.2	40.6	26.1	15.9	97.1	13.8	138
SS	4.0	7.0	38.0	32.0	18.0	95.0	8.0	100
SW	21.5	9.2	46.2	13.8	7.7	95.4	21.5	65
Total	6.9	7.8	37.3	35.2	12.6	92.6	17.0	2,127

Table A6: Symptoms at time of birth for stillbirths and neonatal deaths

	Never cried	Never moved	Never breathed	Total cases
	%	%	%	No.
Ages at death				
Stillbirth	100.0	100.0	100.0	193
0 Day	38.0	14.1	13.4	276
1 Day	12.0	2.8	1.9	108
2-6 Days	7.1	1.5	2.0	198
7-27 Days	2.3	2.3	1.7	172
Total	34.7	25.6	25.2	947

Table A7: Newborn crying at birth and delayed crying for stillbirths and neonatal deaths

	Never cried	Crying delayed five minutes or more	Total cases
	%	%	No.
Age of death			
Stillbirth	100.0	na	193
0 Day	37.7	13.8	276
1 Day	12.0	26.9	108
2-6 Days	7.1	19.7	198
7-27 Days	2.3	14.0	172
Total	34.6	13.7	947

na = not applicable

Table A8: Stopped being able to cry among those able to cry at birth – neonatal deaths

	Stopped being able to cry	Stopped crying five or more hours before death	Total ever cried
	%	%	No.
Ages at death			
0 Day	4.1	7.0	172
1 Day	11.1	10.5	95
2-6 Days	3.8	7.1	184
7-27 Days	1.4	2.4	168
Total	4.4	6.3	619

Table A9: Breathing after birth and assistance to breathe among neonatal deaths

	Breathed immediately after birth?	Had a breathing problem?	Given assistance to breathe?	Total ever breathed	With problem given assistance
	%	%	%	No.	%
Ages at death					
0 Day	97.5	22.2	11.3	239	50.9
1 Day	96.2	32.1	11.3	106	35.3
2-6 Days	98.5	20.6	8.8	194	42.5
7-27 Days	99.4	5.3	2.4	169	44.4
Place of birth					
Facility	98.3	22.8	15.9	290	69.7
Home/other	97.8	16.7	3.3	418	20.0
Total	98	19.2	8.5	708	58.3

Table A10: Bruises or signs of injury on the baby's body after birth for stillbirths and neonatal deaths

	Yes	Cases
	%	No.
Age at death		
Stillbirth	7.8	193
0 Day	4.0	276
1 Day	2.8	108
2-6 Days	4.0	198
7-27 Days	2.3	172
Total (live births)	3.4	947

Table A11: Deaths associated with injury by type

	%	No.
Type of injury		
Traffic accident	31.1	19
Drowning	21.3	13
Fall	11.5	7
Snake bite	8.2	5
Burns or fire	6.6	4
Non-traffic road accident	4.9	3
Poisoning	3.3	2
Blunt force	3.3	2
Stabbed/pierced	1.6	1
Trauma from animal	1.6	1
Force of nature	1.6	1
Other/unspecified	3.3	2
Don't know/not witnessed	1.6	1
Total	100.0	61

Table A12: Injury deaths by age group and geopolitical zone

	Injury deaths		Cases
	%	No.	No.
Age group			
Neonatal	0.8	6	754
1-11 months	2.1	14	676
1-4 years	2.8	41	1451
Zone			
NC	2.6	11	419
NE	2.2	15	671
NW	1.6	22	1338
SE	2.5	5	198
SS	2.6	4	152
SW	3.9	4	103
Total	2.1	61	2881

Table A13: 2019 Reported malaria testing and results among child deaths age 1-59 months with fever

	Any malaria test	Positive only	Negative only	Both positive and negative*	Cases with fever
	%	%	%	%	No.
Provider					
Government hospital	63.2	44.3	7.3	11.6	424
Other government	59.4	44.6	4.2	10.6	471
Private	55.0	38.5	12.0	4.5	200
Pharmacy/PMV (child examined)	39.8	26.3	3.8	9.8	133
Community worker	48.7	25.6	7.7	15.4	39
No health provider	17.7	13.0	2.8	1.9	470
All cases with fever	46.7	33.3	5.6	7.9	1744

* Respondent said 'Yes' to both the question about a positive malaria test and the question about a negative malaria test in the final illness.

Note: 18% of cases with no fever also reported a malaria test.

Table A14: Blood test for malaria among children with recent fever – DHS 2018 (weighted)

	Blood test		Fever cases
	No	%	No.
Provider			
Government hospital	209	38.8	537
Other government	495	32.7	1,516
Private	95	36.9	258
Pharmacy/PMV (all)	164	5.6	2,930
Other	10	3.2	304
No treatment	71	3.6	1,959
All children with fever	1,027	13.8	7,466

Table A15: Maternal diagnosis of HIV

	No.	%
Had HIV test in past	1,193	41.4
Was told she had HIV/AIDS	18	0.6
Total	2,880	100.0

Table A16: Fever and cough in neonates and children

	Fever	Child had a fever			Cough	Had whoop among those with cough	Number
		Duration of fever		Continued until death			
		Median	IQR				
	%	Days	Days	%	%	%	No.
Ages at death							
0 day	4.4	0	0	4.4	2.5	0.0	276
1 day	20.4	1	0 – 1	19.4	2.9	0.0	108
2-6 days	40.9	2	1 – 2	40.9	4.6	0.5	198
7-27 days	54.5	3	2 – 4	48.8	11.6	3.5	172
1-11 months	78.9	5	2 – 7	70.3	22.0	6.2	676
1-4 years	83.5	5	2 – 8	70.9	19.5	4.5	1,451
Zone							
NC	58.8	4	2 – 7	63.7	23.4	5.0	419
NE	65.1	4	2 – 8	62.0	17.6	4.6	671
NW	70.0	4	2 – 7	59.9	14.6	3.9	1,338
SE	51.6	4	2 – 14	53.0	13.6	3.0	198
SS	58.0	5	3 – 7	50.7	18.4	2.0	152
SW	35.2	3	1 – 4	34.0	4.9	1.0	103
Total	63.6	4	2 – 7	59.1	16.4	4.0	2,881

Table A17: Details of fever for children 1-59 months

	Had fever		Severity (if had fever)			Fever pattern (if had fever)			Night sweats	Total cases
			Mild	Moderate	Severe	Continuous	On & Off	Only at night		
	%	No.	%	%	%	%	%	%	%	No.
Age of death										
1-11 months	78.9	533	6.7	36.0	57.2	49.7	48.8	1.3	20.3	676
1-4 years	83.5	1,211	5.9	34.7	59.5	46.7	51.3	1.8	22.9	1,449
Zone										
NC	82.8	251	4.4	29.1	66.1	51.8	45.8	2.4	26.4	303
NE	83.3	399	2.8	35.3	61.9	50.6	47.1	2.3	17.5	479
NW	83.6	871	6.8	40.8	52.5	42.6	55.8	1.5	25.6	1,041
SE	75.4	104	5.8	28.9	65.4	68.3	31.7	0.0	15.2	138
SS	74.0	74	21.6	4.1	74.3	50.0	50.0	0.0	9.0	100
SW	69.2	45	6.7	22.2	71.1	44.4	48.9	2.2	12.3	65
Total	82.0	1,744	6.1	35.1	58.8	47.7	50.5	1.7	22.1	2,125

Note: Two cases have missing data.

Table A18: Details of cough for children 1-59 months

	Had cough		Among children with a cough					Total cases
			Duration of cough		Productive cough	Very severe cough	Coughed up blood	
			Median	IQR				
	%	No.	days	days	%	%	%	No.
Ages at death								
1-11 months	22.0	149	4	3 – 10	40.3	42.3	2.7	676
1-4 years	19.5	283	4	3 – 7	44.5	36.0	3.5	1,449
Zone								
NC	30.7	93	3	3 – 7	30.1	38.7	3.2	302
NE	22.1	106	4	2 – 7	48.1	41.5	2.8	479
NW	17.5	182	5	3 – 10	50.0	34.6	3.3	1,041
SE	16.7	23	7	2 – 14	34.8	43.5	8.7	138
SS	23.0	23	5	3 – 7	30.4	47.8	0.0	100
SW	7.7	5	3	2 – 3	20.1	20.0	0.0	65
Total	20.3	432	4	3 – 7	43.1	58.8	3.2	2,125

Note: Two cases had missing data.

Table A19: Respiratory symptoms in neonates

	Difficulty breathing	Duration (days)		Fast breathing	Breath - lessness	Chest indrawing	Breath sounds				Number of Children age 0-27 days
		Median	IQR				Stridor	Grunting	Wheezing	None of these	
	%	days	days	%	%	%	%	%	%	%	No.
Ages at death											
0 day	17.8	0	0-0	7.3	10.1	3.3	3.3	14.1	1.1	79.0	276
1 day	36.1	1	0 – 1	22.2	15.7	12.0	12.0	10.2	0.9	73.2	108
2-6 days	23.2	2	1 – 3	19.2	8.1	13.7	7.6	13.1	5.1	72.7	198
7-27 days	12.8	2	1 – 5	13.4	9.3	12.8	3.5	18.0	2.3	72.1	172
Zone											
NC	19.0	0	0 – 2	8.6	8.6	8.6	5.2	19.0	0.9	74.1	116
NE	19.8	1	0 – 2	20.3	20.3	12.0	6.8	14.1	3.1	76.0	192
NW	21.3	1	0 – 2	14.2	14.2	10.1	6.4	16.2	3.4	69.6	296
SE	13.3	0	0 – 0.5	10.0	10.0	1.7	1.7	11.7	0.0	83.3	60
SS	28.9	0	0 – 2	11.5	11.5	9.6	3.9	5.8	1.9	80.8	52
SW	23.6	0	0 – 1	5.3	5.3	5.3	5.3	0.0	0.0	92.1	43
Total	20.7	1	0 – 2	13.9	10.2	5.7	14.2	2.4	74.9	2.8	754

Note: Median duration and IQR fast breathing and breathlessness is similar to that for difficulty breathing.

Table A20: Respiratory symptoms in children 1-59 months – difficulty breathing and fast breathing

	Had difficulty breathing		Among those with difficulty breathing				Fast breathing	Had fast breathing		Total Children age 1-59 months
			Duration		Pattern			Duration (days)		
			Median	IQR	Continuous	Off and On		Median	IQR	
	%	No.	days	days	%	%	%	days	days	No.
Ages at death										
1-11 months	19.1	129	3	2 – 6	62.8	34.1	19.7	2	1 – 3	676
1-4 years	14.3	208	3	1 – 5	55.3	42.3	17.4	2	1 – 4	1,451
Zone										
NC	23.1	70	3	2 – 5	55.7	40	18.5	3	1 – 5	303
NE	14.2	68	3	2 – 6	64.7	33.8	19.2	2	1 – 4.5	479
NW	14.1	147	3	1 – 5	53.1	43.5	18.1	2	1 – 3	1,042
SE	16.7	23	2	1 – 4	65.2	34.8	15.9	2.5	1 – 5	138
SS	19	19	4	2 – 7	68.4	31.6	22	2.5	1 – 3	100
SW	15.4	10	0	0 – 3	70	30	6.2	1	0.5 – 1	65
Total	15.8	337	3	1 – 5	58.2	39.2	18.1	2	1-4	2,127

Table A21: Respiratory symptoms in children 1-59 months – breathlessness, indrawing, breath sounds, chest pain

	Breath - lessness	Had breathlessness		Chest indrawing	Breath sounds				Chest pain		Had chest pain		Total Children age 1-59 months
		Duration (days)			Stridor	Grunting	Wheezing	None of these			Duration (days)		
		Median	IQR								Median	IQR	
	%	days	Days	%	%	%	%	%	%	No.	days	days	No.
Age of death													
1-11 months	5.3	1	0 – 2	17	7.3	12.4	3.6	75.4	4.7	32	5	3 – 7	676
1-4 years	4.3	1	1 – 3	14.7	5.8	11.3	3.6	78.6	5.9	86	4	3 – 7	1,451
Zone													
NC	6.9	1	0 – 1	18.5	11.9	7.6	1.7	78.2	4	12	3	2.5 – 5.5	303
NE	1.5	2	2 – 4	12.1	3.6	10.9	5.3	80.4	3.8	18	4.5	3 – 14	479
NW	5.7	1	1 – 2	17.6	5.9	15	3.9	74.1	7.5	78	4.5	3 -7	1,042
SE	2.2	0	0 – 2	6.5	8.7	6.5	0	82.6	2.2	3	8	2 – 14	138
SS	8	2.5	1.5 – 5	14	3	1	4	91	6	6	4	3 – 7	100
SW	1.5	0	0 – 0	12.3	6.2	10.7	1.5	78.5	1.5	1	0	0 – 0	65
Total	4.7	1	0 – 2	15.4	6.3	11.7	3.6	77.6	5.6	118	4	3 – 7	2,127

Table A22: Diarrhoea and vomiting in neonates

	Frequent loose stools		Blood in stools	Vomited	Total Children age 0-27 days (Neonatal)
	%	No.	%	%	No.
Ages at death					
0 day	0.4	1	0	0.7	276
1 day	0	0	0	1.9	108
2-6 days	2	4	0.5	4.6	198
7-27 days	8.1	14	0.6	11.1	172
Zone					
NC	2.6	3	0	4.3	116
NE	1.6	3	0.5	2.6	192
NW	3.4	10	0	4.4	296
SE	0	0	0	3.3	60
SS	5.8	3	1.9	5.8	52
SW	0	0	0	10.5	38
Total	2.5	19	0.3	4.2	754

Note: Among those with loose stools, mean number was 4 per day with IQR of 3-5 days. Duration of illness was median 2 days with IQR of 1-4 days.

Table A23: Diarrhoea in children 1-59 months

	Frequent loose stools		Those who had loose stools							Blood in stools		Had blood Continued until death	Total Children age 1-59 months
			Most in one day		Days had diarrhea		Duration before death		Continued to death				
			Median	IQR	Median	IQR	Median	IQR					
	%	No.	No.	No.	days	days	days	days	%	%	No.	%	No.
Ages at death													
1-11 months	35.1	237	5	4 – 6	4	2 – 7	4	2 – 7	76.8	4.4	29	69.0	676
1-4 years	40.4	586	5	4 – 6	4	2 – 7	4	2 – 8.5	69.6	6.8	99	59.6	1,451
Zone													
NC	31.4	95	5	4 – 6	3	2 – 7	3	2 – 7	79.0	5.6	17	58.8	303
NE	42.8	205	5	4 – 6	4	2 – 8	4	2 – 10	72.7	8.6	41	63.4	479
NW	43.2	450	5	4 – 6	4.5	2 – 8	5	2 – 10	70.7	6.1	64	62.5	1,042
SE	28.3	39	5	4 – 7	3	2 – 5	3	2 – 5	56.4	2.9	4	50.0	138
SS	25.0	25	5	4 – 6	4	3 – 7	4	3 – 7	80.0	2.0	2	50.0	100
SW	13.9	9	5	5 – 6	3	1 – 3	2	2 – 3	66.7	0.0	0	0.0	65
Total	38.7	823	5	4 – 6	4	2 – 7	4	2 – 8	71.7	6	128	128	2,127

Table A24: Vomiting in children 1-59 months

	Vomited		Those who vomited		Total Children age 1-59 months
			Blood in vomit	Vomitus black	
	%	No.	%	%	No.
Ages at death					
1-11 months	34.0	230	5.3	9.7	676
1-4 years	38.8	563	4.4	11.0	1,451
Zone					
NC	42.9	130	6.2	16.2	303
NE	43.2	207	5.4	7.9	479
NW	34.2	356	3.9	12.1	1,042
SE	34.1	47	8.5	8.5	138
SS	32.0	32	0.0	0.0	100
SW	32.2	21	0.0	0.0	65
Total	37.3	793	4.7	10.6	2,127

Table A25: Abdominal symptoms in children 1-59 months – pain

	Abdominal Pain		Those who had abdominal pain							Total Children age 1-59 months
			Severe	Duration of pain		Location of pain				
				Median	IQR	Upper	Lower	Both	Don't know	
	%	No.	%	days	days	%	%	%	%	No.
Age of death										
1-11 months	8.7	59	49.2	5	2 – 7	15.3	22	47.5	15.3	676
1-4 years	15.9	230	44.8	3	2 – 7	10.4	22.6	47.8	19.2	1,451
Zone										
NC	12.9	39	51.3	3	2 – 5	5.1	41	38.5	15.4	303
NE	11.5	55	45.5	5	2 – 14	12.7	20	58.2	9.1	479
NW	15.6	163	43.6	3	2 – 7	11.7	18.4	49.7	20.3	1,042
SE	10.1	14	57.1	3	2 – 7	7.1	21.4	42.9	28.5	138
SS	11	11	54.6	7	3 – 14	27.3	36.4	18.2	18.2	100
SW	10.8	7	28.6	1	0.04 – 2	14.3	14.3	28.6	42.9	65
Total	13.6	289	45.7	3	2 – 7	11.4	22.5	47.8	18.4	2,127

Table A26: Abdominal symptoms in children 1-59 months – protrusion and mass

	Protruding abdomen		Those who had protruding abdomen				Mass in abdomen		Total Children age1-59 months
			Duration of protruding abdomen		Speed with which it developed				
			Median	IQR	Rapid	Slow			
	%	No.	days	Days	%	%	%	No.	No.
Ages at death									
1-11 months	9.3	63	3	2 – 7	54	46	1.5	10	676
1-4 years	8.5	123	3	2 – 7	39.8	59.4	2.1	30	1,451
Zone									
NC	6.6	20	3	1.5 – 7	40	60	1.3	4	303
NE	8.6	41	3	2 – 10	65.9	34.2	2.5	12	479
NW	10.4	108	3	2 – 7	40.7	58.3	1.6	17	1,042
SE	6.5	9	3	2 – 5	11.1	88.9	2.2	3	138
SS	6	6	7	5 – 10	16.7	83.3	3	3	100
SW	3.1	2	3.5	2 – 5	100	0	1.5	1	65
Total	8.7	186	3	2 – 7	44.6	54.8	1.9	40	2,127

Table A27: Head and neck symptoms in children 1-59 months

	Severe Headache	Stiff Neck		Painful neck		Total Children age 1-59 months
	%	%	No.	%	No.	No.
Ages at death						
1-11 months	8.6	4.1	28	2.2	15	676
1-4 years	14.2	4.8	70	2.3	34	1,451
Zone						
NC	12.9	6.3	19	5.0	15	303
NE	17.1	2.7	13	1.3	6	479
NW	12.2	5.8	60	2.3	24	1,042
SE	6.5	0.0	0	0.0	0	138
SS	6.0	5.0	5	4.0	4	100
SW	1.5	1.5	1	0.0	0	65
Total	12.4	4.6	98	2.3	49	2,127

Note: Median duration of stiff neck was 2 days with IQR of 1-4 days. Median duration of painful neck was 1 day with IQR within one day

Table A28: Unconsciousness in children 1-59 months

	Had Unconsciousness		Those who had unconsciousness				
			More than 24 hours before death	Duration of unconsciousness		Started quickly (<24 hours)	Continued to death
				Median	IQR		
	%	No.	%	hours	hours	%	%
Ages at death							
1-11 months	12.9	87	29.9	2	0 – 24	82.8	55.2
1-4 years	16.3	237	16.0	2	0 – 5	88.2	51.1
Zone							
NC	14.5	44	40.9	2	0 – 48	86.4	68.2
NE	12.3	59	17.0	3	1 – 24	91.5	37.3
NW	18.0	187	11.8	2	0 – 5	87.2	47.1
SE	8.7	12	41.7	16.5	0 – 48	50.0	83.3
SS	11.0	11	45.5	2	0 – 3	100.0	100.0
SW	16.9	11	36.4	0	0 – 2	81.8	72.7
Total	15.2	324	19.8	2	0 – 6	86.7	52.2

Table A29: Convulsions in children 1-59 months

	Had convulsions		Those who had convulsions				Total Children age 1-59 months
			Generalised convulsions	Duration of convulsions		Unconscious after convulsion	
				Median	IQR		
	%	No.	%	minutes	minutes	%	No.
Ages at death							
1-11 months	17.2	117	82.9	5	3 – 10	35.9	676
1-4 years	15.7	228	84.2	5	3 – 20	52.2	1,451
Zone							
NC	17.5	53	67.9	6	3 – 20	56.6	303
NE	11.5	55	83.6	5	3 – 10	43.6	479
NW	14.3	149	87.3	5	3 – 15	49.7	1,042
SE	34.8	48	91.7	5	3 -10	25.0	138
SS	28.0	72	85.7	5	3 – 10	42.9	100
SW	18.5	12	75.0	12.5	5 – 25	75.0	65
Total	16.2	345	83.8	5	3 – 15	46.7	2,127

Table A30: Unconsciousness, convulsions and cold to touch for neonates

	Unconscious		Body stiff and arching backwards	Had convulsions		Cold to touch		Was cold to touch		Was baby lethargic after normal activity	Total Children age 0-27 days (Neonatal)
				Within 24 hours of birth	After 24 hours of birth			Duration of cold to touch			
								Median	IQR		
	%	No.	%	%	%	%	No.	days	Days	%	No.
Ages at death											
0 day	10.1	28	0.4	2.2	0.0	12.3	34	0	0 – 0	28.6	276
1 day	13.9	15	0.0	1.9	0.9	19.4	21	0	0 – 1	40.7	108
2-6 days	10.1	20	1.0	3.5	3.1	13.1	26	1	0 – 2	38.4	198
7-27 days	14.0	24	1.7	1.7	0.6	16.3	28	6.5	2 – 9	36.6	172
Zone											
NC	11.2	13	0.9	2.6	0.0	10.3	12	1	0 – 2	12.9	116
NE	3.1	6	0.0	1.6	1.1	21.4	41	0	0 – 1	45.8	192
NW	14.9	44	1.4	2.7	0.7	14.5	43	0	0 – 4	41.2	296
SE	26.7	16	0.0	3.3	1.7	3.3	2	1	0 – 2	26.7	60
SS	7.7	4	1.9	3.9	6.0	21.2	11	1	0 – 3	34.6	52
SW	10.5	4	0.0	0.0	0.0	0.0		No obs.		7.9	38
Total	11.5	87	0.8	2.4	1.1	14.5	109	0	0 – 2	34.8	754

For neonates who had unconsciousness the median Duration was one day with IQR of 1-2 days.

Table A31: Skin symptoms, bleeding and jaundice in neonates

	Any skin rash	Places on skin turned black	Redness or swelling on skin	Red or pus on umbilical stump	Ulcers on the skin	Bled from anywhere	Yellow skin palms or soles	Yellow eyes	Total Children age 0-27 days (Neonatal)
	%	%	%	%	%	%	%	%	No.
Ages at death									
0 day	0.0	1.8	2.2	2.9	0.4	1.8	4.0	6.2	276
1 day	2.8	8.3	3.7	2.9	0.9	1.9	6.5	12.0	108
2-6 days	1.5	2.0	2.5	8.1	1.0	2.5	15.2	26.8	198
7-27 days	4.7	5.2	2.3	7.0	4.1	4.7	15.1	23.3	172
Zone									
NC	1.7	2.6	0.0	6.0	0.9	2.6	6.9	14.7	116
NE	2.1	4.7	2.6	4.7	0.5	1.0	9.9	18.8	192
NW	1.7	4.7	3.0	6.1	2.7	2.7	12.8	18.9	296
SE	0.0	0.0	0.0	1.7	1.7	5.0	3.3	10.0	60
SS	5.8	1.9	7.7	5.8	0.0	5.8	13.5	13.5	52
SW	0.0	0.0	2.6	2.6	0.0	2.6	0.0	2.6	38
Total	1.9	3.6	2.5	5.2	1.5	2.7	9.8	16.3	754

Table A32: Urinary symptoms in children 1-59 months of age

	Any urinary problems		Those who had urinary problem			Total Children age 1-59 months
			More than usual	Blood in urine	Stopped urinating	
	%	No.	%	%	%	No.
Ages at death						
1-11 months	3.6	24	*	*	*	676
1-4 years	3.7	54	*	*	*	1,451
Zone						
NC	3.0	9	*	*	*	303
NE	5.2	25	*	*	*	479
NW	3.7	38	*	*	*	1,042
SE	1.5	2	*	*	*	138
SS	3.0	3	*	*	*	100
SW	1.5	1	*	*	*	65
Total	3.7	78	29.5	5.1	53.9	2,127

Note: Total with urinary problems (78) is too small to support sub-analysis.

Table A33: Skin rash and symptoms children 1-59 months

	Any skin rash		Those who had rash										Total Children age 1-59 month
			Duration		Location on body				'Measles rash'	Skin flaked off in patches	Places on skin turned black	Redness or swelling on skin	
			Median	IQR	Face	Trunk/ Abdomen	Extremities	Every-where					
	%	No.	days	Days	%	%	%	%	%	%	%	%	No.
Ages at death													
1-11 months	7.8	53	7	3-14	7.6	5.7	17.0	69.8	37.7	4.1	5.0	3.1	676
1-4 years	7.2	105	7	3-10	6.7	8.6	8.6	76.2	66.7	6.4	5.4	3.7	1,451
Zone													
NC	5.9	18	3.5	3-8	0.0	11.1	11.1	77.8	38.9	2.6	6.9	2.3	303
NE	8.8	42	7	4-12	2.4	4.8	4.8	88.1	59.5	5.9	5.2	3.1	479
NW	8.6	90	7	4-14	11.1	7.8	14.4	66.7	61.1	7.8	6.0	4.5	1,042
SE	2.9	4	6	3.5-14	0.0	0.0	0.0	100.0	25.0	0.7	0.7	0.7	138
SS	3.0	3	3	3-7	0.0	33.3	0.0	66.7	33.3	3.0	3.0	2.0	100
SW	1.5	1	3	na	0.0	0.0	100.0	0.0	100.0	0.0	0.0	4.6	65
Total	7.4	158	7	3-12	7.0	7.6	11.4	74.1	57.0	5.7	5.3	3.5	2,127

Table A34: Skin sores and ulcers children 1-59 months

	Sores or ulcers on the skin		Had sores	Ulcer on foot		Had foot ulcer		Total Children age 1-59 months
			Sore had clear fluid or pus			Oozed pus	Duration of oozing	
	%	No.	%	%	No.	%	Range (days)	No.
Age of death								
1-11 months	4.6	31	*	0.3	2	*	*	676
1-4 years	3.4	49	*	0.8	12	*	*	1,451
Zone								
NC	3.3	10	*	1.3	4	*	*	303
NE	3.1	15	*	0.0	0	*	*	479
NW	4.6	48	*	0.9	9	*	*	1,042
SE	0.7	1	*	0.0	0	*	*	138
SS	2.0	2	*	1.0	1	*	*	100
SW	6.2	4	*	0.0	0	*	*	65
Total	4.8	80	58.8	0.7	14	35.7	10 - 56	2,127

* too few cases to support further analysis

Table A35: Bleeding and jaundice in children 1-59 months

	Bled from anywhere		Had bleeding	Yellow eyes		Had yellow eyes		Total Children age 1-59 months
			From mouth, nose or anus			Duration of time		
						Median	IQR	
	%	No.	%	%	No.	days	days	No.
Age of death								
1-11 months	1.8	12	41.7	17.3	117	3	2 – 7	676
1-4 years	1.7	25	76.0	19.1	277	3	2 – 6	1,451
Zone								
NC	1.3	4	75.0	20.1	61	3	2 – 6	303
NE	1.3	6	50.0	20.5	98	3	2 – 5	479
NW	1.5	16	56.3	17.8	185	3	2 – 7	1,042
SE	4.4	6	100.0	10.9	15	4	2 – 10	138
SS	3	3	66.7	33.0	33	3	2 – 4	100
SW	3.1	2	50.0	3.1	2	5.5	5 – 6	65
Total	1.7	37	64.9	18.5	394	3	2 – 6	2,127

Table A36: Weight loss, hair change, pallor, white mouth rash in children 1-59 months

	Noticeable weight loss	Severely thin or wasted	Whitish rash in mouth	Red or yellowish hair change	Looked pale in palms, eyes, nails	Total Children age 1-59 months
	%	%	%	%	%	No.
Age of death						
1-11 months	43.3	17.8	12.7	4.7	29.4	676
1-4 years	52.2	18.9	18.1	7.2	33.4	758
Zone						
NC	34.3	14.2	15.2	5.6	31.7	303
NE	53.4	23.8	16.1	7.1	38.4	479
NW	55.0	19.5	20.5	7.8	30.8	1,042
SE	37.0	13.0	3.6	0.0	21.7	138
SS	50.0	13.0	2.0	4.0	37.0	100
SW	26.2	4.6	4.6	0.0	24.6	65
Total	49.4	18.5	16.3	6.4	32.2	2,127

Table A37: Sunken eyes and thirst in children 1-59 months

	Sunken eyes	Drank more than usual	Total Children age 1-59 months
	%	%	No.
Ages at death			
1-11 months	24.4	26.6	676
1-4 years	29.8	40.0	758
Zone			
NC	23.1	13.9	303
NE	37.2	47.8	479
NW	30.0	42.9	1,042
SE	13.0	13.0	138
SS	14.0	19.0	100
SW	6.2	9.2	65
Total	28.1	35.8	2,127

Table A38: Puffiness and swelling in children 1-59 months

	Puffiness in face		Had face puffiness		Swollen legs or feet		Those who had swelling			Generalised puffiness over body	Total Children age 1-59 month
			Duration				Duration		Both feet swollen		
			Median	IQR			Median	IQR			
	%	No.	Days	days	%	No.	days	days	%	%	No.
Age of death											
1-11 months	2.1	14	3.5	2 – 7	3.9	26	4.5	3 – 7	88.5	1	676
1-4 years	7.2	104	3	2 – 7	11.5	167	4	2 – 7	95.8	3	758
Zone											
NC	4.0	12	3	1.5 – 6.5	5.6	17	3	2 – 7	94.1	2.3	303
NE	6.9	33	3	2 – 7	9.2	44	5	3 – 10	100.0	1.9	479
NW	6.4	67	4	2 – 7	11.6	121	4	2 – 7	95.0	3.3	1,042
SE	0.7	1	7	7 – 7	3.6	5	3	1 – 3	60.0	0.7	138
SS	3.0	3	3	1 – 7	3.0	3	4	2 – 7	100.0	0	100
SW	3.1	2	3	2 – 4	4.6	3	4	2 – 28	66.7	0	65
Total	5.6	118	3	2 – 7	9.1	193	4	2 – 7	94.8	2.4	2,127

Table A39: Paralysis and lumps on body in children 1-59 months

	Paralysed in any way		Lumps anywhere on body		Total Children age 1-59 month
	%	No.	%	No.	No.
Ages at death					
1-11 months	0.9	6	1.5	10	676
1-4 years	1.1	16	1.7	24	758
Zone					
NC	1.0	3	1.0	3	303
NE	0.4	2	0.6	3	479
NW	1.3	14	2.3	24	1,042
SE	0.7	1	2.2	3	138
SS	1.0	1	0.0		100
SW	1.5	1	1.5	1	65
Total	1.0	22	1.6	34	2,127

Note: Among 22 children with paralysis, 41% had it on only one side of the body. Specific locations were right side 9%, left side 9%, lower body 23%, upper body 5%, one leg 14%, one arm 55%, and whole body 36%.

Among 34 children with lumps, 59% were in the neck, 12% in the armpit and 32% in the groin.

Table A40: Swallowing symptoms in children 1-59 months

	Trouble swallowing		Those who had trouble swallowing					Pain on swallowing	Number
			Type of swallowing problem			Duration			
			Solids	Liquids	Both	Median	IQR		
	%	No.	%	%	%	days	days	%	No.
Ages at death									
1-11 months	8.3	56	17.9	14.3	67.9	4	2-7	6.2	676
1-4 years	10.7	155	26.5	3.9	69.7	3	2-6	8.3	1451
Zone									
NC	7.9	24	16.7	8.3	75.0	3.5	2-7	5.6	303
NE	14.0	67	34.3	7.5	58.2	3	2-7	13.8	479
NW	9.2	96	21.9	4.2	74.0	3	2-5	6.4	1042
SE	0.7	1	0.0	0.0	100.0	na	na	0.7	138
SS	18.0	18	16.7	5.6	77.8	2	1-6	11.0	100
SW	7.7	5	0.0	40.0	60.0	4	3-14	0.0	65
Total	9.9	211	24.2	6.6	69.2	3	2-7	7.6	2,127

Table A41: Suckling in neonates and infants

	Able to suckle in first 24 hours after birth	Ever suckled in a normal way	Stopped being able to suckle		Those who stopped suckling	
					Time after birth	
					Median	IQR
	%	%	%	No.	days	days
Age of death						
0 days	8.7	6.9	16.0	44	1	1 – 1
1 day	35.2	30.6	38.0	41	1	1 – 1
2-6 days	62.2	63.1	30.3	60	1	1 – 1
7-27 days	73.8	81.4	23.8	41	1	1 – 1
1-11 months	73.4	91.0	16.3	110	1	1 – 1
Total	56.5	65.2	20.7	296	1	1 – 1

Table A42: Bulging or sunken fontanelle in neonates and infants

	Bulging or raised fontanelle	Sunken fontanelle	Total Children
	%	%	No.
Ages at death			
0 days	1.5	3.3	276
1 day	3.7	10.2	108
2-6 days	3.0	10.6	198
7-27 days	4.7	15.1	172
1-11 months	3.6	12.1	676
Total	3.2	10.4	1,430

Table A43: Multiple birth, birth size and duration of pregnancy in stillbirths, neonates and infants

	Multiple birth		Multiple birth		Baby of usual size at birth		Not normal size			Birth weight if known. N=438 (31%)		Duration of pregnancy			Total Children
			Order				Small <2.5 kg	Very small < 1 kg	Large >4 Kg			<8 month	8 month	9+ month	
	Multiple birth		First	Second+											
	%	No.	%	%	%	No.	%	%	%	<2.5kg	No.	%	%	%	No.
Ages at death															
Stillbirth	12.4	24	25.0	75.0	79.4	154	5.7	1.5	2.6	na	na	5.2	6.3	88.5	194
0 day	7.6	21	42.9	57.1	79.7	220	11.2	3.6	2.9	5.6	4	13.4	3.3	83.3	276
1 day	9.3	10	60.0	40.0	83.3	90	15.7	1.9	0.0	11.4	4	6.5	3.7	89.8	108
2-6 days	11.6	23	43.5	56.5	84.9	168	11.6	2.0	0.0	8.6	5	6.6	4	89.4	198
7-27 days	11.1	19	26.3	73.7	87.2	150	9.3	3.5	0.6	13.3	8	9.3	1.7	89	172
1-11 months	14.4	97	37.1	62.9	90.4	611	3.1	0.4	1.5	8.9	19	0.7	0.6	98.7	673
Total	12.0	194	37.1	62.9	86.6	1,239	7.6	1.8	1.3	9.1	40	5.5	2	92.6	1,621

Table A44: Multiple birth, birth size and duration of pregnancy. DHS data comparing death in neonates and survivors

	Multiple birth		Multiple birth		Usual size (not small or very large) at birth		Smaller than normal or very large			Birth weight if known. N=8019 (23%)		Duration of pregnancy			Total Children
			Order				Smaller than average	Very small	Very large			<8 months	8 months	9+ months	
	Multiple birth		First	Second+											
	%	No.	%	%	%	No.	%	%	%	<2.5k	No.	%	%	%	No.
Neonatal death	18.1	243	37.1	62.9	73.2	836	26.8	10.4	7.4	6.1	7	9.3	2.2	88.6	1340
Surviving children	3.1	1029	52.4	47.6	86.6	25219	13.4	2.6	8.7	6.4	508	0.3	0.4	99.3	32853
Total	3.7	1271	49.4	50.6	86.1	26054	13.9	2.9	8.7	6.4	515	0.7	0.4	98.9	34193

Table A45: Congenital abnormalities in neonates and infants

	Physically abnormal at delivery		Those who had a physical abnormality			Total Children
			Defect on back	Large head	Small head	
	%	No.	%	%	%	No.
Ages at death						
Stillbirths	3.1	6	*	*	*	193
0 day	4.0	11	*	*	*	276
1 day	4.6	5	*	*	*	108
2-6 days	2.5	5	*	*	*	198
7-27 days	0.6	1	*	*	*	172
1-11 months	1.6	11	*	*	*	676
Total	2.4	39	20.5	15.4	2.6	1,620

ANNEX 1: PERSONS INVOLVED IN THE 2019 VERBAL AND SOCIAL AUTOPSY STUDY

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ANNEX 2: PHYSICIAN MINIMUM DIAGNOSTIC CRITERIA

***Source*:** NPC, FMoH, IIP, USAID. Annex 5: Physician Minimal Diagnostic Criteria. A Verbal/Social Autopsy Study to improve estimates of the Causes and Determinants of Neonatal and Child Mortality, in Nigeria-Final Report (Version March 2016); Pages 131-135.

Neonatal deaths (0-27 days old)

Birth asphyxia

Did not breath immediately after birth OR Did not cry immediately after birth

Birth trauma

Bruises or signs of injury at birth

Congenital malformation

Physical abnormality at the time of delivery

Diarrhoea

More frequent loose or liquid stools than usual

Meningitis (part of 'Serious Infection')

Bulging fontanelle OR Spasms or convulsions

Neonatal tetanus

Stopped suckling normally more than 2 days after birth AND Spasms or convulsions

Pneumonia (part of 'Serious Infection')

Difficult breathing OR Fast breathing

Preterm delivery

Pregnancy duration less than 8 months OR Pregnancy ended early OR Evidence of preterm delivery in the open narrative

Preterm delivery with respiratory distress syndrome

Pregnancy duration less than 9 months or Pregnancy ended early AND Fast breathing AND No fever AND No cold to touch

Sepsis (part of 'Serious Infection')

Fever or Cold to touch AND No diagnosis of pneumonia or meningitis

Neonatal jaundice

Yellow skin or eyes

Haemorrhagic disease of the newborn

Bleeding from anywhere

Sudden unexplained infant death

No documented illness signs or symptoms AND Appeared healthy and then died suddenly

Unspecified (Unknown)

Does not meet any of the above criteria AND No other specified diagnosis

Young child deaths (1-59 months old)

AIDS

Mother ever tested positive for HIV OR A health worker ever told the mother she had AIDS

If the responses to both of the above are 'Refuse to answer' or 'Don't know', then use the below criteria: Child had swelling in the armpits OR Child had a whitish rash inside the mouth or on the tongue

AIDS with tuberculosis

Same as above for AIDS AND Cough AND The cough lasted more than 2 weeks

Diarrhoea

More frequent loose or liquid stools than usual

Dysentery

Visible blood in the loose or liquid stools

Haemorrhagic fever

Bleeding from anywhere OR Skin turned black

Malaria

Fever

Malnutrition (severe)

Limbs became very thin OR Swollen legs or feet OR Protruding belly

Measles

Fever AND Rash

Meningitis

Stiff neck OR Bulging fontanelle OR Generalised convulsions or fits

Pertussis

Severe cough

Pneumonia

Difficult breathing OR Fast breathing

Sepsis

Fever AND No diagnosis of pneumonia or meningitis

Note: This report uses the term 'other infection' to match the Expert Algorithm terminology rather than the physician minimum criteria term 'sepsis'. The Expert Algorithm also originally had a diagnosis called 'sepsis' but its name was changed prior to the 2014 study to 'other infection' to match CHERG terminology

Tuberculosis

Cough AND The cough lasted more than two weeks

Injury (Venomous, Drowning, Fall, Fire, Poisoning, Road traffic, Violent, Unspecified)
Suffered an injury or accident

Other childhood infectious disease (not specified above)
Fever AND Had an infectious diagnosis not specified above

Malignant neoplasm
Medical records information or death certificate diagnosis

Haemorrhagic disease of the newborn (delayed)
Bleeding from anywhere

Sudden unexplained infant death
No documented illness signs or symptoms AND Illness duration = 0 days

Unspecified (Unknown)
Does not meet any of the above criteria AND No other specified diagnosis

ANNEX 3: EXPERT ALGORITHM DIAGNOSTIC CRITERIA

***Source*:** Kalter HD, Roubanatou A, Koffi A, Black RE. Direct estimates of national neonatal and child cause–specific mortality proportions in Niger by expert algorithm and physician–coded analysis of verbal autopsy interviews. J Glob Health. 2015;5:010415. Online supplementary Document – Verbal autopsy expert algorithms for neonatal and child causes of death and for maternal infection

Neonatal causes of death

Neonatal tetanus

(Age 3–27 days at death AND convulsions or spasms)

AND EITHER

((Able to suckle normally during the first day of life and stopped being able to suckle)

OR (cried within 5 minutes after birth and stopped being able to cry))

Congenital malformation

Gross malformation present at birth

Birth asphyxia

Neonatal respiratory depression: (Did not cry within 5 minutes after birth OR did not breathe immediately after birth)

AND

Neonatal encephalopathy: (Not able to suckle normally in the first day of life OR convulsions/spasms OR lethargy) OR 0 days old at death

Birth injury

Bruises or signs of injury on the body at birth

Preterm delivery with respiratory distress syndrome

(combined with preterm for final cause distribution)

Pregnancy duration less than 9 months

AND (Fast breathing starting on day 0 AND no fever AND no cold to touch)

Meningitis

Fever

AND (bulging fontanelle OR convulsions)

AND (lethargic OR unresponsive/unconscious)

Diarrhoea

More frequent loose or liquid stools than usual

AND more than 4 stools on the day the diarrhoea was most frequent

Pneumonia

(Fast breathing lasting 1 day or more OR difficult breathing lasting 1 day or more and lasting until death)

AND 2 or more of the following 3 signs: (chest indrawing, grunting, never cried OR stopped crying)

Possible diarrhoea (combined with diarrhoea for final cause distribution)

More frequent loose

Possible pneumonia (combined with pneumonia for final cause distribution

Difficult breathing AND VA sepsis AND No VA pneumonia

Sepsis

Fever OR cold to touch

OR 2 or more of the following 7 signs: (fever OR cold to touch, did not suckle normally on the first day of life OR stopped suckling, convulsions, vomited everything, stopped crying, lethargic OR unconscious, chest indrawing OR grunting)

(Note: 'vomited everything' was not specified in 2019 and so 'vomited' was used.)

Neonatal jaundice

Yellow skin or yellow eyes

AND (stopped being able to suckle normally OR lethargic OR unresponsive/unconscious) AND No fever or hypothermia

Neonatal haemorrhagic syndrome

Bleeding from anywhere AND No fever or cold to touch

Sudden unexplained death

Died suddenly without appearing ill AND No illness signs or symptoms

Preterm delivery

Pregnancy duration less than 8 months

Unspecified (all others)

All VA diagnoses are negative

Child causes of death

Injury

Suffered from motor vehicle accident, fall, drowning, poisoning, venomous bite or sting, burn, violence or other injury

AND (Died 1 day or less after the injury AND the illness lasted 1 day or less) OR (Injury and No other VA diagnosis (except malnutrition allowed)) OR (Injury that was the first illness sign/symptom AND had VA other infection or fever))

AIDS

(Swelling in the armpits OR a whitish rash inside the mouth/on the tongue)

AND 3 or more of the following 6 signs: (limbs became very thin, protruding belly, more frequent loose/liquid stools than usual for more than 30 days, fever or a skin rash for more than 30 days, fast breathing, chest indrawing)

Malnutrition (underlying)

Limbs became very thin during the fatal illness OR had swollen legs or feet during the illness

AND One of these was the first symptom of the illness

Measles

Child's age greater than or equal to 120 days AND rash for 3 or more days

AND fever for 3 or more days AND the rash started on the face

(Note: 2019 VASA did not specify where rash started so rash on 'face' or 'everywhere' was accepted)

Meningitis

Fever AND (stiff neck OR bulging fontanelle)

Dysentery

More frequent loose or liquid stools than usual AND more than 4 stools on the day with the most stools AND blood in the stools

OR More frequent loose or liquid stools than usual for more than 14 days AND blood in the stools

Diarrhoea

More frequent loose or liquid stools than usual AND more than 4 stools on the day with the most stools AND No blood in the stools

OR More frequent loose or liquid stools than usual for more than 14 days AND No blood in stools

Pertussis

Cough more than 14 days AND (severe cough OR vomited after coughing OR stridor)

(Note: 2019 VASA did not specify that vomiting occurred after coughing so any vomiting was accepted)

Pneumonia

(Cough more than 2 days OR difficult breathing more than 2 days)

AND (Fast breathing more than 2 days OR chest indrawing OR grunting)

Malaria

Fever that continued till death AND was on and off in character

AND No stiff neck AND No bulging fontanelle AND (pallor OR difficult breathing OR convulsions OR unconscious till death)

OR Fever that continued till death AND was severe fever AND No stiff neck AND No bulging fontanelle AND (pallor OR convulsions OR unconscious till death)

Possible dysentery (combined with dysentery for final cause distribution)

More frequent loose or liquid stools than usual AND (fever OR convulsions OR unconscious up till death) AND blood in the stools AND No VA dysentery

Possible diarrhoea (combined with diarrhoea for final cause distribution)

More frequent loose or liquid stools than usual AND (fever OR convulsions OR unconscious up till death) AND No blood in the stools AND No VA diarrhoea

Possible pneumonia or ARI (combined with pneumonia for final cause distribution)

(Cough or difficult breathing) OR (Fast breathing AND (chest indrawing OR stridor OR grunting OR wheezing))

AND (Severe cough OR post–tussive vomiting OR fast breathing OR chest indrawing OR grunting OR stridor OR wheezing OR fever OR convulsions OR unconscious up till death) AND No VA Pertussis AND No VA pneumonia

Haemorrhagic fever

Fever AND (bled from anywhere OR had areas of the skin that turned black)

Other infection

Fever AND (rash on trunk, abdomen or everywhere OR convulsions OR unconscious up till death)

Possible malaria (combined with malaria for final cause distribution)

Fever AND No other VA infectious causes of death

Malnutrition (combined with underlying malnutrition for final cause distribution)

Limbs became very thin during the fatal illness OR had swollen legs or feet during the illness

Unspecified (all others): All VA diagnoses are negative

Verbal autopsy hierarchies: If a death meets the criteria for a diagnosis, then other diagnoses lower in the hierarchy are not considered.

Neonatal cause of death hierarchy

Injury (added for 2019 VASA using same definition as for child injury)

Neonatal tetanus

Congenital malformation

Birth asphyxia or Birth injury

Preterm delivery with respiratory distress syndrome (combined with preterm delivery for final cause distribution)

Meningitis

Diarrhoea

Pneumonia

Possible diarrhoea (combined with diarrhoea for final cause distribution)

Possible pneumonia (combined with pneumonia for final cause distribution)

Sepsis

Neonatal jaundice

Neonatal hemorrhagic syndrome

Sudden unexplained death

Preterm delivery

Unspecified (all others)

Child cause of death hierarchy

Injury

AIDS

Malnutrition (underlying)

Measles

Meningitis

Dysentery

Diarrhoea

Pertussis

Pneumonia

Malaria

Possible dysentery (combined with dysentery for final cause distribution)

Possible diarrhoea (combined with diarrhoea for final cause distribution)

Possible pneumonia (combined with pneumonia for final cause distribution)

Hemorrhagic fever

Other infections

Possible malaria (combined with malaria for final cause distribution)

Malnutrition (combined with underlying malnutrition for final cause distribution)

Unspecified (all others)

ANNEX 4: STUDY REPORTS, INSTRUMENTS AND DATASET

The 2019 VASA study reports, instruments and dataset will be available on the National Population Commission website at: nationalpopulation.gov.ng. These include:

- Nigeria 2019 Verbal and Social Autopsy Study: Main Report
- Nigeria 2019 Verbal and Social Autopsy Study: Qualitative Component
- Saving the Lives of Nigeria's Children: Key Findings and Policy Implications of the 2019 Verbal and Social Autopsy Study
- 2019 VASA Slide deck – National level
- 2019 VASA Slide deck – Zonal level (six slide decks, one for each geopolitical zone)
- 2019 VASA Survey Questionnaire
- 2019 VASA dataset (3,075 completed surveys, no identifiers)
- 2019 VASA Qualitative component study instruments