Report on the in-clinic research of the AIGHD within participating clinics
in the Health Insurance Fund project in Nigeria
from 2007 till 2011.

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Amsterdam, August 2012

Introduction

This paper provides an updated analysis of the enrollment and health care utilization data from Hygeia Community Health Care (HCHC), formerly known as the Hygeia Community Health Plan (HCHP). The previous interim analysis used data until September 2010. This analysis includes data from the end of 2007 up to 31 December 2011. The Amsterdam Institute for Global Health & Development (AIGHD) is contracted by the Health Insurance Fund (HIF) to conduct independent operational research within the HIF program. The main objectives of the research of the AIGHD are to quantify and qualify the impact of the HIF program intervention. Focus of the research is on the quality of the health care provided by the participating clinics and the benefits of the HIF program on the health of the participating populations. A secondary objective is to provide the HIF with independent feedback and recommendations on how to improve the HIF project with respect to both medical and organizational aspects. To this end AIGHD will produce yearly reports with recommendations.

Methods

In the HIF program, detailed information is collected to reduce the possibilities for fraud, to enhance administrative control, and to improve the quality of medical data capturing. The Dutch NGO PharmAccess, in collaboration with the Nigerian health management organization (HMO) Hygeia, is responsible for managing the data collection process and the database. The database contains information on the recruitment of subjects into the health insurance scheme, and information on the frequency and reasons for visits to the local healthcare providers. Collection of data on clinical status and disease outcomes is currently not provided for in the HIF program. For this evaluation we used the HCHC data collected by Hygeia. This database consists of two main datasets. For all enrollees data is collected on date of enrollment and subsequent re-enrollments, termination of the insurance, date of birth and gender of the enrollees. Subjects are assigned unique identification numbers, which can be linked to the utilization data. The enrollee id contains a code for the particular household the subject is a member of. Therefore, it is known which enrollees belong to the same household. The database also contains information on all healthcare utilization of the enrollees. For each enrollee every encounter with a participating healthcare provider is recorded. Each record contains information on the date of the encounter, which healthcare provider was consulted, performed investigations, diagnosis made, prescribed medications, procedures performed, and whether the subject was admitted to the clinic or seen at the outpatient clinic. Descriptive statistics are calculated and tabulated for enrollment numbers, family composition, demographic characteristics of the enrollees, overall rates of healthcare consumption, specific reasons (diagnoses) for contacts with healthcare providers. Predictors for high (as well as low) rates of healthcare consumption will be investigated using multivariate regression analyses. Diagnostic and therapeutic practices will be described and compared for selected diseases. All analyses will be done separately for each separate geographic location: Kwara North, Kwara Central and Lagos. Trends over time will be visualized by plotting summary statistics per unit of time (either monthly or quarterly), and tested using the chi square test for trend or linear regression analysis. When referring to the three different parts of the HCHC program in the graphs and tables, the region around Ilorin is designated as "Kwara North". The other two parts of the HCHC program are denoted as "Kwara Central" (Afon region) and the "Lagos Market Women".

Data collected from April 2008 onwards, has been coded using a scheme based on ICD-10. However, up to March 2008 the coding of data was at a much less detailed level. Therefore, certain analyses in the report by necessity only data from Q2 2008 onwards. For the period of January and February 2009 coding was also

unreliable. The data from these two months are used for calculating summary statistics and are also included in all graphs. However, when performing statistical test of trends over time, data from these two time points (or the entire first quarter of 2009) were excluded.

Enrollment

Enrollment of subjects into the Nigeria HCHC program started in the beginning of 2007. Figure 1 shows the number of insured subjects over time. These figures have been calculated using start and lapse dates from the enrollment database. If for a particular enrollee there was no data on renewal of the insurance, we assumed the insurance had lapsed. The actual numbers of insured subjects over time are of great importance for all further analyses in this section as these numbers serve as denominator in these analyses. The total number of actively insured subjects at the end of 2011 peaked at 82,415 subjects. Because of substantial numbers of subjects not re-enrolling, the number of actively insured subjects has decreased in Kwara North.

Figure 1. Number of insured subjects over time
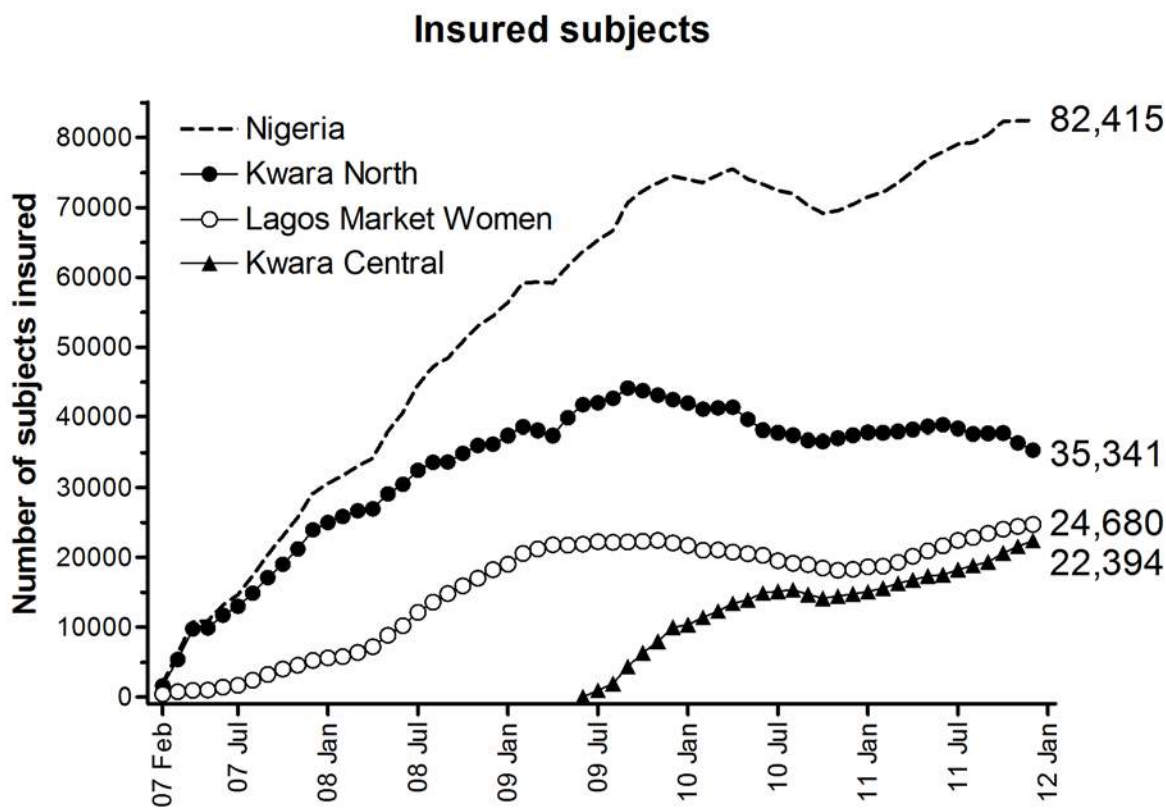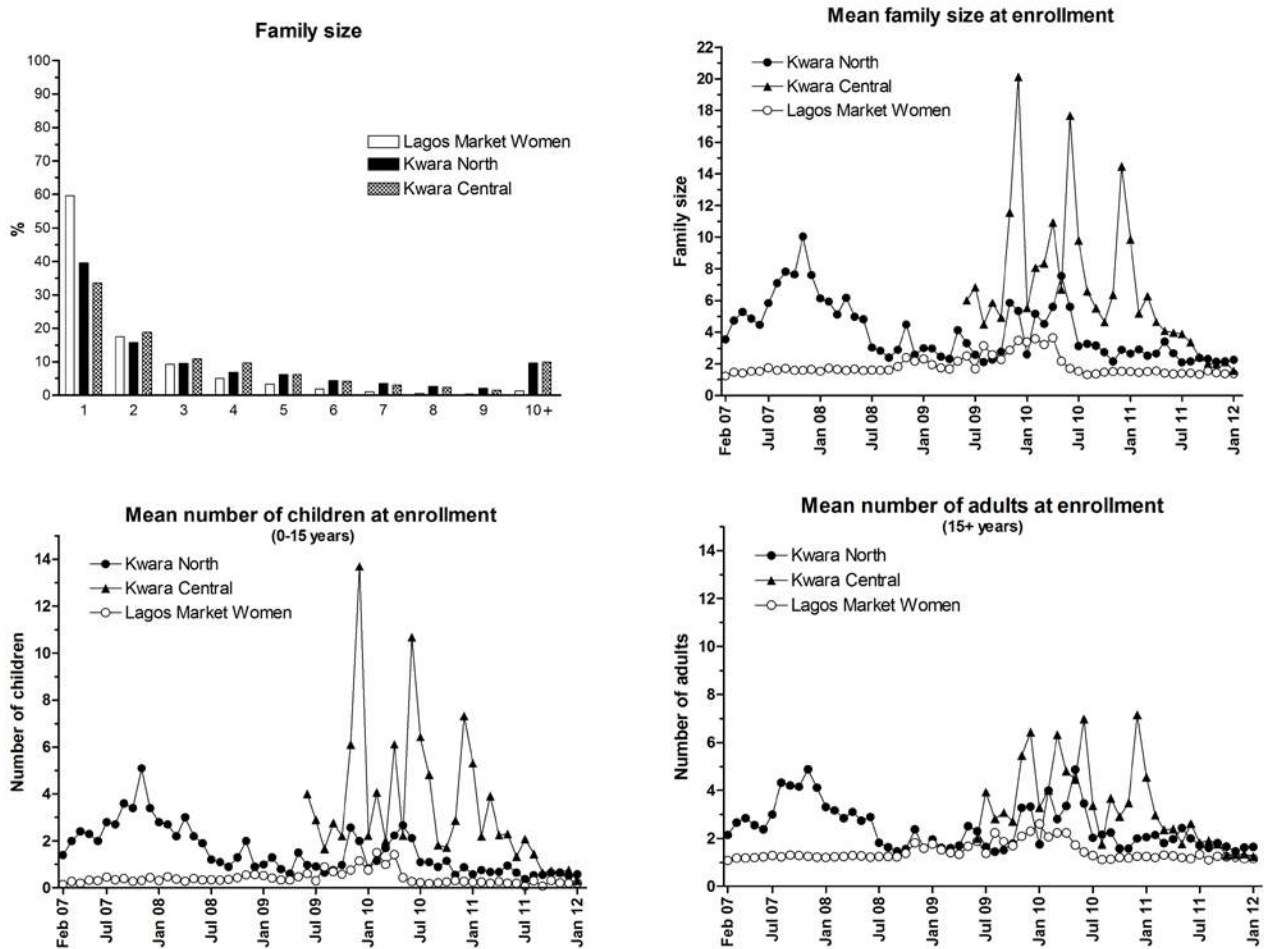

Demographics and Household Composition

We have detailed information on the household composition of the three target groups. This information was obtained by performing household surveys in the target population. These household surveys were performed shortly before the HCHC program was started in the particular target group. The AIID and AIGHD executed the household surveys. The sample of the household survey was randomly drawn from a registry of

the target population, thereby ensuring that the sample was representative for the whole target population. Using data from the household survey that was performed by AIID / AIGHD in Lagos among a representative random sample of the target population of market women, we estimate the average household size in this population to be 3.62 persons. The average number of children per household in the Lagos target group is 1.37. Just 11.5% of households were single parent households. 20.2% of households consist of a just a single member, while just 0.3% of household consisted of 10 or more members. Males made up 46.9% of the sample. The mean age of the target group was 25.8 years. Using data from the household survey that was performed in Kwara North, we estimate that the average household in Kwara North consists of 6.6 persons. The average age of all individuals in this household survey is low, at 21.5 years, because 51.2% of the population was under the age of 18. Males made up 51.7% of the sample. The data from the Kwara Central household survey indicate that the average age of all individuals in the sample was relatively low, at 26.6 years. This was because there were many children in the sample: 49.6% of the sample was under the age of 18. There was an even representation of women and men in the sample, with 47.8% males. The average number of individuals in the household was 5.6.

Table 1. Demographic characteristics at enrollment in the HCHC program

Gender and age at enrollment from February 2007 till December 2011			
	Kwara North	Kwara Central	Lagos Market Women
Age at enrollment (mean, years)	24.1	23.6	33.5
Age groups (%)			
- Newborns (<1 month)	0.7	0.3	0.6
- Under 5 (0.1-5 years)	19.5	18.2	10.7
- Children (5-15 years)	18.3	29.4	7.6
- Adults (15-55 years)	53.9	42.1	66.0
- Elderly (55+ years)	7.6	9.9	15.2
Male gender (%)	45.9	45.9	36.2

Figure 2. Household size and composition at enrollment in the HCHC program

There were considerable differences between the three target groups with respect to demographic characteristics and the composition of the households that were enrolled.

During the first entire period the HCHC program has been recruiting, the mean number of members of households newly enrolled from the Lagos Market Women was generally the lowest of all three groups: between 1.20 and 3.7 persons (Figure 2, top-right panel). During the period from mid-2009 and mid-2010 the mean number seemed to increase somewhat compared to the first 1½ years, however since the second quarter of 2010 the mean number has been consistently below 2.0 again. During the entire enrollment period, the average size of newly enrolling households was 2.1 persons. A total of 59.7% of all households insured in Lagos enrolled only a single member (Figure 2, top-left panel), typically a female adult, which is a much higher figure than the 20.2% of households consisting of a just a single member that we observed in the household survey among the Lagos Market Women. In Lagos, predominantly adults enrolled into the HCHC program (Table 1, Figure 2, bottom panels). Women were considerably overrepresented among the adult and elderly (Table 1), which became even stronger over time (Figure 3, top panels). The mean age at enrollment for Lagos was 33.5 years, which is considerably higher than the mean age of the target group which was 25.8 years (household survey). The demographic trees for the insured Lagos population at the end of 2007 and 2009 clearly demonstrate the overrepresentation of women in the adult and elderly age groups (Figure 3, bottom panel). It also shows the gross underrepresentation of children, although the

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proportion of children increased considerably during the latter years of the program. It is also readily noticeable that children between the ages of 5 and 15 are relatively underrepresented.

The mean number of household members enrolled in Kwara North fluctuated widely over time, with a lowest value of just 2.1 and a maximum of 10.0 persons per newly enrolling family. We have no information if the number of enrolled persons per household is the same as the real number of people actually living in that particular household. The average (apparent) size of newly enrolling households was 3.8 persons. In contrast to the Lagos Market Women, just 39.5% of all households consisted of a single person. A total of 9.6% of all households consisted of at least 10 members. The mean age at enrollment for Kwara North was 24.1 years, which is close to the mean age observed in the Kwara North household survey (21.5 years). The proportion of males in the insured population was 45.9%, which is a little lower than the observed 51.2% in the Kwara North household survey. However, females were considerably overrepresented among the adults, and underrepresented among all other age groups: children as well as the elderly (Figure 3). However, during the latter years of the program, the proportion of women among adults became increasingly larger, while the proportion of women in all other age groups approached 50%. Despite this, the demographic trees of the insured population at the end of 2007 and 2011 look not too dissimilar from the known demographics of the target population. Although, similar to the patterns observed in the demographic trees of Lagos, also in Kwara North children and young adults are relatively underrepresented in the insured population.

Also in Kwara Central, the mean number of household members fluctuated widely over time, with a lowest value of just 1.6 and a maximum of 20.1 persons per newly enrolling family. The average size of newly enrolling households was 5.3 persons. However, during the latter half of 2011 the number of household members of newly enrolling families decreased considerably and approached the numbers observed in Kwara North. 33.5% of all insured households consisted of a single person. A total of 9.9% of all households consisted of at least 10 members. The largest households presumably consist of extended families as these large households contain multiple adult females as well as males. The mean age at enrollment for Kwara Central was 23.6 years, which is even lower than the average age observed in the Kwara Central household survey (26.6 years). The proportion males in the insured population was 45.9%, which is very similar to the 47.8% males observed in the household survey. However, females were considerably overrepresented among the adults, among all other age groups the proportion of females was close to 50% (Figure 3).

Figure 3. Evolution of gender distribution over time
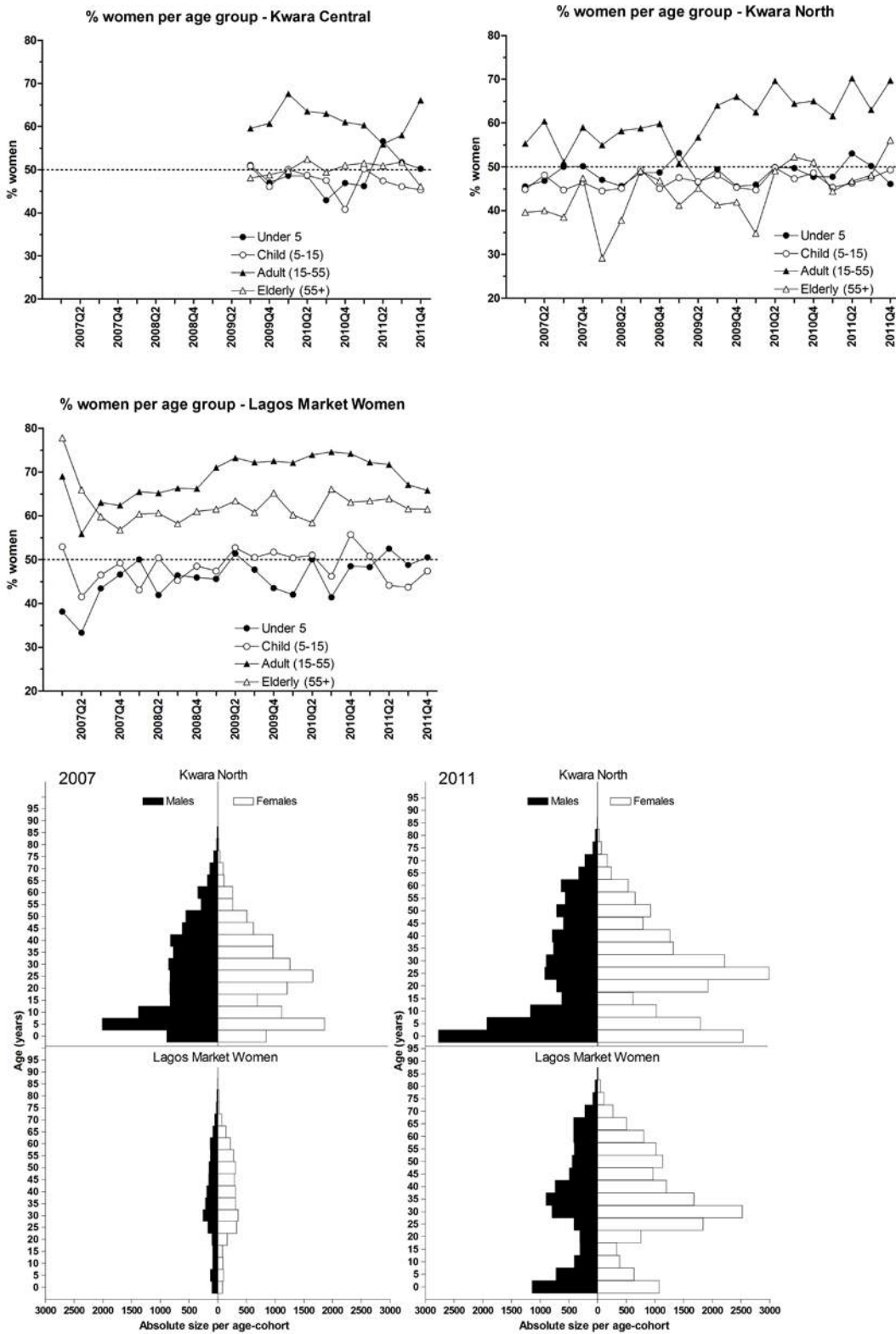
Healthcare utilization

The evolution of the average number of clinic visits per month per 1000 insured persons is shown in Figure 4, top-left panel. These numbers are much higher among the Lagos Market Women (363 visits per 1000 insured persons per month on average for the whole observation period) compared to Kwara North (113) as well as Kwara Central (96). In both Kwara North and Kwara Central, and to a lesser extend among the Lagos Market Women, the number of clinic visits was significantly higher in the first 2 to 4 months after the HCHC program first started enrolling subjects. Throughout the whole duration of the HCHC program, women consistently accounted for nearly twice as many clinic visits per 1000 enrollees per month compared to men, 221 vs. 129, respectively (Figure 4, top-right panel). This was true for all target groups. There were large differences between the various age groups regarding the number of clinic visits per month per 1000 enrollees (Figure 4, bottom-left panel). The highest visit rates were observed for the elderly at 313 visits per 1000 enrollees per month. The lowest rates were observed for the children aged 5 to 15 years with just 59 visits per 100 enrollees per month. The under-fives and adults had very similar rates with 199 and 192 visits per 1000 enrollees per month, respectively. These patterns were consistent over the entire duration of the HCHC program and were observed for all target groups. The low visit rates of the children aged 5 to 15 years might be a reflection of the better health of this age group compared to the other age groups. This could also be an explanation why relatively few children aged 5 to 15 are enrolling in the HCHC program, especially among the Lagos Market Women. For all age groups, and for both genders, there appeared to be seasonal patterns, with the highest visit rates around July (wet season) and the lowest visit rates around January (dry season). This seasonal pattern was most apparent in Lagos and Kwara North, but to a lesser extent in Kwara Central.

Figure 4. Evolution of the number of clinic visits over time
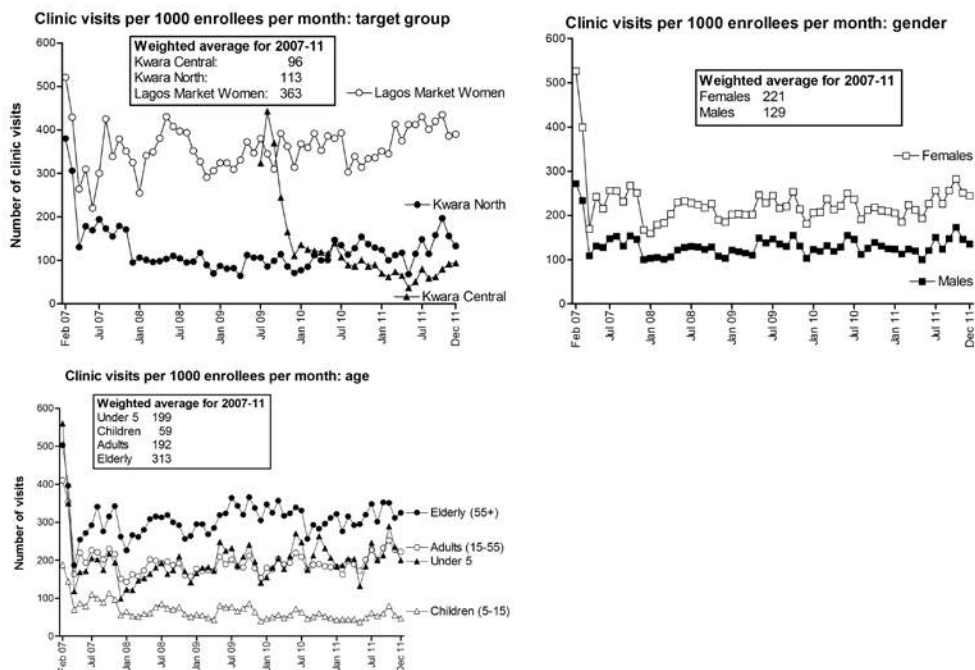
There were large differences between the target groups with regard to the distribution of the number of clinic visits per enrollee during the first year following enrollment (Figure 5, left panel). Only subjects with a potential follow-up of at least 12 months were taken into account for this analysis. In Kwara North as well as Kwara Central a much larger proportion of the enrollees did not make a single clinic visit during the first year after enrolling into the HCHC program, 56.3% and 60.2%, respectively, compared to 23.9% for the Lagos Market Women. In our previous analysis the proportion of enrollees without a single clinic visit during the first 12 months of their insurance was much lower in Kwara Central, but this has now increased to the same level as for Kwara North. Very few subjects at all had more than 7 clinic visits during the first year after enrollment in Kwara North and Kwara Central. Among the Lagos Market Women the proportion of subjects with 10 or more clinic visits was 15.5%. In a multivariate logistic regression analysis we observed that independent factors associated with having zero clinic visits during the first year after enrollment were male gender, age category (higher odds for children aged 5 to 15 years, and lower odds for babies, young children and elderly compared to adults), a higher number of household members concurrently enrolled in the HCHC program, and being from Kwara North or Kwara Central (Table 2). Subjects who did not make a single clinic visit during the first year after enrolling, were significantly less likely to re-enroll in Kwara North and in Lagos, but not so in Kwara Central. In Kwara North 38.3% of these subjects re-enrolled compared to 60.7% of subjects who did visit the clinic at least once (p<0.0001). Among the Lagos Market Women just 17.1% of subjects with zero clinic visits re-enrolled after 12 months compared to 47.0% of subjects who did visit the clinic at least once (p<0.0001). However, in Kwara Central 69.3% of subjects with zero clinic visits re-enrolled after 12 months compared to 66.3% of subjects who did visit the clinic at least once (p<0.0001). The re-enrollment rate after the first year was highest in Kwara Central. The distribution of the number of clinic visits per enrollee during the 12 months following re-enrollment (Figure 5, right panel), showed basically the same distribution as for the first 12 months for Kwara North. However, in Kwara Central and to a somewhat lesser extend among the Lagos Market Women, there were substantially more subjects who did not have a single clinic visit during the second year of their insurance. Only subjects who had a potential follow-up of 12 months following re-enrollment contributed data to this analysis.

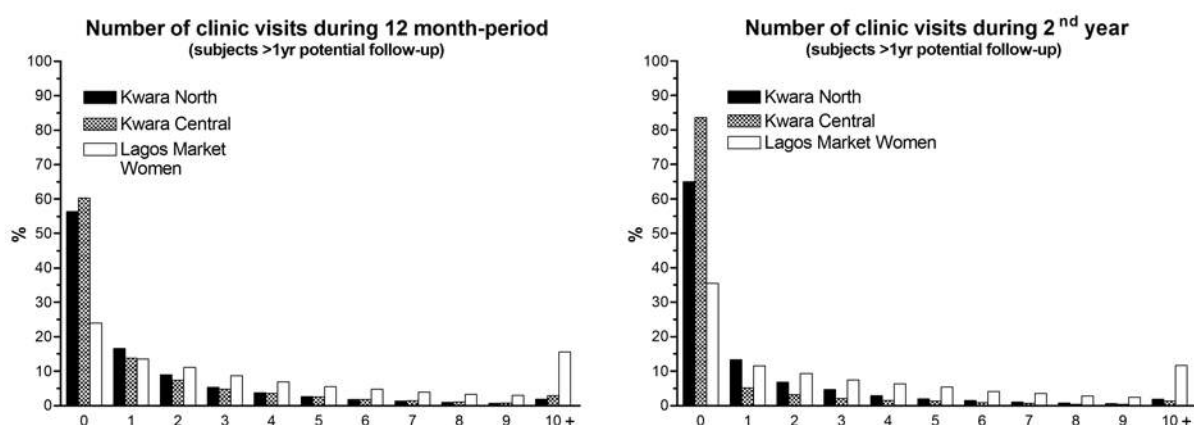**Figure 5.** Number of yearly clinic visits per person for the 1st and 2nd year of the HCHC program

Table 2. Predictors for having zero clinic visits during the first year of insurance

Predictor	OR (95% CI)	p-value
Male gender	1.65 (1.61-1.69)	<0.0001

Age groups		
- Baby	0.28 (0.23-0.34)	<0.0001
- Under five	0.61 (0.60-0.64)	<0.0001
- Child	1.70 (1.65-1.76)	<0.0001
- Adult (reference group)	1	
- Elderly	0.83 (0.80-0.87)	<0.0001
Target group		
- Kwara Central	3.19 (3.05-3.34)	<0.0001
- Kwara North	3.45 (3.35-3.55)	<0.0001
- Lagos Market (reference group)	1	
Number of insured persons in household (per additional insured person)	1.024 (1.022-1.026)	<0.0001

We performed multivariable logistic regression analysis to identify predictors for re-enrolling after the first contract had lapsed (Table 3). We only looked at predictors for taking a 2nd contract, not for subsequent contracts. We found that subjects from Kwara North and Central, respectively, were almost 2 and 3 as likely to re-enroll compared to the Lagos Market Women. The number of clinic visits a subject made during the first year was highly predictive for re-enrolling: for each additional visit a person had made, the odds for taking a second contract increased with 13.3%. Additionally, subjects who had not made a single clinic visit during the entire first year, had an odds ratio of 0.666 compared to subjects who had made at least one clinic visit. Males were just as likely to re-enroll as females. Compared to the adults, only the elderly had a significantly higher (11.5%) odds of re-enrolling. Children were just as likely as adults to re-enroll. Subjects who had been diagnosed with hypertension and/or diabetes mellitus, as well as women who were (had been) pregnant during the 1st year, were more likely to re-enroll. The total number of subjects from a household that were insured through the HCHC program was also positively associated with the likelihood of re-enrolling with an odds ratio of 1.082 per additional household member. Note that in a logistic regression analysis without adjusting for pregnancy and the number of clinic visits in the first year, males have a 16.6% lower likelihood of re-enrolling (p<0.0001).

The most frequently reported diagnoses in the entire HCHC program are shown for each target group in Table 4. The denominator for this analysis is the total number of clinic visits (not individual subjects). Infectious diseases and pregnancy-related clinic visits make up a large proportion of all clinic visits. Malaria, upper respiratory infections (URTI), skin infections, typhoid fever and gastroenteritis are the most commonly reported infectious diseases. However, chronic conditions like hypertension, diabetes and arthropathies also occur frequently. In the Lagos Market Women, these chronic conditions occur much more frequently compared to Kwara North and Kwara Central. These figures are a good indication of the burden of disease in the three target groups. Furthermore, these figures inform us about the particular kinds of health issues as well as the volume of patients that the participating clinics need to be able to handle. These figures help identifying areas were participating (or aspiring, for that matter) clinics might still be lacking, and guide Hygeia and PharmAccess with implementing targeted training as well as upgrading efforts to address these issues. This qualitative and quantitative knowledge of the expected uptake of health care helps the Health Insurance Fund with planning the up scaling of infrastructure as the HIF program grows in the current target groups and expands into other regions.

Table 3. Predictors for re-enrolling

Predictor	OR (95% CI)	p-value
Target group		

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- Lagos Market Women (reference group)	1	
- Kwara North	1.79 (1.73-1.85)	<0.0001
- Kwara Central	2.91 (2.76-3.07)	<0.0001
Number of visits in 1st year (per additional visit)	1.13 (1.13-1.14)	<0.0001
Not having any visits in 1st year	0.67 (0.65-0.69)	<0.0001
Male gender	1.01 (0.99-1.04)	0.38
Age group		
- Baby (<0.1 years)	1.16 (0.96-1.40)	0.11
- Child (0.1-5 years)	1.01 (0.98-1.05)	0.51
- Child (5-15 years)	0.98 (0.94-1.01)	0.18
- Adult (15-55 years, reference group)	1	
- Elderly (>55 years)	1.12 (1.07-1.17)	<0.0001
Diagnosed with hypertension / diabetes	2.24 (2.13-2.35)	<0.0001
Pregnancy during first year of insurance	1.42 (1.35-1.49)	<0.0001
Number of insured persons in household (per additional insured person)	1.08 (1.08-1.09)	<0.0001

Table 4. Top-15 diagnoses in the HCHC program

Top-15 diagnoses					
Kwara North	%	Kwara Central	%	Lagos Market Women	%
Malaria (clinical)	18.24	Malaria (clinical)	14.92	Malaria (clinical)	21.25
Antenatal care	12.96	Myalgia	12.28	Hypertension	16.52
Upper resp. tract inf.	11.37	Upper resp. tract inf.	11.89	Antenatal care	10.74
Hypertension	10.91	Hypertension	10.92	Upper resp. tract inf.	10.47
Myalgia	6.97	Malaria (lab-confirmed)	9.30	Myalgia	7.12
Malaria (lab-confirmed)	5.81	Antenatal care	7.97	Diabetes	5.30
Abdominal complaints	4.51	Typhoid Fever	3.91	Malaria (lab-confirmed)	4.39
Health Check	2.95	Peptic Ulcer Disease	3.00	Typhoid Fever	3.41
Peptic Ulcer Disease	2.55	Health Check	2.54	Peptic Ulcer Disease	2.70
Eye disease	2.50	Skin infections	2.37	Arthropathies	2.24
Skin infections	2.49	Eye disease	2.09	Skin infections	1.83
Gastroenteritis	1.92	Asthma	2.03	Health Check	1.49
Diabetes	1.80	Diabetes	1.99	Gynecologic disease	1.38
Arthropathies	1.32	Gastroenteritis	1.92	Abdominal complaints	1.21
Sepsis	1.28	Arthropathies	1.72	Gastroenteritis	0.81

Table 5. Top-15 diagnoses for those who visited just 1 or 2 times during first year of insurance

Top-15 diagnoses for those who visited just 1 or 2 times during first year of insurance					
Kwara North	**%**	**Kwara Central**	**%**	**Lagos Market Women**	**%**
Malaria (clinical)	26.42	Malaria (clinical)	16.68	Malaria (clinical)	32.77
Upper resp. tract inf.	9.88	Myalgia	14.92	Upper resp. tract inf.	12.49
Malaria (lab-confirmed)	8.38	Malaria (lab-confirmed)	13.87	Myalgia	7.26
Antenatal care	6.98	Upper resp. tract inf.	12.40	Hypertension	5.89
Myalgia	6.76	Typhoid Fever	5.03	Malaria (lab-confirmed)	5.71
Abdominal complaints	5.06	Hypertension	5.01	Typhoid Fever	5.23
Health Check	4.54	Skin infections	3.26	Peptic Ulcer Disease	2.80
Skin infections	3.33	Health Check	2.62	Arthropathies	2.39
Hypertension	2.81	Abdominal complaints	2.37	Skin infections	2.32
Typhoid Fever	2.49	Eye disease	2.33	Health Check	2.18
Peptic Ulcer Disease	2.40	Peptic Ulcer Disease	2.22	Gynecologic disease	1.85
Eye disease	2.27	Gastroenteritis	2.10	Antenatal care	1.80
Arthropathies	1.88	Asthma	2.06	Diabetes	1.68
Gastroenteritis	1.54	Antenatal care	1.77	Abdominal complaints	1.48
Helminthiasis	1.18	Arthropathies	1.52	Eye disease	1.38

In each target group, there are substantial proportions of enrollees who do not visit a participating health care provider once during the first year after enrollment. Obviously, apart from a few demographic characteristics, we know very little of these people. As mentioned above, these subjects are more often younger males, and in Kwara North the proportion of enrollees without a single clinic visit is highest. To learn more about the enrollees who do no frequently visit a participating health care provider, we tabulated the most frequent diagnoses for the 31.365 enrollees who visited just 1 or 2 times during the first year after they enrolled in the HCHC program. Table 5 shows that acute illnesses and conditions like malaria, upper respiratory infections, typhoid fever, gastroenteritis and traumas are, relatively speaking, more commonly diagnosed in this group of subjects. These acute illnesses usually require just a single consultation with a health care provider. Conditions for which as subject is likely to need more frequent medical attention, like hypertension, diabetes, arthropathy and pregnancy, were relatively less often diagnosed in the group. These patterns are the same for the three target groups.

There were 7,674 subjects, from a total of 126,169 subjects, who visited the participating health care providers at least 10 times during the first year after enrolling into the HCHC program. These subjects make up 6.08% of the cumulative number of ensured subjects, but are responsible for 76,740 (26.4%) of the cumulative total of 290,385 visits. Table 6 shows that chronic illnesses and pregnancy are, relatively speaking, more commonly diagnosed in this group of subjects. Chronic illnesses and pregnancy usually require frequent consultations with a health care provider. Conditions for which as subject is likely to need just a single consultation, like malaria, upper respiratory tract infections, typhoid fever, etc, were relatively less often diagnosed in this group. These patterns are the same for the three target groups.

**Table 6.** Top-15 diagnoses for those with 10 or more visits during first year of insurance

Top-15 diagnoses for those with 10 or more visits during first year of insurance					
Kwara North	**%**	**Kwara Central**	**%**	**Lagos Market Women**	**%**
Hypertension	18.50	Hypertension	19.27	Hypertension	20.60
Malaria (clinical)	15.26	Myalgia	13.57	Malaria (clinical)	15.62

Antenatal care	13.06	Antenatal care	9.79	Antenatal care	14.98
Upper resp. tract inf.	9.81	Malaria (clinical)	9.09	Upper resp. tract inf.	8.32
Health Check	5.60	Upper resp. tract inf.	8.84	Diabetes	6.60
Myalgia	4.26	Malaria (lab-confirmed)	5.20	Myalgia	6.43
Malaria (lab-confirmed)	3.79	Peptic Ulcer Disease	3.46	Malaria (lab-confirmed)	3.64
Abdominal complaints	3.62	Asthma	3.44	Typhoid Fever	2.81
Diabetes	3.31	Diabetes	2.80	Arthropathies	2.60
Peptic Ulcer Disease	2.45	Typhoid Fever	2.57	Peptic Ulcer Disease	2.43
Skin infections	2.41	Eye disease	2.31	Health Check	1.68
Gastroenteritis	2.22	Health Check	2.29	Skin infections	1.56
Arthropathies	2.21	Arthopathies	2.19	Gynecologic disease	1.30
Typhoid Fever	1.26	Skin infections	2.05	Infant Immunization	1.17
Eye disease	1.24	Gastroenteritis	1.72	Abdominal complaints	1.15

Malaria and upper respiratory tract infections were the most common infectious diseases, especially in the youngest children. Figure 6 shows the monthly rates of malaria (left panels) and upper respiratory tract infections (right panels) for all age groups by target group. In all target groups, the highest malaria rates are consistently observed for the youngest children. The malaria rates for the older children, adults and elderly were very similar. For all age groups, there even appears to be a yearly trend, with the lowest monthly malaria rates around January and the highest rates around July. In Kwara North, the lowest malaria rates for young children lie around 2% per month around January, and up to 11% per month around July. Among the Lagos Market Women, the rates were much higher than for Kwara North, with up to 25% of the youngest children being diagnosed with malaria per month around July. The lowest monthly malaria rates for the youngest children from the Lagos Market Women were between 10 and 15% and thus substantially higher compared to the rates in Kwara North. The malaria rates Kwara Central also showed peaks around July and were generally comparable to the figures seen for Kwara North. The same seasonal pattern is also apparent in Figure 4.

In all target groups, the monthly rates of upper respiratory tract infections (URTI) were also highest in the youngest children (Figure 6, right panels). The rates of URTI for the older children, adults and elderly were very similar, except for the older children from the Lagos Market Women, were the URTI rates were slightly higher than those for the adults and elderly, but still substantially lower compared to the youngest children. A seasonal trend in the rates of URTI was not observed in any of the target groups. Rates of URTI were highest among the Lagos Market Women (up to 20% of the youngest children presenting with URTI each month), compared to Kwara North (about 5% per month) and Kwara Central (about 3% per month).

**Figure 6.** Rates of malaria and upper respiratory tract infections (URTI) over time
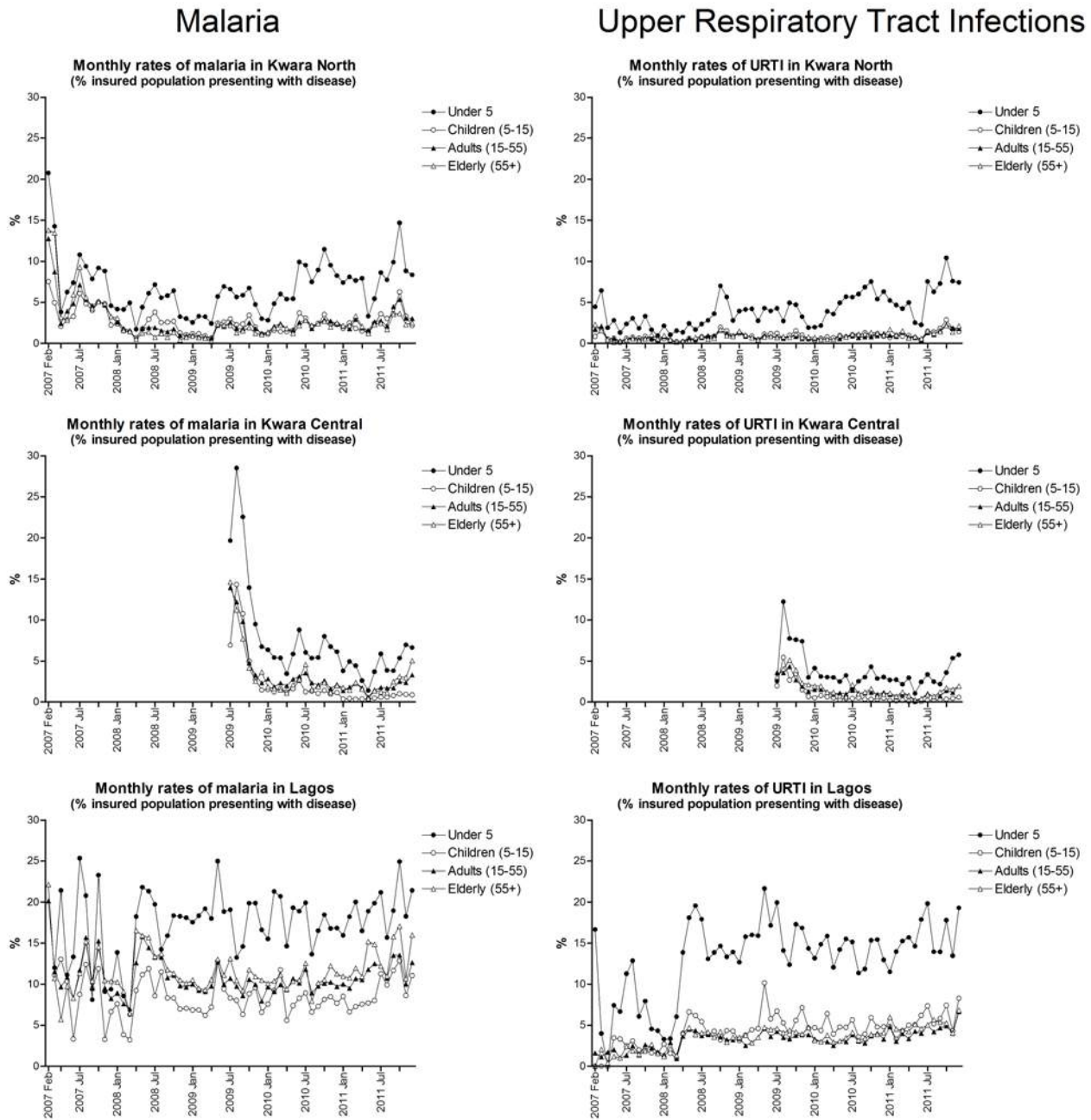
One of the biggest challenges with diagnosing malaria in resource-constraint settings is performing a blood test to demonstrate the actual presence of malaria parasites in the blood. In many clinical settings, the diagnosis of malaria is predominantly based on clinical signs and symptoms. In the HCHC program there have been upgrading efforts and several training sessions for both clinicians and laboratory technicians, focusing on properly diagnosing and treating malaria according to WHO (and local) standards. These upgrading and training activities took place at the end of 2007. Unfortunately, in the HCHC program, coding of laboratory testing for malaria and coding which particular antibiotics were prescribed was not sufficiently detailed up to the first quarter of 2008. Therefore only data from April 2008 onwards has been analyzed.

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Among the Lagos Market Women the proportion of malaria diagnoses which were based on a malaria blood test fluctuated between 17% and 29% (Figure 7, left panel). This percentage remained stable throughout the whole observation period. In Kwara North the proportion steadily decreased from a maximum of 81% in the third quarter of 2008 (which was shortly after the training sessions of hospital personnel on malaria diagnosis and treatment) to below 20% since the beginning of 2011. At the start of the observation period in Kwara Central less than 20% of malaria diagnoses was based on a malaria blood test, but this percentage steadily increased to almost 70% at the end of the observation period, although in the last quarter of 2011 the percentage had suddenly dropped to 31%.

According to Nigerian and WHO guidelines, malaria should preferably be treated with a combination of artemisinin plus another antimalarial agent (but not chloroquin). In Kwara North the proportion of malaria cases receiving treatment with artemisinin-combination therapy increased from 12% to around 30% during the observation period (Figure 7, right panel). Among the Kwara Central and Lagos Market Women these percentages were stable between 29 and 50% and between 60 to 70%, respectively, throughout the whole duration of the program. The proportion of children younger than 5 years of age was very similar to the overall findings in each target group.

**Figure 7.** Malaria diagnostic and therapeutic practices
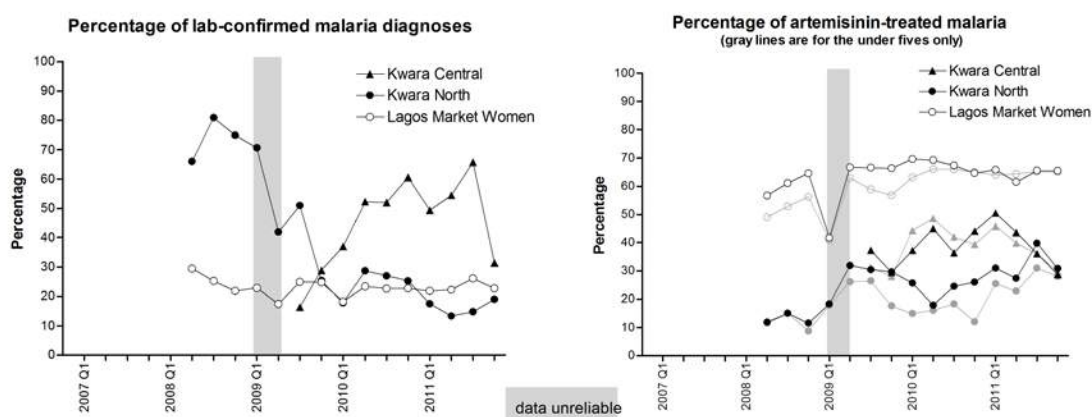
Pregnancy-related clinic visits, like diagnosing pregnancy, antenatal care (ANC) and deliveries are responsible for a substantial proportion of all clinic visits in the HCHC program. Of the 181,670 cumulatively enrolled subjects, 59,499 (32.8%) were women of child-bearing potential (aged 15 to 50). Of the 761,329 reported diagnoses in the HCHC program, 93,917 (12.3%) were pregnancy-related, for 22,538 episodes of pregnancy.

Figure 8, left panel, shows the mean number of pregnancy-related visits over time for the three target groups. The first clinic visit for a particular pregnancy determines to which time period (quarter) all visits of that pregnancy are allocated. Because many of the pregnancies for which the first visit was in the 3rd or 4th quarter of 2011 are still ongoing at the moment of database freeze, the mean number of visits during these quarters only appear to drop down, and were not taken into account for this analysis. A limitation of this analysis is that pregnant women who do not make a single visit to one of the participating clinic during their pregnancy obviously go completely unrecorded. Therefore, the reported numbers only apply to women who at least once visit a clinic during their pregnancy. Among the Lagos Market Women, we observed a statistically significant increase in the mean number of visits from 4.5 to 6.2 at the end of the observation period (p<0.0001). In Kwara North the mean number of visits actually decreased somewhat from 3.4 to 3.0

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visits per pregnancy (p<0.0001). In Kwara Central the mean number of visits per pregnancy fluctuated between 3.0 to 4.5 without a clear trend.
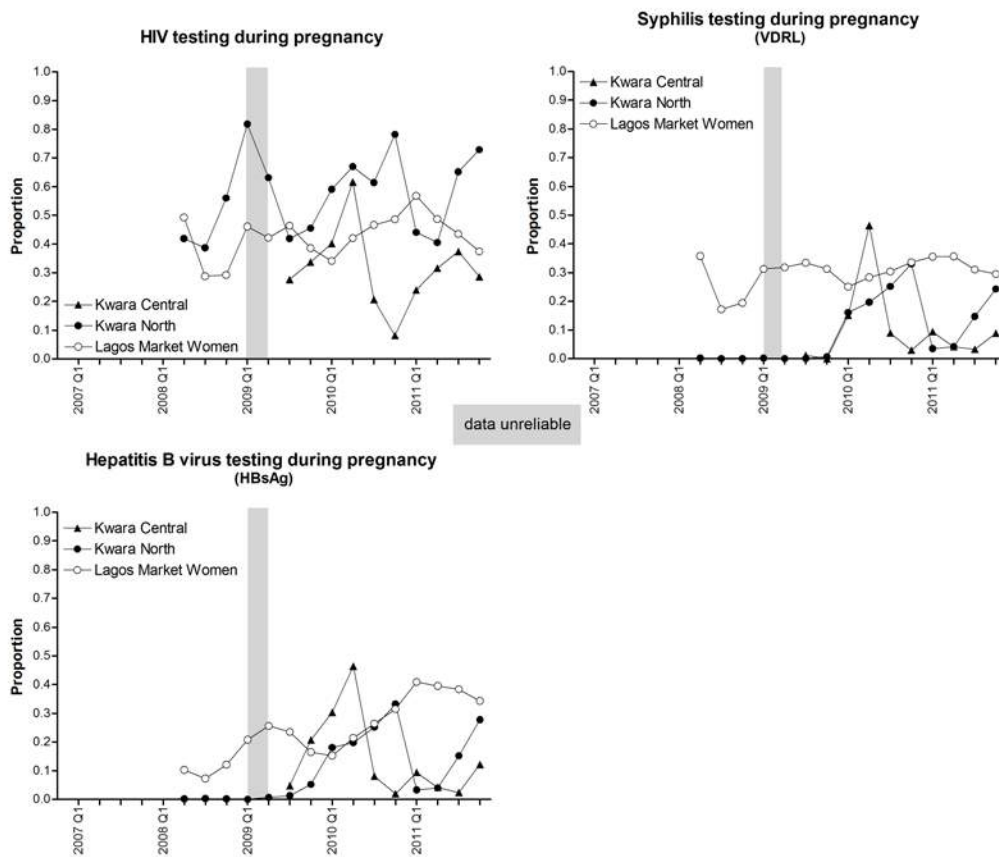
Figure 8, right panel, shows the proportion of pregnancies for which the delivery was recorded in one of the participating clinics. Here too the last two quarters of the observation period (3rd and 4th quarter of 2011) do not yield reliable results as many of the pregnancies for which the first visit was recorded in one of those time period were still ongoing at the moment of the database freeze. Therefore, the findings from the 3rd and 4th quarter of 2011 were not taken into account for this analysis. Again, a limitation of this analysis is that pregnant women who do not make a single visit to one of the participating clinic during their pregnancy obviously go completely unrecorded. Therefore, the reported numbers only apply to women who at least once visit a clinic during (and because of) their pregnancy. Among the Lagos Market Women the proportion of women who delivered in the clinic, significantly increased over time from 29% to 55% (p<0.0001). In Kwara North and Central on the other hand, the proportion fluctuated considerably but was without apparent trend during the observation period.

**Figure 8.** Clinic visits during pregnancies, and deliveries in the clinic
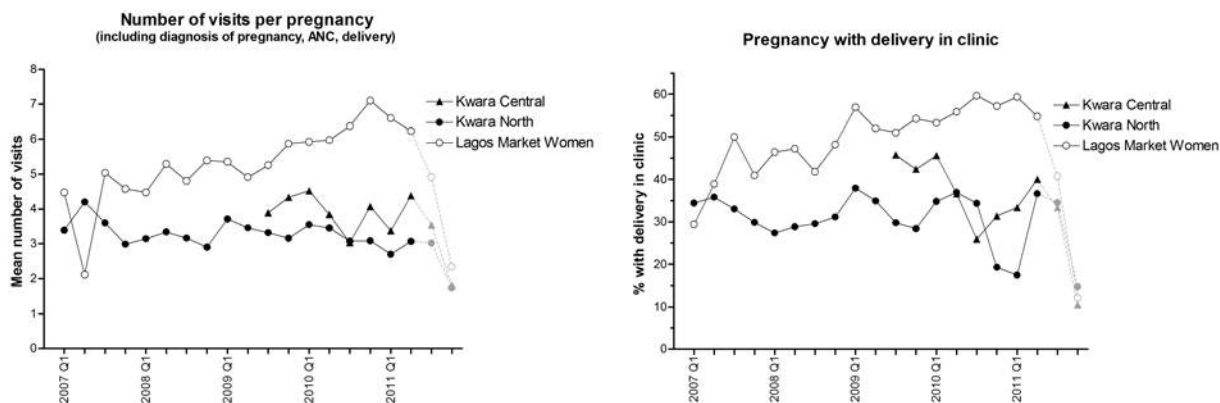
The WHO recommends testing for particular diseases, like HIV-1, syphilis and hepatitis B virus infections for all pregnant women. Figure 9 shows the proportion of pregnancies for which testing was performed for each of these particular diseases. Unfortunately, in the HCHC program, coding of laboratory testing for these diseases was not sufficiently detailed up to the first quarter of 2008. Therefore only data from April 2008 onwards has been analyzed. Because testing for these diseases is usually done early in pregnancy, there is no apparent drop in testing during the last 2 quarters as was seen for the mean number of clinic visits during pregnancy and the proportion of pregnancies with a delivery in the clinic. The proportion of pregnant women that was tested for HIV fluctuated widely over time in all three target groups: between 20% and 80% of pregnancies were tested. Testing for syphilis and hepatitis B virus infections was done for about 30% of pregnancies in Lagos. These tests were less frequently performed in Kwara North and Kwara Central, except for a short period in 2010, in 2011 the rates have decreased again to below 10%. However, in the last half of 2011 the proportion of pregnant women being tested for syphilis and hepatitis B virus infections started to increase again.

Figure 9. Evolution of testing for specific diseases during pregnancy

Supplementation of blood forming nutrients (mainly iron), folic acid (to prevent neural tube defects) and (multi)vitamins are routinely prescribed for pregnant women. Figure 10 shows the proportion of pregnancies for which above mentioned supplementations were prescribed. Coding of these supplements was not sufficiently detailed up to the first quarter of 2008. Therefore only data from April 2008 onwards has been analyzed. There is an apparent drop in supplementation during the last 2 quarters of the observation period, but this might be because many of the pregnancies registered in these quarters are still ongoing and supplementation might not yet have been started. Supplementation of blood forming nutrients and folic acid was prescribed to the majority of pregnant women in all three target groups. Supplementation of multivitamins was prescribed for a lower proportion of women, especially among the Lagos Market Women.

Figure 10. Evolution of supplementation of specific nutrients during pregnancy
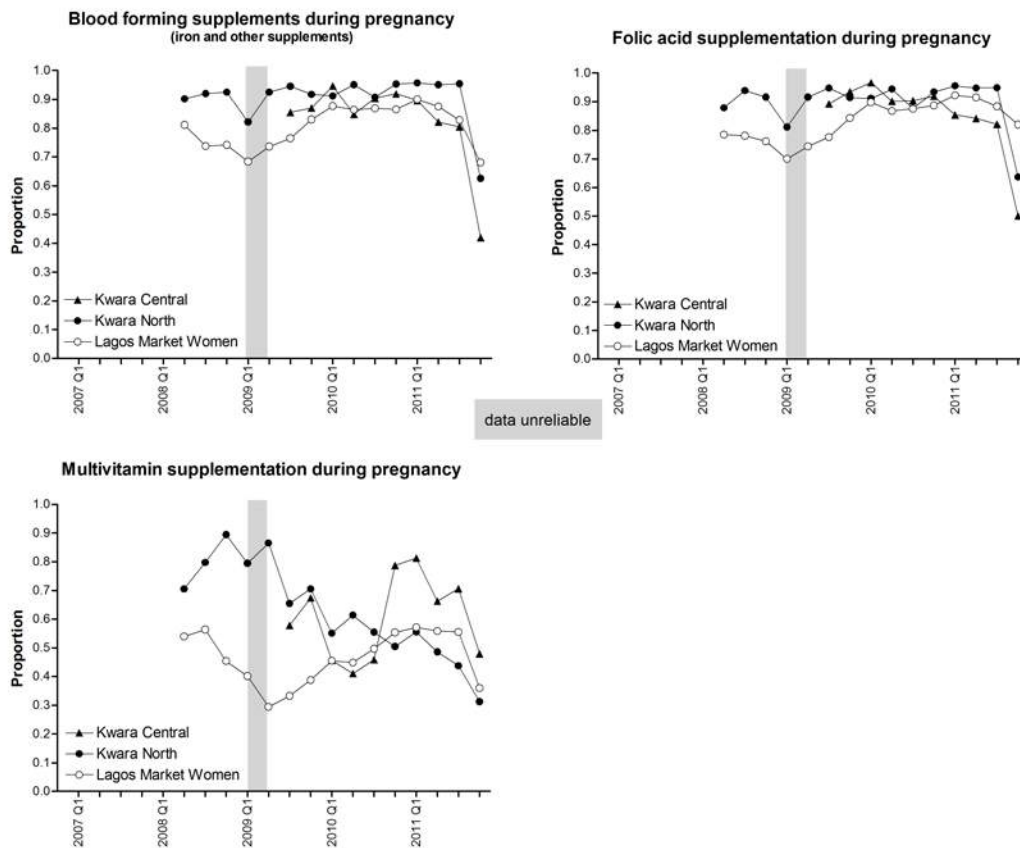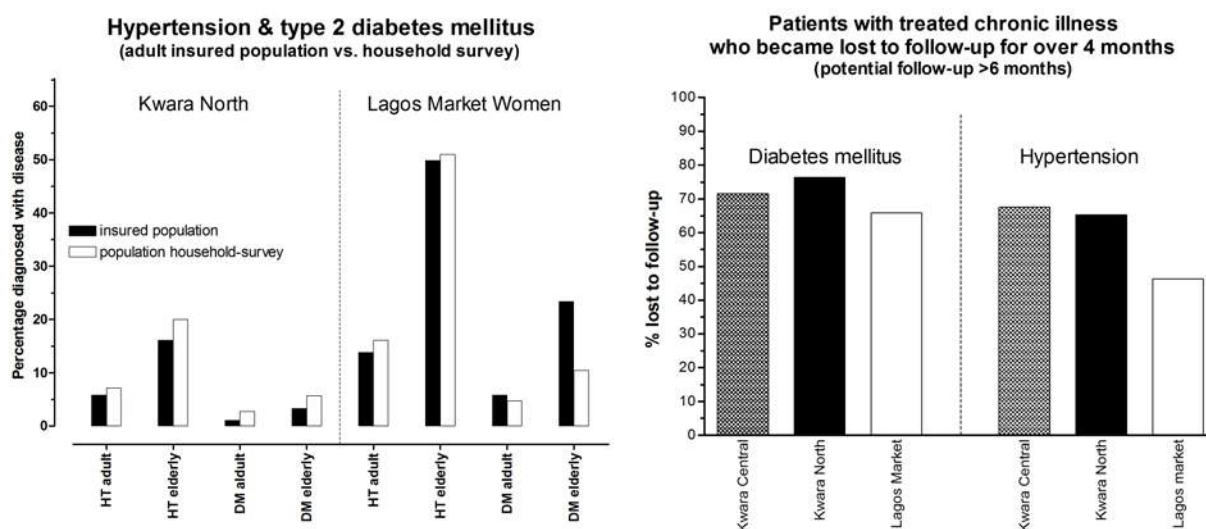

Chronic diseases like hypertension and diabetes are responsible for a substantial number of clinic visits in the HCHC program. In Kwara North and among the Lagos Market Women there were a cumulative total of 120,135 adults and elderly, for which a cumulative number of 607,318 diagnoses were reported, 93,319 (15.4%) of which were hypertension and 29,714 (4.9%) were diabetes. Figure 11 (left panel) shows the percentage of the cumulative number of insured adults and elderly that have, at some point during the HCHC program, been diagnosed with either hypertension or diabetes.

In Kwara North 5.8% of adults and 16.1% of the elderly in the HCHC program have been diagnosed with hypertension. These percentages are a little lower than the observed prevalence of hypertension among adults and elderly in the household survey that was performed in a representative sample of the Kwara North target population. Among the Lagos Market Women these figures were much higher with 13.9% of adults and 48.9% of the elderly in the HCHC program having been diagnosed with hypertension. Similar to Kwara North, these figures are very close to the observed prevalence of hypertension among adults and elderly in the household survey that was performed in a representative sample of the Lagos target population.

In Kwara North 1.1% of adults and 3.3% of the elderly in the HCHC program have been diagnosed with diabetes. These percentages are about half of the observed prevalence of diabetes among adults and elderly in the household survey that was performed in a representative sample of the Kwara target population. Again, among the Lagos Market Women these figures were much higher with 5.8% of adults and 23.4% of the elderly in the HCHC program having been diagnosed with diabetes. The prevalence of diabetes in adults

is very close to the observed prevalence of diabetes among adults in the household survey that was performed in a representative sample of the Lagos target population. However, the observed prevalence of diabetes of 23.4% among elderly was more than twice as high as the observed prevalence among elderly in the household survey among the Lagos Market Women. In the household survey diabetes was defined as a (random) blood glucose of more than 7 mmol/L, which is not even a strict definition. We have no explanation why the prevalence of diabetes among elderly in the Lagos target population is so high.

Figure 11. Prevalence of hypertension and diabetes among adults and elderly in the HCHC program and the household surveys performed in the Kwara North and Lagos target groups

For chronic diseases like hypertension and diabetes it is of the greatest importance that patients who need treatment for these conditions remain in active follow-up. We analyzed the retention rate for patients diagnosed with either hypertension and/or diabetes. In an effort to exclude patients with mild disease from the analysis, we limited the study population to those subjects where treatment for the disease had actually been started. Only patients with a potential follow-up of at least 6 months following the first diagnosis of the disease were included. Lost to follow-up was defined as not having visited the clinic anymore for at least 4 months. As many clinics have these patients visit the clinic at least once a month, our definition of lost to follow-up is very conservative. Figure 11 (right panel) shows the proportion of patients diagnosed with and treated for either hypertension and/or diabetes who became lost to follow-up. Lost to follow-up rates of diabetic patients in Kwara Central and Kwara North were highest at 72% and 76%, respectively, among the Lagos Market Women the rate was 66%. Lost to follow-up rates of hypertensive patients in Kwara Central and Kwara North were highest at 67% and 65%, respectively, among the Lagos Market Women the rate was 46%.

Conclusions and Recommendations

This report provides an overview of the trends in enrollment and health care utilization in the Hygeia Community Health Care program among the Lagos Market Women and in Kwara State (Kwara North and Kwara Central), Nigeria, from the start of the program in the beginning of 2007 up to the fourth quarter of 2011.

Certain analyses are hampered by the fact that the employed coding scheme was changed in the second quarter of 2008. Data collected before Q2 of 2008 used a less detailed coding scheme. For example, malaria can be diagnosed based on clinical symptoms alone, however preferably this diagnosis is established using laboratory blood testing. Shortly before the new coding scheme was implemented, there had been an extensive training effort combined with upgrading of laboratory facilities, with the aim to improve malaria diagnostic procedures. Because of the changes in the coding scheme, the currently available data cannot be used to reliably estimate the effect of these training and upgrading activities as data obtained before and after training cannot be compared. During certain months Hygeia had experienced technical difficulties with the database, resulting in unreliable data for the particular time period. Overall, there has been a steep learning curve for both Hygeia and participating health care providers concerning the collection and management of health care utilization data. Clearly, care should be taken to ensure sufficient quality of data throughout the whole duration of the program in the future, as these data are vital for the monitoring and evaluation of the HIF program as a whole.

Substantial numbers of people have been enrolled in the HCHC program. However, the people who elect to enroll are not fully representative of the target population as a whole. The exact household size and composition are known from the data gathered in the household surveys that were conducted in the target population. The number of household members enrolling into the HCHC program is much lower than the real household size. Furthermore, there is an overrepresentation of women and adults (especially elderly). In Lagos hardly any children have been enrolled. The total number of household members being simultaneously enrolled has decreased dramatically in Kwara Central in the past year.

Re-enrollment after the pre-paid period is another important topic. Many enrollees default after the first pre-paid period, apparently never to re-enroll. In Kwara North the total number of people actively insured have decreased in recent years. Currently we are uninformed about the specific reasons for people to choose to default. Factors associated with a lower likelihood of re-enrolling are male gender, age (elderly are most likely to re-enroll), subjects diagnosed with a chronic illness, young mothers, and subjects from households with multiple members being enrolled in the HCHC program. Even when subjects do re-enroll, they often wait for several months (even more than half a year) after their insurance has lapsed, before they re-enroll. We recommend that the HIF and its partners investigate reasons for defaulting and for delayed re-enrollment.

The number of visits per 1000 enrollees per month per target group has been fairly constant over time. There are substantial differences between men and women, with women consistently have almost twice as much clinic visits compared to men. The elderly have by far the most clinic visits. Frequent follow-up visits for chronic illnesses appear to be driving this. Children between the age of 5 and 15 years have to lowest number of clinic visits, which could be interpreted as them being the healthiest age group. These data can be used by the HIF and its partners to improve planning of resources based on the expected size and composition of the enrolled target group.

There is a very substantial proportion of enrollees who do not have a single clinic visit registered, especially in Kwara Central and Kwara North were 60% and 56%, respectively, of enrollees did not have a single clinic visit in the first year. It is unknown whether or not this is because these subjects were not ill even once during this period or because of other reasons, such as lack of trust in the quality of the health care provider or lack of funds for traveling to the clinic. A large pool of subjects who are infrequent health care consumers is a prerequisite for establishing a risk pool of sufficient size and making any insurance scheme self-sufficient. Unfortunately, subjects who make infrequent use of their health insurance are also substantially less likely to re-enroll. Therefore, the HIF should try to acquire more information about why these subjects did not use the available health care services. Conversely, there is a substantial proportion of subjects (15.5%) among the Lagos Market Women (but less than 3% in Kwara Central and Kwara North) that has 10 or even more clinic visits during the first year. This group mainly consists of pregnant women, elderly and those diagnosed with a chronic illness.

The most common reasons for clinic visits are 1) antenatal care, 2) febrile illnesses, often diagnosed as malaria and/or typhoid fever, and 3) chronic diseases like hypertension and diabetes. The program thus far has generated a substantial volume of data on the reasons for clinic visits, which should be used to plan further upgrading and training activities in participating clinics. In Kwara Central there has been a substantial decrease in recent years in the number of clinic visits per 1000 insured persons, which is largely explained by a big increase in the proportion of insured subjects that does not even have a single clinic visit during their first year of the insurance. For Kwara North and the Lagos Market Women the number of clinic visits per 1000 persons insured has slightly increasing for the past few years.

The majority of malaria diagnoses are still based on a clinical diagnosis only, the number of laboratory-confirmed malaria cases is actually declining over time in Kwara North, while increasing in Kwara Central. The proportion of malaria cases treated with artemisinin-based regimen, as recommended by WHO, is increasing in all target groups, and has increased in 2011 to more than 70% in Kwara North and Kwara Central in the 3rd quarter of 2011, although in the 4th quarter of 2011 the proportions dropped substantially in Kwara North and Central but not in Lagos. A new development in 2011 is that children under 5 years old, the group most vulnerable for fatal malaria, that was up to 2010 less likely to be treated with artemisinin-based regimens, now have similar or even higher rates than the adults.

In Kwara North the average number of documented antenatal care visits per pregnancy was substantially lower (3.3 visits) than in Kwara Central (3.8) and among the Lagos Market Women (5.7). In Lagos the number of visits per pregnancy continues to increase. As an unknown number of pregnant women never seek medical attention during pregnancy, the real numbers will be even lower. Recommended screening for certain infections (HIV, hepatitis B virus, syphilis) and certain deficiencies (folic acid, iron) during pregnancy was only performed in a minority of pregnant women. Testing for HIV is still only done in about half the pregnant women. Testing during pregnancy for syphilis and hepatitis B virus have strongly decreased in Kwara North in 2011 to below 6%, while in Kwara Central and the Lagos Market Women the rates at the end of 2011 were around 30%.

Hypertension and diabetes mellitus are common problems, especially in the elderly. When comparing the proportions of insured subjects who have been diagnosed with these conditions with the estimated prevalence of these conditions based on the results of the household surveys, there appear to be many patients who are still undiagnosed. Furthermore, even among patients who have been started on antihypertensive and antidiabetic treatment, the proportion of patients getting (temporarily) lost to follow-

up has increase compared to the previous analysis in 2010 and is now over 70% in Kwara Central and Kwara North. In the Lagos Market Women the rates of loss to follow-up was a little lower at 66%. Clearly, there is still an urgent need to find ways to better retain these patients in care.