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CHAPTER THREE

Research Design

Research Design

In this chapter, the central research question and secondary questions for this study are presented. The research approach, methodology, ethical considerations and research setting are also described.

3.1 Main objective and research questions

This thesis aims to assess implementation fidelity of maternal nutrition intervention strategies aimed at pregnant women in rural Kenya as well as to understand emic knowledge regarding maternal nutrition and health and its influence on health-seeking behaviour.

To achieve this main objective, the approach to this thesis is two-fold. The first part of this study assessed the implementation fidelity of biomedical maternal nutrition interventions and the factors that constrain implementation fidelity in a specific context – a rural area in Kenya. The second part involved understanding ethno-medical maternal beliefs and practices, including how they influence maternal nutrition behaviour and access to biomedical care interventions.

The following research questions were formulated to provide guidance and direction in the research approach for this thesis:

1. What is the level of implementation fidelity of biomedical maternal nutrition interventions?
2. What are the challenges and motivations to implementation fidelity of biomedical nutrition intervention strategies?
3. How do emic cultures conceptualize adverse pregnancy outcomes associated with maternal malnutrition and how do these cultural conceptualizations influence the women's care-seeking behaviours?
4. How do emic cultures perceive ANC and how do these perceptions influence early and frequency of access to ANC services?
5. How do food beliefs and practices influence the nutritional behaviour intention of pregnant women? What local food stuffs are traditionally recommended or restricted for consumption by pregnant women?
6. What are the underlying reasons for food recommendations and restrictions during pregnancy?

Answering these research questions will provide vital reference information for the design and implementation of culturally congruent biomedical care intervention strategies targeting pregnant women.

3.2 Research setting

3.2.1 The study region

This research was conducted in the Republic of Kenya. Kenya is a country in sub-Saharan Africa whose capital and largest city is Nairobi. It has a total area of 582,646 square kilometres, of which 571,466 square kilometres are land and the rest water. Approximately 80% of the land area of the country is arid or semi-arid, and 20% is arable. Kenya's population is very diverse and home to most of Africa's linguistic and ethno-racial groups. There are believed to be at least 42 ethnic communities, each with its own diverse cultural belief systems.

Within Kenya, the research took place in Uasin Gishu County. The county was deliberately selected out of the 47 counties of Kenya, because the major project funding this thesis research, A Sustainable Approach to Livelihood Improvement (ASALI), is based there. The climatic conditions and soil type in this region are generally favourable for a wide range of livestock and crop production, hence it is commonly known as the country's food basket [1]. The predominant settlement pattern in Uasin Gishu County is rural (64.1%); according to the KDHS, malnutrition in Kenya is highly prevalent in rural areas. This is also the case in Uasin Gishu County; as indicated in Table 2.1, the nutritional status of this county is worse than the national norm, despite the food surplus produced there. This makes Uasin Gishu County an interesting area to investigate with respect to the aim of this thesis.

Uasin Gishu County, whose capital is Eldoret, lies in the mid-west of the Rift Valley. The county covers a total geographical area of 3,345.2 km². It is a highland plateau whose altitude ranges from 1500m–2700m above sea level, and soils range from red brown loam to clay, making communication by road difficult, particularly during the rainy season when the roads become impassable. It experiences high and reliable rainfall which is evenly distributed throughout the year. The average rainfall ranges between 624.9 mm and 1,560.4 mm, with two distinct peaks occurring in March to September and May to August. Dry spells occur between November and February. The temperatures range between 7 degrees Celsius and 29 degrees Celsius. There is an average land holding of 5 acres in rural areas, and 0.25 of acres within Eldoret Municipality. Generally, these conditions are favourable for livestock keeping, crop and fish farming, which indicates the availability of plenty of food. The population density of Uasin Gishu County is presented in Table 3.1.

Table 3.1 Uasin Gishu County's demographic and health profile verses the country's profile

	Indicator	Kenya	Uasin Gishu
<i>Physical and climatic conditions</i>	Capital town	Nairobi	Eldoret
	Total geographical area (km ²) ¹	580,367	3,345.2
	Total population ²	38,610,097	894,179
	Rural population	67.7%	64.1%
	Total Female population	13,209,075	445,185

Source: 2009 Census [2]

¹ Square kilometers

² Population based on 2009 census

Uasin Gishu County is divided into six sub-counties: Turbo, Soy, Ainabkoi, Moiben, Kesses and Kapseret. The sub-counties are further subdivided into 30 wards (administrative units). There is a marked variation in population density and distribution of health facilities among the six sub-counties, as indicated in the Table 3.2. Uasin Gishu County has 171 health facilities in total, of which only 90 are public facilities. Most of the health facilities are concentrated within Eldoret municipality, but its catchment extends up to the rural areas and neighbouring countries – Uganda, Rwanda and South Sudan. All big and private health facilities (referral hospitals³, hospitals⁴, sub-hospitals⁵ and medical clinics⁶) are found in the county's major towns, especially in Eldoret Municipality. Rural areas are mainly served by primary public health facilities commonly known as health centres⁷ and dispensaries⁸. However, when devolved county government was established in 2013, one health facility in each sub-county was upgraded to a sub-hospital, (locally known as sub-county hospital) some of which are yet to be fully operational. Map 3.1 and Table 3.2 show Uasin Gishu County, its location in Kenya, and the distribution of health facilities.

³ **A referral hospital** is where all cases that cannot be handled by hospitals are referred to for specialized treatment; it not only handles treatment but is also a medical research center.

⁴ **Hospital:** has several specialist doctors, several clinicians and nurses, theater services, inpatient and outpatient.

⁵ **Sub-Hospital:** has one general physician /graduate doctor, clinicians and nurses, inpatient and outpatient services, no theater

⁶ **Medical clinic:** Private consultants

⁷ **health center** has one clinician, 3 nurses, laboratory services, inpatient and outpatient, no theater

⁸ **dispensary** has one nursing officer in charge, two nurse assistants, outpatient services, labor word, a small laboratory, no inpatient services, no clinician

Map 3.1 Distribution of Health Facilities in Uasin-Gishu County

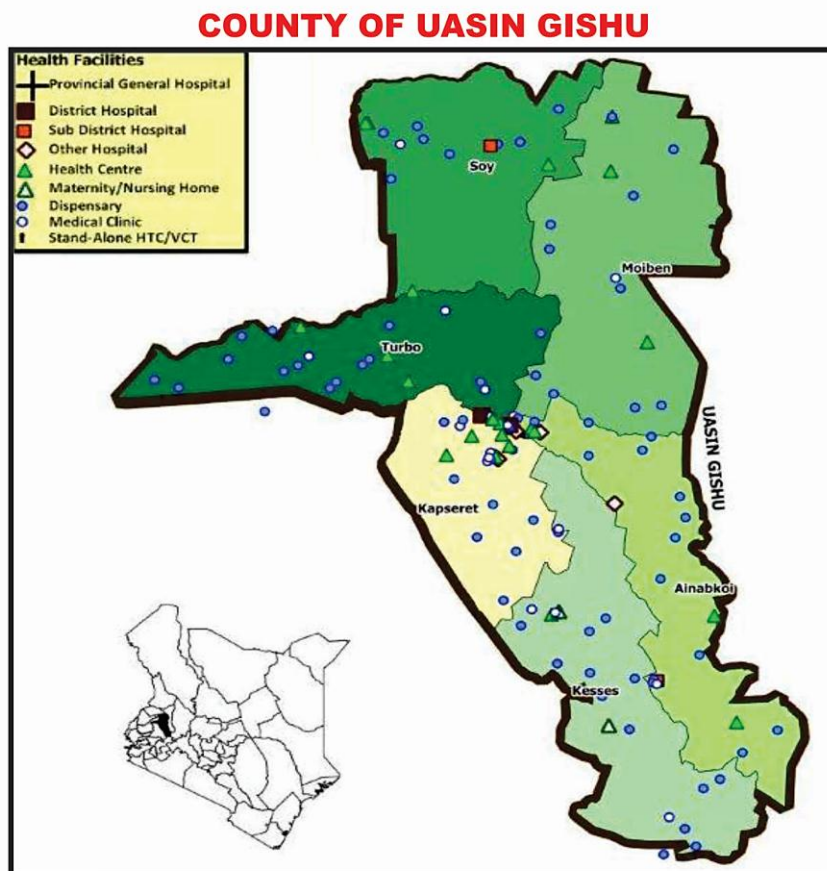


Table 3.2 Uasin Gishu County administrative and political units, population distribution and health facilities coverage

Sub-county	Wards ⁹	Population ¹⁰	Area Km2	Population density per km ²	Public health facilities	Population per facility
Ainabkoi	3	117,962	479.9	246	14	6,939
Kapsaret	5	184,347	415.8	443	10	18,435
Kesses	4	114,529	581.6	197	13	6,737
Moiben	5	158,451	777.1	204	17	8,803
Soy	8	268,925	768	350	19	11,692
Turbo	5	179,442	322.7	556	17	11,963
Total	30	1,023,656	3,345.1	306	90	10,237

Source: Uasin Gishu County health strategic and investment plan 2013-2018[3]: pp7,10

⁹ Wards: Administrative units

¹⁰ 2013 population estimates

As indicated in Table 3.2, while the number of existing facilities is quite appreciable, they are not sufficient to service the wide catchment area, including the health needs of the County itself. The population living in rural areas has limited access due to bad roads and long distances from existing health facilities. The average distance to a health facility in the county is 7 km. Due to bad roads, operations in the rural health facilities are affected, especially during the rainy season. During this season, operations begin at around 10.30 a.m. (to wait for the roads to dry up to become passable) and close by 3.00 p.m. (to get home before it rains for the roads to become too slippery for motorists).

3.2.2 Ethnography of the Study Community – The Kalenjin

In Uasin Gishu County, the Kalenjin (pronounced as “KAH-len-jeen”[4]) are the predominant group. The Kalenjin are the third largest ethnic group in Kenya, comprising 13% of Kenya’s population, and they primarily inhabit Kenya. Their present-day homeland is Kenya's western highlands and the Rift Valley. According to Donovan (1997:421[5]), Kalenjin is a relatively recent designation of a group of linguistically allied people who belong to the southern Nilotic sub-group of the Nilo-Saharan language family. The Kalenjin-speaking people include the Pokot, the Marakwet, the Keiyo, the Sabaot, the Tugen, the Terik, the Nandi and the Kipsigis. Each of these people speaks a distinctive dialect, and each maintains separate habits and customs. However, within the broader context of Kenya’s political culture, the Kalenjin are recognised as a distinct population which share a common language, similar cultural traits, and more often than not, a common political interest [5]. According to the 1969 census, the Kipsigis were the largest group of the Kalenjin (32%), followed by the Nandi (27%), Pokot (13%), Tugen (8.6%), Keiyo (8.5%), Marakwet (6%), with the rest constituting less than 1% [6]. In Uasin Gishu County where this study was conducted, the Nandi are the majority, followed by the Keiyo. Apart from Kalenjin, other communities with a notable presence in the county, especially in urban settlements, include the Luhya, Kikuyu, Luo, Kamba, Kisii, Sudanese, Indians and Europeans [1].

Marriage, pregnancy and childbirth

Pregnancy and childbirth among the pre-colonial Kalenjin were only legal among “adult” men and women. For both males and females, becoming an adult in Kalenjin society is a matter of undergoing an initiation ceremony. Traditionally, these ceremonies were held about every seven years. Everyone undergoing initiation, or *tumdo*, thereby becomes a member of a named age-set, or *ipinda*. Men underwent circumcision and were secluded for lengthy periods during which Elders provided guidance and wisdom on the skills necessary for adulthood such as: animal husbandry, war and cattle-rustling tactics, identification and use of trees, shrubs and herbs, social organization of the Nandi, together with tribal taboos [7]. Today, men circumcision is still practised; the age-sets have lost their military function, but still provide bonds between men of the same set. For women, clitoridectomy (which involves excision of the clitoris as part of a rite of passage from childhood to adulthood) was a

prerequisite for marriage, pregnancy, and thus motherhood. According to Kanogo's study among the Kipsigis:

"Sex, conception and motherhood before initiation was considered to be ritually unclean, evoked supernatural powers and would pollute the ethnicity, hence was a serious crime. It was also believed that children born in such situations 'would be weaklings', both physically and mentally, as well as ritually impure. Girls who conceived prior to initiation were not only considered ritually unclean, but were considered to become barren after giving birth, hence were humiliated and ostracised. To prevent this social, ritual, and potentially physical blemish on the community, such girls would be rushed to initiation as soon as their pregnancy was discovered. Then the child was suffocated with mud during birth. A ritual sacrifice by the girl's father would then be done to remove all the uncleanliness and she could 'live like a normal person' again." (Kanogo, 2005:176)[8]

Kanogo further states that some girls who conceived before initiation would escape and seek refuge at mission maternity hospitals and wards, once these were established in their locality. Children who escaped suffocation were not considered Kalenjins but something else and were permanently banished to mission life or to adoption, a life away from 'society', and might still be killed in a number of ways including strangulation, exposure, or mere neglect. No Kalenjin man would marry the mother of such a child. Even the fathers did not marry girls who became pregnant before clitoridectomy. On the other hand, if a girl became pregnant before marriage but after clitoridectomy, there was no term disgrace involved, and after the necessary rites, her child was considered an asset in her father's lineage.

However, with the coming of missionaries, infanticide was stopped and clitoridectomy prevalence dropped drastically (27%) [9], but early marriages, teenage pregnancies and unsafe abortions are still commonly experienced among the Kalenjin community [10,11] and in rural Kenya [12], which could increase the risk of serious reproductive health complications and malnutrition among primigravidae [12].

In contrast, pregnancy during marriage has always been a happy moment, not only for the woman but also for the entire community. Among the Nandi, when a woman discovers that she is pregnant for the first time a few months after marriage, a feast called *rutet-op-karik* is held. Her relatives and friends are invited to celebrate by drinking and dancing [4]. Among the Marakwet, it is at this ceremony that the bride price for the woman is negotiated and paid [13].

A man must abstain from cohabiting with his wife as soon as she finds she is pregnant. After the birth of a child, three months must elapse for the husband to have his meals in his wife's house or have sexual intercourse with her [4]. For some communities like the Marakwet, this abstinence could last for two years. This was a natural way of birth control [13].

As soon as labour begins, the woman sits on the edge of a large stone and seizes a rafter of the ceiling. She is supported from behind by an old woman, and the *kork-ap-sikisis* (an elderly friend) receives the child. Immediately after birth, the woman's belt is tied tightly around her waist. If she suffers through a long labour, the women outside beat grain mortars with pestles to drown her cries. The *kork-ap-sikisis* washes the child and buries the placenta in cow dung. The fourth day after birth, a ceremony known as *kurset-ap-lakwet* (the naming of the child) takes place. The child receives the name of a deceased ancestor or relative; this name is called *kainet-ap-oik* (the spirit's name), and the deceased ancestor or relative is expected to watch over and keep his or her namesake from harm. For one month after childbirth, the mother is considered unclean and may not touch food with her hands; she uses a stick of the *segetiek* tree to feed herself with. Her house is washed daily with water and cow dung. She is also expected to abstain from sex until the baby can walk.

Food production and nutrition

The Kalenjin are primarily a cattle-based society, and their life centres on their cattle. Traditionally, cattle were thought of in the abstract as belonging to men. In the past, one of their principal occupations and delights was to raid other people in order to take their livestock [14]. During male circumcision, the initiates were given detailed instructions among others on war tactics, raiding and care of cattle [15]. Hence men could acquire cattle independently by raiding or wage labour and have total rights to control such cattle. Husband and wife jointly control house property cattle, though the husband's control predominates. Women keep some of their house property cattle after their husband's death. People with a purely pastoral economy tend not to live in permanent villages; and even when they have taken up agriculture and their movements are restricted, as is now the case with the Kalenjin, the tendency to scattered homesteads persists. Thus, the average rural landholding among the Kalenjin of Uasin Gishu County is 5 acres per homestead [1].

Community members of both sexes have the right to cultivate the land. According to Oboler [7], the staple crop, the joint product of the labour of husband and wife, is divided between them. Traditionally, the wife's share is used for food, and the husband's share was brewed into beer. Today, the husband's share is sold, and he controls the income. Three forms of property are said to belong to women: the vegetable garden, chickens, and milk from the afternoon or evening milking. Morning milk was consumed by the household's male members in the past; today, it is still a male-controlled commodity [7]. Women are free to dispose of these three items as they wish: consumption by the woman's household, given away to friends/relatives, and any surplus is sold. These basic principles still have considerable force in modern society. More than half of the respondents in this study were small-scale farmers, and the reported farm produce was vegetables, milk and chicken.

The staple crop of the pre-colonial period was finger millet, or eleusine. This is mixed with hot water and cooked into a stiff porridge-like paste called *kimnyiet* or *ugali*. Vegetable source is commonly eaten with *kimnyiet* as a relish. Cow's and goat's milk is drunk, and the

blood of cattle, goats, and sheep is taken hot or mixed with milk [4]. Live animals are periodically bled by means of an arrow called *longnet*, which is shot into one of the superficial veins of the neck to extract the blood. Meat from oxen, sheep and goats can also be eaten with *kimnyiet*.

Although traditionally pastoralists, modern Kalenjin communities of Uasin Gishu County are mainly large-scale wheat and maize farmers with a wide range of horticultural crops and livestock enterprises (including dairy, poultry, sheep, goats, pigs), bee-keeping and fish-farming, earning the county a name for being Kenya's food basket. The characteristics of the agricultural sector vary widely from predominantly small-scale with low external inputs to highly mechanized large-scale farming with very high levels of external inputs. It is also rich in sport tourism, as a result of the performances of its world-famous athletes[1].

3.3 Research approach

The research design was defined by a grounded theoretical orientation and the research questions rather than a particular disciplinary approach [16]. The research was conducted using a mixed methodology during sampling, data collection, and data analysis [16]. Multiple sources of data were collected for triangulation using different research instruments and methods, including document analysis, closed and open-ended questionnaires, and key informant interviews. Quantitative methodology was useful in understanding the existence and magnitude of ethno-medical healthcare practices and in measuring the implementation fidelity of biomedical nutrition interventions. Qualitative methodology was useful in understanding the meanings and implications of these ethno-medical care interventions for nutritional behaviours and compliance with interventions and in understanding the perceptions of pregnant women about biomedical care interventions.

Two different empirical studies were conducted based on the two main objectives of this thesis, which are elaborated in section 3.3.2. The first study on ethno-medical maternal care practices and implications for maternal nutrition and health-seeking behaviour aimed at answering research questions 4-6. The second study on biomedical maternal nutrition interventions aimed at answering research questions 1-4.

3.3.1 Sampling and selection of participants

Probability and non-probability sampling techniques and procedures were used in the selection of the research participants. Research participants for the empirical research were: Kalenjin pregnant women and women who gave birth within the past year who were seeking care in the rural public health facilities in the county. Other participants were key informants like TBAs, who at the same time happened to be traditional herbalists, maternal and child healthcare (MCH) nurses, community health workers (CHW) and nutritionists.

Respondents were recruited at the public health facilities in Uasin Gishu County because these are the main facilities found in the rural areas; private facilities are concentrated within Eldoret Municipality. Another reason for selecting public health facilities is because maternal healthcare services including nutrition interventions are offered free of charge and are thus affordable for all women. All of the 90 public health facilities in the county were included in the sampling frame. Quota and purposive sampling techniques were employed in the selection of a representative sample of health facilities for the study. The selection criteria included: health facilities in all six sub-counties must be proportionately represented in the sample; all the health facilities must be in the rural area (outside the municipality territory) and have catchment areas comprised of at least 90% Kalenjin clients to enhance cultural homogeneity. This means that areas dominated by other non-Kalenjin ethnic groups and those within the municipal boundaries were excluded. The last criterion is that the selected facilities should be spatially separate to diversify the responses. In the end, a total of 23 health facilities were sampled for the first study. For the second study, the subjects were selected from the six sub-county hospitals of Uasin Gishu.

Selection and recruitment of pregnant and postnatal women

All the Kalenjin pregnant and postnatal women who came for routine antenatal and child welfare check-ups in the sampled health facilities were included in the sampling frame. They were recruited at the Maternal and Child Health welfare clinics and in the maternity wards. Eligibility criteria for the study participants were: pregnant or gave birth within the past year, a Kalenjin by birth, willing and able to participate, able to give informed consent [17]. Age diversity was also taken into account. This selection criterion eliminated non-Kalenjin women.

We continued interviewing women in each sub-county until no new themes emerged, but ensured diversity in age and the stated selection criteria [18]. In the first study, 154 women were interviewed, and 188 women in the second study. Each woman was interviewed once.

In the second study, the inclusion criteria were more restrictive: pregnant Kalenjin women who had at least one prior ANC visit in a health facility during their current pregnancy or had delivered a baby within the last month, and were willing and able to participate. These selection criteria excluded the following women: pregnant and visiting ANC for the first time, non-Kalenjin, unable or unwilling to participate. This was particularly important in evaluating adherence to biomedical interventions, assuming that they had been given an intervention in their previous ANC appointment(s). A systematic sampling technique was used to select study participants, with every second woman who met the inclusion criteria being recruited until the minimum desired sample size of 188 was attained.

The number of women seeking care in the previous 6 months was determined by reviewing maternal-care registration records. This was used to estimate the number of women who would be attending the clinic during the period when the study was planned. In the hospital records, approximately 60-240 women seek maternal care per month in each of the six sub-county hospitals. Thus, on average, a total of 795 women was seen per month in these hospitals.

Selection of healthcare providers and key informants

Quota sampling and purposive sampling techniques were used in the selection of key informants to represent each sub-county [18]. One TBA was selected from each of the six sub-counties, who was highly praised by women respondents who gave birth at home or took herbal remedies during pregnancy, and who could be reached at home or in the market centre. One MCH nurse from each of the six sub-counties and one CHW were selected for the study. The latter was selected from one of the largest rural facilities in the county because those workers are likely to encounter a wide range of pregnancy nutritional experiences and challenges, given their large catchment area. In total, six TBAs who were also herbalists, six nurses offering MCH care, and one CHW were sampled for both studies.

3.3.2 Description of the two studies

Study one: Ethnomedical maternal care practices and implications for maternal nutrition and health-seeking behaviour

The first study's main aim was to gain insight into ethnomedical maternal care practices adopted by pregnant women and their implications for maternal nutrition behaviour and access to biomedical care interventions. This study was used to answer research questions 4-6. It was conducted between September 2014 and October 2016, and the field data collection exercise took place between April and August 2015.

A researcher-administered questionnaire with closed and open-ended questions was used to collect data from the sampled women. Open-ended questions were added because this gives room to probe and explore topics as they arise and to gather insight and detail-rich information about a given phenomenon [19]. The questionnaire was divided into four sections: The first section covered the demographic characteristics of the respondents, including age, educational level, parity, ethnic affiliation, gestational age at the first ANC visit and marital status. The other sections contained questions about food restrictions, recommended food, restricted activities and activities encouraged during pregnancy. Every practice mentioned was probed to obtain insight into the underlying reasons. The respondents were questioned about their opinions regarding these cultural practices and whether they indeed practised them. The women were individually interviewed face-to-face to give us the opportunity to observe their facial expressions and body language, which is particularly important for the correct interpretation of the answers [20]. Interviews were conducted in a private room at the health facility to ensure clear recordings and to provide privacy for the respondent. Each woman was interviewed once by the author of this thesis and two female research assistants. The interviews lasted between 30 and 60 minutes, depending on the woman's responses.

Key informant interviews (KII) followed later to provide clarity on the issues raised during the original interviews. TBAs were interviewed about the following main issues: perceived restricted and recommended foods; in-depth information on underlying reasons for these

recommendations; and their food and maternal care advice for pregnant women. Each interview took 85–100 min. The key informants, particularly the TBAs, accompanied the researcher to the gardens to identify the food crops and herbal plants that were mentioned in the study, giving them their local names. Key informants were also questioned about the kind of health advice they give pregnant women and maternal health challenges they face in dealing with pregnant women. Notes were taken and the responses were tape-recorded.

Study two: Biomedical maternal nutrition interventions

The second study was employed to answer study questions 1-4, and its main aim was to understand the implementation fidelity of biomedical maternal nutrition interventions, and its challenges and motivations. This study was conducted between November 2016 and May 2018 with field data collection being done between March and June 2017. Field reconnaissance study and document analyses were conducted first to establish the appropriate programs for the study amongst those that exist in the community that target pregnant women. We focused on the implementation of the MIYCN intervention program, because its coverage targets all pregnant women in the country irrespective of their nutritional status. After establishing the relevant interventions, a detailed literature search was done to understand the program's theory, guidelines and intervention messages/strategies that are used in the implementation. In addition, KIIs with intervention implementers (in this case, nursing officers working in the MCH and TBAs) and another literature search were conducted to acquire information for the main survey design and instrument development.

Researcher-administered questionnaires with closed and open-ended questions were again preferred for this study to collect data from the selected sample population. The topics covered in the questionnaire included: demographics, reasons for early ANC booking, reasons for late ANC booking, whether the interviewee had ever used TBA services for their current pregnancy, gestational age and the number of times they visited TBA care, the nature of TBA care received and their perceptions of both TBA and ANC services. Further questions were asked about whether the respondents received any biomedical nutrition interventions as detailed in the MYICN programme implementation guidelines, adherence level and challenges to adherence. The women were individually interviewed face-to-face in a private place within the health facility premises, and each interview lasted for 30-45 minutes, depending on the responses.

After the data collection, further KIIs were conducted with MCH nurses and TBAs for triangulation purposes and to improve our understanding of the key issues raised during the interviews and clarification of facts and trends established in the study in order to enhance ecological validity [16]. The health workers were interviewed at their place of work, while TBAs/herbalists were interviewed either in their homes or at the market centres where they sell their herbal medicines. Notes were taken and the responses were tape recorded. The KIIs lasted between an hour and 2.5 hours.

Table 3.3. Chapters addressing the various research questions

Study	Data collection methods	Study questions addressed	Chapters presented
Study one	Questionnaires <ul style="list-style-type: none"> • 188 respondents 	3,5,6	7,8
	Key informant interviews <ul style="list-style-type: none"> • Traditional birth attendants/herbalists =6 • MCH Nursing Officers= 1 • Community health workers =1 		
Study two	Document analysis <ul style="list-style-type: none"> • ANC appointment cards • ANC attendance register • ANC services implemented register 	1,2,4	4,5,6
	Questionnaires <ul style="list-style-type: none"> • 154 respondents 		
	Key informant interviews <ul style="list-style-type: none"> • MCH nursing officers =6 • Nutritionist =1 		

3.3.3 *Data processing and analysis*

All interviewees and key informants (except the MCH nursing officers and community health workers) who consented to be audio-recorded had their interviews transcribed into English. The author of this thesis transcribed the Swahili tapes, while the Kalenjin tapes were transcribed by a Kalenjin-speaking transcriber. For those who did not consent to be audio-recorded (about two-thirds of the respondents), extensive note-taking was done. The transcripts and notes were coded and categorised into themes using the software for handling qualitative data MAXQDA (version 12.1.3), with each participant identified by a pseudonym. The codes were then analysed for patterns, pre-set themes, emerging themes and categories.

The questionnaires were further coded into SPSS programme (version 23) for statistical analysis to establish the frequencies of the responses (descriptive statistics). For specific analytical approaches, we refer to the separate research questions reported in chapters 4-8.

3.4 Ethical considerations

A research proposal detailing the research questions and methods to be used for the different studies was approved by the National Commission for Science, Technology and Innovation (NACOSTI) in Kenya and a research clearance permit (number: NACOSTI/P/15/2335/5353 dated 2nd April 2015) was issued to facilitate the research process. At the county level, all aspects of the study were discussed with the county director of health, county commissioner, and county director of education, and their approval was obtained to conduct the study in the county. Permission to access individual health facilities was requested from the officers in charge of the facilities prior to the actual data collection. Informed consent (written) was also obtained from all of the participants of the study. The consent form explicitly outlines the aims and objectives of the study along with the confirmation of strict confidentiality for the participants. The participants were informed of their right to abstain from participating in the study, or to withdraw from it at any time without reprisal if they felt uncomfortable continuing. Measures to ensure the confidentiality of the information were taken.

Informed consent from adolescents less than 18 years old was guided by Fisher et al.'s (2003) recommendation that unlike younger adolescents, those over 16 can make informed decisions as well as adults [21]. Ruiz-Canela et al. state that "If adolescents are mature enough to understand the purpose of the proposed study and the involvement requested, then they are mature enough to consent" [22]. In this study, the consent forms were read out to the adolescents in the presence of a legal guardian/parent, and informed assent was sought from minors, while legal guardians/parents gave written informed consent.

One ethical issue arising in the conduct of this research was the lack of direct benefit to respondents for participating in the research. The knowledge gained is intended to improve nutrition interventions that will eventually benefit pregnant women. There was no physical harm associated with participation in this research. Voluntary participation of the respondents was of primary significance. If any of the participants refused to continue their participation, they were free to do so at any time without giving a reason.

There may have been a possibility of emotional harm if the responses were leaked to those in authority. Therefore, confidentiality of the information and the anonymity of the participants were strictly guaranteed. Interviews were conducted at a private sound-proof site. Personal identifiers were removed. All participants were referred to using aliases. All of the information gathered for the study was only used for academic purposes. Written documents that may be produced using the data gathered will not contain any personal information about the participants. The respondents were free to pull out of the study if they felt uncomfortable disclosing any information.

Various precautions were taken to ensure the different forms of data that were generated in the field were securely stored. Hard copies of data, i.e. questionnaires and interview notes,

were first anonymised before securely locking them in a filing cabinet that could only be accessed by the main researcher. This was done in the period of field data collection, analysis and storage after analysis. Other files including audio tapes, videos, and photographs were downloaded from the hard drives and were kept in password-protected computer files that could only be accessed by the main researcher. Access and sharing restrictions will apply to these data. Additional approvals will be required from the ethical review committees for applications to re-use data, and in keeping with the informed consent agreements. Applications can be submitted to the Kenya National Commission for Science Technology and Innovation (customercare@nacosti.go.ke / info@nacosti.go.ke).

3.5 Validity of the results

Validity is based on determining whether the research findings are accurate from the point of the researchers, the participants, or the readers of an account [23]. It also refers to trustworthiness, authenticity or credibility. Various methods were employed by the researcher at different stages of the study to reduce threats to the validity of the findings posed by extraneous influences on the behavior of the participants and observer and to ensure the trustworthiness of the research findings.

Multiple researchers were involved in the design of the study, data collection and analysis. Research assistants were involved in data collection during the interviews with pregnant women in both studies. They were properly trained in the research instruments and language translation, and they participated in the pilot study and a review of research instruments after the pilot to ensure consistency and inter-researcher reliability. The individual interviews were conducted in a quiet private room at the health facilities to prevent interruptions by other women and distracting noises and to enhance clear recordings [24]. Voluntary participation was guaranteed, and respondents were assured of the confidentiality of their responses. Interviews were audio-recorded only when consent was obtained and then used for referral for accuracy checks during data coding.

Triangulation of several sources of data and multiple perspectives from participants was used to enhance the validity of the collected information. Key informant interviews, informal conversations, document analysis, observation, use of closed and open-ended questionnaires and cross-checking questions were adopted for triangulation and validation of the data. Themes for the qualitative study were based on the convergence of these several sources of data to build up a coherent justification for them.

Several reliability procedures were also adopted during the study. Transcripts were checked to ensure they did not contain obvious mistakes made during transcription. This was done to ensure that there was no drift in the definition of codes, a shift in the meaning of the codes during the process of the coding, by constantly comparing data with codes and by writing memos about the codes and their definitions. Continuous reflection with colleagues was undertaken to reduce researcher bias. The researcher also used two other persons to conduct independent coding, and this was used to cross-check the codes for similarity and to increase validity [25]. The research results for this thesis are presented in the next chapters.

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