Comparing inpatient and outpatient treatment for acute malnutrition in infants under 6 months; a mixed method case study.

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A thesis submitted in partial fulfilment of the requirement for the degree of
Master in International Health
by
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Where other people's work has been used (either from a printed source, internet or any other source) this has been carefully acknowledged and referenced in accordance with departmental requirements.
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Abbreviations

CLM	« Cellule de Lut contre la Malnutrition »
DC	day centre
DHS	Demographic Health Survey
EBF	exclusive breastfeeding
ENN	Emergency Nutrition Network
FGD	focus group discussion
HT	homebased treatment
LBW	low birth weight
MAM	moderate acute malnutrition
MAMI	The Management of Acute Malnutrition in Infants under six months
MoH	Ministry of Health
MUAC	mid upper arm circumference
RUTF	ready to use therapeutic food
SAM	severe acute malnutrition
SC	stabilisation centre
SS	supplementary suckling
TFC	therapeutic feeding centre
UN	United Nations
WHO	World Health Organisation

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Introduction

"The mother of malnutrition is the hunger, the father is the illness, the grandmother is the shortage, the close pregnancies are the cousins." This traditional Senegalese proverb gives an impression of how malnutrition is viewed as a health problem in communities in Senegal. It is in conversation with mothers and caregivers of malnourished infants at the primary care clinic where I work as medical doctor, that I got interested in the topic of this thesis. The clinic is called Keru Yakaar, which means House of Hope in the local language (Wolof). For many mothers hope for cure drives them to travel long distances in order to receive good care. Mothers with their infants having any kind of feeding problem are especially attracted to its so called "milk program". They come with new-borns that are not breastfeeding well, young infants that do not grow sufficiently, or little ones that are small or simply not flourishing ("xiiboon" is the Wolof word for these issues all together). A milk supplement and a local flower mixture, called "soungouf", were until recently the standard remedies. With the introduction of Plumpy'Nut® in 2013, children from 6 months on showed a faster recovery, but those under 6 months remained a large proportion of patients with often a long treatment duration. The national protocol, saying that young infants should be treated inpatient made me wonder if we were doing the right thing. A sister clinic (St. Martin) we work closely with, has experience in the inpatient treatment approach. I considered referring all young infants there, but both mothers and health workers were not in favour of this proposition. Mothers and caregivers preferred a service they already knew and that was close. Health workers underlined the many physiological causes of infant malnutrition, like breast feeding problems, that could be addressed in an outpatient way by proper education and supervision. The discussion that arose, yielded valuable arguments for both treatment options. This study documents these arguments in a scientific way, hopefully contributing to the formulation of a well-balanced treatment approach for malnourished young infants. Finally, the aim is to give mothers what they all hope for: a healthy future for their infant.

Abstract

Introduction: Treatment of acute malnutrition in infants under 6 months is a relevant topic regarding the global problem of maternal and child malnutrition. While treatment for older age groups has shifted more towards an outpatient, community based approach, young infants are mostly treated in hospital. This study compares an inpatient and outpatient treatment approach for malnourished infants under 6 months in two case clinics in urban Senegal.

Methods: Patient populations of the nutrition programs of the two case clinics were described quantitatively, with the infants < 6 months with severe acute malnutrition analysed in detail. Interviews with health workers and focus group discussions with mothers were analysed qualitatively on key issues for a successful program.

Results: In this study outpatient treatment shows similar success rates to inpatient. Treatment duration is longer outpatient, but with similar loss to follow up. Outpatient care is perceived as more accessible, given that there is a milk supplement available. When referral is adequate, basic medical care can be done outpatient and exclusive breastfeeding can be more easily promoted. Re-lactation can be better supervised inpatient and better care can be provided for severe underlying illnesses and psychosocial problems. The community plays a key role in treating malnourished young infants because of its influence on health seeking behaviour, breastfeeding practices and its contribution to treatment and prevention.

Conclusion: Regarding the magnitude of the health problem of young infant malnutrition and the strong relationship with breastfeeding practices, an outpatient community-based treatment approach should be considered.

Key words: SAM < 6 months, young infant malnutrition, treatment, outpatient, inpatient
Word count: 12027

1. Background

Malnutrition and wasting

Improving nutritional status with a focus on maternal and child malnutrition is a perennial global health priority, as formulated recently in the United Nations (UN) Sustainable Development Goals (UN 2015). Malnutrition, or more specifically undernutrition, is a broad term for various forms of underweight, like chronic malnutrition (stunting), and acute malnutrition (wasting) (Unicef 2009). Maternal and child malnutrition means malnutrition of pregnant women, lactating mothers and children under five years of age, including intrauterine growth restriction and suboptimal breastfeeding (Unicef 2009). Malnutrition in the first two years of life, or 1000 days after conception, has a negative impact on survival, disease prevalence, cognitive development and economic productivity of individuals and communities (Black 2008). Maternal and child malnutrition were responsible for as much as 45% of deaths among children under the age of 5 in 2011 and account for 11% of total global disease burden (Black 2013, figure 1).

Almost one third of child malnutrition is the acute and more dangerous form: wasting (Black 2013). Wasting is defined by the World Health Organisation (WHO) anthropometrically: weight for height z-scores <-2 standard deviations below the mean. A z-score below -3 indicates severe acute malnutrition (SAM) (WHO/ Unicef 2009). Children suffering from SAM are more vulnerable to common childhood illnesses like pneumonia and diarrhoea and have a nine times higher risk of mortality than those with z-scores around -1 (Unicef 2009). Globally, wasting accounts for 12.6% of deaths among children under 5 years of age (Black 2013-b). Prevalence of childhood wasting is highest in Western and Middle Africa and South-East Asia with a prevalence of >4% for severe wasting (Black 2008).

Wasting under 6 months

Malnutrition in infants under 6 months of age is assumed to be low, but data are hard to obtain (ENN 2010). Kerac (Kerac 2011) published prevalence of SAM under 6 months in 21 developing countries using the WHO definitions of acute malnutrition (WHO/ Unicef 2009). Twelve out of the 21 studied countries had prevalence rates of > 10 % in this age group (Kerac 2011, Figure 1). Kerac estimates that of 20 million children under 5 who are severely wasted in those countries, 3.8 million are less than 6 months old (Kerac 2011). In the first 6 months of life growth, maturation and development take place rapidly and nutrient needs are of extreme importance (Lucas 2003). Young infants are more vulnerable and their mortality risk is higher with nearly 70% of under 5 deaths occurring in the first year of life (Black 2008). Interventions to improve maternal and child malnutrition are therefore often focused on this age group. The recent Lancet series on Maternal and Child undernutrition emphasizes breastfeeding and complementary feeding as a lifesaving intervention. For example, one fifth of all neonatal deaths could be prevented by early initiation of breastfeeding (Black 2013).

Maternal and child health in Senegal

Senegal is a politically stable lower middle income country with 14.1 million inhabitants (World Bank 2014). Compared to other countries in the region Senegal has achieved greater progress on improving maternal and child health, but not sufficient to have reached the Millennium Development Goals (Alles 2013, Wuehler 2011-a). Under five mortality is 65 per 1000 live births and is slowly decreasing. The infant mortality rate was 45 per 1000 live births in 2012 (WHO 2012). More than half of those deaths were neonatal deaths with a neonatal mortality rate of 24 per 1000 live births (WHO 2012). Maternal mortality is relatively low compared to surrounding countries with 484 per 100.000 live births in 2011 (DHS 2013). The majority of women (71%) delivers with a skilled health worker (DHS 2013). Maternal anaemia is a serious problem with 64 % of pregnant women being anaemic

(World Bank 2014). Birth weight is documented only in 43% of deliveries, therefore the percentage of infants born with low birth weight (LBW), (less than 2500g) is not known. Of the registered birth weights, 10% of infants are born with a LBW, but when asking the mothers this percentage can be as high as 29% (WHO 2012). The use of family planning methods is low with 20% of women using a modern method and a reported 25.6% unmet need for family planning services (DHS 2013).

Social determinants of malnutrition in Senegal

Almost one in five (16,5%) children under 5 years old is stunted in Senegal and 9,1% are wasted (DHS 2013). The demographic and health survey (DHS) shows that wasting under the age of 6 months is 5.4% (DHS 2013, figure 1). The nutritional working group (CLM) that functions directly under the prime minister in Senegal, has recently performed a survey on food security and nutritional status (ENSAN 2013). There are regional differences with some regions exceeding the critical limit of 10% wasting (ENSAN 2013). The proportion of people living with low food security is 25.1% in rural areas and 12.1% in urban areas (ENSAN 2013). Short rainy seasons can cause fluctuations in food security due to low agricultural productivity, and consequently low household grain stock, leading to poverty and poor dietary diversity. The years 2010 to 2012 had short rainy seasons, which has been associated with a rise in food insecurity. Wasting has been increasing from 8,8% in 2012 to 9,1% in 2013. Food insecurity alone is not sufficient to explain child wasting. This is illustrated by the fact that some regions with a stable agricultural supply have a high prevalence of wasting (ENSAN 2013). In cities, food insecure households mainly live from informal trade or day labour (ENSAN 2013). Socio-economic status, which can be indicated by the educational level of the mother, is of great importance and is proven to be a contributing factor to child malnutrition (Badji 2006, Alles 2013). In Senegal, half of all girls (49%) do not finish primary school (DHS 2013). In addition, Senegalese mothers giving birth at a young age more often have malnourished children (Linnemyar 2008).

Malnutrition prevalence	Africa	Senegal
stunting under 5 years	35,6%	16,5%
wasting under 5 years	8,5%	9,1%
SAM under 5 years	3,5%	2,2-4,5%
wasting under 6 months	around 10%	5,4%
SAM under 6 months	no data	no data

Figure 1. Malnutrition prevalence rates in Africa and Senegal (Black 2013, Kerac 2011, DHS Senegal 2013)

Infant feeding practices in Senegal

Although almost all babies are breastfed the first year of life, exclusive breastfeeding rates are low (38%) among infants 0-6 months in Senegal (DHS 2013, Wuehler 2011-b). Some maternal dietary practices during pregnancy already play a role. For example, cultural beliefs forbid pregnant women from eating from certain food groups and items (CLM 2013). In addition, after birth breastfeeding is not immediately initiated because of traditional birth rituals. In some tribes the infant is given goat milk for the first few days (CLM 2013). Introduction of complementary foods from as young as 2 months is common practice, which displaces the superior nutritional content of breastmilk (Lucas 2003, Simondon 1997). Most breastfed infants are given water, because mothers think breastmilk is too concentrated (CLM 2013). Giving water did not show a direct relationship with undernutrition, but increased the risk of diarrhoea (Gupta 2007). Early weaning is related to short pregnancy intervals, and thus is also a risk factor for early malnutrition (Lucas 2003, Mane 2006). About one in five pregnancies takes place after less than two years from the previous delivery (DHS 2015).

Health services and care for young infants

The health care governance in Senegal is divided into 14 health districts, with most of them having a district referral hospital. Those hospitals have a huge lack of human resources, especially in rural areas (MoH 2009). Primary health care is provided by almost 1000 health posts, often staffed by a nurse and birth assistant. They are responsible for most preventative care like vaccination, prenatal care and patient education, in addition to first line care for common illnesses and referrals. One health post serves between 5.000 and 15.000 inhabitants (MoH 2009). Coverage of some of these first line care activities is high with 79% measles vaccination coverage and at least on prenatal visit in 95% of pregnancies (DHS 2013).

Compared to other countries in the Sahel region, Senegal is more active in implementing nutrition policies (Wuehler 2011-a). In 2006, the WHO system for Integrated Management of Childhood Illnesses (IMCI) was adopted by the Senegalese government in order to strengthen primary care for children aged 0 to 5 years. This system helps less educated medical staff to treat common illnesses like diarrhoea and pneumonia more adequately and to refer appropriately (CLM 2006). IMCI training has been provided for most of the public health posts in the country. In 2013, a national treatment protocol for acute malnutrition was added, following the WHO guidelines (Wuehler 2011-b, Golden 2013). This protocol focusses on children from 6 months to 3 years. As such, malnourished infants <6 months therefore do not receive routine care and are most often referred to the hospital level (Golden 2013).

Some private non-profit health services traditionally have played a role in treating malnourished children, because of their focus on vulnerable populations and in some cases because of external funding. These clinics function generally under public health authorities, their data are implemented in national statistics and they follow national guidelines. Two of these health services are used as cases in this study, one with an outpatient treatment approach, the other treating malnourished infants mainly inpatient. By comparing experiences from these clinics recommendations for appropriate treatment approaches for this patient group can be generated.

2. Problem statement, justification, aim and methods

a. Problem statement

More insight into treatment approaches for malnourished infants under 6 months is needed. In Senegal treatment traditionally takes place in hospitals, while infants at risk are likely to present earlier during primary care visits. Some private non-profit clinics have historically played a role in treating these infants. In the Dakar region two clinics (St. Martin and Keru Yakaar) are widely known for providing this care. St. Martin provides mainly inpatient care, while Keru Yakaar gives outpatient care. We can learn from the two clinics and gain insight into factors contributing to the success of either inpatient or outpatient treatment for wasted infants under 6 months. This can help in developing feasible treatment approaches in similar contexts.

b. Justification

A shift from inpatient treatment to a more outpatient, community based approach has recently taken place in many countries (as in Senegal) for children from 6 months to 5 years suffering from SAM (WHO/UNICEF 2007, WHO 2013). Different aspects that contributed to this shift can facilitate further development of the treatment approach for infants < 6 months with SAM.

Evidence for community based treatment for severe wasting

The introduction of a ready-to-use therapeutic food (RUTF) was an important step in outpatient malnutrition care (Collins 2006-a). RUTF is a lipid-based paste usually with peanut or soy as the main ingredient that provides all energy and recommended nutrient intakes for children with SAM and is easy to administer by the caregiver (WHO/ Unicef 2007). Another finding that facilitated home based care was the Mid Upper Arm Circumference (MUAC) as a screening tool to detect acute malnutrition in the community (Collins 2006-a, Briend 2012). Children detected with a MUAC less than 115 mm in are recommended by the new guideline to be referred to a nutritional service at primary health care level. There, weight and height are taken and the z-score can be calculated (WHO/ Unicef 2009). Children with z-score <-3 or severe oedema are considered as SAM. Children are referred for inpatient care when complications are present (such as pneumonia, severe dehydration or underlying illnesses). Uncomplicated cases are being monitored on an outpatient basis with weekly visits including medical care and health education (WHO/ Unicef 2007). This community based outpatient approach has shown better treatment outcomes of uncomplicated SAM (increased access to services, an increase in coverage and recovery rates) compared to standard inpatient treatment (Ciliberto 2005, Collins 2006-b).

Recommended treatment approach for wasting under 6 months

The treatment approach for infants under 6 months has not made this shift to community based care. Because of physiological differences in young infants, MUAC has not been proven as an effective screening method (Myatt 2006). Weight-for-length has remained the recommended inclusion criterion, which requires skilled personnel and is therefore not suitable as a screening tool (Kerac 2012-b). RUTF is not a suitable nutriment option for infants under 6 months. Therefore F-100 has remained the standard nutritional treatment (WHO 1999). F-100 is a therapeutic infant formula based on skimmed milk and cereals containing 100 Kcal per 100 ml (WHO 1999). F-100 is often provided freely by government health authorities, but exclusively at the inpatient level. As a re-lactation technique, the WHO guideline recommends the supplementary suckling (SS) method. This method involves taping a nasogastric tube to the breast with the other end held in a cup with diluted F-100. By suckling the breastmilk production is stimulated and supplementation can be decreased according to weight gain (WHO 1999). The revised WHO SAM treatment guideline has not adopted many changes for infants <6 months (WHO 2013, Appendix 1). It still recommends the SS method with (diluted) F-100. It is remarkable

that it states outpatient care is possible in uncomplicated cases, while any practicalities are missing. Being breastfed effectively (if possible) is one of the treatment objectives (WHO 2013). The way communities are involved in reaching this goal is not explained, although an older document underlines the importance of communities in young feeding practices (WHO 2008).

Current practice of treating wasting under 6 months

The Management of Acute Malnutrition in Infants under six months (MAMI) project is a research project initiated by the Emergency Nutrition Network (ENN) involving organisations and experts aiming to narrow the knowledge gap on management of malnutrition in young infants (ENN 2010). MAMI reviewed 37 treatment guidelines for infants < 6 months SAM in different countries. Most of the programs used guidelines that were based on the WHO's 1999 treatment guideline (WHO 1999) and said to treat infants with SAM <6 months as inpatients (ENN 2010, Kerac 2012-a). Apart from analysing the guidelines, MAMI looked at current management in malnutrition <6 months studying 33 datasets of nutrition rehabilitation programs (ENN 2010). They used the Sphere Standards as a reference. The Sphere Standards are internationally set criteria for success in nutrition rehabilitation programs. Those standards are: >75% cure rate, mortality <5%, default <15%, non-recovery rate <10% (The Sphere Project 2015). The datasets showed that, despite having mostly inpatient treatment guidelines, about 13% of infants were treated as outpatients in a day centre (DC) or using home-based treatment (HT). MAMI found a slightly higher cure rate in day centres (82%) and home treatment (78.1%) compared to the two inpatient options: stabilisation centres (67.7%) and therapeutic feeding centres (73.9%), while admission criteria were roughly the same (ENN 2010). The default rate did not significantly differ, with 9.2% in day centres compared to 7% in admission centres (ENN 2010, figure 2).

<6 months	Sphere discharge outcomes												
Programme	Cured		Died		Excluded		Non-recovery		Defaulter		Missing		Total
	n	%	n	%	n	%	n	%	n	%	n	%	
DC	605	82.0%	17	2.3%	1	0.1%	39	5.3%	68	9.2%	8	1.1%	738
HT	89	78.1%	4	3.5%	2	1.8%	6	5.3%	13	11.4%	0	0.0%	114
SC	67	67.7%	8	8.1%	0	0.0%	2	2.0%	9	9.1%	13	13.1%	99
TFC	2,254	73.9%	161	5.3%	8	0.3%	351	11.5%	214	7.0%	63	2.1%	3,051
Total	3,015	75.3%	190	4.7%	11	0.3%	398	9.9%	304	7.6%	84	2.1%	4,002

Figure 2. MAMI report chapter 5, review of field treatment, outcomes by program type. DC= day centre, HT= homebased treatment (both outpatient), SC= stabilisation centre, TFC= therapeutic feeding centre (both inpatient) (ENN 2010)

Key issues in the success of home based treatment

The MAMI working group calls for a shift in treatment approach to outpatient care because of the large burden of disease of wasting among infants under 6 months of age (ENN 2010). They report that current inpatient programs and health workers struggle in terms of resources (time, space and staff) to give young infants the necessary treatment and counselling. In addition, coverage of such programs is currently low (ENN 2010). The shift from inpatient to outpatient treatment in older age groups did not happen by the discovery of RUTF and the MUAC alone. Both the medical system and the community needed to change. Collins 2006 describes 3 essential factors contributing to the effectiveness of outpatient care in malnourished children that will serve as a model in this paper (Collins 2006-b). First, care must be accessible with acceptable socio-

economic costs. Secondly, community engagement is needed to help people understand the health problem and accept the service provided. Third, good quality medical care with simple sustainable protocols is necessary (Collins 2006-b). A Lancet review on SAM underlines this model and advises a nutritional program design taking those key issues into account (Collins 2006-a). In this study the three key issues will be used as a framework to study two treatment programs for wasted infants under 6 months. Insights can contribute to the development of future treatment approaches for this patient group.

c. Aim and research questions

Aim

The aim of this study is to compare two treatment approaches of infants < 6 months suffering from SAM by doing a double case study of two urban nutrition programs, one with a mainly inpatient approach, the other using an outpatient approach.

Objectives

1. To describe the populations visiting the nutrition programs at the two case clinics, particularly the population <6 months SAM of St. Martin (inpatient) and Keru Yakaar (outpatient).
2. To explore advantages and disadvantages of both treatment approaches (inpatient and outpatient) as experienced by mothers and health workers.
3. To compare the two approaches in order to formulate recommendations for treatment of SAM under 6 months in similar contexts.

Research questions

1. What are characteristics of the population visiting the nutrition program at the two clinics, the population <6 months SAM in more detail?
2. What do both health workers and mothers describe as advantages or disadvantages of either of the treatment approaches?
3. What recommendations can be given to health workers and policy makers concerning treatment approaches in similar contexts?

d. Methods

Study design and framework

This is a mixed method case study using both quantitative and qualitative methods. For the quantitative part a limited retrospective survey was conducted to explore and compare characteristics of the treated population in the nutrition programs of two clinics, with greater emphasis placed on the infants <6 months with SAM (Creswell 2009). For the qualitative part both semi structured interviews with health workers and focus group discussions (FGDs) with mothers visiting the nutrition program were performed. The use of a quantitative survey together with both interviews and FGDs was intended to provide triangulation (Kielman 2011). Ethical clearance was obtained from the national ethical committee of Senegal (Comité National d'Ethique pour la Recherche en Santé, code: SEN15/30) and at the Royal Tropical Institute in The Netherlands.

For the qualitative part, the 3 key issues for a successful nutrition program described by Collins (Collins 2006-b) were used as a framework: Access, Community engagement and Quality of care (figure 3). The 3 issues were used to formulate interview and FGD questions (Appendix 2) and to analyse the responses.

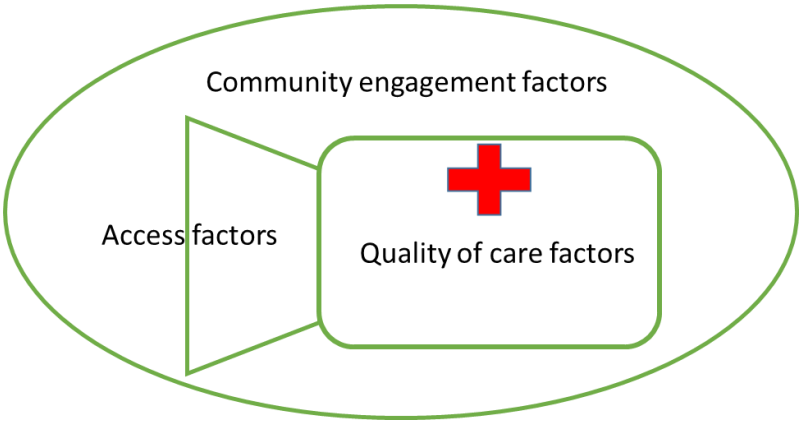

Figure 3. Key issues in the success of treatment of malnourished infants, based on Collins 2006-b

Setting

This study took place in two private, non-profit clinics in the capital of Senegal. Both clinics have a long history of treating malnourished children, including infants <6 months. Because care for malnourished children has until recently been limited at public health services, the clinics are widely known and have a large catchment area, serving both urban and rural population.

St. Martin is a clinic linked to a catholic NGO that functions as a semi-hospital, having some admission beds, of which 10 for the nutrition program. The clinic was established 60 years ago and it runs the program for malnourishes children and infants in the current form since more than 20 years. The program has been using WHO protocols and in 2001 they started producing local RUTF (Diop 2003). Most patients <6 months are being treated inpatient. The core of the approach is the milk supplementation using cup and spoon feeding technique using diluted F-100. Daily teaching sessions and individual supervision of mothers of malnourished young infants are part of the approach. Characteristics of the clinic are:

1. Resources: The clinic as a whole is self-supporting by patient contributions for running costs. The nutrition program is not self-supporting. The clinic receives incidental donations in money or goods.
2. Medicines: F-100 is provided freely by the government. Medicines are being purchased at the national pharmacy or in the private sector.
3. Accessibility: The clinic is situated in a populous poor urban area and has traditionally had a focus on the poor with low patient fees.
4. Governance: The director of the clinic is a Senegalese paediatrician and all of the staff are Senegalese, except for some short-term volunteers. The nutrition program is led by a Senegalese nurse and 3 nurse assistants. A midwife helps out with night shifts.
5. Population: Especially for their nutrition program the catchment area is large with about half of the patients coming from rural areas.

Keru Yakaar is a primary care clinic that runs an outpatient program for malnourished infants and children for the past 17 years. Since 2013, the clinic has followed the WHO protocol and provides outpatient care with weekly appointments. Milk supplementation is done by cup and spoon method, using infant formula. Mothers receive breastfeeding support and participate in education sessions.

Characteristics of the clinic are:

1. Resources: The clinic as a whole is self-supporting by patient contributions for running costs. The nutrition program is not self-supporting.

2. Medicines: Because of a partnership with a French NGO the clinic is able to provide infant formula for a low price. Medicines are being purchased at the national pharmacy or in the private sector.
3. Accessibility: The clinic is situated in a populous urban area and has traditionally had a focus on the poor with low patient fees.
4. Governance: The director of the clinic is a Zambian medical doctor and all of the staff are Senegalese, except for a few volunteers. The nutrition program is run by two Senegalese nurses and a midwife who provides breastfeeding counselling.
5. Population: The clinic has regional catchment area because of its reputation. Patients come from all over the capital. Those coming from rural areas are in minority.

Quantitative procedures

Quantitative data were collected retrospectively at the two clinics. First, to give a general overview of the year 2014, the number of treated cases were collected using all registers (St. Martin) or files (Keru Yakaar) from 2014. Patient data were grouped by age and severity of malnutrition: severe (z-score <-3) or moderate (≥3 z-score <-2), and treatment approach (inpatient or outpatient). For the second part, we collected data from all infants < 6 months treated for SAM (z-score <-3). At St. Martin the inpatient population was selected, given that the outpatient population is a minority. Keru Yakaar only serves an outpatient population. At both clinics data were collected from 1st of January 2013 to 1st of September 2015. In Keru Yakaar a new treatment protocol had been introduced in the course of 2013, using the WHO guideline as a base. Data from before 2013 were therefore less complete and often data like height were missing. From both clinics files were excluded when basic anthropometric data were missing. The z-score has been re-determined using the height and weight (WHO/ Unicef 2009) to detect errors. The number of variables that could be collected from the files was limited. In general the following variables were collected apart from the anthropometric values: address, birth place, profession of the father, about the infant being breastfed, whether they were twin, low birth weight, illnesses, medication administered and treatment outcome.

Qualitative procedures

The qualitative data came from interviews with health workers at both clinics and 4 FGDs with mothers visiting the programs. The health workers were selected using convenience sampling (Kielman 2011). All health workers in the 2 nutrition programs were approached for possible participation, a few of them declined (figure 4). All participating health workers signed an informed consent form before the interview was conducted.

Two FGDs with inpatient mothers at St. Martin and two FGDs with outpatient mothers at Keru Yakaar were conducted. Mothers/ caregivers were selected using homogenous sampling to be able to share similar experiences, in this case treatment of their malnourished infants (Kielmann 2011, Figure 4). They were recruited after a regular teaching session. The health worker in charge selected the caregivers who had young infants and asked them individually to participate. The cut-off point of having an infant under 2 years was retained because this made women able to speak out of their personal experiences with young infant feeding practices. A group of 8 to 12 mothers or female caregivers was targeted. This group size was chosen because a larger group would make discussion less dynamic and a smaller size would limit the number of perspectives. Purpose and general information about the research were explained. Those who agreed signed an informed consent form and were directed to the court yard of the clinic, to start the focus group discussion.

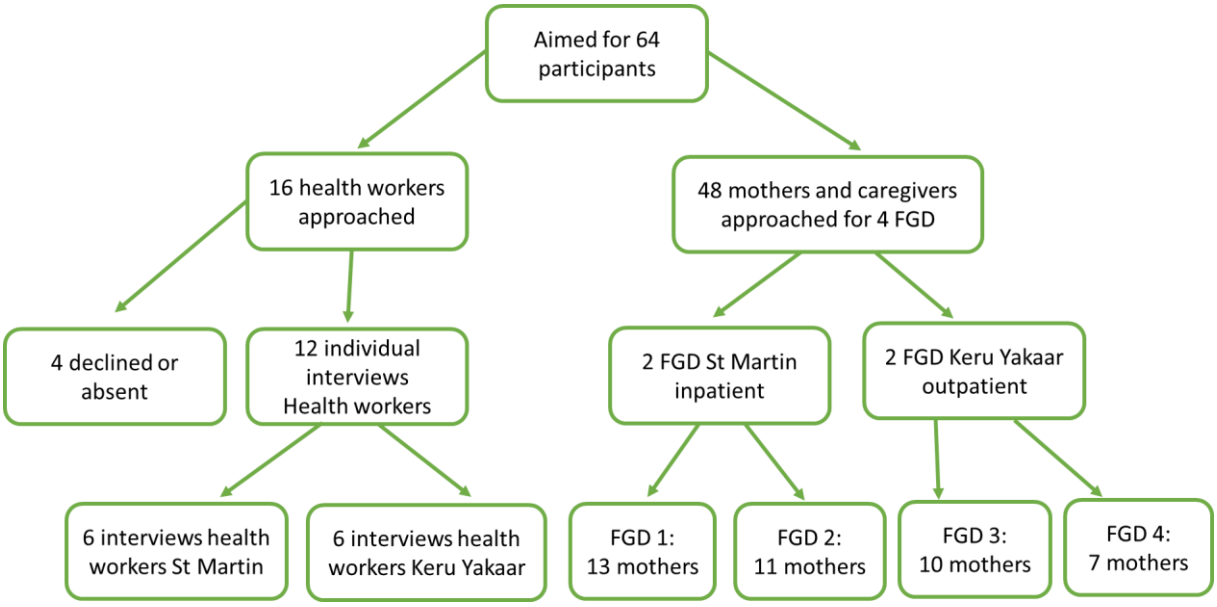

Figure 4: Sampling flow chart interviews and FGD

During FGDs the questions were asked specifically about the treatment approach the participants had experienced, either inpatient or outpatient (Appendix 2). Health workers who had experience with both treatment approaches were asked to compare the two approaches. The interviews were conducted in French, recorded and transcribed. The FGDs were conducted in French, with Wolof (the main local language) being simultaneously translated by a Senegalese female research aid. The FGDs were recorded and transcribed.

Quantitative analysis

Quantitative data were analysed using Excel calculating totals and means, standard deviation and differences. Concerning the data collection of infants <6 months, variables were analysed only when more than half of the files contained the variable. The treatment outcome was re-defined using the revised WHO standard (WHO 2013). In some cases this meant we needed to correct the registered treatment outcome. The treatment outcome exclusively breastfed was not available in the dataset. Outcome criteria used to analyse the data were:

- Successful treatment: sufficient weight gain (5g/kg/day for at least 3 days) and z-score above -2. Success was marked when both criteria were met.
- Abandon: disappeared from the program with treatment duration shorter than the recommended minimum of 11 days or was noted as abandoned by the health worker.
- Non-response: treatment >11 days with weight gain <5g/kg/day and z-score at discharge not above -2.
- Transfer: transferred to a higher level of treatment at any stage within the treatment course
- Death

For the duration of treatment mean we excluded the ones that died, were transferred, abandoned or non-responders. This was because most transfers and deaths happened the same day or a few days after admission and most abandoned and non-responders stayed either much longer or much shorter in the program.

Qualitative analysis

Interview and FGD transcripts were read and first coded following the three pre-defined key factors Access, Community engagement and Quality of care and if they were mentioned in inpatient or outpatient treatment context. This formed six codes: Inpatient-Access, Inpatient- Community

engagement, Inpatient- Quality of care, Outpatient- Access, Outpatient- Community engagement and Outpatient- quality of care. Sub-codes were given in order to indicate different access factors, community factors and quality of care factors. These codes emerged from the transcriptions until saturation. For example, when distance was mentioned as an access factor in the outpatient FGD it was coded as Outpatient- Access- Distance. The coded phrases were entered in Excel, ordered and re-read. Some of the codes could be re-grouped, such as Outpatient-Access- trust and Outpatient-Access- perception of care were both grouped under Outpatient- Access- Perception of care. In this way a maximum of 4 sub-codes per key factor remained. The codes were read and summarized, quoted phrases were translated into English.

Research team

The main researcher is of Dutch origin, but has worked for the past 4 years in the clinic Keru Yakaar as medical doctor and collaborated for the past few years with the nutrition program at St. Martin clinic. She is a well-known health worker at both of the clinics which facilitates trust and openness. The research aid is an experienced Senegalese nurse, working at the Keru Yakaar nutrition program, who speaks the local language and knew many of the participating women. She was able to explain the purpose of the research in a comprehensive way and translate during FGDs. A male Senegalese medical student assisted with recording and transcription.

3. Results

a. Quantitative analysis

Nutrition program attendance in 2014

St. Martin received in 2014 1205 children aged under 5 years for their nutrition program. Of the total number of children 387 were classified as severe acute malnutrition (SAM), which is 32% of the total. The others were classified as moderate acute malnutrition (MAM). The distribution in age groups shows the highest number in the age group 13 to 24 months with a total of 615 children (51%). They treated 43 infants under 6 months in that year (3.6% of the total number of children), of which 32 were SAM (74%) (figure 5).

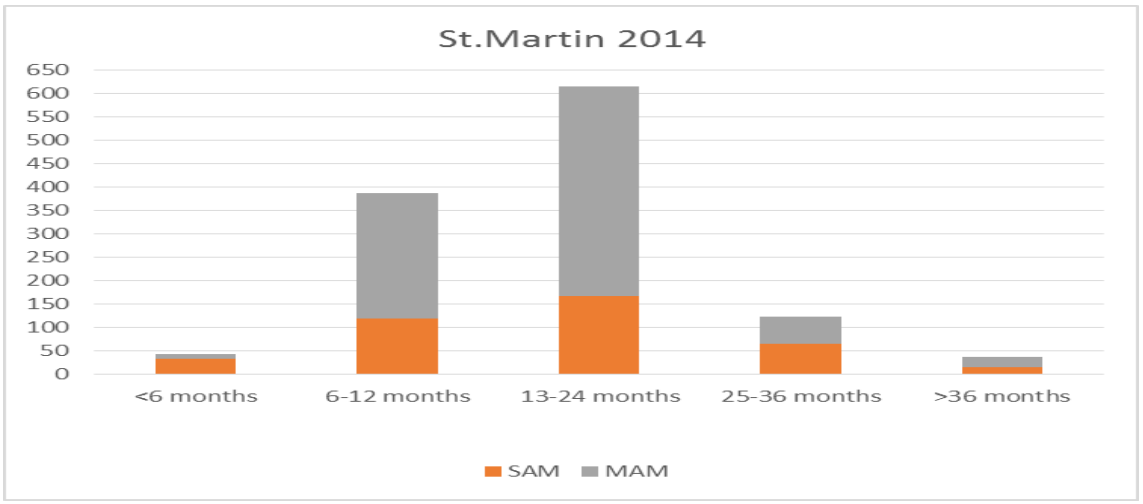

Figure 5. Nutrition program attendance per age group St. Martin in 2014

Keru Yakaar has a smaller scale nutrition program that treated in 2014 185 children under 5 years for malnutrition. This clinic received relatively more young infants under 6 months: 63 in 2014 (34%). A number of 29 of the infants < 6 months had SAM. This means that half of the infants under 6 months (46%) were classified as SAM, compared to 3 in 4 in St. Martin (figure 6).

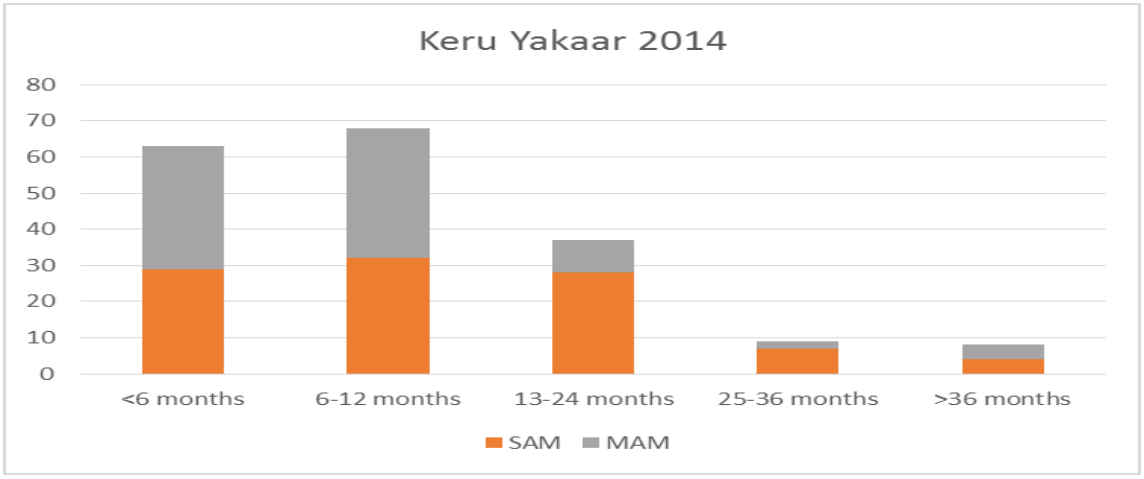

Figure 6. Nutrition program attendance per age group Keru Yakaar in 2014

Most of the malnourished young infants in St. Martin were treated as inpatients (68%), while in older age groups most children were treated as outpatients (62%). Because most patients under 6 months took longer to rehabilitate, in general 1 in 5 beds were occupied by infants < 6 months (18%). Keru Yakaar does not offer inpatient care, so patients needed to be referred in order to be admitted, which happened in 8 cases (13%).

Population SAM <6 months

When zooming in to the population SAM under 6 months, from 1st of January 2013 until 1st of September 2015, a total of 143 infants had been treated in both clinics together. A total of 17 files were excluded due to a missing height, 3 for St. Martin and 14 for Keru Yakaar. This resulted in a total of 127 files included, 67 from St. Martin and 60 from Keru Yakaar.

Both clinics have a regional function, illustrated by the fact that a large number of patients came from outside the health district (38% and 76% respectively) (table 1). A health district is a geographical area, in both clinics part of the capital city, that is normally the target area of a health service. Some patients even travelled a very long distance: in St. Martin 42% of the patients came from rural areas compared to 5% at Keru Yakaar. The level of poverty of patients was hard to extract from the database, although it is known that poverty is more common in rural areas. The data give the impression that the inpatient population came in a later and more severe stage of malnutrition with a mean age at admission of 2.7 months (compared to 2.5 months outpatients) while having a lower mean weight at admission of 2.80 kg (versus 3.14 kg in outpatient infants) (table 1).

SAM <6 months, distance and severity		
	St. Martin, inpatient	**Keru Yakaar, outpatient**
number data analysed	67	60
distance		
coming from outside district	48 (76%)	23 (38%)
coming from rural erea	27 (42%)	3 (5%)
anthropometric data		
mean age at admission (months)	2,7 (SD 1,6)	2,5 (SD 1,4)
mean weight at admission (kg)	2,80 (SD 1,10)	3,14 (SD 1,08)
mean height at admission (cm)	51,7 (SD 7,4)	54,4 (SD 6,3)
z-score at admission <-4	27 (40%)	18 (30%)

Table 1. Population SAM <6 months, distance and severity of malnutrition

The database shows that for 8 (10%) of the St. Martin infants and 10 (16%) of those at Keru Yakaar, the mother was sick or had died. A large percentage of our studied population was infants with low birth weight. At Keru Yakaar this concerned 33 infants, which is more than half of the patients (58%). The high percentage of twin infants in both of the programs is remarkable with 34% at St. Martin and 24% at Keru Yakaar. Underlying illnesses, like congenital heart disease or cleft lip, can cause malnutrition in infants and were diagnosed in 16% of infants in Keru Yakaar. Having an acute illness, like diarrhoea or a respiratory infection, can contribute to malnutrition. At St. Martin 57% and at Keru Yakaar 35% had an acute illness at admission (Table 2).

Medical treatment, like a broad spectrum antibiotic, some basic lab tests and vaccines were administered following a protocol, although documentation was limited. A broad spectrum antibiotic is standard treatment for severe malnutrition. In St. Martin only from 43 out of 67 files was the prescription of any medicine registered. It was unclear in the other cases if medicines were not prescribed or failed to be documented. Of the documented patient files 65% contained a prescribed

antibiotic on admission. In Keru Yakaar 39 % infants received an antibiotic. As nutritional treatment in St. Martin diluted F-100 was used most of the time. In a few cases it was documented that infants received RUFT when discharged, probably following the protocol for older children. In Keru Yakaar infant formula was sold for a low price. Only 4 cases were found there who only received breastfeeding counselling without a milk supplement. Similarly to St. Martin, in some cases the protocol for older children has been used for infants of 4 or 5 months of age. In this clinic a mixture of flours, called soungouf, which is used for moderate malnutrition over 6 months, has been given to some of the young infants.

SAM <6 months, patient characteristics		
	St. Martin, inpatient	**Keru Yakaar, outpatient**
number data analysed	67	60
patient characteristics		
twin or triplet	23 (34%)	14 (24%)
mother sick or died	8 (10%)	10 (16%)
acute illness at admission	26/ 46 (57)%	21/ 60 (35%)
premature/ low birth weight		33/ 58 (57%)
underlying illness at admission		8/ 49 (16%)
treatment characteristics		
Antibiotic on admission	28/ 43 (65%)	19/ 49 (39%)
Nutritional supplement used most	F100 diluted	infant formula

Table 2. Population SAM <6 months, patient characteristics and treatment characteristics

Outcomes

From the inpatient treatment group in St. Martin 40 (60%) were treated successfully with a mean duration of treatment of 22 days. 12 (18%) patients abandoned treatment, 5 (7%) were classified as non-responders. 6 (9%) were transferred (to a paediatric care service) and 4 (6%) died.

From the outpatient treatment group of Keru Yakaar 39 (65%) were treated successfully with a mean duration of treatment of 58 days. 10 (17%) patients abandoned treatment, 6 (10%) were classified as non-responders. 4 (7%) were transferred (to St Martin) and 1 died (table 3).

treatment outcome SAM <6 months		
	St. Martin, inpatient	**Keru Yakaar, outpatient**
number data analysed	67	60
treatment outcomes		
mean duration of treatment (days)	22 (SD 20)	49 (SD 36)
mean dur of treatment if succes (days)	24 (SD 22)	58 (SD 35)
successful treatment	40 (60%)	39 (65%)
abandon	12 (18%)	10 (17%)
non response	5 (7%)	6 (10%)
transfer	6 (9%)	4 (7%)
died	4 (6%)	1 (2%)
supplement feeding at discharge		27/ 34 (79%)

Table 3. Treatment outcome inpatient and outpatient treatment group <6 months

b. Qualitative analysis

Introduction

All quotes could be coded for one of the 3 key factors (Access, Community engagement or Quality of care). Some were not mentioned specifically in inpatient of outpatient context and were therefore not coded as such. For each of the 3 key factors, 4 sub-codes were defined, forming 24 final codes (12 for inpatient and 12 for outpatient). As regards the access factors the following sub-codes emerged:

- Distance
- Cost
- Perception of the health service
- The availability of milk

As regards quality of care the following sub-codes emerged:

- Re-lactation technique
- Mother-child attachment
- Medical care
- Patient education

Community engagement factors that emerged were:

- Health seeking behaviour
- Treatment involvement
- Breastfeeding practices
- Domestic tasks.

Domestic tasks can be an access factor as well as influencing the quality of care, but it was coded as community involvement because the community plays a huge role in this. In this section, community engagement factors will be mentioned as third, because they partly overlapped the two other factors.

The health workers interviewed were of different educational levels and included three nurse assistants, three nurses, two midwives, two general doctors and two specialists. The specialists had a more advisory role (one at each clinic), while the nurses and nurse aids were in charge of most of the clinical work.

The participants of the focus group discussions were mothers and caregivers that were in the treatment process at that moment. The characteristics of the participants were not investigated, but from the discussion we can remark that some mothers had paid jobs, but most were at home and a number of them were illiterate.

Key factor 1 Access

a. Distance

Almost all participants, both mothers (in all 4 FGD) and health workers (11 of 12), mentioned distance as an important access obstacle to care for malnourished infants.

> *"Distance plays a role because the majority of the mothers who come here are not from the neighborhood, they come from far away and that's a problem." (a health worker from St Martin)*
>
> *"If there would be a service like here In Grand Yoff, I would not have to do all this distance to come here, I would be close to home." (2 mothers inpatient during a FGD)*

Distance- Inpatient

Many mothers in the inpatient group had travelled a large distance to get to the health service. One mother came from Kedougou, which is located near the Malian border, about 200 kilometres from the capital Dakar. Because treatment duration was long often inpatient treatment was the only option, especially for those that did not have family in Dakar.

> *"We receive a lot of children who come from another region, so the problem of housing therefore arises. If you give them the opportunity to stay at the clinic where they are safe normally they will not refuse because they come from far." (a health worker from St Martin)*

Distance- Outpatient

An outpatient treatment approach involves weekly visits for often a long period of time. If the service is not close to the patient this can be inconvenient. Three outpatient health workers mentioned a large distance as a risk factor for loss to follow up. The moment the infant gets a little better the mother often gives up coming to the appointments.

> *"There is sometimes the transportation problem because if you ask the mother for what reason she was absent at the appointment she would say I had no transport to come, these cases we see here." (a health worker in Keru Yakaar)*

b. Cost

The cost of treatment was a recurrent factor in both treatment approaches. Women make their calculations as soon as a certain treatment is offered. This calculation is not easy to predict. Even poor women sometimes manage to obtain the means to cover all costs if they value the treatment of their sick child highly.

> *"She (the mother) can tell she wants to (start treatment) but it is the numbers that come immediately into her head that make her decide not to when she finds it expensive." (a health worker from St. Martin)*
>
> *"It cannot be a matter of lack of money, because you will surely be able to manage and even if you have to borrow money to care for your child you will do so." (a mother inpatient during a FGD)*

Cost- Inpatient

Inpatient care is perceived by mothers as more expensive, which makes them hesitate to come. In some cases the perceived costs do not correspond with the real costs. The way St. Martin has

organized their care makes inpatient care very accessible, costing only one dollar a day. It rarely happens that patients are not able to pay for the treatment there.

> *"I think they (the costs) are the same (for hospitalization) but if there will be any difference there will not be much since here hospitalization costs 500 CFA a day."(a health worker from St Martin*

Cost- Outpatient

Despite knowing the real costs, in the patients' minds outpatient care is cheaper and this perception plays a role even in seeking care.

> *"So you pay per day, then hospitalization is more expensive and there are mothers who have no way to pay that, that is why many people ask for outpatient care." (a health worker in Keru Yakaar)*

c. Milk

Most women who seek care expect receiving milk for their infant. Even though almost all mothers expressed the importance of breast feeding, many of them had already given a milk supplement to their baby before visiting a health service.

Milk- Outpatient

The fact that the outpatient service Keru Yakaar offers infant formula for a cheap price can be an attractive access factor. Some women who came did not breastfeed or for some reason thought their baby needed supplemental milk. Sometimes the infant was not even malnourished and therefore did not have an indication to receive the milk. For health workers this often rose tension and demanded a thorough explanation to the mother.

> *"I think often what they want is milk, saying they do not have enough milk for their child, their goal to come take the milk even if the child does not need it." (a health worker from Keru Yakaar)*
>
> *"Sometimes mothers say the baby is small, but when you take the weight and height of the child you will find out that the child is normal, but the mom she thinks her child is small so there is a problem. And if you do not give her milk she will be frustrated, but the one thing the child needs is breast milk." (a health worker in Keru Yakaar)*
>
> *"Often when I ask them questions, I note that they have already bought milk somewhere. Sometimes it is milk from the pharmacy but often it's cheap milk from the shop." (a health worker in Keru Yakaar)*

d. Perception of health care

The way the health care is perceived by the mother was a recurrent theme in access. Mothers explained that they were very selective in where to go for help for their infant. At entry level, the health workers that receive patients had an influence on the decision of a woman as to whether she would stay or not. The following phrases show the role of the health worker and the importance of a proper explanation of the health workers about why the child needs treatment. It appeared that whenever a mother was convinced a certain treatment is really going to help her infant, many other

access barriers could be overcome more easily.

"But when the health workers says the child will be hospitalized they (the mothers) will tell you they have no one to leave at home but after explaining what the health worker is going to do they can accept and sometimes the father too." (a health worker in St Martin)

"Yes it depends on the health worker, the health worker will know what is necessary to do." (a mother inpatient during a FGD)

"It is hard, but there where you can find health for your baby, you will do everything to get there." (a mother inpatient during a FGD)

Perception of health care- Inpatient

In general it appeared that hospital care is perceived by the mothers as only for serious cases. This forms a barrier to visit a hospital and they will often wait until the case is severe. This makes the inpatient population generally sicker, which can confirm the image people have from hospitals.

"Sometimes in the social reality the hospital or health facility is not well seen, that means that if a child is hospitalized for a mother it is synonymous to having a serious disease, that can even cause death, so in general people try to avoid hospital care." (a health worker in Keru Yakaar)

"She (the mother) brings in the child who is severely malnourished that is in an almost terminal stage. We put him on IV fluid but he is almost dying. It's difficult for the child to recover because he has been malnourished since a long time." (a health worker in St Martin)

Perception of health care- Outpatient

Some health workers explained that trust is the key word in access. In general, women are more familiar with the outpatient primary care services so trust can more easily be generated. Because women are familiar with going there for vaccination or prenatal care, the service is seen to be accessible in case of nutritional problems as well. A midwife and two nurses remarked that preventive care like prenatal visits could be an opportunity to prevent many more cases of malnutrition and low birth weight. Some women testified they accessed the service in this way.

"For me, my sister brought me here because the child was coughing and after consulting the doctor he found that the child's weight is not good and that is why I have been sent here." (a mother inpatient during a FGD)

"When she (a woman) is pregnant often that is where it starts, women are not well fed and do not properly take medications. There are mothers who do not come to prenatal visits and cannot buy medicine so when these mothers give birth the child has a small weight and is already malnourished." (a health worker in St Martin)

Unfortunately in practice women expressed that it is often not always the nearest health post that they have the most confidence in.

"It's not any health post that one trusts because when you go to some health post your child will not be cured. This was my case when I went to a health post and payed 15.000CFA (20 dollars) for medication, but the child was still not better so then I came here." (a mother outpatient during a FGD)

Key factor 2: Quality of care

a. Re-lactation technique

The technique for giving supplemental milk that was most mentioned in both clinics was the cup and spoon method. Arguments for this method are that it is easy to teach the mothers and the way of preparing the milk is more hygienic then, for example bottle feeding. The supplementary suckling technique that was practiced before in St. Martin has been abandoned because the personnel found it to complicated.

> *"The milk supplementation technique that we recommend her is the cup and spoon method because there is less risk of contamination than with bottle feeding. The mother can easily be instructed to measure the amount of milk given, that's why we prefer cup and spoon." (a health worker in St Martin)*

Breastfeeding support was only mentioned separately as part of treatment by two of the health workers. Health workers admitted that exclusive breast feeding is hardly even met as a discharge criteria, and some of them doubted if this was at all achievable. Several health workers admitted that many mothers go home with supplemental milk. This could cause problems when they do not have the means to buy infant formula.

Re-lactation technique- Inpatient

Inpatient care can be more effective because there is better supervision with both breast feeding and the cup and spoon feeding.

> *"From my point of view it's better to keep them because in general the hospitalized child will better follow the treatment protocol and therefore he recovers faster than children who come to outpatient."(a health worker in St Martin)*
>
> *"When its hospitalization you (the health worker) are there every time the mothers give the milk, you help them and after 2 or 3 days they can continue independently."(a health worker in St Martin)*

Re-lactation technique- Outpatient

All the 6 health workers from Keru Yakaar and mothers of 2 FGDS testified cup and spoon feeding to be a useful method in home-based setting. A precondition that was mentioned was that mothers should have good understanding of the technique. The risk exists that errors are not corrected in a timely manner having weekly appointments. The fact that treatment takes long was mentioned by two health workers as an advantage, because of the frequent teaching moments and the long follow up period.

> *"What causes problems is when the person returns home and does not give the treatment correctly, in that case the treatment duration will be longer." (a health worker in Keru Yakaar)*
>
> *"Even though it (outpatient treatment) takes longer, the mothers will learn from it, because in the recovery of malnutrition having patience is the most important."(another health worker in Keru Yakaar*)

b. Mother-child attachment

The importance of the mother-child attachment in nutritional treatment was mentioned by 5 out of 12 health workers and 4 mothers (in 3 FGDs).

Mother- child attachment- Inpatient

Two health workers from inpatient setting explicitly mentioned some cases they had seen of mothers with serious psychosocial problems. They remark that the mother did not show affection to the infant. Shame because of unwanted (teenage) pregnancy and child birth was mentioned by them as well. Inpatient care was explained to be useful for both recognizing and finding a solution for these psychosocial problems.

> *"There are mothers who come and have no affection for their child so you are forced to choose someone, maybe a member of his family that is more emotional towards the child to replace the mother as caregiver." (a health worker in St Martin)*
>
> *"In a hospital there can be health professionals for children with psychomotor problems, they can give counseling for the child." (a health worker in Keru Yakaar)*

Mother- child attachment- Outpatient

Home based care can stimulate mother-child affection in the sense that mothers stay in their natural environment. Lack of privacy was mentioned by health workers as a disadvantage of inpatient care. Most mothers said to prefer to be home especially for breastfeeding the child. For them home is the place where breastfeeding is a common and socially accepted practice.

> *"It's not worth hospitalizing, you just advise the mother how to breastfeed her child. Even when she is admitted in hospital she should breastfeed too, so is better to let her go home in her natural environment so she can breastfeed and if needed we give a milk supplement." (a health worker in Keru Yakaar)*
>
> *A mother: "I prefer keeping my baby home, because at home I will take good care of my child by giving him milk with a spoon and cup and also by breastfeeding. I can stay close to my child and he will feel my maternal warmth."* (a mother outpatient in FGD)

c. Medical care

While mothers during FGDs had much to say about access factors, health workers were logically more concerned and gave more extended responses about the medical care for infants.

Medical care- Inpatient

Both health workers and mothers mentioned medical care as an argument for treating as inpatients. Even for just simple or routine medical care, about half of the health workers and most of the mothers admitted that these treatments work better as inpatients. Mothers had the idea that their baby would recover sooner when medicines were administered under supervision of a health worker. Some health workers (4/12) thought that compliance to treatment would be worse at home. Complications such as pneumonia or severe oedema were arguments to choose for hospital treatment. Three of the health workers specifically mentioned congenital illnesses as underlying causes of malnutrition, that need specialist care.

"I prefer to hospitalize my child because at the hospital, the child will be well monitored and followed and will have good care. He will be recovering and then I would return home." (a mother inpatient during a FGD)

"Me, I recommend hospitalization because if the child is hospitalized there is a good support." (a mother inpatient during a FGD)

"If the person stays in the hospital all the time, health workers are there to monitor the child and check the mother for treatments she gives and remind her to give the drug to her child in time."(a health worker in Keru Yakaar)

"It can also be genetic diseases indurated the nutritional problem so the best is to hospitalize to see improvement and see what the cause of this malnutrition." (a health worker in Keru Yakaar)

Medical care- Outpatient

Some health workers (5 out of 12) said that medical care can be done likewise in an outpatient setting, because it is routine care and easy to administer. Some of the interviewees from Keru Yakaar came up with examples of infants who visited a paediatric service with their underlying illness who continued the nutritional follow up outpatient. An argument that was given is that there are simply not enough hospitals to provide the routine medical care inpatient.

"I do not think there is any difference (in medical treatment), because what we give to the outpatients we also give in hospital, so I think it can be done either way." (a health worker in Keru Yakaar)

"It is true that there are not enough hospitals and even in hospitals there are not enough paediatricians, we cannot decide to hospitalise every case with malnutrition even without the complication. You have to look case by case, so that only the complications stay in hospital."(a health worker in Keru Yakaar)

d. Health education

Educating the mothers on nutritional practices and health is seen by all interviewees as an important aspect of health care. Education should be about breastfeeding and how to use the re-lactation technique, but also on feeding practices after 6 months of age. Health teachings were said to be important in preventing relapse.

"Here we educate the mothers about how to feed the child from six months on. We give for example tips on how to vary the food. It should not happen that a child between 0 and 6 months is malnourished and after six months he will relapse. We need to prevent that."(a health worker in St Martin)

Health education- Inpatient

Health education was said to be more intensive during inpatient care, with more individual time with the health worker. Some mothers, who do not grasp the message at once, especially need this intensive education. Only one health worker admitted that in daily practice the health workers do not always have sufficient time to provide the supervision and health education needed.

"For health education, inpatient care is good, because the mother will be there all the time so you can see all that needs to be supervised. One can see if the mother applies well the advises. If not the health worker can correct it and do everything to help her."(a health worker in Keru Yakaar)

"If the level of understanding of the mother is low it is best to keep the child malnourished child in hospital."(a health worker in Keru Yakaar)

"For certain people the explanation needs to take place inpatient because a soon as they come home after having heard a teaching they forget quickly. Sometimes when mothers come back the next day and when you ask questions they will tell you that they have all forgotten." (a health worker in St Martin)

Health education- Outpatient

In outpatient care, health education needs to take place during the regular visits. In Keru Yakaar this was done in group sessions. Besides, the midwife was specifically pointed to give individual breastfeeding counselling. In a dedicated breastfeeding corner she helped mothers to find out why breastfeeding is not optimal and gave appropriate guidance. Because nutrition and breastfeeding are large topics, some health workers mentioned that a teaching once a week is not sufficient. They proposed other options, for example day care.

"Many times breastfeeding is a problem, mothers just need to give the breast, but often moms do not even know how to breastfeed their children." (a health worker in Keru Yakaar)

"From my point of view one health message per week is not much and often the mothers don't even listen so they will not remember what you have been talking about. But if they hear the message every day I think they may well identify the lessons and can start sharing what they are told."(a health worker in Keru Yakaar)

Key factor 3: Community engagement

a. Health seeking behaviour

Visiting a health service because of a nutritional problem starts with recognizing the health issue at home. The community, especially the father of the baby and the mother in law, were said to be much involved in signalizing the fact that an infant is underweight. In some cases, family members were said to force the mother to seek help for their babies. In case of children from unwanted pregnancies there is shame involved and the community can be the only hope for an infant.

"Normally when the child takes the breast it must gain weight but when there is no growth another mother in the house can know that there is a problem because the child needs to grow normally." (a mother during a FGD)

"The young mothers do not ask for help, they do not come to the hospital and above all they wait for someone to accompany them or to force them to go there." (a health worker in St Martin)

During birth rituals and in the early life of a baby, religion and traditional medicine are of great importance. The most natural health seeking behaviour for many women during the first few months after birth of their baby was said to be going to the Marabout (religious leader). Even when women went to a health service , treatment practices were sometimes mixed with traditional methods.

> *"It is found that mothers who come to the hospital always go through traditional medicine." (a health worker in St Martin)*
>
> *"Me I went to see a marabout with my child and he gave us a preparation to drink and to wash the baby for 3 days." (a mother inpatient during a FGD)*
>
> *"If it's a first child the family will advise the mother but they have a lot of traditional stuff in their heads. For example with the Fulani they'll tell you that when the child is born the first thing to give him is tea before he starts to be breastfed, not knowing that colostrum is good for a baby and I do not know who is going to tell them." (A health worker in St Martin)*

Health seeking behaviour- Outpatient

The above description shows that whatever health service is offered, the influence must reach the community at the very start of the problem. One way to make the health care known is by testimonies of mothers who received good care. Mothers whose child had been well treated for malnutrition, shared their experiences with their community. In all four FGDs mothers testified they had been coming to the clinic because of a neighbours advise. At both clinics health workers and patients witnessed a good reputation of the clinic. For outpatient services this publicity is more likely to happen because it is closer to the patient.

> *"Because I knew of a child who had been here for treatment. That's why when I found out that my child was malnourished I came straight here. (a mother outpatient during FGD)*
>
> *"If one is treated somewhere until the child has recovered, then if you see a child with the same problem you find a child in the case of malnutrition who has the same problem as your child then you will advise the mother to come here for treatment." (a mother outpatient during FGD)*
>
> *"There are women who talk about their treatment and their experiences to other women and how their children were supported and they bear the testimony of their cured children." (a health worker in St Martin)*

b. Treatment involvement

The treatment of a sick or malnourished infant involves not only the mother, but the community as a whole. Most health workers mentioned that the community contributes financially to the treatment. How supportive a community is can differ hugely. Health workers said they took this into account when deciding for inpatient or outpatient treatment. When the community is not supportive, it can be better to admit an infant with its mother until the infant is rehabilitated.

> *"This (community involvement) is not the same for everyone. There are families that help and are encouraging, they are with you wherever you go. Other families are different and if the child is ill they do nothing." (a health worker in Keru yakaar)*
>
> *"If there is no medical complication a child can stay home, but we study the different cases. If we see that the mother does not stay very close to the child or when we know the family situation is not supportive we will keep the child."(a health worker in St Martin)*

Treatment involvement- Inpatient

The fact that hospital care is perceived as expensive makes that family members are more likely to contribute. Family members will also help the mother practically while admitted, for example by bringing her food.

> *"For the complicated cases, the inpatient ones, they receive visits from members of their family who will support them financially." (a health worker in Keru Yakaar)*
>
> *"Sometimes it is the family who pays and gives a helping hand to the mother by bringing the food." (a health worker in St Martin)*

Treatment involvement- Outpatient

One of the advantages of home based treatment, mentioned by 5 health workers is that the community can be involved in the treatment, like re-lactation. Family members can help practically with feeding the infant or providing sufficient time for the mother to breastfeed were mentioned examples. Sometimes a family member takes over the care in case the mother is not able to give the appropriate care.

> *"I think it is better (outpatient treatment) because she (the mother) will be at the house with her family and they will help her. For example the father can be a great help."(a health worker in Keru Yakaar)*
>
> *A grandmother explains: "But this is not my baby, the mother had an early pregnancy and she could not handle taking care of the child, that's why I have taken him." (a grandmother inpatient during a FGD)*

c. Breast feeding malpractices

Even in supportive families, different theories and (mis)conceptions about young infant feeding can influence the treatment of malnourished infants. The importance of breastmilk for the infants was said to be underestimated in communities. Even in poor households mothers easily start bottle feeding or give porridge in an early stage. This was mentioned as a concern by 11 out of 12 the health workers. When infant formula is to expensive the mother often dilutes the milk, which can cause malnutrition.

> *"Mothers say their breast is not good for their babies and it is very difficult to explain to a mom that her milk is the best for her baby, and I believe that at community level there should be instruction on breastfeeding." (a health worker in St Martin)*
>
> *"It is common in many of our families that from the age of three months we want to start giving the child porridge it is mostly a problem of ignorance about the child's diet and for them it is unheard of to give only the breast up to 6 months of age and no water. For them it is their strong belief that this is not possible." (a health worker in St Martin)*

Breastfeeding malpractices- Inpatient

Inpatient treatment can protect the mother from the influence of misconceptions and malpractices around breastfeeding. Pressure of peers can be high for giving water or food supplements to malnourished infants. Inpatient care carries the risk of relapse though, when community habits do not change.

"Hospitalization is convenient because it allows the mother to follow advice closely. Because they are far from tasks and influences and any problems they usually face that can prevent them from following treatments." (a health worker in St Martin)

Breastfeeding malpractices- Outpatient

The other way around, the advantage of outpatient treatment can be that the community will be positively influenced by the acquired practices around breast feeding. A few health workers said this was happening. Mothers did not mention this influence, but the effect will probably go unnoticed.

"This is the case of illiterate who have lots of traditions, but when they arrive at the clinic, by applying what we tell them they see a difference and what they experience they will pass on to others."(a health worker in St. Martin)

"Here the mothers take part of health teachings actively and whatever they learn they apply at home and when they see a neighbor who is in trouble they will teach her."(a health worker in Keru Yakaar)

d. Domestic tasks, work

Caring for a malnourished infant has implications for the domestic tasks that the mother needs to do. During FGD domestic tasks were one of the most frequent themes and they were mentioned most frequently as barrier to treatment.

Domestic tasks, work- Inpatient

Mothers who did manage to stay for inpatient care often saw it as a great advantage to be able to fully focus on their child.

"When the mothers are here, they have much more time to care for their child and they respect the feeding hours. They are being monitored every three hours the child they must nourish their child."(a health worker in St Martin)

"Here you get up in the morning, you do some laundry and the rest of the day you have time to nourish your child."(a mother inpatient during FGD)

Domestic tasks, work- Outpatient

In case of inpatient treatment the mother needed to fully free herself from all her domestic tasks. Automatically this demanded effort and cooperation from the father and other household members. In some cases the mother needed to bring her other children to other households in order to get admitted. Domestic tasks were often a reason to refuse inpatient care. The fact that domestic tasks can be continued was mentioned by several mothers in all 4 FGD's as an advantage of outpatient care. Working mothers in general prefer outpatient treatment. They often came before or after work to the clinic.

"It is hard because you left your family, your child at home and you do not know what is going on at home before coming here so you have to put the child in good hands for it to be well taken care of."(a mother inpatient during FGD)

"When I was offered to stay I went to ask my husband. He refused because there is work at home and I live with his co-wife, so my husband preferred me to do outpatient treatment because of the work at home." (a mother outpatient during FGD)

"If she has other children at home and no one to care for them she will prefer to go home and refuse hospitalization because she needs to feed the others at home."(a health worker in Keru Yakaar)

4. Discussion

The population of malnourished infants <6 months

The two case clinics (St. Martin and Keru Yakaar) both have been treating malnourished children and infants since a number of years. Even though both clinics function in an urban setting, for the nutrition programs they have a wide catchment area, both rural and urban (table 1). Young infants represented an important part of the population visiting these nutrition programs (34% in Keru Yakaar and 1 in 5 hospital beds in St. Martin, figure 5 and 6). A remarkable difference between the inpatient and outpatient population is that in St. Martin the majority of the infants <6 months presented were severely malnourished (74% compared to 46% in Keru Yakaar) (figure 5 and 6). This can indicate that patients came in a later stage. The infant formula that is available in Keru Yakaar might be related to the earlier presentation.

In Senegal there is currently no large natural disaster or political instability. Causes of young infant malnutrition will be expected to be more at household level in direct causes like feeding problems. This paper does not study causes of infant malnutrition in Senegal, but the quantitative data do give some patient characteristics of the infants < 6 months with SAM. Some perinatal characteristics were remarkably common in this study population, such as twin birth (34% in St. Martin and 24% in Keru Yakaar) and low birth weight (57% in Keru Yakaar), with an overlap in the two groups (table 2). A possible causality between low birth weight and infant SAM would be a domain of further study. The social aspect of young infant malnutrition is reflected by the number of orphans or mothers unable to breastfeed. In St. Martin this was reported in 10% and in Keru Yakaar 16% of the treated infants (table 2). Those families are often poor and unable to buy infant formula. Furthermore, illness plays a causal role in malnutrition. In the study population acute illnesses were prevalent (57% in St. Martin and 35% in Keru Yakaar) (table 2). The patients with an underlying illness like congenital disorders represented 16% in Keru Yakaar (table 2). The disorder can even be unknown until the child comes with severe malnutrition to a health service.

Treatment approach < 6 months

There is very little documentation on outpatient treatment of infants SAM (ENN 2010). These data show that it is indeed possible. The two clinics follow in general the most recent WHO treatment guideline (Appendix 1). This protocol, or the previous one (WHO 1999, is used in many other nutrition programs for young infants (ENN 2010, Kerac 2012). Therefore, the results of this study could be applicable in a broader context. Despite the differences in access and population characteristics between St. Martin and Keru Yakaar the two populations can still be compared because of the selection of only the severe cases (SAM) with the same anthropometric inclusion criteria. In our two studied populations treatment success did not seem to differ much between inpatient (60%) and outpatient (65%) treatment of infants < 6 months with SAM (table 3). It must be noticed that treatment success is hard to define. The international Sphere standards, designed to evaluate nutrition rehabilitation programs as a whole, are not yet validated for programs for young infants (The Sphere Project 2015). The discharge criterion for the age group from 6 months can be defined by the z-score, while for young infants a sufficient growth per day or exclusive breast feeding are mentioned criteria (ENN 2010). These data were often not available in both clinics. Treatment duration in successful treatment was shorter in the inpatient group (22 days compared to 58 days outpatient) (table 3). It can be questioned if a shorter treatment duration means a more effective treatment. It is remarkable that loss to follow up was about the same for inpatient and outpatient treatment. Apparently mothers were still motivated to come to their appointments even after two months of treatment. Qualitative data show that some health workers prefer a longer treatment duration, because of the opportunity to provide regular nutritional education and follow up.

Access to treatment

Distance

The inpatient population shows a larger part (76%) coming from outside the district than outpatient (38%) (table 1). This might be because of the way they organize care with rooming in, that helps mothers in case they cannot find a place to stay nearby. The qualitative data show that the majority of women would wish to have a service closer to home.

Cost

Cost of treatment is a common access obstacle, and often the first consideration for mothers regarding treatment. This barrier cannot easily be captured in numbers though. It is strongly linked to perception of the service and economic advantages like cheaply offered infant formula. The cost effectiveness from health delivery perspective has not been studied, which is a limitation. It is known that both health services have some external funding available for their nutrition program in order to be able to offer care for an affordable price. Cost for the patient was about the same amount for both programs, when taking transport costs into account.

Milk

The inpatient approach has the advantage that it can use F-100 that is freely provided by the government. The question can be raised what products could be used in outpatient rehabilitation setting. A randomized controlled trial in the Democratic republic of Congo included 161 infants under 6 months either with severe wasting or failure to gain weight at home. The study shows that diluted F-100 therapeutic milk and standard generic infant formula were equally effective (Wilkinson 2009). From the qualitative data we learn that many mothers often buy milk at shops or pharmacies and give the bottle as a first response to nutritional problems. When infant formula would be available at primary care level, mothers of malnourished infants would be more likely to come, which gives opportunities to promote breastfeeding and prevent them from buying bad quality milk and bottle feeding.

Perception of health service

The reputation of a health service is of huge importance. Both studied clinics have a good reputation and patients testified to be willing to travel large distances to get there. The reputation was related to good treatment results and to trust. The first contact and reception at the clinic were shown to be of importance. Guerrero found that lack of good reception or earlier experience of rejection at a health service was one of the main barriers of access to outpatient nutrition programs (Guerrero 2010). Inpatient care is perceived to be only for children who are seriously ill. When inpatient care would be the only available option (as is currently generally the case), mothers would be waiting until the situation is serious before visiting the health service. Quantitative data confirm that in St. Martin more infants were severely malnourished at presentation (figure 5 and 6). Primary care services like health posts are often the first contact with health care. The interview data mention this preventive signalling function as still underutilized.

Quality of care

Medical care

Qualitative data on quality of care factors show that most health workers were worried about a lack of medical care in outpatient setting. Most health workers remembered the patients in their program suffering from congenital diseases who really needed specialist care. In a non-emergency setting as in Senegal these cases are expected to be more frequent than in, for example, a famine. Nevertheless in our data only 16% of cases had such an underlying illness. During interviews a few health workers explained that even for those more complicated cases, nutritional treatment could

happen in an outpatient program, while simultaneously following paediatric appointments. Adequate referral is crucial here. Most medical conditions in malnourished infant are minor and can often be treated following outpatient protocols following the IMCI system. Acute illnesses like diarrhoea or respiratory infection were reported in 57% in St. Martin and 35% in Keru Yakaar (Table 2). The WHO guideline prescribes a broad spectrum antibiotic at admission for all infants SAM, although scientific evidence is weak and there is a concern about upcoming resistance (WHO 2013, ENN 2010). Only a proportion of the infants did receive an antibiotic in the study group (68% in St. Martin and 39% in Keru Yakaar) (table 2), probably because their clinical condition did not require one for all infants.

Re-lactation

The supplementary suckling methods is the recommended inpatient re-lactation method in the WHO protocol (WHO 2013, Appendix 1). Field reports show good results, but say that this method requires intensive guidance of both mothers and medical staff (Oberlin 2006, Vygen 2013, Singh 2014). In St. Martin SS has been abandoned mainly because of the known practical difficulties and lack of understanding by the staff (Lelijveld 2014). The cup and spoon feeding method was used for re-lactation in both studied clinics. In literature this method is described mainly in emergency settings (Seal 2001). This study shows that cup and spoon feeding is not impossible in outpatient setting and all the 6 health workers from Keru Yakaar and mothers of 2 FGDS testified it being a useful method. Advantages that are given are that the method is easy to teach, hygiene is sufficient and breastfeeding can be continued. When there is a lack of understanding, the re-lactation cannot be easily corrected when outpatient. This could be solved by a home visit. A fact that has not been easily admitted by the mothers is that most of them already gave the bottle before coming to the health service. Health workers expressed serious concern about this, especially the hygiene aspect. Bottle feeding does increase the risk of diarrhoea, as shown by Hipgrave, who found more than double incidence of diarrhoea among infants 0-5 months who had received donated infant formula after the earthquake in 2006 in Indonesia (Hipgrave 2011).

Mother-child attachment

Mother child attachment is often underestimated as a factor in nutritional care (ENN 2010). The MAMI project concluded that children and young infants receiving stimulation during treatment for severe malnutrition have significantly superior intellectual development than the control group (ENN 2010). Even though there was not a specific question about this in the interviews, several health workers and mothers expressed that a lack of stimulation and interaction could hinder recovery. Mothers who have trouble in the family sphere or psychologically were said to interact less with their infant. Psychosocial care was said to be provided by the regular health workers. Inpatient care would be better suitable for this. When pathology is absent, home is the most natural environment for mothers and home treatment was said to be beneficial regarding mother-child attachment.

Education

Both clinics provide health education and take time individually and in group sessions to discuss relevant topics. A huge advantage of inpatient care is that teaching can happen in practice and that education and correction can take place while feeding the child. Ashworth underlines this advantage of hospital based care with more teaching possibilities and showed less risk of relapse (Ashworth 2005). Inpatient care has the advantage that women can be fully detached from their community for a period of time. This can favour learning new feeding practices, but has a danger of relapse, when peers do not support the changes. Outpatient care carries the risk of failure when the mother has not understood the message. On the other hand, she can be an initiator of change in her community

when new feeding practices are shared with neighbours and peers. Even though examples of this peer support were given, measuring this community effect was outside the scope of this study.

Community engagement

Communities are is involved in all aspects of treatment. Community engagement factors therefore overlapped with both access and quality of care factors. This was a limitation in the presentation of results.

Health seeking behaviour

The qualitative data revealed that family members like the grandmother are involved in recognizing the problem of malnutrition, and what type of care will be sought. Religious leaders have a strong influence on health seeking behaviour, especially concerning new-borns. Fathers or other male household members will decide on the financial aspect of care. This study was conducted in a clinical setting and therefore health seeking behaviour was difficult to take into account. In general, outpatient care is physically closer to those community key figures, which can facilitate communication and interaction. Guerrero describes that how well-known a nutrition program is in a community, partly defines the success of that program (Guerrero 2010). In our case clinics, positive publicity happened mainly by mothers of successfully treated patients. When a clinic has a good reputation, news can spread very fast in a community and attract news patients.

Involvement in treatment

Interviews and FGD revealed that involvement of the community in treatment can differ. Financial support is more prominent in hospital care. For a health worker it is essential to ask questions about the family situation in order to be able to decide if there is sufficient community support for outpatient care. If this is not the case, an inpatient treatment was recommended.

Breastfeeding (mal)practices

As the qualitative data show, there are several believes and misconceptions about young infant feeding and breastfeeding in communities in Senegal. Many women say they do not have enough milk, but do not know how to improve this and early introduction of food and water adds up to the problem. Breast feeding counselling can be done in outpatient setting, as shown by Aidam et al. Even though they studied a healthy population, a 100% increase of exclusive breast feeding rate by doing a combination of educational session during regular prenatal visits and home visits was observed in Ghana (Aidam 2005). It would be ideal if the community (in smaller or larger sense) would be educated with the mother of the treated child. A study in Bangladesh showed the importance of peer support in breastfeeding counselling. Local mothers received a short training and performed 15 home based counselling visits to healthy mothers with their new-born babies. The intervention dramatically improved EBF rates (Haider 2000). Keru Yakaar does not do home visits on a structural basis, so influence on breastfeeding practices tend to stay in clinical setting. Additionally, although during interviews health workers explained the importance of breastfeeding, exclusive breast feeding as an outcome measure was hardly mentioned. Most of the infants were discharged still needing milk supplement (79% in Keru Yakaar) (table 2). This raises the question if medical staff themselves were convinced about the importance of EBF. Especially in hospital setting the danger exists that problems will be medicalized and even the patient starts believing it is the artificial milk that rescued the child instead of the breast.

Domestic tasks

Domestic tasks was, together with costs, the main barrier for both treatment forms mentioned by both mothers and health workers. Mothers either refused treatment or defaulted because of domestic tasks. Often it was not the mother taking this decision, but the husband or the community

as a whole. Regarding the long treatment mean duration (22 days inpatient and 58 days outpatient), the important role of the mother in domestic tasks must be taken into account when reflecting on treatment approaches. St Martin sometimes offers that siblings can stay rooming in. Some mothers proposed an afternoon outpatient program, because that fit their domestic work schedule better than mornings. Two health workers came up with the idea of day-care, to be able to give intensive education, while mothers can return home in the evening. This intermediate treatment form could be a solution for some of the women.

5. Conclusion and recommendations

Conclusion

Within the global health issue maternal and child malnutrition, malnutrition under 6 months has often received less attention. Prevalence of malnutrition in this age group is comparable or higher than in older age groups (Kerac 2012). Disease burden is probably higher regarding the vulnerability of young infants and a global infant mortality that counts for 70% of the under 5 mortality (Black 2013). Specific causes and treatment approaches are still a domain of study (ENN 2010). In Senegal 5.4% of young infants are wasted and some risk factors like a low rate of EBF and high prevalence of LBW are present (MoH 2013). Two clinics in urban Senegal served as case settings for comparison of an inpatient and outpatient treatment approach for infants with SAM under 6 months.

Quantitative data on the populations visiting the programs provided some patient characteristics. Infants < 6 months represented an important part of the population visiting the nutrition programs at the two clinics (34% in Keru Yakaar and 1 in 5 occupied beds in St. Martin). In both clinics the majority of patients came from outside the health district (78% and 57%). In St. Martin more patients came from rural areas, which is explained by their regional function. Of the infants <6 months with SAM in St. Martin slightly more had an acute illness at admission such as diarrhoea or respiratory infection. Cup and spoon feeding was the most common method of re- lactation used in both settings, and F-100 in inpatient (St. Martin) and infant formula in outpatient (Keru Yakaar) setting. Treatment success did not seem to differ much between inpatient (60%) and outpatient (65%) treatment. Duration of treatment was much shorter with inpatient approach (22 days compared to 58 days outpatient), but loss to follow up was about the same. The high number of twins and infants with low birth weight in the studied populations is remarkable and can be a topic for further study. The large amount (74%) on infants still receiving milk supplement at discharge is concerning.

Experiences from both health workers and mothers/ caregivers with both of the treatment approaches were explored using interviews and FGDs. The three key issues of Collins (Collins 2006-b) for a successful nutrition program (Access, Quality of care and Community engagement) were used as a framework to analyse the interview and FGDs data and to compare the treatment forms.

As access factors distance, cost, milk and perception of health care were found. Distance is an important access factor and needs specific attention in outpatient care, needing weekly visits to the health service. Costs form a barrier for both treatment forms. Outpatient treatment is perceived to be cheaper, even though in reality costs were about the same as inpatient. The available milk supplement plays a role here, with F100 freely available on hospital levels, while infant formula not being available in clinical (outpatient) setting. Most of caregivers already try supplemental feeding before visiting a health service raising concern about quality and lack of hygiene. Trust in a certain health service facilitates early presentation and can more easily be accomplished in primary care setting.

As quality of care factors medical care, re-lactation technique, mother-child attachment and education were found. Most acute illnesses can be treated with primary care protocols. A clear referral system is essential for underlying illnesses and severe illnesses. Cup and spoon feeding as a milk supplementation technique needs explication and supervision, but not in the extend that it is impossible at home. In case of psychosocial pathology inpatient care can give better guidance, but the normal mother-child attachment can be promoted in home based setting. Intensive health education can be more effectively done inpatient, but for the long term benefit and the prevention of relapse the community needs to be involved.

Community engagement factors were the health seeking behaviour, treatment involvement, breastfeeding (mal)practices and domestic tasks. Good quality care will give good outcomes that will automatically be a publicity to the community. Visiting a health service can then become a more natural option in the health seeking process that is strongly influenced by community practices and religion. The success of outpatient treatment will depend on how supportive the family and community are. Breastfeeding malpractices could potentially be better addressed in outpatient setting, given the strong influence of peers. Domestic work will often be a barrier to treatment, either inpatient or outpatient.

This paper describes different aspects of inpatient and outpatient treatment of infants under 6 months with SAM. With data from two case clinics it shows that outpatient treatment can be done with similar success rates as inpatient care, which is currently the standard. Outpatient care is perceived as more accessible, given that there is affordable infant formula available. Inpatient care can better guarantee the quality of care with more intense supervision and education. The community has the potential to play a role in both access and quality of care because of its influence on health seeking behaviour, breastfeeding practices and its contribution to treatment and prevention. Bearing in mind the magnitude of the health problem and the strong relationship with breastfeeding practices, a future treatment approach for SAM under 6 months of age should be sought more on community level.

Recommendations

Based on the findings of this study some recommendations can be made regarding treatment for infants <6 months SAM. Advantages of either of the treatment approaches can be weighted, depending on the context. Figure 7 summarizes these factors and pictures the balancing of both inpatient and outpatient advantages.

A nutritional service for young infants must be accessible.

- Outpatient care, especially when provided from a primary care service, can render a service accessible, because it is generally provided closer to the patient and is perceived to be cheaper.
- When outpatient care is not yet widely available a convenient rooming in for mothers could prevent default.
- Primary care services are utilised for various maternal and child health services, therefore prevention and early detection of young infant malnutrition could easily take place on this level.
- Trust must be generated by good reception and communication. When trust is lacking, patients prefer staying home or travel a large distance in order to receive good care.
- A lack of affordable milk supplement can be an obstacle for outpatient care and if not available, competition with local milk providers will influence access. Inpatient care has the advantage of a free available milk supplement (F-100), which cannot be used in outpatient setting.

Quality of care in a nutrition program for young infants must be good.

- The cup and spoon method for milk supplementation can be done in outpatient setting, but needs sufficient explication and preferably a home visit.
- An appropriate referral system should be in place to select patients with underlying illnesses that need hospital care. Most non-severe acute illnesses can be handled in outpatient setting using treatment protocols.

- In addition, some patients will need intensive health education or psychosocial counselling that will require inpatient care. Outpatient treatment will be preferred by mothers, being able to breastfeed in their natural environment.
- Education on health, food and breastfeeding needs to happen, in groups and individually, ideally involving communities.

Community engagement will be defining the success of a treatment approach.

- Good care gives good outcomes that will result in a good reputation of the clinic. This will work out in a preventive way, leading others to seek help earlier.
- Supportive families can make outpatient care possible and feasible.
- Malpractices around young infant feeding can be a barrier and a reason to choose for inpatient treatment. Outpatient treatment on the other hand can provoke a positive influence on community practices.
- Domestic work can be continued with outpatient care, but the danger is that the mother lacks time for treatment or feeding. When this is suspected, inpatient treatment is a better option.

Inpatient		Outpatient
no daily transport needed	Access	closer to the patient
		perceived as cheaper
free milk supplement available		can prevent from buying milk from shops
		more trust in primary care
supervision with relactation technique	Quality of care	
professional care for psychosocial problems		natural environment for mother-child attachment
better care for underlying illnesses		
more intensive health education		health education shared with peers
	Community engagement	more likely to influence health seeking behaviour
		family members can help taking care of the infant
less influence of community malpractice		breastfeeding practices can change in community
mother free from domestic tasks		domestic tasks/ work can be continued

Figure 7. Advantages of inpatient or outpatient treatment for infants <6 months SAM

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7. Appendices

Appendix 1: Summary WHO treatment approach severe acute malnutrition <6 months

Admission criteria:

infants under 6 months with weight for length <-3 Z-score or bilateral pitting oedema.

Criteria for inpatient care:

a. bilateral oedema
b. recent weight loss or failure to gain weight
c. ineffective feeding (attachment, positioning and suckling) directly observed for 15–20 min
d. any pitting oedema
e. any medical or social issue needing more detailed assessment or intensive support

Medical treatment:

a. standard broad spectrum antibiotic
b. vitamin A
c. measles vaccination
d. malaria testing and treatment
e. other necessary care

Nutritional treatment:

a. support breastfeeding re-lactation in breastfed infants
b. give standard supplementary feed: Diluted F-100 with supplementary suckling technique if possible
c. assessment of the physical and mental health status of mothers or caregivers should be promoted and relevant treatment or support provided

Discharge criteria:

Infants who are less than 6 months of age can be discharged from all care when they:

a. are breastfeeding effectively or feeding well with replacement feeds
b. have adequate weight gain
c. have a weight-for-length ≥–2 z-score

Outpatient care requires:

a. counselling and support for optimal infant and young child feeding
b. weight gain of the infant should be monitored
c. if the infant does not gain weight, or loses weight, then he or she should be referred to inpatient care
d. assessment of the physical and mental health status of mothers or caregivers should be promoted and relevant treatment or support provided

Appendix 2: Questions interviews and FGDs

Questions interviews health workers

Introducing questions:

Why do mothers come to the clinic for help with a malnourished infant? What do they expect?
Would either inpatient or outpatient treatment be most successful and why?
Would mothers with malnourished infants opt for inpatient or outpatient treatment and why?

Accessibility

What is the difference in cost of both treatment forms?
What is the difference in duration of treatment, is this an advantage or disadvantage?
Would distance play a role in either of the treatment forms and how?

Community engagement

In what way does the family/community support in either if the treatment forms?
In what way can domestic tasks form a barrier to either of the treatment forms?
What do mothers tell their relatives to promote the treatment?

Quality care

Which treatment form is most effective for giving milk supplementation (like cup and spoon feeding)? Why?
Which treatment form pays better attention to illnesses/ medical treatment? Why?
Which treatment form is most effective concerning health education/ counseling by the health workers?

Questions FGDs

Your cousin, a young mother, comes to you with her little baby. She is worried because the baby does not grow well, he is very little. Maybe she does not have enough milk, maybe the baby is not drinking well, or maybe he is ill?

1. What would you advise the mother about where to go, what to bring and what to expect? (expectations, access factors: costs, distance)

At the clinic it appears that the main problem is that the baby does not get enough breast milk. Breast milk is the best milk and if the mother would increase the number of feedings the baby will produce more milk so the baby can grow.

2. What would help this mother to improve her breastfeeding habits? (community factors: family support, quality of care factors: supplement, health workers)

After a week the health worker says that your cousin needs to feed the baby extra with powder milk with a cup and spoon (not a bottle), after giving the breast, each feeding each 3 hours. This feeding takes time and practice to succeed. The health worker at the clinic explains there are two ways of doing this treatment: either the mother goes home and gives the milk supplement and comes back after a week to take the weight again, or the mother stays at the clinic with the baby for a week for this treatment.

3. Which of the two treatment forms would you think is best for your cousin and why? (expectations, access factors: duration, costs, community factors: family support, domestic tasks, quality of care factors: milk supplementation, medical treatment, health workers)

You cousin decides to stay at the clinic. A moment when your cousin is with you at the clinic, her husband calls you to tell there is no more money to support the treatment.

4. What do you tell him to convince that your cousin needs to finish her treatment with the baby?
   (community factors: publicity, quality of care factors: supplementation, medical treatment, health workers)