Introduction

In the third week of march 2010 a Medical Checks for Children team visited Western Kenia, checked and treated 1293 children aged newborn to 12 years free of cost. The team consisted of Ines von Rosenstiel, Femke Neervoort, Heidi Schulkens, Maria Ria Schmitz, Annekee Kramer-van Dijk, Joanne Wildenbeest, Theo van Dijk, Marian van Kalmthout, Pamela Breas-Baker, Brian Simions, Esther Zumpolle, Beatrijs Bartels.
Our host patron durning the Kenia stay was Archbishop Makarios, Head of the Greek Orthodox Seminary in Riruta.

The medical checks were organized for the third time in close cooperation with the Sophia Foundation for Children (SFFC). The mission was the first implemented in Western Kenya.

Technical equipment and some of the supplies were brought from Europe by MCC team members. Most of the medication was ordered through SFFC in Kenia. Additional local medication was purchased from the main pharmacy in Nairobi.

The cooperation of the Sophia Foundation for Children and the Archbishop Makarios existed out of the following (amongst others):

- Transfer of knowledge about expected diseases, through their earlier work in Kenia.
- Transfer of data on demographics.
- Selection of primary schools and orphanages.
- Providing facilitating board and lodging of all MCC team members.
- Transportation of the MCC team from Kilimanjaro airport to TPC and transportation to the diverse check locations in Western Kenia.
- Prior announcement of the medical camp in the locations.
- Ordering and delivery of medications.
- Giving support to the MCC team during the medical camp.
- Managing facilitating and (pre)-payment of hospital in/out patient referrals.

The MCC team was very satisfied with the cooperation with Archbishop Makarios and the strong input of the Sophia Foundation. Our special thanks go to Marina Shakola and Matheos Demetriades, because their active, direct support and enthusiasm gave MCC the opportunity to work in Western Kenia and they facilitated all aspects of the medical camp. Special thanks go to the translators and teachers. We enjoyed working together with all the local helpers. We hope they will continue to inspire their communities in the same way they inspired us as they play a vital role in spreading awareness and knowledge about child health & hygiene.
We are grateful to all the care takers and community people for bringing the children and helping to conduct the program. We are happy we got the opportunity to work with and to learn from all volunteers, translators and other supporting members who have helped directly or indirectly, despite their own obligations.
And last but not least, we would like to thank the children and their care-takers who came to the checks for their inspiring presence.

Medical Checks for Children on location:
The medical checks of the children were performed on six days at different locations.

Table 1: Place of stay and number of checked children per date.

Day	Date	Place		Number of Children
Saturday	20-3-2010	School/village	Chawongere	303 Children
Sunday	21-3-2010	School/village	Chawongere	209 Children
Monday	22-3-2010	School	Chebugundi	213 Children
Tuesday	23-3-2010	School	Kensegei	264 Children
Wednesday	24-3-2010	School	Kimerek	169 Children
Thursday	25-3-2010	Orphanage	Nyeri	82 Children
		Non-orphanage school	Nyeri	53 Children
Total				1293 Children

During the free of costs medical checks, the children were checked following the MCC carrousel:

1. Registration of the child
2. Measuring height and weight (saturation occasionally)
3. Blood test (haemoglobin)
4. Physical examination
5. Giving medication (pharmacy)
6. Education on tooth brushing (a tooth brush was given to each child), and hand washing.

Data collection
Anthropometric measurements were recorded, and a finger prick sample was taken for determination of the haemoglobin (Hb) concentration. Each child was examined by a clinical officer. History of illnesses in the preceding four weeks was recorded. Specifically, caretakers were asked if the child had diarrhoea, an upper respiratory infection, vomiting, eating soil (pica), decreased appetite, weight loss or malaria. They were also asked if their child received treatment for any of these, and if so, from where. The data of the children were analysed for a daily quick scan of children's health on location.

Diagnosis and categories of ailments:

During the week, MCC checked 1293 children. The overall health and nutritional status of the children was moderately poor, with 22% of stunting and 29% of anaemia. Due to the high risk of mortality and morbidity under five years of age, the focus of MCC is on checking vulnerable young children. Off all checked children, 95% of the children had the age of twelve years or younger and 43% of the children had the age of five or younger. Nyeri orphanage mainly gives shelter, education and medical attention to 82 older children.

Table 2: Age and gender distribution of checked children, total and per area. Figures represent absolute numbers with percentage of children in the area between brackets.

Age category	Total (%)	Chawongere day 1	Chawongere day 2	Chebugundi	Kensegei	Kimerek	Nyeri Orphanage	Nyeri Non-Orphanage
1 – 5 years	562 (43)	136 (45)	107 (51)	100 (47)	116 (44)	74 (44)	13 (15)	16 (31)
5 – 12 years	668 (52)	161 (53)	96 (46)	113 (53)	143 (54)	95 (56)	35 (41)	25 (47)
≥ 12 years	63 (5)	6 (2)	6 (3)	0 (0)	5 (2)	0 (0)	34 (44)	12 (22)
Total	**1293 (100)**	**303 (100)**	**209 (100)**	**213 (100)**	**264 (100)**	**169 (100)**	**82 (100)**	**53 (100)**

Table 3: Diagnosed diseases at different locations

Locations	Chawongere day 1	Chawongere day 2	Chebugundi	Kensegei	Kimerek	Nyeri (orphanage)	Nyeri (non-orphanage)
Total nr of children	303	209	213	264	169	82	53
Age 0 – 5 years	45%	51%	47%	44%	44%	15%	31%
Age 6 – 12 years	53%	46%	53%	54%	56%	41%	47%
Age > 12 years	2%	3%	0%	2%	0%	44%	22%
Antiworm treatment	100%	100%	100%	100%	100%	0%	100%
Underweight	13%	26%	15%	21%	13%	5%	20%
Stunting	26%	25%	23%	25%	9.5%	17%	6%
Wasting	19%	24%	10%	6.5%	13%	1%	9%
Anaemia	39%	38%	27%	19%	12%	46%	19%
Deep anaemia	5%	4%	1.4%	1.5%	2%	0%	0%
Pneumonia	2%	5%	4%	0%	0%	0%	0%

Most of the ailments, except the dental problems, could be treated on the spot.
We referred 6 acute sick children (0,5%) to the medical specialist in the St. Elisabeth Hospital for further diagnoses and/or treatment (table 4).

Table 4: Children referred to St. Elisabeth Hospital

Child	Diagnosis	Treatment	Discharged
Beatrice Imali, female, 5 years old. Diagnosis: March 21, 2010	Tuberculosis, cardiomegally. Referred to Coptic Hospital: diagnosis cor pulmonale.	Crystalline penicilline, FBP, high protein diet and iron and folic acid. Three heart medications	When stable
Wilkister Khasokha, male, 5 months old. Diagnosis: March 20, 2010	Septicaemie, pneumonia (or TB) and malaria.	Oxygen (respiratory support), nutritional support and IV antibiotics	After one week
Jackline Kagega, female, 11 years old. Diagnosis: March 2010, 2010	Severe malaria and pharyngitis.	Crystalline penicillin, IV quinine	March 25, 2010
Alvin Lukalo, male, 2 years and 3 months old. Diagnosis: March 22, 2010	Severe pneumonia and malaria.	Antibiotics and fluid.	After one week
Darstone Mwasu, male, 1 year old. Diagnosis: March 20, 2010	Severe malaria, pneumonia and bacterial conjunctivitis.	IV crystalline penicilline, CAF eye drops, nutritional support and IV quinine.	After one week
Jackson Rinshi, male, 1 year and 3 months old. Diagnosis: March 20, 2010	Septic burns and malaria.	IV crystalline penicilline, nutritional support, multivitamins, iron and wound dressing	After ten days

Table 5: Number of children with diagnosis, total and per area

Major Diagnosis	Anaemia	Deep anaemia	Underweight	Pneumonia	Stunting	Wasting	Anti-worm treatment
Chewongere day 1	118	15	39	6	79	58	303
Chewongere day 2	79	8	54	10	52	50	209
Chebugundi	58	3	32	9	49	21	213
Kensegei	50	4	55	0	66	17	264
Kimerek	20	3	22	0	16	22	16
Nyeri Orphanage	38	0	4	0	14	1	0
Nyeri Non-Orphanage	10	0	11	0	3	5	53
Total	373	33	217	25	279	174	1211

1: Growth abnormality and malnutrition:
(underweight: 17% (217/1230), wasting: 14% (174/1230), stunting: 22% (279/1293)
Malnutrition has been related to poor cognitive and school performance. There is strong evidence to suggest that malnutrition places children under the age of 5 at increased risk for mortality.
Our anthropometric indices are presented for 1293 children. The prevalence of stunting, wasting and being underweight was 22%, 13% and 17% respectively. Comparing these data to the literature from Western Kenya shows less percentage of stunting in the area MCC checked. A. Kwena reported 30% stunting, 4% wasting and 20% underweight in 2103 children in rural area of Western Kenya in his study in 2003 (Am. J. Trop. Med. Hyg. 68 2003 jj 94-99).
From literature it is known that being stunted is associated with concurrent malaria, as does the presence of wasting increases with severe malarial anaemia. MCC did not check for malaria in their health program, so this is an unknown quantity in our selected group of children.
Analysis of the nutritional status shows significant differences among the locations visited. Within the children assessed, it is unknown how many children have HIV related weight loss (wasting syndrome).
Especially Chawongere showed a high prevalence of wasting and malnutrition mirroring the resource poor setting with lots of sick children.
Nyeri orphanage children showed an statistically very important improvement in nutritional status compared to 2008 and 2009, due to the beneficial support of good feed program and all round support by the SFC.

Percentages of growth retardation is correlated with poverty, malnutrition, living conditions, hygiene and the prevalence of chronic diseases.
The major causes of malnutrition are poor feeding practices and or lack of food inadequate childcare. Adequate food intake and education programs addressing nutrious food need to be provided.
Malnutrition is thought to account for one third of all deaths of children under five years of age (UN Millennium Developmental Goals). Therefore, we assessed growth abnormalities, measuring and weighing all children in a standardized fashion, using the following criteria:

- Underweight = weight for age at or under the third percentile of the reference population (WHO growth curves), only children up to 10 years old. This is an indicator of malnutrition or weight loss because of disease.
- Wasting = weight for height at or under the third percentile of the reference population(WHO growth curves), only children up to 120 cm in height. This is an indicator of acute malnutrition.
- Stunting = height for age at or under the third percentile of the reference population, (WHO growth curves) only children up to 19 years of age. This is an indicator of chronic malnutrition.

It has to be noted that reference data were only available for certain heights, weights and ages (as specified above), leading to the following general prevalence's of growth abnormalities in Western Kenya:

Table 6: Growth indices of checked children per location.

	Total (%)	**Chawon-gere day 1**	**Chawon-gere day 2**	**Chebugundi**	**Kensegei**	**Kimerek**	**Nyeri Orphan-age**	**Nyeri Non-Orphanage**
Weight/age < P3	**217/1230 (17)**	39/297 (13)	54/203 (27)	32/213 (11)	55/259 (21)	22/169 (13)	4/48 (8)	11/41 (27)
Height/age < P3	**279/1293 (22)**	79/303 (26)	52/209 (25)	49/213 (23)	66/264 (25)	16/169 (9.5)	14/82 (17)	3/53 (6)
Weight/height < P3	**174/1230 (14)**	58/297 (20)	50/203 (25)	21/213 (10)	17/259 (7)	22/169 (13)	1/48 (2)	5/41 (12)

During the medical check-ups, we paid attention to issues of hygiene and nutritional advise, We emphasised on hand-washing, vitamin C, fruit and vegetable intake, so their children may grow healthy and strong. We noticed the policy of a lot of mothers to feed their babies up to the age of one year or even more, sourly only with breast milk. For babies, we advised exclusive breastfeeding up to six months and then start with the introduction of additional foods. We are aware of the problems financially, and because of draught, scarcity of healthy food for many families. This is one pf the strongest arguments of MCC to link up and cooperate with other organisations, like SFFC, facilitating/paying for school lunches.

2: Anaemia (373, **29%**) (see table 3 and 5)
Anaemia is the most prevalent micronutrient disorder. In Kenia no national policy has been implemented so far to provide iron supplements to pregnant women or young children. While iron deficiency is frequently the primary factor contributing to anaemia, it is important to recognise that the control of anaemia requires a multi-faceted approach which, through integrative interventions, addresses the various factors that play a significant role in producing anaemia in a given community. In addition to iron deficiency, infectious diseases such as worm infections, other chronic infections, particularly HIV-AIDS and tuberculosis, malaria, as well as other nutritional deficiencies, and as side effects of ART medication in HIV positive children.
Maize porridge and some green leafy vegetables dominate the menu on a daily basis; complemented by beans, rice and green bananas.
Anaemia is also likely to be a marker for current or recent malaria illness. Our cluster of children were not checked for parasitaemia.
Anaemia was highly prevalent in older children living in Nyeri compared to other locations. As iron requirements in adolescents are high for growth.
A possible explanation could be partially in the fact that after puberty girls are at more risk of iron deficiency than boys, because girls need more iron to compensate for the blood loss during menstruation. It is unknown how many children with abdominal problems have iron deficiency anaemia and a coexisting H. pylori infection. From literature it is known that one should suspect an infection with H. pylori when the iron deficiency anaemia is refractory to iron administration.
In Nyeri the food protocol was very effective treating protein-energy malnutrition, but less successful to iron deficient anaemia. The micronutrient deficiency should be addressed through close evaluation of the food-based strategy, especially dietary diversification, possibly through home gardens or provision of 'sprinkles' containing multiple micronutrients to be mixed with food.

We treated the children with anaemia (and their mothers if they were breast fed) with supplements for three months. In 33 children (2,5%) the haemoglobin level equals or was less than 5.0 mmol/l. These children were referred to the Hospital for further diagnostic procedures. We asked for a re-check of the haemoglobin level, HIV test, malaria test and exclusion of sickle cell anaemia (an inborn malformation of the red blood cells). At the time of the writing of the report we were not informed about the test results yet.
When it comes to the prevention of anaemia, the vitamin C intake is important because vitamin C facilitates the uptake of iron in the gut (as milk counterparts it). Cheap and available sources for vitamin C in Kenia are lemon and passion fruit. An idea of an additional program 'Trees for food' was implemented to help plant fruit trees at schools.
For babies, we advised exclusive breastfeeding up to six months, then start with the introduction of additional foods. Mothers of breastfed, anaemic babies were treated with iron supplementation for 3 months.

3: Worm treatment (1211 (94%) prophylactic or therapeutic)(see table 3 and 5)
A strong relationship exists between a Helminth, an Ascaris Lumbricoides, a Hookworm or a T. Trichiura infection and anaemia. In the last years a de-worming program was established in Kenia where there is a high prevalence of these infections in (school-aged) children yet. This

de-worming program have a 80% coverage. Ascaris percentage in studies show 19.3% hookworm (7.6%)
We treated children who were not in a de-worming program on the spot with Albendazol.
Health education on the spot was aimed at increasing awareness of worm transmission, the divers problems caused by intestinal helminth and the importance of annual de-worming every six months.
Simple ways of improving personal hygiene and sanitation through hand washing, nail trimming, wearing of shoes and use of a latrine and clear water supplies were encouraged.
Although all members of a population can be infected by worms, those who are at most risk and would benefit most from preventive interventions are the pre-school and school age children.

4: Pneumonia (25; 1.9%) (see table 4)
The 14 children with a severe acute respiratory infection (ARI) were treated with appropriate antimicrobials and home treatment advice.
"Pneumonia", "coughing", "fast/difficult breathing", "chest indrawing" and "inability to suck milk" are the key words used by care-takers indicating a (severe) ARI (fever with tachypnoe).
For doctors working in Europe it is amazing how few children have asthma in Kenia. We only 2 children with symptoms ofastma, benefiting from Salbutamol.
The principles of the Integrated Management of Childhood Illness (IMCI, see www.who.int/child-adolescent-health/integr.htm) (respiratory rate of 50 breaths per minute or more in a baby of 2 months up to 12 months, and 40 breaths per minute or more in a child of 12 months up to 5 years, lower chest wall indrawing and stridor which is a harsh noise made when the child inhales) for recognition and treatment of pneumonia were transferred to the local nurses and caretakers.

5: Cardial problems
The MCC carrousel includes a cardial examination. We suspected 4 children of having a pathological heart murmur, which needed referral to a specialist in the Coptic Hospital in Nairobi. Mitral regurgitation or ventricular atrial septal defects being the most common heart problems in the third world. For this condition no treatment is available although a good dental situation is essential for a healthy live.
The children and their care takers with the suspected pathological heart murmurs were stressed on teeth brushing procedures. Besides this, they were told to give their child antibiotics when going to a dentist for a teeth extraction.

6: Skin diseases
In respect to skin diseases we saw children with pyoderma, tinea capitis, viral skin disorders (mainly moluscum contagiosum) pedicolosis capitis, dermatitis reactions due to insect bites, and hardly any scabies.
Antifungal cream (eventually in combination with hydrocortison) was given for fungal infections (dermatomycosis) and hydrocortison crème was given for different forms of dermatitis. We did not treat the big amount children with tinea capitis with griseofulrine as there were limited supplies and the great majority heals spontaneously when in puberty. A possible explanation of the high amount of pediculosis capitis could be the requent use of the same razorblade when shaving the children hair.

7: Eye problems (12 kerato-conjunctivitis)
Especially in the group of children above five years of age a rather common complaint was dry and/or painful eyes. Xerophtalmia can be attributed to Vitamin A deficiency. Vitamin A deficiency effect growth, the differentiation of epithelial tissues and immune competence. The most dramatic impact, however is on the eye and includes night blindness, xerosis of the conjunctiva and cornea and ultimately corneal ulceration and necrosis of the cornea. Vitamin A deficiency occurs when body stores are exhausted and supply fails to meet the body's requirements, either because there is a dietary insufficiency, requirements are increased, or intestinal absorption, transport and metabolism are impaired as a result of conditions such as diarrhoea. The most important step in preventing Vitamin A deficiency is

insuring that children's diets include adequate amounts of carotene containing cereals, tubers, vegetables and fruits. We treated children with painful eye's with extra vitamin suppletion.

8: Dental (painful caries: 30, 2.9%)
In general a high caries prevalence in Western Kenya children was found as only 30% of the children was caries free. Clinically there was more dental caries in the younger age groups (60%) ((5-12) vs. (>12)). No fillings were encountered. We are not knowledgable about the fluoride concentration of the drinking water in Western Kenya.
This Medical Check for Children mission to Western Kenia did not include a dentist.
The number of cases mentioned probably underestimate the prevalence of dental disease in the children we checked with severe toothaches and caries and in need of extraction. We stressed the care takers of the children with painful caries to take their child to the local dentist.
We had the impression that the more wealthier the people were , the higher the percentage of painful caries. Maybe this is due to the more buying of sweets and cookies when there is more money available.
After the check local volunteers gave out toothbrushes and educate the people in teeth brushing.

Education health workers, caretakers and other local helpers:
One of the important tasks of MCC is to encourage the continuation of health education of the caretakers and older children. During our week we talked about common diagnoses of frequent illnesses and medication. We especially focused on anaemia and malnutrition, balanced diet, infection, parasites and failure to thrive. Our information mainly to cused on nutritious food and vitamin supplements, as well as hygienic and health promotion issues.
The first steps were set with a mutual cam pain: "Trees for food" to plant trees around school areas.

Last words:
My third trip to Kenia has again been a beautiful experience in my live and in the lives of the team members. West Kenya has so much beauty to offer.
Over the last 11 years I have participated in medical missions at different places in Asia and Africa. Witnessing the evolution of the programs and the development of local expertise is exciting.
It is stimulating to work with team members from different background and cultural backgrounds, exchanging ideas and to learn from each other, and other organisations as SFC.
I enjoy learning from the local cultures and experiencing the beauty of people at the different destinations. I am inspired by the efforts of our hosts facing the vast medical demands with limited supplies.
Both medical and non-medical volunteer work is fantastic and I am proud to work with such kind and generous individuals.
Our special personal thanks goes to Marina Shakola, who organised the MCC Kenya missions in a perfect way working together in a very tide time schedule. Her contribution in the referrals to the Medical Checks for Children organisation was exampling. The team hopes to return to West Kenya next year to see the smiling faces of the children and work together again with all the people who put their time and energy in creating a better world for all of us.

MCC is planning to return to Kenya in march 2011 with two teams. One team serving the locations around Nairobi and Naivasha and one team serving Western Kenya schools and Nyevi orphanage.

Ines von Rosenstiel, medical mission leader MCC mission Western Kenia 2010