

Looking for gold, finding malaria

Assessment of changes in malaria-related knowledge, attitudes, and practices resulting from the Ministry of Health malaria program in smallscale gold mining areas in Suriname



August 2012

Acronyms and foreign words

ABS	Algemeen Bureau voor de Statistiek (General Bureau of Statistics)
ACD	Active Case Detection
ATV	All Terrain Vehicle
BCC	Behavior Change Communication
BOG	Bureau of Public Health (Bureau Openbare Gezondheidszorg)
cabaret	Brothel (Por)
Centre de Prevención et	Prevention and vaccination centre
Vaccinación	
Curatela	Gold miners' village (Por)
FG	French Guiana
Garimpeiro	Gold miner (Por)
GDP	Gross Domestic Product
GNI	Gross National Income
IMF	International Monetary Fund
ITBN	Insecticide Treated Bed Net
КАР	Knowledge, Attitudes and Practices
MSD	Malaria Service Deliverer
MZ	Medical Mission Primary Health Care Suriname (Medische Zending)
OGS	Ordening Goudsector (Regulation Gold Sector), Commission
Sranantongo	Suriname lingua franca
Tourtonne lab	Malaria testing and treatment centre in north Paramaribo, in the
	neighborhood where many Brazilian gold miners stay, shop, hang
	out or conduct business when they are in the city.

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Opinions expressed in this report are those of the authors and do not necessarily reflect the views of the Ministry of Health, the Bureau of Public Health (BOG), or other institutions the authors are affiliated with. The consultant is responsible for all errors in translation and interpretation.

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Summary

Introduction: This report presents the results of a Knowledge, Attitudes and Practices (KAP) survey, which was conducted among people living and working in gold mining areas in Suriname. This study is a follow-up of the 2009-2010 KAP survey and serves, in combination with other project data, to assess the impacts of an intense malaria control campaign in Suriname's small-scale gold mining areas. The main question was: *How and how much have malaria-related knowledge, attitudes, and practices among gold miners and other inhabitants of mining areas changed as a result of the interventions of the Suriname Ministry of Health/Global Fund malaria program?*

Methods: Field work took place in June 2012 in three larger mining area's; Benzdorp/Lawa River area, Sarakreek area and the Maripaston area. The selected research locations were mostly the same locations as those that had been surveyed for the 2009 KAP study, though in the present study Sella Creek was replaced by Maripaston. In population centers every third economic unit (shop, home, restaurant etc) was selected for participation in the study, and in the forest every mining camp. The survey supervisors and most surveyors were familiar with the study areas and the local populations were familiar with malaria program staff. A cross-sectional survey with open-ended and closed-ended questions was conducted with 268 mining teams or other economic units. Study limitations included budgetary constraints, which prohibited inclusion of the exact same areas as were included in the 2009 KAP survey.

Research results: The research areas are situated on varying distances from the capital city of Paramaribo. The nearest area is Maripaston (est. pop. 1,500), where the largest share of participants in the survey were Suriname nationals. In the Sarakreek area (est.pop. 1,500-2,000) south of the Brokopondo lake, similar numbers of Surinamese and Brazilians were interviewed. Most surveyed gold miners and mining service providers in Benzdorp (est.pop. 2500-3,000) were Brazilians.

The youngest respondent was 18 years of age, and the oldest 64. Respondents were on average 36 years old. Most respondents were male (64.7%), but more than a third (35.3%) were female. The sample population was dominated by Brazilians (51.9%) and Suriname nationals (38.4%). The majority spoke Brazilian Portuguese (72.3%), and half of the respondents (48.5%) could make themselves understandable in Sranantongo, followed by Dutch (33.3%). Respondents had enjoyed on average 7.4 years of education. Surveyed men worked mostly as a gold miner (40.0%) or owned a shop (18.8%). Shop owner was the primary occupation for almost a quarter of women as well (23.6%), followed by being a cook (21.3%) or restaurant/hotel owner (13.5%).

Mining camps and other economic units in the mining areas have different sizes. On average, 5.7 persons live and sleep 'usually' in one economic unit in the gold mines. Most respondents sleep mostly on a bed (70.7%), others in a hammock (20.0%), and some respondents (9.1%) mentioned they spent the night on either one. National TV stations cannot be received in any of the research areas, but many camps have a satellite dish to receive Brazilian channels. A generator, which is owned by 75.7 percent of the surveyed economic units, is necessary to operate this TV or other electric appliances. People obtain personal information and public messages mostly by telephone (36.7%) or by word of mouth (19.5%).

More than three quarters of respondents (76.0%) had seen or heard information about malaria in Suriname, with no significant difference between the various mining areas. Posters were the most named source of malaria information followed by information from health workers, radio and television.

Among the individuals who had been exposed to malaria awareness materials, most reported that this information had been totally clear (84.2%) or partly clear (9.4%). When asked about disease symptoms, 32 respondents (11.9%) could not name any symptom of malaria, which is a slight improvement from 2009. Other respondents named a wide variety of disease symptoms, all of which are indeed associated with malaria. This finding is not different from the 2009 results. Knowledge of the causes of malaria is less accurate. Provided answers suggest that many respondents erroneously relate malaria to water quality and/or water use.

The grand majority of respondents (82.6%) could name at least one malaria test & treatment location. The Bureau for Public Health (*Bureau Openbare Gezondheidszorg* – BOG) in Paramaribo is overall the best known malaria test location, and was named by 40.8 percent of respondents. Second and third listed among the mentioned malaria test locations are the MSD in the gold mining areas and the malaria lab in north-Paramaribo.

The grand majority of respondents (81.9%) affirmed that there are ways to protect oneself against malaria, which is an increase from 2009. When asked about the most important thing they could do to prevent getting malaria most respondents named sleeping under a bed net (76.7%), which presents a steep increase from 2009. The grand majority of interviewed inhabitants of mining areas knew that bed nets can be used to protect oneself against mosquitoes (84.4%, as compared to 76.9% in 2009) and malaria (30%, as compared to 14.4% in 2009)

Combining the various measures, we can conclude that close to half of the respondents (47.3%) has knowledge of the cause, symptoms, preventive measures, and treatment of malaria. This is an improvement from 2009, when no more than one third (33.1%) of respondents had optimal malaria knowledge.

Three quarters of the respondents from the selected mining areas had been ill with malaria at least once in their lives (75.2%). Malaria testing is one of the prime activities of the "Looking for Gold, Finding Malaria" program. The grand majority of respondents who had suspected to be ill with malaria had taken the malaria test and indeed tested positive (83.9%). Almost two-thirds of respondents (63.0%) had obtained services at a malaria clinic at least once. The largest groups of both Suriname nationals (45.6%) and foreigners (34.2%) in the gold mining areas had been treated in a government health center in Paramaribo. Three quarters of the respondents who had obtained malaria treatment at least once, had been treated for free the last time they had done so (75.4%). Even though these malaria services are, in most cases, provided for free, travel to the health providers can be quite expensive.

When asked why they were using bed nets in their own homes, most inhabitants of the mining areas referred to protection against mosquitoes (84.7%); almost a doubling from the number of people who

reported the use of bed nets against mosquitoes in 2009 (47.4%). Hundred-and-twelve respondents (43.4%) reported that in their home, store, or camp there was no single bed net.

Conclusions: Overall malaria knowledge has increased in 2012 as compared to 2009. Our composite measure of knowledge of the causes, symptoms, preventive measures, and treatment of malaria suggests that almost half of the small scale gold miners in surveyed mining areas have correct knowledge of malaria as compared to one third of the respondents in 2009. The results with regard to behavior are not unidirectional. Generally the data do not reveal much of a difference in terms of treatment seeking behavior between 2009 and today, though we observe minor improvements. In conclusion we can say that malaria-related knowledge has increased considerably and in almost al subareas between 2009 and 2012, but behavior has lagged behind. In many areas there is no notable change in behavior, for example with regard to the number of persons who have tested for malaria without feeling symptoms. The number of persons who reported the possession and use of bed nets has even significantly decreased; a finding that is difficult to explain.

Recommendations: The researchers made recommendations in five sections. In "quick wins", the research stress the importance to continue Behavior Change Communication (BCC), particularly through posters and personal communication between malaria program health workers and the target group. Also bed net distribution needs to continue. With regard to malaria program services, it is recommended that work with MSD is continued and continuously adapted to new situations in the field. Recommended cooperation partners include the French government, in order to promote malaria services in French Guiana small-scale gold mining areas, and OGS for logistical arrangements. In the field of policy; continuation of the malaria program is recommended after Global fund finding expires.

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1. Introduction

This report presents the analysis of data gathered through a Knowledge, Attitudes, and Practices (KAP) survey about malaria in three main gold mining areas in Suriname, South America. This study is a follow-up of the 2009-2010 KAP survey and serves, in combination with other project data, to assess the impacts of an intense malaria control campaign in Suriname's small-scale gold mining areas.

In the 1990's, the interior of Suriname suffered from an uncontrolled malaria epidemic. Factors that had contributed to the spread of malaria included a period of civil warfare (1986-1992), which destroyed much of the medical infrastructure in the interior, and the rapid growth of small-scale gold mining in subsequent years. Malaria flourishes in small-scale gold mining areas because the activity creates large puddles with standing water and its workers are highly mobile. In addition, gold miners who work in isolated places far removed from health posts tend to take malaria medicine haphazardly without proper testing and diagnosis when they suspect being ill.

By the end of the year 2000, interior villages had become virtually malaria-free due to an effective Global Fund-supported anti-malaria campaign. However, the disease continued to plague small-scale gold mining areas. In 2008, the Government of Suriname Ministry of health signed a grant agreement with Global Fund¹ to execute a project entitled "Searching for gold, finding malaria". The program started in 2009, with as its main purpose to eradicate malaria in Suriname's small-scale gold mining areas, and thereby prevent a relapse of this disease in interior villages. The main program activities are ongoing and include free testing and treatment of people with malaria symptoms in the small-scale gold mining areas; Active Case Detection (ACD); an information and awareness campaign; and the free distribution of Insecticide Treated Bed Nets (ITBN) in small-scale gold mining areas.

In 2009-10, a baseline study was conducted to assess existing knowledge, attitudes and behavior with regard to malaria among small-scale gold miners and people providing services to the miners in small-scale gold mining areas. The main conclusions of this survey are listed below

Malaria prevention through the use of bed nets: In 2009, 62.6 percent of inhabitants of small-scale gold mining areas possessed a bed net, but in the night prior to the survey 37.0 percent of inhabitants of surveyed mining locations had slept under a (insecticide-treated) bed net. Half of the respondents did not consistently use a bed net, and in virtually all mining camps or businesses one or more persons were sleeping without a bed net. The main reason for not using a bed net was "not having one".

Malaria knowledge: In 2009, only one third of respondents (33.1%) had adequate knowledge about the cause, symptoms, prevention, and treatment of malaria. Even though the majority of people (69.2%) knew that malaria is transmitted by a mosquito, the belief that malaria is caused by drinking or being near 'bad' water was common. A quarter of people either did not believe that one can protect oneself against malaria or did not know whether his would be possible. Only half of the respondents -mostly Suriname locals- had heard about Insecticide Treated bed nets.

¹ See Global Fund and Suriname web site: http://www.theglobalfund.org/en/savinglives/suriname/malaria1/

Malaria treatment: In 2009, non-treatment, incorrect or incomplete malaria treatment, and undiagnosed treatment with over-the-counter medicine occurred frequently. Many people had bought over the counter medicine (18.0%) and not finished the prescribed doses of medicine (19.4%).

The aim of the present KAP survey is to analyze:

How and how much have malaria-related knowledge, attitudes, and practices among gold miners and other inhabitants of mining areas changed as a result of the interventions of the Suriname Ministry of Health/Global Fund malaria program?

If the program has been effective, we would expect to find after three program years, in comparison with 2009/10:

- A larger share of inhabitants of mining areas who possess and sleep under (insecticide-treated) bed nets;
- A larger percentage of respondents who have adequate knowledge of malaria prevention, symptoms and treatment;
- A smaller share of respondents who have been diagnosed with malaria in the past three years; and
- A larger share of respondents who treat malaria correctly. That is, they get tested when they suspect being ill, they do not buy over-the-counter malaria medication, and they complete the prescribed malaria treatment.
- A significant share of inhabitants of mining areas who name the Malaria Service Deliverer (MSD) of the malaria program as a location where one can test for malaria
- A significant share of respondents who have been exposed to malaria outreach materials in Suriname.

Possible changes in the above listed indicators are discussed in further detail in the conclusions.

The present report presents the findings of the second (2012) KAP survey. We first provide a brief background on Suriname, malaria, and small-scale gold mining. Next we discuss the methods, including the sample population and sites. In the results we evaluate access to information; sleeping behavior; experiences with malaria and its treatment; knowledge of malaria and ways to prevent it; the use of bed nets; and awareness of their function in preventing malaria transmission. The data will evaluate changes in malaria knowledge, attitudes and behavior and suggest directions for possible program adjustments in order to effectively eradicate malaria from the Suriname interior.

2. Background

2.1 Suriname

Suriname is situated on the Northern tip of the South American continent and part of the larger Amazon region. The country (land surface: 163,820 km²) has a relatively small yet diverse population (531.170; ABS 2011). Suriname's national language is Dutch but many other languages are spoken, including the national lingua franca *Sranantongo* and languages pertaining to the various ethnic groups.

About 85 percent of Surinamers live on the 30-km wide Northern coastal plains and two thirds (66.7%) live in the greater Paramaribo urban area (districts of Paramaribo and Wanica). The densely forested interior, which covers 80 percent of the country, provides a home and sustenance to various groups of Indigenous Peoples (est. 8,000 p) and Maroons² (est. 54,000 p). In the past two decennia other groups have entered the interior; mainly Brazilian *garimpeiros* (gold miners) but also other people who directly or indirectly work in the gold mining industry, laborers of logging firms, Chinese shop owners, development workers, and teachers and health workers from Paramaribo.

Suriname's interior is rather isolated from the urban zones and in many ways the most marginalized area of the country. Many interior families do not have easy access to clean drinking water, electricity, decent education, quality health care, and other public services.

With a per capita Gross National Income (GNI) of US\$ 5.249³, Suriname may be considered a middle income country (ABS 2010). For the past few decades, mining has been the cornerstone of Suriname's economy. The export of minerals—bauxite, oil, and gold—represents more than 50 percent of the Gross Domestic Product (GDP)(IMF 2007). In 2011, IAMGOLD, Suriname's only large scale gold producer, produced almost 12,000 kg of gold. In that same year, the small-scale gold mining sector produced more than 19,000 kg of gold, with a market value of 914 million US dollar.

2.2 Small-scale gold mining and malaria in Suriname

Since the early 1990s, small-scale gold mining has boomed in Suriname's forested interior. The exact number of gold miners and mining service providers is difficult to estimate because these people are not registered and they are mobile, moving both between countries and within the countries between mining areas. The Commission Regulation Gold Sector (*Commissie Ordening Goudsector*-OGS) has estimated that about 20,000 small-scale miners may be mining for gold in Suriname and that at least a similar number of people are providing auxiliary services⁴. The majority of inhabitants of small-scale gold

² Maroons are the descendants of African slaves who ran away from plantations in the 17^e and 18^e centuries to establish independent communities in the interior.

³ National income per capita formal and informal sector. ABS 2010, data from 2009.

⁴ By March 2012, the Commission Regulation Gold sector (OGS), which is making an effort to register gold miners, had registered 3,827 Suriname nationals and 10,849 foreigners who either were working as laborers in the gold mining areas or owned mining equipment. The Commission OGS estimates that 40,000 persons are working in the gold mining areas.

mining areas (65-75%) are Brazilians and the remaining gold miners and mining service providers are mostly Surinamers of tribal Maroon descent.

With the rise of small-scale gold mining, malaria boomed as well in the Suriname interior. In 2001, the *Medische Zending* (Medical Mission, MZ) Primary Health Care Suriname, the organization responsible for the delivery of primary health care in the Suriname interior, treated more than 12,000 cases of malaria. In 2005, with support from Global Fund, MZ started an intensive anti-malaria campaign in interior villages. This campaign consisted of the spraying of houses; testing and treatment of malaria cases; the distribution of free Insecticide Treated Bed Nets (ITBN); and awareness rising. This campaign was successful and the number of malaria cases dropped from 10,713 in 2003 to 1,487 in 2008. Among children under five, the number of malaria cases reduced from 3393 in 2001 to 48 in 2008 (ABS et al. 2009: 37).

While these efforts were laudable, they were not sufficient as long as gold mining areas continued to exist as untreated point sources of malaria transmission. Gold miners were minimally reached by the regular malaria campaigns because travel to the mining areas is logistically difficult and expensive, and the population consists largely of migrants who do not speak the local languages. Another obstacle to intervention programs was the miners' semi-legal status with no clear formal mining rights or working permits. Malaria re-entered interior villages as local gold miners from these villages returned home, and through social and economic contacts between gold miners and local people.

The in 2009 initiated "Looking for Gold, Finding Malaria" program has as its aim to eradicate malaria from small-scale gold mining areas, and thereby eliminate malaria in Suriname as a whole. The next section describes this program.

2.3 The "Looking for Gold, Finding Malaria" campaign

The "Looking for Gold, Finding Malaria" program (2009), hereafter referred to as "malaria program" executes various activities in small-scale gold mining areas in the Suriname interior, namely:

- 1. **Distribution of ITBNs**. In total about 15,000 bed nets have been distributed among small-scale gold miners and other inhabitants of small-scale gold mining areas. In the target areas, the following numbers of bed nets have been distributed:
 - a. Benzdorp/Lawa: 2029
 - b. Sarakreek/Makoe: 1418
 - c. Maripaston: 1058
- 2. Behavior Change Communication (BCC). Awareness materials have been developed specifically for the small-scale gold mining areas, with images and in a language that reflect the living condition in these locations. The materials included a DVD-movie, three different posters, and flyers. These materials have been distributed in all small-scale gold mining areas.
- 3. Active Case Detection (ACD). During ACD missions, most or all members of each mining community where malaria cases have been detected, are tested and treated for malaria. Malaria testing occurs

with the rapid test but blood samples are also obtained for microscopic research. The microscope slides with blood samples are regularly sent to Paramaribo, where they are studied in the malaria program lab in north Paramaribo, referred to as "Tourtonne lab". When malaria program microscopists are in the interior, the samples are studied immediately in the field. Positive cases receive appropriate medication.

- 4. Malaria awareness rising through personal communication and interaction with the target group. When the malaria program staff members are in the small-scale gold mining areas, they work on awareness rising by informing individuals and families from the target group about the causes of malaria, malaria prevention, use of bed nets, testing, and correct ways of medication. In addition, people have been trained in the treatment of bed nets with insecticide.
- 5. **Malaria Service Deliverers.** In most small-scale gold mining areas, relatively steady residents have been identified and trained as deliverers of malaria services. The MSD are area residents from different nationalities, speaking the language most spoken in the area, and familiar with the local mining population. The received a training in malaria testing (rapid-test), collection of blood sample for lab research, the provision of correct medication to positive cases, and reporting. There are several MSD in the Benzdorp and Sarakreek general areas, but none are stationed in Maripaston. The close proximity of an MZ clinic reduces the need for an MSD in this latter area.

Program activities are executed in all locations where gold mining takes place but vary in intensity. The program is most active in the Benzdorp/Lawa region because of the large gold mining population in this region and its proximity to French Guiana. Many small-scale gold miners who are clandestinely working in French Guiana live in, travel from, flee to, or visit the Suriname side of the border at Benzdorp. In Sarakreek and Maripaston the program is less active, mostly because less positive malaria cases have been reported in these areas lately. Posters, flyers and bed nets have been distributed in these areas though. The present study evaluates the preliminary impacts of the above listed activities pertaining to the "Looking for Gold, Finding Malaria" program on malaria-related knowledge, attitudes, and behavior among the inhabitants of three major gold mining areas in the Suriname interior.

3. Methods

3.1 Study period & locations

Field work was conducted in June 2012 in three larger mining area's; Benzdorp/Lawa River area, Sarakreek area and the Maripaston area (figure 1). In each location, one to two weeks were spent conducting fieldwork. The survey supervisors and most surveyors were familiar with the study areas and the local populations were familiar with malaria program staff. For this reason, it was not necessary to spend much time on reconnaissance, building report, and explanation of the project.

Figure 1. Map of the study locations



The selected research locations were mostly the same locations as those that had been surveyed for the 2009 Knowledge, Attitudes and Practices study (KAP). Nevertheless, budgetary and time constraints motivated small adjustments to the study sites. In 2009, baseline data were collected in Sella Creek, Stuwmeer/Sarakreek area, and Benzdorp/Lawa River. In the present study Sella Creek has been replaced by Maripaston. Sella creek is located in the far interior of Suriname and travel to this location is extremely expensive, requiring plane, charter boat, and All Terrain Vehicle (ATV) transportation. Because no new malaria cases have been reported for this location in the past several months, malaria program staff no longer visits this area on a regular basis. Scheduling a trip merely for conducting the survey would place too much of a strain on the program budget. The mining area of Maripaston was selected as a substitute location. Maripaston is located closer to Paramaribo and can be accessed over land. Like in Sella Creek, the small-scale gold mining population in Maripaston is primarily Surinamese and of Maroon ethnic descent.

The **Benzdorp/Lawa river area** in the district of Sipaliwini is an ancient mining area (figure 2), and continues to host one of the largest concentrations of small-scale gold miners in Suriname. The area can be reached by plane, in about 1 ½ hours from Paramaribo. An estimated 2500-3000 gold miners and mining service providers are living in this area⁵. The main population enclaves are the Benzdorp *curatela* somewhat land inward and locations along the river (Kabanavo, Peruano, and Antonio do Brinco).

Figure 2. Impressions of the Benzdorp area



Benzdorp miners' village (curatela) from the air



Bars and stores along the Lawa River at Antonio do Brinco, Benzdorp general area

⁵ During the latest ACD, 1679 persons were registered in the general Benzdorp area. This number is much lower than the estimated total population in the area (2,500-3,000) because there are always houses, camps and businesses empty when residents travel for work or leisure to Paramaribo or French Guiana.

The Benzdorp *curatela* (figure 3) is one of the longest established *curatelas* in Suriname and contains businesses that offer a wide range of services, including supermarkets, ATV repair shops, brothels, hair and beauty salons, carpenters, mechanics, and so forth. The Lawa River constitutes the border with French Guiana, and the nearest village to the Benzdorp mining locations is Maripasoela (FG). Maripasoela is a large urban centre on the French side of the Lawa River, which features a small yet modern hospital and a Prevention and Vaccination Center (*Centre de Prevención et Vaccinación*). The inhabitants of the Benzdorp/Lawa River area can access most French health services for free and hence they often seek medical assistance on the French side of the river.

Figure 3. Impressions of the Benzdorp area 2



Travel in the early morning

Benzdorp curatela (gold miners' village)

The **Sarakreek area** is located in the district of Brokopondo, south of the hydraulic lake (figure 4). The area can be reached by driving by car from Paramaribo to Afobaka at the North side of the lake (2 hours), and continuing by boat across the lake. This area is a historic mining area, where small-scale manual gold miners and mechanized mining companies already extracted gold in the late 19th century. At present there are various small-scale gold mining sites in this region, with an estimated total population of 1500-2000 individuals.

The grand majority of the mining population in this region (75-90%) consists of Brazilian migrants (Heemskerk & Duijves 2012). They live both scattered through the forest in their mining camps and in the *curatelas* that have sprouted throughout the region. The nearest traditional village is Lebidoti, a Maroon community which features a clinic of the Medical Mission Primary Health Care Suriname, known by its abbreviation as "MZ".

Figure 4. Impressions of the Sarakreek area



Boat landing along the lake, Sarakreek area

Travel by ATV in the Sarakreek area

Maripaston (figure 5) is a small-scale gold mining site located in the district of Para and a relatively recent mining location. This area can be reached by car in about three hours from Paramaribo. Road conditions are reasonable, though some sand tracks to the mining sites are poorly navigable in the rainy season. The nearest settlement is Makakreek (Makakriki); a small Matawai Maroon community along the Saramaca river. Nearby Kwakoegron, a larger Maroon community up-river from Makakreek, does offer various basic services, including an MZ clinic. In addition, there are some Indigenous settlements nearby.

An estimated of 1500 small-scale gold miners are active in this area. The largest share of the gold miners in Maripaston consists of Suriname nationals of Maroon ethnic descent (80-90%). Between 5-10 percent of the Maripaston mining population consists of Brazilians, and the remainders are primarily other Suriname nationals (e.g. Hindustani excavator operators), Chinese store owners, and Dominicans.

Figure 5. Impressions Maripaston; mining pit with men working with a gold pan (batea) (hft MP fotos?)

3.2 Study population & sample

The total number of persons working in the Suriname gold mining regions is not known, but has been estimated by the Commission Regulation Gold Sector (OGS) at 40,000 individuals (De Ware Tijd, 3 March 2012). This population estimate includes mining service providers such as cooks, All Terrain Vehicle-drivers, sex workers, shop-owners and others working in the mining areas. A total of 5,000-6,000 persons may be working in the areas that are covered in this study – Benzdorp/Lawa river area (2,500-3,000 p), the Sarakreek area (1,500-2,000 p) and the Maripaston area (1500 p).

Sampling occurred through the same method as was used for the 2009 KAP study. The researchers took a random sample of gold mining equips, households, or other economic units in the mining areas. The various other economic units included cantinas, bars, hotels, transportation stations, brothels, and stores. In the population centers or *curatelas,* every third economic unit was approached by a member of the research team. If there was no-one present at the third unit or if the inhabitants refused to participate, the surveyors would approach the nearest economic unit.

In the forest outside of the population centers, all camps were approached for participation in the study. This approach was different from the one used in 2009, when every third camp was approached. Because of the high costs of transportation and the considerable distances between camps, the 2009 strategy was extremely costly and resulted in a relatively low number of camps that had been surveyed. In the Benzdorp and Sarakreek areas, ATV transportation costs about 500 USD per day per ATV, which seats two passengers at most. Skipping camps would mean that a two-person survey team would only

be able to conduct a few interviews each day. In order to obtain the target sample size (250), it was not feasible time and budget-wise to visit every third camp.

The surveys were preferably conducted with the owner or manager of the place or with the head of the household. If this person was not present, the surveyors questioned another well-informed individual over 15 years of age. After approaching the selected person, the interviewer performed an informed consent procedure. If the person agreed to participate in the survey, the interviewer would proceed with the survey questions.

The study sample consisted of 268 mining teams or other economic units among whom 156 from the Benzdorp/Lawa area (58.2%), 51 from the Sarakreek area (19.0%) and 61 from the Maripaston area (22.8%)(table 1). This present 2012 sample is larger than that of 2009, when 160 mining teams and other economic units had collaborated in data collection. Not all questions were applicable to everyone and in some cases answers were inconsistent or missing. As a result, the number of persons who responded to a certain question was often lower than the 268 of the complete sample. In this report, the sample size for the various presented results is reported as N_{total} .

Table 1. Numbers of inhabitants of gold mining areas who were surveyed in the three research locations

Location	Total
Benzdorp/Lawa river area	156
Sarakreek area	51
Maripaston area	61
Total	268

3.3 Survey

A cross-sectional survey with open-ended and closed-ended questions was used to collect data. The design of the survey form was based on the 2009 KAP survey, and adapted only slightly were needed to improve the clarity of the question. In addition, the consultant added some questions that were specifically related to program activities. The final survey form is attached as Annex 1. The survey form consisted of 68 questions covering the following subject areas: demographic characteristics, socioeconomic indicators, knowledge and perceptions of malaria, bed net usage, treatment seeking behavior, and personal prevention practices. The survey was first composed in Dutch and next translated into the Portuguese language.

3.4 Protection of Human Subjects and Ethical Review

Research procedures adhered to professional ethical standards for anthropological and health research. Prior to conducting a survey interview, the interviewee was approached in an unobtrusive manner. The surveyor introduced him or herself and explained the purpose of the research. The interviewee was also explained that participation in the research was voluntary and anonymous, and that the person had the opportunity to get him/herself tested on malaria as well. Names of study participants have not been recorded. The answers have been processed using a coding system that guarantees respondent anonymity. Information provided to the survey team by the interviewees, has been treated

confidentially and is not revealed in a way that can be linked to their person. All data have been presented in an aggravated manner.

3.5 Data analysis

Survey data were entered in the statistical software package SPSS. The data were cleaned and crosschecked prior to and during the analysis. Summary statistics and multivariate statistics have been used to present the data. In the data representation, the denominators for the various results are reported as N_{total} . The survey data are compared with data obtained in the 2009 KAP survey to evaluate the program activities that have been carried out by the malaria program in the past three years.

3.6 Research Team

The study has been conducted under the auspices of the malaria program director and under supervision of the consultant. For fieldwork, the malaria program composed a team of surveyors consisting of staff members and outside field researchers. A disadvantage of including malaria program staff members was the fact that these persons were not independent surveyors. The advantages of working with the malaria program field workers, however, outweighed this concern. The malaria program workers have been providing services in the target areas for two years now, and established a relationship of trust and mutual respect with the gold miners. Because many gold miners do not have legal documents to reside and work in the country and because most do not have legal mining titles, they are often suspicious of outsiders. An additional advantage was that the malaria program staff members were familiar with the different mine sites and knew how to get around. People from the urban areas do not easily travel to the interior and never visit the mining areas. It would simply not be feasible to rely on outsiders alone.

The surveyors spoke Dutch, Sranantongo, tribal Maroon languages, and/or Brazilian Portuguese. They were selected on the basis of their previous experiences with similar survey work; their language skills; and/or their familiarity with the research localities. Prior to entering the field, the consultant held an instruction session with the surveyors to discuss the sampling strategy, the research approach, and the survey questions.

During field work the surveyors were headed by a staff member of the malaria program. During the first trip to the Benzdorp/Lawa area the consultant came along with one of the survey teams to review the survey work, double-check filled-out forms and give instruction to optimize data collection. At the same time, another survey team was working in on a faraway location in the same general area and hence it was not possible to oversee all surveyors at a time. The consultant did not join the survey teams to the other two locations (Sarakreek and Maripaston).

Two data entry assistants employed by malaria program were appointed for data entry. The consultant has conducted the data analysis and written the report.

3.7 Limitations & Assumptions

- Budgetary constraints prohibited inclusion of the exact same areas as were included in the 2009 KAP survey. Because the study locations are largely comparable, we are confident that the study results offer an accurate representation of changes in malaria-related knowledge, attitudes, and practices in Suriname gold mining areas.
- The research team varied in survey work experience and not all surveyors proved to have the necessary survey qualities. As communicated above, the consultant was not able to oversee data collection in all locations. As a result, a number of survey forms were incomplete and/or the recorded answers inconsistent. In cases where a form contained too many errors or omissions, it was removed from the stack. In the cases where the analysis revealed inconsistencies and questionable results, we have reported it in the text.
- Due to time constraints, the consultant could not join the research team to all field work areas.
 For this reason she was not able to assist during all data collection trips. Besides, she was not able to conduct surveys herself, nor have informal conversations or conduct observations in all fieldwork areas. This resulted in a lack of in qualitative impressions of the different research locations.

In collecting data and interpreting the results, we rely on various assumptions.

- **Representativeness.** The researchers assume that by conducting a random sample in the mining areas, the study provides an accurate representation of the demographic characteristics, socioeconomic indicators, knowledge and perceptions of malaria, bed net usage, treatment seeking behavior, and personal prevention practices.
- **Reliability**. We also assume that interviewees answered to the questions to their best ability and in a truthful manner.

4. Malaria knowledge and information

In this chapter we analyze malaria knowledge among the inhabitants of gold mining areas. The chapter starts with a brief sketch of the demographic and social profile of the respondents, which provides insight in the population make-up, language skills and educational background – all of which affect the acquisition of knowledge. Next we discuss access to information and the various ways in which malaria knowledge is transmitted. Subsequent sections discuss knowledge about the causes, prevention measures, symptoms, and treatment of malaria. The following chapter, 5, will present data related to malaria prevention and treatment behavior.

4.1 Demographic and social profile

The sample included representatives of households, gold mining equips, other economic units in the mining areas in a wide range of ages. Based on year of birth we found that the youngest interviewee was 18 years of age and the oldest 64. Respondents were on average 37 years old; the median age was 37 ($N_{total}=266^6$). Most respondents were male (64.7%), but more than a third (35.3%) were female.

Reflecting the population in Suriname gold mining areas, the sample population is dominated by Brazilians (51.9%) and Suriname nationals (38.4%). The remaining respondents were Chinese (5.2%), Dominicans (0.7%), Peruvians (0.7%), Colombians (0.7%), Guyanese (0.4%), French (0.4%), Dutch (0.4%) and individuals with other, not specified nationalities (1.1%; N_{total} =268)(Figuur 6)



Figure 6. Respondents by nationality, Ntotal =268.

⁶ For two respondents in the Maripaston area the sex was not listed.

Most inhabitants of the visited mining areas were Brazilians and Surinamese but the population makeup differs in the three areas. The sample population from the Benzdorp/Lawa area was dominated by Brazilians (70.5%), complemented mostly by Surinamese inhabitants (19.9%; N_{total}=156). In the Sarakreek area the team interviewed same numbers of Surinamese and Brazilians; both 45.1 percent. In addition, 9.8 percent of respondents in this area were Chinese (N_{total}=51). The inhabitants of the Maripaston area who participated in the survey were mainly Surinamese (80.3%) followed by Brazilians (9.8%; N_{total}=61).

The majority of survey respondents, almost three quarters (72.3%), speak Brazilian Portuguese (N_{total} =268). Half of the respondents (48.5%) can make themselves understandable in Sranantongo (N_{total} =266). These languages are followed by Dutch, which is mentioned by 33.3 percent as a language that they can use to make themselves clear (N_{total} =268). Other languages mastered by the respondents are tribal Maroon languages (25.8%), English (18.7%), Chinese (5.2%) and Spanish (2.6%)(N_{total} =268).

Considered by area, we find that in the Benzdorp/Lawa area, where mostly Brazilians reside, Portuguese is the main language and spoken by 85.8% of area residents (N_{total} =155). In Sarakreek, where both Brazilians and Surinamese live, the area inhabitants mostly speak Portuguese (74.5%) and Sranantongo (54.9%; N_{total} =51). Sranantongo is the most used language in the Maripaston area (90.2%), followed by Dutch (75.4%) and tribal Maroon languages (52.5%; N_{total} =61)(figure 7).



Figure 7. Share of people working in the gold mining areas who speak a certain language

When looking at educational achievement, we find that the number years of education completed ranges from 0 to 20 years. Respondents had enjoyed on average 7.4 years of education (N_{total} =253). Respondents from the Sarakreek area were on average least educated (Mean=6.0 years, N_{total} =50). People in the Maripaston area had attended, on average, most years of formal education (Mean=9.1 years (N_{total} =59). The average inhabitant of the Benzdorp/Lawa area had completed 6.8 years of formal

education (N_{total}=144). There is hardly any difference between men and women in terms of educational achievement.

A wide variety of professions are practiced in the mining areas (figure 9). Surveyed men worked as a gold miner (40.0%) or were shop owner (18.8%), machine owner (9.1%), entrepreneur (8.5%) or had another job such as camp boss (7.3%), or transport provider (ATV, boat; 6.1%). Other occupations, such as hotel, bar or cabaret (brothel) owner, cook, civil servant, manager, hair dresser, logger and mechanic, where only mentioned by three or less individuals (figure 8).

Almost a quarter of women owned a shop (23.6%). Fewer women worked as a cook (21.3%), were a restaurant or hotel owner (13.5%), or owned a cabaret (11.2%). Both full time house wife and entrepreneur were the main occupation for 6.7 percent of the females. Saleswomen (4.5%) sold different things such as groceries, clothing and drinks. Other jobs, such as machine owner, gold miner, hair dresser, excavator owner, sex worker, camp boss and transporter were named by three or fewer respondents (figure 10).



Figure 8. Main professions performed by male survey respondents (Ntotal=165)

 $0.0\% \quad 5.0\% \ 10.0\% \ 15.0\% \ 20.0\% \ 25.0\% \ 30.0\% \ 35.0\% \ 40.0\% \ 45.0\%$

Figure 9. Professions observed in the mining areas











Transport providers with ATV



Guards



Hairdresser, manicure, pedicure



Restaurant and snack bar



Jeweler



Gold miner





Figure 10. Main professions performed by female survey respondents (Ntotal=89)

About half of surveyed mining camps or other economic units had an ATV (46.9%). In the more isolated areas as Benzdorp/Lawa and Sarakreek, where cars cannot be used, resp. 53.2 and 54.9 percent of mining camps or other economic units owned an ATV. In the Maripaston area only 19.7 percent of houses, mining camps, or shops owned an ATV. Mining camps or other economic units in the Sarakreek area were relatively more likely to possess a boat (15.7%) and/or outboard motor (11.8%). In the Maripaston area, which can be reached by car, almost 30 percent of respondents owned a car.

Camps or economic units in the mining areas have different sizes (figure 11). On average, 5.7 persons live and sleep 'usually' in one economic unit in the gold mines. The range is wide with the smallest number of usual residents being one person (6.4%), whereas there were eight locations where more than 15 persons spent the night. At one location in the Benzdorp general area, the respondent reported a number of 60 usual sleepers (N_{total} =267). This place is the building of medium-scale mining company Nana resources at Buese, and hosts the employees of this company. When asked about how many persons had slept in the surveyed economic unit the night before the interview, similar numbers of sleepers were reported (Mean=5.3, range=0-50). Most homes or camps housed no persons younger than sixteen (86.2%). Places where minors were present were often the homes of families with small children. Other respondents reported the presence of one (10.1%), two (3.0%) or four (0.7%) youngsters under sixteen who were sleeping in the surveyed economic unit (0.4; N_{total} =268). Most respondents sleep usually on a bed (70.7%), others in a hammock (20.0%), and some respondents (9.1%) mentioned that they spent the night on either one (N_{total} =265).



Figure 11. Sleeping arrangements in the gold mining areas.

4.2 Communication means

National TV stations cannot be received in any of the research areas, but many camps have a satellite dish to receive Brazilian channels. In the Benzdorp/Lawa area 76.3 percent of economic units have a television (N_{total} =156). More than half of the camps, homes, or other economic units in the Sarakreek area have a television (58.8%; N_{total} =51). Most people in these areas watch the popular Brazilian station Globo (82.6% in Benzdorp/Lawa; 86.2% in Sarakreek). DVD is watched to a lesser extent (18.2% in Benzdorp/Lawa; 31.0% in Sarakreek). In the Maripaston area, where 70.5 percent of economic units own a television, Globo is less popular. At this site 61.1 percent of respondents watched this channel. The inhabitants of Maripaston were more likely to watch a DVD instead (97.5%; N_{total} =40)(figure 12).

A generator, which is owned by 75.7 percent of the surveyed economic units, is necessary to operate a TV or other electric appliances. The largest percentage of economic units that own a generator was encountered in the Maripaston area. Economic units in the Maripaston area also were more likely to have a radio than those in the other areas (59.0%, N_{total} =61). This feature may be explained by the fact that the national radio stations can be reached in this area. People who own a radio mostly listen to it in the evenings (45.1%, N_{total} =71).



Figure 12. Number of camps or economic units in the mining areas possessing selected consumer goods.

People obtain personal information and public messages mostly by telephone (36.7%) or by word of mouth (19.5%). Other sources of information are poster/pamphlet (12.7%), newspaper (8.6%), radio (8.2%), television (2.2%), in church (2.2%) or via the internet (0.7%; N_{total}=267)(figure 13).

Figure 13. Ways people get personal information or public messages (N_{total}=267).



4.3 Information about malaria

Respondents were asked if they had obtained malaria information or had been exposed to malaria awareness materials in Suriname, for example through posters or radio and television commercials. More than three quarters answered affirmatively (76.0%) while others claimed that they had never seen or heard information about malaria in Suriname (23.0%; N_{total} =261). There is no significant difference between the various mining areas.

The way people had received information about malaria differs between mining areas. Posters were the most named source of information. Especially in the Sarakreek area posters were named frequently as a source of malaria information (84.2%). In the Benzdorp/Lawa area, 66.7 percent of respondents referred to posters and in the Maripaston area only 40.4 percent, half as often as in the Sarakreek area. The second most important sources of information were health workers. (Malaria program) health workers were mentioned by more than a third of the respondents in the Benzdorp/Lawa area (35.9%), but less so in the Sarakreek area (15.8%)(figure 14). This finding may reflect the relatively greater intensity of malaria program activities in the Benzdorp area, as a frontier region and high-risk location

In the Maripaston area, 17.0 percent of respondents had become informed about malaria through radio and 38.3 percent through television. These figures for Maripaston are much higher than those for the Sarakreek area (resp. 2.6% and 5.3%) and the Benzdorp/Lawa area (resp. 6.0% and 16.2%). DVD was named more than three times more often in the Sarakreek area (21.1%) than in the Maripaston area (6.4%).



Figure 14. Sources of information about malaria, in Suriname

Among the individuals who had been exposed to malaria awareness material, most reported that this information was totally clear (84.2%) or partly clear (9.4%). A few respondents lamented the fact that the information was difficult and confusing (2.5%) or not in a language that they understood (2.0%)

 $(N_{total}=202)$. Two percent of respondents said that they didn't know (2.0%). The share of respondents who had completely understood the malaria information in the Sarakreek area (95.0%) was high as compared to that in the Benzdorp/Lawa area (88.7%) and the Maripaston area (63.0%). In the Maripaston area another 35.5 percent had understood the information partially, which brings the total number of persons who had been reached at least to some extend to 98.5 percent.

4.4 Knowledge of malaria symptoms

When asked about disease symptoms, 32 respondents (11.9%) said they could not name any symptom of malaria and would possibly not correctly identify the disease (N_{total} =268). This figure is a slight improvement from 2009, when 14.4 percent of surveyed persons in the mining areas did not know any symptoms of malaria. In the recent study, respondents who could name symptoms named one (9.0%), two (41.4%), three (30.6%), or more than three (7.0%) symptoms (figure 15).



Figure 15. Number of symptoms named by respondents in the mining areas.

When considering the average number of malaria symptoms named by the respondents in a specific area, knowledge of the symptoms of malaria is best in Benzdorp/Lawa area with an average of 2.3 malaria symptoms named per respondent. According to this criterion, knowledge of malaria symptoms was worst in Maripaston area, where respondents named on average 1.9 symptoms. When looking at the number of respondents who named at least one symptom of malaria, we find again that Benzdorp/Lawa area residents score best with 91 percent naming at least one malaria symptom. According to this indicator, Maripaston scored second best with 85.2 percent of residents naming at least one malaria symptom. Gold miners and other inhabitants of Sarakreek were least likely to name a malaria symptom (82.2%)(table 2).

Benzdorp/Lawa N=156 Sarakreek area N=51 Maripaston area N=61

Table 7	Dercentere	ofreen	ndantau	who at	laact .	namad			ntom	~f	manlaria
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	Benzdorp/Lawa area N=156	Sarakreek area N=51	Maripaston area N=61	Total
% of respondents who at least named one				
symptom of malaria	91.0%	82.4%	85.2%	88.1%

Respondents named a wide variety of disease symptoms, all of which are indeed associated with malaria. The most mentioned disease symptoms were a headache (named by 69.0% of respondents), fever (56.3%), and feeling cold (30.2%). Furthermore, almost a quarter of people named 'body pains' (24.6%) and others mentioned throwing up (15.7%), having a bitter taste (14.9%), and nausea (12.3%; N_{total} =268). In all three areas, fever and body pains were the most often mentioned disease symptoms. This finding is not different from the 2009 results.





Notable differences included the number of persons in the Sarakreek area who named 'feeling weak' as a symptom, as compared to the other areas (Maripaston area 0.0%, Benzdorp/Lawa area 1.9%). The symptom 'no appetite' also was named often by respondents in the Sarakreek area, but scarcely in the Maripaston area (8.2%) and the Benzdorp/Lawa area (3.2%). In the Maripaston area, a bitter taste (1.6%) and feeling cold (14.8%) were less often answered than in the other areas (figure 16).

4.5 Knowledge of the causes of malaria

Knowledge of the causes of malaria is less accurate. Provided answers suggest that many respondents relate malaria to water quality and/or water use (figure 17). This is particularly truth for Suriname respondents, of whom 21.6 percent named dirty water in general and 15.7 percent named drinking polluted water as a reason for contracting malaria. 'Only' 8.0 percent of foreigners mentioned dirty water in general as a cause of malaria and only 0.6 percent shared the belief that dirty drinking water could cause malaria. In general, forty percent of all answers is related to some sort of water issue. The roots of this idea can probably be traced to earlier malaria prevention campaigns, which have stressed the elimination of mosquito breeding places, such as pools with standing water. Misunderstanding of this message may have led people to link the disease directly to dirty water.



Figure 17. Causes of malaria named by Suriname nationals (N=102) and foreign migrants (N=165).

Most respondents know that malaria is being transmitted by a mosquito (62.3%; N_{total} =268). This is the case for 67.3 percent of foreigners (N_{total} =165) and 53.9 percent of Surinamese respondents (N_{total} =102). These percentages imply a minor improvement in knowledge as compared to 2009, when 60.2 percent of foreigners and 44.8 percent of Suriname respondents reported that malaria was transmitted by a mosquito.

Respondents, without significant difference between Suriname nationals and foreigners, also named sleeping without a bed net as one of the causes for getting malaria (19.8%; N_{total} =268). Although this answer was given less frequently than during the 2009 study, this finding suggests that previous malaria awareness campaigns in the interior have been successful in promoting the bed net as a means of preventing malaria (figure 17).

4.6 Knowledge of malaria testing

Respondents were asked whether they knew where one can go to do a malaria test and, if necessary, obtain treatment. The grand majority of respondents (82.6%) could name at least one malaria test & treatment location (N_{total} =264). The remaining 17.4 percent said they did not know. Suriname nationals appeared more informed than foreign migrants; 85.2% of Suriname nationals versus 74.4% of foreign inhabitants of mining areas could name at least one malaria test location.

The Bureau for Public Health (*Bureau Openbare Gezondheidszorg* – BOG) in Paramaribo is overall the best known malaria test location, and was named by 40.8 percent of respondents (N_{total}=238; Figure 16). Mostly Suriname respondents referred to BOG (77.9%), while this government health center was less known among foreign migrants (16.2%). Second and third listed among the mentioned malaria test locations are services provided by the "Looking for Gold, Finding Malaria" program: the MSD in the gold mining areas and the malaria lab in north-Paramaribo (Tourtonne). These places were named by, respectively, 37.0 percent and 20.2 percent of respondents. National data confirm that these places are regularly frequented by people who want to conduct a malaria test (table 3). On a national level, the malaria program lab in Paramaribo is the second most important location for malaria testing, after the MZ clinics.

Both the MSD and the malaria lab are relatively better known among migrants than among Suriname nationals in the gold mining areas. The MSD ranked first in the list of malaria test locations named by migrants; named by 52.8 percent of respondents from this group. The difference may in part be explained by the absence of MSD in Maripaston, where a large share of the Suriname respondents was working.

A significant share of respondents (18.1%), primarily migrants (25.4%), named French Guiana as a place where they would go for malaria testing and treatment. Of the respondents who referred to French Guiana, 90.7 percent was interviewed in the Benzdorp/Lawa general area. A significant share of the inhabitants of this region works (partly) in French Guiana, and for many the French Guiana health post is as close as or even closer than the nearest Suriname location to seek malaria services. Less commonly named locations included the Medical Mission clinics in the traditional villages (MZ, 7.6%), any hospital

(3.4%), Medilab (1.7%), any clinic or general practitioner (1.3%), the Department of Dermatology⁷ (0.8%), and Brazil (0.4%)(figure 18).





Malaria Program data about the number of persons who were tested for malaria at different locations indicate that in 2011, the Medical Mission had performed the largest number of malaria tests (table 3). The relatively low number of respondents from the sample who named MZ as a test location may be explained by the fact that foreign migrants are not very likely to seek medical assistance at the MZ clinics. The malaria program lab in Paramaribo is the second most important place where people turn to for a malaria test.

⁷ It is not possible to conduct a malaria test at the Department of Dermatology. Other blood tests (e.g. HIV-test) are performed and this may have led the respondent to believe that the Department also tests for malaria

Organization	Number tested
Bureau for public Health (BOG)	1251
Medical Mission (Medische Zending)	9455
Malaria program lab –north Paramaribo	1762
Malaria program workers in the mining areas -MSD	835
Malaria program-ACD (active case detection)	1783
Totaal	15086

Table 3. National level data on the number of persons tested for malaria in different locations

4.7 Knowledge of malaria prevention

The grand majority of respondents (81.9%) affirmed that there are ways to protect oneself against malaria (N_{total} =265). This is an increase from 2009, when merely 73 percent of respondents reported that they knew ways to prevent malaria. Twenty persons said that they did not know (7.5%; N_{total} =265).

When asked about the most important thing they could do to prevent getting malaria, most respondents named sleeping under a bed net (76.7%; N_{total} =265). This figure presents a steep increase from 2009, when only 59.2 percent of respondents named the bed net as a way to prevent malaria. There was not much difference between Suriname nationals and others in the share of respondents who gave this answer (table 4).

Table 4. Percentage of respondents who named 'sleeping under bed net' as an effective method to prevent malaria

	Maripaston N=61	Sarakreek N=51	Benzdorp N=156	Total
Names 'sleeping under bed net' as an effective	91.5%	82.4%	85.2%	76.2%
method to prevent malaria				

Two other frequently mentioned strategies to reduce the chances of getting malaria were keeping the surroundings clean/destroy mosquito breeding places (22.5%), which was relatively more often named by Suriname nationals, and using insect repellent (18.7%; N_{total} =262).

Other answers that related to protection against mosquitoes referred to using a mosquito candle, taking malaria prophylaxis, bathing before nightfall, using Baygon (insect spray), and not going to the forest/malaria areas/gold mining areas. Thirty-one persons (11.8%) in the total sample could not list any strategy they used to reduce the chance of getting malaria (N_{total} =262). As compared to Surinamers, relatively more foreign migrants answered they did not know any malaria prevention strategy (15,4%, versus 6% of Suriname respondents)(figure 19).

Despite the various malaria campaigns that have been held in Suriname, 16.0 percent of respondents still believed that one can protect oneself against malaria by not drinking river water or dirty water

(N_{total}=262). More than twice as many Suriname nationals as foreign migrants voiced this opinion (24% versus 11.1%). Curiously, when this question was asked earlier on in the survey in slightly different wording, 40.6 percent of respondents expressed the opinion that one could protect oneself against malaria by drinking only clean water. We cannot explain the huge disparity in the answers within the same survey, other than the fact that respondent answers were inconsistent. The reference to clean water suggests that there are still people who believe that malaria is transmitted through poor quality drinking water.

These figures suggest that, most respondents directly made the link between mosquitoes and malaria.

In response to another yet similar question in the survey, respondents also named prevent being bitten by a mosquito (25.3%), not work in the burning sun (5.8%), not catch a cold (1.6%), drink *bita* (0.4%) and dress with long sleeves (0.4%) (N_{total} =245).



Figure 19. Ways to prevent getting malaria known and mentioned by respondents

Survey respondents were asked whether they knew why bed nets are used. The grand majority of interviewed inhabitants of mining areas knew that bed nets are used to protect oneself against mosquitoes (84.4%, as compared to 76.9% in 2009) and malaria (30%, as compared to 14.4% in 2009) (N=263). Other mentioned functions of a bed net included protection against other flying and crawling insects (2.7%) and against bats (3.4%). Twelve persons (4.5%) could not think of any use for the bed net.

Three quarters of respondents (76.7%) said they knew where they could obtain a bed net (N_{total} =257). The data did not show any difference between Suriname nationals and foreign migrants in this regards.

Places mentioned as selling points of bed nets included Chinese stores, department stores in Paramaribo (Kirpalani's, Jeruzalem Bazar), BOG, malaria program, Paramaribo, Stoelmanseiland, and 'everywhere'.

An insecticide-treated bed net or mosquito net is a mosquito net that repels, disables and/or kills mosquitoes coming into contact with insecticide on the netting material. The largest share of respondents, 63.9 percent, had heard of Insecticide Treated Bed Nets (ITBN; N_{total}=263). In this regard we do not notice a change from 2009, when 62 percent of the respondents had heard of bed nets with insecticide. Like we found in the earlier KAP survey, it appears that Suriname nationals are much better informed of Insecticide Treated Bed Nets than foreigners: 81.2 percent of Surinamers versus 53.1 percent of migrants in the mining areas had heard of ITBNs.

More than two-thirds of the respondents (68.7%) could tell why bed nets are being treated with insecticide, while the remaining 31.3 percent did not know (N_{total} =259). In 2009, by contrast, less than half of the respondents (47.4%) knew why bed nets are being treated with insecticide. The most common reason mentioned for treatment of nets with insecticide, named by 49 percent of respondents, is to kill mosquitoes. Respondents also mentioned that ITBNs served to keep mosquitoes away, against malaria, and to kill insects in general (table 5).

Why are bed nets insecticide treated?	N	%
Kill mosquitoes	127	49.0%
Keep mosquitoes away	91	35.1%
Against malaria	6	2.3%
To kill insects	3	1.2%
Don't know	81	31.3%

Table 5. Reasons named by respondents for why bed nets are treated with insecticide (N_{total} =259)

Probably as a result of the differences in population make-up in the different mining areas, we also find significant differences in knowledge of the Insecticide Treated Bed Nets between mining areas. In the Maripaston area, 83.3 percent of inhabitants knew about Insecticide Treated Bed Nets, versus 51.0 percent in the Sarakreek area and 60.5 percent in the Benzdorp/Lawa area. This finding is contradictory to the expectation that, given the relatively larger exposure of inhabitants of the Benzdorp/Lawa area to malaria program activities, the inhabitants of Benzdorp/Lawa should be best informed.

4.8 Conclusion: Overall malaria knowledge

As discussed above, we measured the level of knowledge about malaria by asking people about their knowledge of the symptoms, cause, prevention, and treatment of malaria. Table 6 summarizes the share of respondents with correct knowledge of these issues in the different mining areas.

We aggregated the results into one variable, 'optimal malaria knowledge' (table 6). We measured this variable by calculating the share of respondents who:

1. Correctly identified the mosquito as the cause of malaria, AND

- 2. Listed at least one symptom of malaria, AND
- 3. Named at least one effective method to protect oneself against malaria, AND
- 4. Has knowledge of malaria treatment

Ad.1. The answers 'mosquito', 'malaria mosquito', 'mosquito bite' and similar answers were considered correct answers

Ad.2. As symptoms of malaria we counted among the correct answers: head ache, fever, diarrhea, vomiting, bitter taste in the mouth, feeling cold, body pains, pain in the eyes, dizziness, nausea, stomach ache, having now appetite, weakness, losing weight, tiredness, flu-like symptoms, and joint pains.

Ad.3. Among the prevention methods we counted as correct answers: use (insecticide treated) bed net, avoid mosquito bites, use preventive medication, use of repellent, and use of mosquito candle.

Ad.4. Knowledge of malaria treatment was considered good if the respondent knew where to go for malaria testing and treatment. All other questions that related to malaria treatment were only applicable to the people who had had malaria at least once, and using these measures would reduce the sample size.

Combining the various measures, we can conclude that close to half of the respondents (47.3%) has knowledge of the cause, symptoms, preventive measures, and treatment of malaria. This is an improvement from 2009, when no more than one third (33.1%) of respondents had optimal malaria knowledge.

Respondent:	Maripaston	Sarakreek /Makoe	Benzdorp	Total
Can correctly name the cause of malaria, as being	53.3%	74.5%	64.1%	63.7%
the bite of a mosquito				
Can correctly name one or more symptoms of	85.2%	82.4%	93.6%	89.6%
malaria				
Can name at least one effective method to	93.2%	82.1%	83.8%	85.8%
prevent malaria				
Knows where to go for malaria research	86.4%	76.5%	83.1%	82.6%
Has optimal knowledge of causes, symptoms,	46.4%	43.6%	49.0%	47.3%
prevention, and treatment of malaria	(N _{total} =56)	(N _{total} =39)	(N _{total} =145)	(N _{total} =241)
N complete sample	61	51	156	268

Table 6. Knowledge of the cause, symptoms, prevention, and treatment of malaria (% of respondents)

5. Behavior when confronted with malaria

This section of the results describes actual behavior when people suspect they have, or actually have, malaria. It starts with an assessment of when, how often, and where people have had malaria. Next we discuss whether and where people go for a malaria test when they suspect they have contracted the disease. Treatment behavior and the costs of treatment are the topics of the following sections. Finally we look at malaria prevention mechanisms used by inhabitants of gold mining areas, including the use of bed nets.

5.1 Experiences with malaria

Three quarters of the respondents from the selected mining areas had been ill with malaria at least once in their lives (75.2%; N_{total} =266). This number is slightly lower than the figure for 2009 (85.3%). A possible explanation is the fact that the current high gold prices have attracted many new people from urban areas in Suriname and from abroad to the mining business. These newcomers entered the gold mining areas when the malaria campaign had been running for some years, and hence their exposure to malaria has been lower.

More than one third of respondents (38.1%) had had malaria more than five times, and another 4.2 percent of respondents had been ill with malaria so often that they could not remember the number of times they had had the disease (figure 18). Twenty percent of respondents had once or twice been ill with malaria, and another 12.5 percent had had malaria three to five times in their lifetime.





For the majority of respondents (69.9%) more than two years had passed since they had suffered from malaria (figure 21). Three years ago, a much larger number of respondents had suffered from malaria

less than two years prior to the interview (58.0 % in 2009 versus 29.6% in 2012). This figure suggests that there has been less malaria in Suriname mining areas since the implementation of the "Looking for Gold, Finding Malaria" program.





A comparison across research sites suggests significant differences between sites in terms of the share of people who recently experienced malaria (Chi-square, p<0.01; Figure 22). In Maripaston, for example, only one person had been ill with malaria in the week prior to the interview. This woman reported that she had gotten ill in the mining site of Dolin, French Guiana. None of the other interviewees from Maripaston had experienced malaria in the past two years. They either had never had malaria (38.3%) or they had had malaria more than two years ago (58.3%; N_{total} =60).



Figure 22. Time since latest malaria event, by region (N=196)

The situation is different in the Benzdorp general area. Forty percent of respondents in this area had experienced malaria in the past two years, either in the past month (1.6%), between one and six months ago (12.0%) or between six months and two years ago (26.4%).

Of the 185 persons who could name the location where they had experienced malaria for the last time, two-thirds (65.9%) fallen ill in Suriname (figure 21). This does not necessarily mean that they contracted the disease in Suriname. For example, many Brazilians living in the miners' villages of Peruano and Antonio do Bronco (Benzdorp/Lawa area) work in the gold mines in French Guiana, but their families stay on the Suriname side of the border where they are less likely to be bothered by the immigration police. The workers, both women and men, return 'home' to their spouse and/or children every couple of weeks.

For 19.5 percent of respondents, the last time they had fallen ill with malaria they had been in French Guiana. For the Benzdorp area this percentage was slightly higher: 23.3 percent of respondents from this area had experienced their latest case of malaria in French Guiana (N_{total} =116, only counting people who had had malaria and could tell where)(figure 23).



Figure 23. Number of respondents with the place where they were the last time they had fallen ill with malaria, by region (N_{total} =192)

Test data from the malaria program suggest that the proximity to the French border is debit to the relatively larger number of recent malaria cases in the Benzdorp general area. Table 7 shows the number of persons who were tested positive by malaria program staff in 2011, by the country where they most likely were infected. The source country was determined by asking the positive-tested person about his or her travel behavior in the two to three weeks prior to falling ill. While this method does not

provide 100 percent certainty about the country where malaria was contracted, it gives a reasonable indication. Of the 625 persons who had been tested positive for malaria by either the malaria program lab in Paramaribo or an MSD in the gold fields, three quarters (74.6%) had probably contracted the disease in French Guiana (2011 data).

Table 7. Positive malaria cases detected by the malaria program, by likely country of infection (2011).

Source country	Number of positive malaria cases		
Brazilie	3		
Guyana	25		
Frans Guyana	466		
Suriname	131		

Source: malaria program, unpublished data. Pers. com. 12 July 2012

When asked to recall their most recent experience with malaria, the largest share of people said they had known they had malaria because of a head ache (74.2%) and/or fever (72.7%). Other people mentioned the typical hot-cold feeling (51.0%), shivering (37.4%) and feeling nauseous (33.8%; N_{total} =198). Other respondents recalled that they had been throwing up (2), felt weak (2), had diarrhea (1), were cold even in the hot sun (1), had been dizzy (1), had no appetite (1), and suffered from muscle aches (1). All mentioned symptoms are indeed among the possible symptoms of malaria. One person said he knew that he had been ill with malaria because he had bought over-the-counter medication (Artecom) and the symptoms had disappeared.

5.2 Malaria testing behavior

Malaria testing is one of the prime activities of the "Looking for Gold, Finding Malaria" program. Persons suspecting to be ill with malaria can take the malaria rapid test with an MSD in the gold mining areas⁸, or with malaria program staff in the malaria lab in Paramaribo. In addition, the malaria program performs Active case detection (ACD) in all gold mining areas. During these visits, all inhabitants including children are asked to take the malaria test. These ACD visits take place in all mining areas (figure 24).

Respondents were asked whether they had ever tested for malaria without showing symptoms. Just under half of respondents (46.4%) had been tested for malaria without feeling ill, suggesting that they had participated in an ACD campaign (figure 24).

Respondents were asked whether they taken a malaria test the last time they had suffered from malaria symptoms. The grand majority of respondents who had suspected to be ill with malaria had taken the malaria test and indeed tested positive for malaria (83.9%; N_{total} =199). Yet there were also persons who had not taken the malaria test, but simply "knew" they had malaria (8.0%). Yet others had taken the test and tested negative, but still they were convinced that they were ill with malaria (8.0%).

⁸

Figure 24. Inhabitant of the mining areas is tested for malaria during an ACD visit to Kabanavo, Benzdorp general area



Figure 25. Malaria testing behavior



The data suggest that malaria testing is not done consistently by every person who suspects to have malaria. Two-thirds of respondents reported that they always got tested for malaria when they suffered from symptoms (65.5%; N_{total} =200, only counting persons who had had malaria at least once). One person did not know, and the remaining 34 percent of respondents conveyed that they had not always taken a malaria test when they had exhibited malaria symptoms (figure 25).

5.3 Malaria treatment

Almost two-thirds of respondents (63.0%) had at least once been to a malaria clinic for malaria research. Respondents were asked what they had done to get better the last time they had been ill with malaria. The answers are displayed in Figure 26. The figure shows that migrants and Suriname nationals tend to seek health assistance in different places when they suspect being ill with malaria. The largest groups of both Suriname nationals (45.6%) and foreigners (34.2%) in the gold mining areas had been treated in a government health center in Paramaribo. These health facilities included the BOG and the malaria clinic in Paramaribo north. Two more migrants specifically referred to the malaria clinic in Paramaribo north and four Suriname nationals specified that they had been treated at the Bureau for Public Health (*Bureau Openbare Gezondheidszorg*-BOG).





A significant share of migrants, 27.2 percent, had sought malaria treatment with an MSD in the gold fields, versus only 7.4 percent of Suriname nationals (figure 26). This finding does not necessarily reflect different preferences in health seeking behavior. A grand share of the Suriname respondents (22.8%) had been interviewed in the Maripaston area where no MSD is stationed. In general many Suriname nationals tend to be working in areas near traditional villages, in Brokopondo or Para (incl. Maripaston). In many of these villages, the Medical Mission operates primary health care clinics that offer free malaria testing and treatment. Indeed, one third of Suriname respondents (33.8%) reported that they had been treated at a Medical Mission clinic in one of the traditional villages the last time they had been ill with malaria.

Figure 27. MSD at Antino, Benzdorp general area



Among those who had suffered from malaria at least once, 44.7 percent had at some point of time bought over-the counter medication, without taking the malaria test. This is a slight decrease from 2009, when we found that 53.8 percent of respondents had at least once relied on self-medication. Relatively more migrants than Suriname nationals reported the use of over-the-counter medication the last time that they had felt sick and suspected malaria (16.7% versus 1.5%). This is a slight decrease from 2009, when 18 percent of the total sample had bought medicines in a pharmacy or supermarket. It is possible that the use of over the counter medication has been underreported because people know this behavior is discouraged by the government. Very few people rely on traditional healers to treat malaria.

Artecom is the most popular over-the-counter malaria drug; 67.4 percent of the 89 persons who had bought antimalarial drugs on their own account had chosen for this medicine. The second most popular

self-medication drug is Quinine, which had been bought and used at some point in time by 16.9 percent of respondents. Other anti malaria medicines that people had bought without testing or prescription included Halfan (5.6%), Falsidar (4.5%), Lariam (4.5%), Artemisinin (4.5%), and Mefloquine (1.1%). One person had used Ostebon; this is not an antimalarial but a calcium carbonate + vitamin d3 tablet.

Persons who had either tested negative or not conducted the malaria test the last time they had suspected malaria were relatively more likely than others to rely on self-treatment. All three persons who reported that they had sought the help of a traditional healer to cure their latest malaria cure were part of this group (12.5%) and ten respondents had bought medication in a pharmacy or supermarket (41.7%; $N_{total}=24$). The remaining 11 persons among those who had not tested or tested negative, claimed that they had been treated by a health professional; by an MSD in the gold mining areas or at one of the Medical Mission clinics or a government clinic in Paramaribo. This latter result is questionable because it is not likely that health personnel would extend treatment and/or medication to persons who have not tested positive for malaria.

Malaria treatment outside the formal health services is undesirable. The haphazard intake of antimalarial drugs in the absence of the disease promotes the development of antimalarial drug resistance. Self-medication also elevates risks of under or over-dosing, and of taking the wrong medication for the specific type of malaria, which may further facilitate the evolution of drug-resistant malaria parasites and impede proper healing.

Among those who had suffered from malaria and received treatment, 86.4% of respondents said they had completed the treatment, while the remaining persons said they had not completed the cure N_{total} =198). This figure is comparable to that of 2009, when 80.6 percent of respondents had completed their latest malaria treatment.

5.4 Costs of malaria treatment

Suriname offers free malaria testing and treatment for both Suriname nationals and foreign migrants at various locations in the interior and Paramaribo city. In the gold mining areas, the malaria program has trained MSD to perform he malaria test and extend the correct medication for positive cases. In interior villages, testing and treatment are covered by the Medical Mission clinics (figure 28). In Paramaribo, free malaria testing can be done, among others, at the BOG and the Paramaribo north malaria clinic. Also in the clinics in the hospital and the *Centre de Prevención et Vaccinación* of Maripasoela, and in other health centers in French Guiana, malaria testing and treatment are provided free of cost.

Three quarters of the respondents who had obtained malaria treatment at least once, had been treated for free the last time they had done so (75.4%; N_{total}=187). This figure suggests a 19.7 percent increase as compared to 2009, when 55.7 percent of respondents had received their latest malaria treatment at no cost. Some respondents said they did not remember whether their cure had been provided for free (7.5%) and 17.1 percent reported that they had paid for treatment.

It seems curious that people paid for treatment that is provided for free of cost in a great number of locations but a closer look at the data explains the majority of these cases. Eleven of the 32 persons who

had paid for treatment had bought over-the-counter medication at a pharmacy or supermarket and two persons had relied on a traditional healer, which explains the fact that they had paid for their treatment. Two persons reported that they had obtained malaria treatment in a private clinic in Paramaribo, where it is likely that they had to pay. Four respondents had been tested in a government health center in Paramaribo the last time they had been ill with malaria, and another four persons at an MZ clinic . All of them had experienced their latest malaria more than two years ago. Before the malaria program had started its activities, persons who were not registered had to pay for malaria testing and treatment at a government clinic.



Figure 28. Health posts in the interior of Suriname and French Guiana

Prevention and vaccination centre in Maripasoela, French Guiana; the nearest health post for gold miners in the Benzdorp general area

MZ clinic in Lebi Doti; the nearest health post for gold miners working along the southern edge of the Brokopondo lake

Five persons among those who said they had paid for treatment had been treated by an MSD in the gold mining areas. We cannot explain why they had paid for treatment.

Overall, almost half of persons who had paid for treatment (43.8%; N_{total}=32) had been ill with malaria more than two years ago and possibly before the malaria program had started its activities.

Of the 32 individuals who had reportedly paid for their latest malaria treatment and/or medication, 31 provided the price they had paid at the time (figure 19). Eleven persons (35.5%) had paid less than 25 USD, either in gold or in money (SRD, USD or Euro). Ten respondents recalled that they had paid the equivalent of between 25 and 100 USD, and another 10 persons had paid fees exceeding 100 USD.





Even though these malaria services are, in most cases, provided for free, travel to the health providers can be quite expensive (figure 29). The majority of persons had not paid for travel to place where they had been treated for malaria (61.6%; N_{total}=185). These persons may have lived in a *curatela* with an MSD; resided along the river across from Maripasoela; lived in a village with an MZ clinic; or they may have lived or worked in another location on walking distance from a malaria treatment provider. Seventeen persons (8.5%) could not tell whether they had paid, and the remaining 29.2 percent of respondents reported that they had paid a certain amount to get to the nearest health post or MSD.

Fifty-three out of the fifty-four persons who had paid for transportation in order to obtain malaria treatment named the amount they had paid. One third (35.8%) of these individuals had paid less than 25 USD or the equivalent in gold or another currency and 16.9% had paid an amount corresponding to 25-100 USD. Almost half of the persons in this group (47.2%) had spent more than 100 USD to arrive at the nearest place to be treated for malaria and travel back to their place of residency. Four persons had even paid more than 200 USD for transportation to and from the health post, with 600 Euro (735 USD) being the highest amount that had reportedly been paid. The data suggest that even if free treatment is provided, high travel expenses might deter people from seeking medical treatment. The placement of Malaria Service Deliverers in all mining areas is therefore an effective strategy to encourage people to get tested for malaria and obtain proper medication when they suspect being ill with malaria.

5.5 Use of bed nets and other malaria prevention behavior

When asked why they were using bed nets in their own homes (table 8), most inhabitants of the mining areas referred to protection against mosquitoes (84.7%; N_{total} =216); almost a doubling from the number of people who reported the use of bed nets against mosquitoes in 2009 (47.4%). The second most mentioned reason to use a bed net was protection against malaria, which was mentioned by 21.8 percent of 2012 respondents versus 14.8 respondents in the 2009 KAP survey. Other common reasons to use bed nets at home were protection against insects and protection against bats. Uncommon answers included: "to protect the chickens against bats" and "so that people do not notice when you are having sex".

Table 8. Reasons why a bed net is being used in the home or working location of the responder	٦t
(N _{total} =219)	

	N	%
Protection against mosquitoes	184	84.0%
Protection against malaria	46	21.0%
Protection against insects	39	17.8%
Protection against bats	34	15.5%
To protect my baby	1	0.5%
Protection against dengue	1	0.5%
no-one notices when you are having sex	1	0.5%
Protect the chickens against bats	1	0.5%

Hundred-and-twelve respondents (43.4%) reported that in their home, store, or camp there was no single bed net (N_{total} =258). In 21.7 percent of cases, there was just one bed net in the 'economic unit', and in another 25.2 percent of cases there were two to four bed nets around. Having more than four bed nets in the home or camp was rare, and reported by merely 9.7 percent of respondents. Overall, the average number of bed nets per economic unit was 1.8, with a minimum of zero and a maximum number of 60 bed nets⁹ (N_{total} =257). The average number of bed nets in the residence reported this time (2012) was much lower than the average number of 3.2 bed nets per economic unit reported in 2009. This finding is curious because the malaria program has distributed 15,000 bed nets in the interior, after the first KAP was performed. The average number of bed nets is much lower than the average number of bed nets is much lower than the average number of bed nets is much lower than the average number of bed nets is much lower than the average number of usual sleepers per home, shop, or camp (5.3¹⁰). We must take into account that couples and children may sleep with more than one person underneath one bed net. Nevertheless, the large divergence between the number of bed nets and the number of persons per economic unit suggests that there are many individuals who sleep without a bed net.

We estimated the percentage of gold miners who have a bed net by calculating the number of bed nets as a percentage of the number of usual sleepers. In using this measure, we assume that all bed nets in a

⁹ Excluding one outlier of a person who reported the presence of 60 bed nets in his place.

¹⁰ Excluding one outlier of a case where 60 sleepers were reported.

home or business belong to the persons who usually sleep there and that there is one bed net per miner. In fact, the measure indicates the availability rather than ownership of bed nets. Calculated as such, we find that 38.4 percent of inhabitants of gold mining areas have one bed net. This figure signifies a sharp decrease from 2009, when 62.6 percent of the inhabitants of sampled camps had a bed net.

Global Fund Indicator: % of gold miners who have a bed net (normal/ITBN/LLINs) 2009: 62.6% (N_{total}=151) 2012: 38.4% (N_{total}=255)

Again, given the large quantity of distributed bed nets, it is surprising to find this low bed net availability. The finding is even more curious given that bed nets are cheap and can be bought throughout the country; that they are number one in listed ways to prevent malaria; and the grand majority of respondents knew where to get one. We can only speculate about possible explanations. In the first place, the rising price of gold over the past few years has promoted new migration waves to the mining areas. As a result, there are many newcomers in the various sites. Secondly, because there is much less malaria today than there was some years ago, people become more lenient in the use of malaria prevention methods. Third, it is observed that people in mining areas frequently sleep on a double bed, especially in places with relatively settled houses. The malaria program bed nets only fit on a single bed or a hammock, and hence they do not suit the needs of these people.

We suspect some underreporting because several families had stored the malaria program bed nets somewhere in their homes and, as they were not using them, may not have recalled their presence. One of the reasons why some persons do not use the malaria program bed nets is that the nets fit a hammock or one person bed, but many persons -both individuals and couples- sleep on larger beds. The bed net does not comfortably fit on these beds. Nevertheless, despite possible underreporting and despite the fact that people share hammocks, the data do suggest that a significant share of mining area inhabitants do not have a bed net available at night. Bed net distribution has not helped to improve this situation.

The listed common indicator may not give a good impression of access to bed nets because, as stated above, particularly couples and small children sleeping on beds often share one bed net. A better impression of bed net usage may be obtained by analysis of how many persons slept with a bed net in the night prior to the interview, in comparison to the total number of persons who slept in the house that night.

We find that in 45 percent of homes, camps, or other economic units, no single person slept with a bed net in the night prior to the interview (N_{total} =260). In that night, 35.8 percent of all inhabitants of surveyed economic units had slept with a bed net (N_{total} =255¹¹). Among the respondents themselves this percentage was higher: 49.4 percent of survey respondents had slept with a bed net the night before the interview (N_{total} =263). The figure is lower than that for 2009, when 59.4% of respondents reported that they had slept with a bed net the previous night (N_{total} =159). The data suggest that Benzdorp/Lawa

¹¹ Five cases were removed where the reported number of persons sleeping with a bed net in the previous night was larger than the total reported number of persons sleeping in the house, in the night prior to the interview.

inhabitant are the most persistent bed net users, while less people use bed nets in Sarakreek and Maripaston (table 9). One possible reason for this observation is that since malaria is virtually eradicated in Maripaston and the lake area, people no longer feel a need to use a bed net.

Table 9. % of gold miners sleeping under a (Insecticide Treated) net in the night prior to the survey.

Global Fund Indicator: % of gold miners sleeping under a (Insecticide Treated) net in the night prior to				
the survey				
Area	% of respondents sleeping with a bed	% of camp inhabitants sleeping with a bed		
	net in the previous night	net last night, as estimated by the		
		respondent*		
Benzdorp/Lawa	58.4% (N _{total} = 154)	40.0% (N _{total} = 149)		
Sarakreek	31.4% (N _{total} = 51)	28.1% (N _{total} = 49)		
Maripaston	41.4% (N _{total} = 58)	31.6% (N _{total} = 57)		
Total	49.4% (N _{total} = 263)	35.8% (N _{total} =255)		
* Based on estimates of the camp or business owner or head of household of the number of sleepers at his/her				
place yesterday, and the number of people using a bed net in that place the previous night				

The main reason mentioned to not use the bed net is that the person does not have one (60.7%, N_{total} =117; Table 10). Again, this answer is curious given the large number of bed nets that have been distributed and the ease of obtaining one. Other people said they just do not like it (17.1%)¹², feel suffocated or too warm under a net (6.8%), or said they had already sprayed Baygon (insecticide) and hence there was no need for the bed net (8.0%) (N_{total} =117).

Table 10. Share of respondents naming certain reasons	s for not sleeping under a bed net (N=117)
-------------------------------------------------------	--------------------------------------------

Reason	%
Does not have a bed net	60.7%
Does not like it	17.1%
Feel suffocated/warm	6.8%
Other	8.0
Used Baygon	0.9

In only 23.8 percent of the surveyed camps, at least one of the bed nets was insecticide treated (N_{total} =261). This figure is lower than that for 2009, when 30.5 percent of interviewees reported that there was at least one ITBN in their home, shop, or camp. When considering just the economic units with at least one bed net, we find that only in 38.7 percent of locations the bed nets are ITBNs. In all other homes, shops, or mining camps, the inhabitants do not have bed nets that were distributed by the malaria program. One third (35.5%) of all bed nets present in surveyed homes, mining camps, and shops, was insecticide treated (N_{total} =472 bed nets)

¹² Unfortunately, this answer is not further questioned which limits the insights.

With regard to malaria prevention methods other than the use of a bed net, we found that more than half of the respondents never used insect repellent (57.7%, N_{total} =260; Figure 30). On the other hand, 17.7 percent of interviewed inhabitants of gold mining areas reported the daily use of repellent.



Figure 30. Frequency of repellent use among respondents (N_{total} =260)

6. Conclusions

In the previous chapters we assessed knowledge of the causes, symptoms, prevention mechanisms, and treatment of malaria among the inhabitants of gold mining areas, as well as their actual behavior when confronted with this disease. The main question was:

How and how much have malaria-related knowledge, attitudes, and practices among gold miners and other inhabitants of mining areas changed as a result of the interventions of the Suriname Ministry of Health/Global Fund malaria program?

This concluding chapter synthesizes the results in response to this question.

6.1 Knowledge

Overall malaria knowledge has increased in 2012 as compared to 2009. Our composite measure of knowledge of the causes, symptoms, preventive measures, and treatment of malaria suggests that almost half of the small scale gold miners in surveyed mining areas have correct knowledge of malaria as compared to one third of the respondents in 2009 (resp. 47.3% and 33.1%, Box 1). Malaria knowledge is on average best in the Benzdorp area, where malaria program activities have concentrated. Differences between areas are not large though, and much smaller than in 2009.

Box 1: Optimal malaria knowledge

Global Fund Indicator: % of gold miners who:

- (a) Know that malaria is caused by a mosquito, AND
- (b) Can name at least one symptom of malaria, AND
- (c) Know at least one way to protect oneself against malaria, AND
- (d) Are informed about where to get malaria treatment.

2009		2012		
Sella Creek	12.5%	Maripaston	46.4%	
Lake area	40.0%	Lake area (Sarakreek)	43.6%	
Benzdorp area	33.9%	Benzdorp area	49.0%	
Total	33.1%	Total	47.3%	

Despite our observation that knowledge of malaria has increased, the data suggest that there are several areas where misconceptions and knowledge gaps continue to exist. With regard to the causes of malaria, the idea that malaria is caused by dirty water continues to be strongly embedded in people's minds. Some people specifically referred to drinking dirty water or creek water, while others believed that also bathing with, or simply being near, poor quality water can cause malaria. The idea that malaria somehow is caused by bad water seems particularly persistent among Suriname nationals.

Nevertheless, there were relatively fewer persons referring to water quality in 2012 than in 2009. In 2009, 41.4 percent of Suriname gold miners and 10.2 percent of foreign migrants had answered that

"drinking polluted water" was a cause of malaria. Today (2012), a much lower 15.7 percent of Suriname nationals and 0.6 percent of foreign migrants share this idea. Other misconceptions included that malaria is caused by bats, alcohol consumption, drinking water with mercury, or insects in general.

Knowledge of malaria symptoms, malaria test locations, and malaria prevention is generally good. Most gold miners and mining service providers could name at least one symptom (88.1%); a slight improvement over 2009, when 85.6 percent of interviewees were able to name at least one malaria symptom.

The grand majority of respondents (82.6%) could name at least one malaria test & treatment location, with Suriname nationals proving better informed than foreign migrants. Since its inception the malaria program installed two types of malaria testing locations; MSD in the various gold mining areas and the malaria lab in north Paramaribo. These locations came second and third among the places people named as malaria test sites and were named by respectively 37.0 percent and 20.2 percent of respondents. Among foreign migrants, the MSD even were the best known place to go for a malaria test (named by 52.8%). This finding suggests that the training of laypersons as deliverers of malaria services in locations close to the target group has been effective in improving access to malaria services. Better access, in turn, is likely to promote more conscious use of malaria services rather than turning to self-medication.

The grand majority of 2012 respondents (81.9%) were able to list ways to protect oneself against malaria, as compared to 73 percent of respondents in 2009. Sleeping under a bed net was identified by three-quarters of respondents (76.7%) as an effective method to protect oneself against malaria; a steep increase from 2009, when only 59.2 percent of respondents named the bed net.

Given the large share of respondents who indicated that they have been exposed to malaria awareness materials in Suriname (76.0%), it is likely observed improvements in malaria knowledge can in part be attributed to the malaria program. This reasoning is strengthened by the finding that malaria posters and (malaria program) health workers were the most important sources of information. Particularly the ACD campaigns when malaria program staff visits every home, form important moments of personal information exchange. The fact that most inhabitants of mining areas are Brazilians and speak only Portuguese is not a barrier for information transmission because the malaria program awareness materials are all translated into Portuguese and most malaria program staff members can communicate in this language.

6.2 Behavior

Whereas malaria knowledge seems to have improved on all fronts, the results with regard to behavior are not unidirectional. Generally the data do not reveal much of a difference in terms of treatment seeking behavior between 2009 and today, though we observe minor improvements. Among those who had suffered from malaria at least once, 44.7 percent had at some point of time bought over-the counter medication, without taking the malaria test. This is a slight decrease from 2009, when we found that 53.8 percent of respondents had at least once relied on self-medication. Among those who had malaria and received treatment, 86.4 percent of respondents had completed their most recent

treatment, as compared to 80.6 percent in 2009. In 2012 just under half of respondents (46.4%) had tested for malaria without showing symptoms, as compared to 50% in 2009.

Possession and use of bed nets seem to have reduced in the past several years (table 11). Respondent scores on almost all bed net indicators have worsened, including the share of persons owning or sleeping with a bed net. We speculated about the possible causes for the poor results in 2012. Factors that might have been of influence include: (a) arrival of many newcomers to the mining areas in response to the high gold prices, (b) low malaria incidence in the Suriname mining areas reduced the perceived need for a bed net, (c) many inhabitants of the mining areas prefer to sleep on a double bed and the malaria program bed nets are too small to fit these beds. Even taking these factors into account, it remains surprising that given the continued presence of malaria and the wide availability of free and cheap bed nets, a minority possesses and/or uses a bed net.

Bed net indicator	2009	2012		
Percentage of respondents sleeping with a bed net in the previous night	59.4%	49.4%		
Percentage of camp inhabitants sleeping with a bed net last night, as estimated by the respondent*	37%	35.8%		
Percentage of gold mining area inhabitants who have a bed net	62.6%	38.4%		
Percentage of gold mining area inhabitants who know where to purchase or get a bed net	83.0%	76.7%		
Percentage of respondents who have heard of insecticide treated bed nets	62.0%	63.9%		
* Based on estimates of the camp or business owner or head of household of the number of sleepers at his/her place yesterday, and the number of people using a bed net in that place the previous night				

Table 11. Bed net indicators

6.3 Impact of the malaria program

The malaria program executes activities with the aim to eradicate malaria in Suriname's small-scale gold mining areas. Based on the available survey data we selected a list of indicators to measure impact of the various program activities (table 12).

Behavior Change Communication (BCC) occurs both through the distribution of awareness materials (posters, DVD) and house-to-house visits by malaria program staff. Three-quarter of respondents said they had been exposed to awareness materials in Suriname. The data suggest that these efforts are paying off. As shown in Box 1, today a relatively larger percentage of respondents have adequate knowledge of malaria causes, prevention, symptoms and treatment.

One of the main messages promoted by the malaria program awareness campaign has been that sleeping with a bed net is the most effective way to protect oneself against malaria. We find a 28.7 percent increase in the number of respondents who indeed referred to the bed net as an effective way to prevent malaria.

Another point of attention in the awareness campaigns had been the message that people who suspect that they have malaria, get tested and obtain a proper diagnosis and treatment. We observe a slight decrease in the number of individuals who reported that they always get tested when they suspect they have malaria. On the other hand, fewer persons reported buying over-the-counter medication the last time they were ill with malaria, suggesting that this malpractice is reducing. Slightly more people reported that they had completed their treatment they last time they had malaria, as compared to 2009.

The malaria program **distributed 15,000 ITBNs** in the gold fields in the past three years. Curiously, the effects of this activity do not show in the survey data. As compared to 2009, a much smaller percentage of respondents reported that they possessed a bed net in 2012. Meanwhile the number of houses or camps with at least one ITBN has remained virtually the same between 2009 and 2012, as has the share of persons who reported that they had slept with a bed net in the night prior to the interview.

Malaria testing and treatment is one of the prime activities of the "Looking for Gold, Finding Malaria" program. One out of five respondents named the malaria lab in Paramaribo as a location where they would go for a malaria test if they needed one, and 37 percent of respondents named the MSD in the mining areas as places for malaria testing. Among those who actually had experienced malaria, 39.6 percent had gone to a government clinic (incl. malaria lab) and one out of five had used the services of an MSD the last time they had been ill. Considering that many persons had experienced malaria a long time ago or in locations outside of Suriname, these figures suggest that the malaria program testing and treatment services are quite well used among recent cases of malaria.

Active Case Detection has occurred in most mining areas, and concentrates on areas where new cases are reported. It is noteworthy that the number of persons who said that they had been tested for malaria without feeling symptoms has not truly changed between 2009 and 2012. Given the number of persons tested for malaria during the ACD campaigns in the past three years, one would expect a significant increase. We cannot explain this result.

Malaria Service Deliverers have been identified and trained in virtually all small-scale gold mining areas. More than one third of respondents named the MSD as a place to conduct a malaria test, and one out of five respondents had actually used the services of an MSD the last time they had fallen ill.

In conclusion we can say that malaria-related knowledge has increased considerably and in almost all sub-areas between 2009 and 2012, but behavior has lagged behind. In many areas there is no notable change in behavior, for example with regard to the number of persons who have tested for malaria without feeling symptoms. The number of persons who reported the possession and use of bed nets has even significantly decreased; a finding that is difficult to explain.

The overall decrease in the number of persons who had been ill with malaria in the two years prior to the studies suggests that nowadays fewer inhabitants of mining areas become infected with malaria. Both these research data and annual figures from the malaria program suggest that malaria control has been effective in Suriname mining areas. The data also indicate, however, that eradication of malaria

remains a utopia as long as the French government falls to adequately attack malaria in gold mining areas on its territories. Bilateral cooperation is a must if we seek to effectively root out malaria in Suriname.

Table 12. Indicators of malaria program success

Program activity	Percentage of inhabitants of gold mining areas who	2009	2012
General	Have been diagnosed with malaria in the past two years	58.0%	29.6%
Awareness campaign	Have adequate knowledge of malaria causes, prevention, symptoms and treatment	33.1%	47.3%
	Have been exposed to malaria outreach materials in Suriname	Not asked	76%
	Identify 'sleeping under bed net' as an effective method to prevent malaria	59.2%	76.2%
	Get tested when they suspect having malaria	70.2%	65.5%
	Have bought over the counter medication the last time when they were ill with malaria	18.0%	11.0%
	Completed their treatment the last time when they were ill with malaria	80.6%	86.4%
Distribution	Possess a bed net	62.6%	38.4%
ITBNs	Possess an insecticide treated bed net (% of camps)	37.0%	35.8%
	Slept with a bed net in the night prior to the interview	37%	35.8%
Testing and treatment	Name the malaria lab in north Paramaribo as a location where one can test for malaria	Not asked	20.2%
	Used the services of a government health clinic the last time they had malaria $^{\rm 13}$	43%	38.6%
ACD	Has tested for malaria without feeling symptoms	50.0%	46.4%
Training of MSD	Name the MSD as a location where one can test for malaria	Not asked	37.0%
	Used the services of an MSD the last time they had malaria (only those who had malaria)	Not asked	20.1%

¹³ Only persons who had had malaria at least once. In brackets the persons who said they had been tested at a government clinic, which may have referred to the malaria lab.

7. Recommendations

Considering:

- 1. That the general aim of the malaria program is to eradicate malaria in small-scale gold mining areas as the last remaining point sources of malaria transmission in Suriname,
- 2. That the goal of the present study was to assess changes in malaria knowledge and behaviour among gold miners and service providers in small-scale gold mining areas between 2009 and 2012, and
- 3. The data collected in the framework of this consultancy and our key findings reported here above

We provide a number of recommendations organized in four sections; quick wins, services, cooperation, and policy. "Quick wins" are a list of specific activities that are viewed as something that can be done with little effort and can normally be done in a short period of time. "Services" refers to recommendations aimed at improving migrant and mobile population access to prevention, treatment and support for HIV services. Cooperation focuses on ways in which various migrant and HIV services organizations can both build capacity within the development and implementation of policy.

Based on our study results we recommend the following

Quick wins

- 1. Malaria knowledge has increased but misconceptions continue to exist. This means that Behavior Change Communication (BCC) needs to continue. Particularly one-on-one communication between staff workers and posters have been effective means to transfer information. These efforts should continue.
- 2. Particularly among Suriname nationals, the idea that poor quality water causes malaria is persistent. In one-on-one conversations, this misconception should be specifically addressed.
- 3. The most important reason for not using a bed net was "not having one". Continued distribution of bed nets, preferable nets that fit a two-person bed, could increase the number of bed net users.

Services

4. Small-scale gold mining populations are mobile. External factors including gold prices, government policies, and gold discoveries may rapidly change where miners go. For these reasons, mobility is crucial in the provision of HIV services to migrant populations in small-scale gold mining areas. The work with MSD should be continued, and adapt to new situations in the field.

Cooperation

5. Cooperation with French Guiana is crucial if malaria is to be eradicated in particularly the border areas. At this moment, many new malaria cases are contracted in French Guiana. To

date, the French government has not been very willing to extend malaria services in mining areas where "illegal miners" are working. It is impossible to root out malaria in Suriname if the disease is flourishing just across the (open) borders.

- 6. Once the Commission OGS has established Mining Service Centres in the interior, possible collaboration with this organization should be assessed. Foreseen forms of collaboration could include transportation sharing (flights/rides), temporary accommodation of the mobile VCT site, and announcements in the areas prior to arrival of the mobile malaria service team.
- 7. The Suriname malaria program has been extremely successful in delivering health services to small-scale gold mining populations in isolated areas throughout the country. The lessons learned should be shared with neighbouring countries struggling with the same issues, as well as with other health departments seeking to extend services to small-scale gold mining areas. Collaboration with, for example, the national AIDS program could lead to cost sharing.

Policy

8. At this moment, the malaria program is funded by Global Fund and operates as a semiindependent program within the Ministry of Health. Before Global Fund funding expires, there must be a plan of how to continue with the program. Discontinuation of the malaria program could lead to a resurgence of malaria and deterioration of public health in the Suriname interior.

Future research and evaluation

- 9. Provide surveyors more training and support, preferably in the field. Besides, add a professional/experienced researcher to the team to supervise and assist the team. This will help to prevent incomplete survey forms and/or inconsistent recorded answers.
- 10. Let the consultant join the research team to all field work areas. As a result the consultant will be able to have informal conversations or conduct observations in all fieldwork areas and this provides qualitative impressions of the different research locations.
- 11. The use of insecticide treated bed nets is crucial in keeping new malaria infections low, but it seems that people are not very inclined to use them. A brief qualitative evaluation of reasons why people do not use bed nets could shed light on this issue. An important reason for not using the bed net was that the respondent did "not like" it. It is important to discover why people do not like the bed nets, whether they do not like particular types or all bed nets, and what can be done to make the bed nets more to their liking.

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Newspaper

• De Ware Tijd (5 maart 2012) Ordening goudsector vordert, eerste servicecenter klaar.

ANNEXES

ANNEX 1 survey form

INTERVIEWER LEGT DOEL VAN ONDERZOEK EN RECHT RESPONDENT WIL WEL GEÏNTERVIEWD WORDEN	ΓΕΝ VA 1 JA	AN DE RE	ESPONDENT UIT (CONS RESPONDENT WIL NIET	ent pr Geïnte	OCEDUR	RE)) WORDEN	2 Ne	E
2. PLAATSNAAM 3. REGIO			4. RESSO	RT				
GEGEVENS VAN DE GEINTERVIEW	/DE, K/	AMPBAA	S, EIGENAAR VAN HET	BORDE	EL, WINI	KELIER		
5. GESLACHT RESPONDENT								
6. LEEFTIJD RESPONDENT								
7. NATIONALITEIT ^① Surinaamse ^② Nederlan	idse 3 H	Brazilaans	e ④ Andere					
8. WELKE TALEN KUN JE VERSTAANBAAR MAKEN? © Aukaans/Ndvuka	③ Engel:	s ④ Portuș	gees S Andere6 A	ndere				
9. HOEVEEL JAREN ONDERWIJS HEEFT U GENOTEN (T	'EL JAF	REN BLI.	IVEN ZITTEN NIET MEE)					
EC	ONON	AISCHE	GEGEVENS					
10. BEROEP OF WERKZAAMHEDEN VAN DE GEINT	ERVIE	WDE	l					
HEEFT IEMAND IN UW HUIS/KAMP EEN V/D VOLGE	NDE (OMCIRKE	L HET JUISTE ANTWOORD)				
11. ATV	Yes 1	No 2	14. Buitenboord	Yes 1	No 2	16.	Yes 1	No 2
12. Auto/ Truck	1	2	motor 15. Boot	1	2	Televisie 17. Radio	1	2
13. Generator	1	2				(muziek)		
18. INDIEN U EEN RADIO HEEFT, WANNEER WORD ① 'smorgens ② 'smiddags ③ 'savonds ④ de hele dag ⑤ Andere	T ER G	GELUIS	FERD NAAR DE RADI	0?				
19. NAAR WELKE STATIONS LUISTERT U?	nale stati	ions (Radi	o 10, Sky)	nschapsra	idio (bv R	adio Paakati)		
③ Buiter	landse 2	zenders	④ Anders	:				
20. INDIEN U EEN TV HEEFT, NAAR WELKE ZENDERS H ③ Andere Braziliaanse zender ④ Anders:	KIJKT L	J? ФВ	Braziliaanse zender GLOBO	@ Alleen	n DVD			
21. OP WELKE ANDERE MANIEREN KRIJGT U PERSOO (1) Radiozender (2) Kerk (3) Posters en pamflett	NLIJKE en	E INFORI @ And	MATIE OF OVERHEIDSB lere mensen	ERICHT	EN?		. [
WOO			PGEGEVENS					
22. HOEVEEL MENSEN SLAPEN GEWOONLIJK IN U 23. HOEVEEL VAN DIE MENSEN ZIJN JONGER DAN	W HU	IS/KAM	P?					
24. HOEVEEL MENSEN HEBBEN DE AFGELOPEN N	аснт	r in uw	HUIS/KAMP GESLAP	PEN?				
25. WAARIN/OP SLAAPT U HET MEEST ? 10 Bed 2 Ha	angmat (③ Andere						
		MALA	RIA					
KUNT U VERTELLEN WAT DE BELANGRIJKSTE ZIE 26.	KTEV	ERSCH	IJNSELEN VAN MALA	ARIA ZI.	JN?			
27.								
28.								
HOE KAN IEMAND VOLGENS U MALARIA OPLOPEN	\? (SC	HRIJF A	LLE ANTWOORDEN OP	S.V.P.)				
29.								
30.								
31. ZIJN ER MANIEREN OM MALARIA TE VOORKOM (NOEM DE ANTWOORDEN NIET OP)	IEN? (D Ja Ø	Nee ③ Weet niet					

32. Indien ja, wat kan men doen om zich tegen malaria te	KRUIS ALLE GENOEMDE ANTWOORDEN AAN
	A7 ? VOORKOMEN DAT JE IN DE HETE ZON STAAT
AT? ONDER EEN KLAMBOE SLAPEN A2? ZORGEN DAT JE NIETDOOR MUGGEN GEBETEN WORDT	A8 7 DE O MGEVING ROND HET HUIS SCHOON HOUDEN A9 ? SCHOON WATER DRINKEN
A3? PREVENTIEF MEDICIJN OF MIDDEL GEBRUIKEN (INCL. BITA)	A10? WEET NET
A5 ? MUGGENSPRAY GEBRUIKEN	A12. ? GEEN
A6?Voorkomen dat je kou vat	
33. HEBT U OOIT MALARIA GEHAD? 10 Ja @ Nee 3 N	Weet niet
34. HOE VAAK HEEFT U MALARIA GEHAD? ① Nooit ② 1-2 maal ③ 3-5 maal ④ Meer dan	5 keer © Weet niet meer
35. HOE LANG GELEDEN HEEFT U VOOR HET LAATST	MALARIA GEHAD?
D Deze week nog D Deze maand T -6 maanden geleden G maanden-2 jaar geleden Sme	er dan 2 jaar geleden
36. WAAR WAS DAT?	
37. HOEWIST U DAT U MALARIA HAD? (KRUIS ALLE ANTW ① Koorts ② Rillingen ③ Heetkoud gevoel ④ Hoofdpijn	oorden aan die genoemd worden © Misselijk © Anders
38 BENT ILDIE LAATSTE KEER DAT ILMALARIA HAD OOK POSITIE	
① Ja ② Nee, ik testte negatief maar ik wist dat het toch had	③ Nee, niet getetst
39. DE LAATSTE KEER DAT U MALARIA HAD, WAT HE	EFT U GEDAAN OM ER VANAF TE KOMEN?
 Naar traditionele genezer Zelf medicijn aangeschaft in ag Test en behandeling in overheidskliniek in de stad Getes 	ootheek, <i>supermercado</i> , of ander verkooppunt st en behandeld door een MSD in de αoudvelden
©Test en behandeling in privé kliniek in de stad © Test en beh	andeling bij Medische Zending
Medicijn van collega/vriend(in) gehad Medicijn van collega/vriend(in) gehad	
40. DE LAATSTE KEER DAT U EEN MALARIA KUUR NA ① Ja ② Nee ③ Weet niet	M, HEEFT U DIE TOEN AFGEMAAKT?
41. HOEVEEL GELD HEEFT U BETAALD VOOR DE BEF ① Gratis ② < 0.5 g. Au ③ 0.5-2 g. Au ④ Meer	HANDELING DE LAATSTE KEER DAT UMALARIA HAD?
42. HOEVEEL GELD HEEFT U TOEN BETAALD VOOR T	RANSPORT OM DE BEHANDELING TE KRIJGEN?
(TOT AAL RETOUR PRIJS, DUS OOK OM WEER TERUG NAAR DE WE	ERKPLEK TE GAAN)
43.HEBT U ALTIJD EEN MALARIA ONDERZOEK GED/ ① Ja ② Nee ③ Weet niet	AAN WANEER U SYMPTOMEN VERTOONDE?
44. DOET U OOK WEL EENS MALARIA ONDERZOEK Z ① Ja ② Nee ③ Weet niet	ZONDER DAT U SYMPTOMEN VERTOONT?
45. WEET U WAAR EEN MALARIA ONDERZOEK WOR	DT GEDAAN? 0 Ja @ Nee 3 Geen antwoord
46. KUNT U ME EEN PLAATS OPNOEMEN? ① MZ ② MS	BD IN DE GOUDVELDEN ③ MALARIA KLINIEK TOURTONNELAAN
BOG ⑤ ZIEK ENHUIS/HUISARTS ⑥FRANS GUYANA/MA	RIPASOELA @ANDERS
47. BENT U OOIT NAAR EEN KLINIEK GEWEEST VOO	R EEN MALARIA ONDERZOEK? 10 Ja 2 Nee 3 Weet niet
48. BENT U ALTIJD BEHANDELD TEGEN MALARIA WANNE	ER U POSITIEF BLEEK TE ZIJN? 10 Ja 2 Nee 3 Weet niet
49. HEEFI U WEL EENS MALAHIA MEDICIJN GEKOCHI EN ① Ja ② Nee ③ Weet niet	I GEBRUIKT ZONDER VOORAFGAAND ONDERZOEK?
50. ZO JA, WELK MEDICIJN HEEFT U TOEN GEBRUIKT (ON ① Malarone ② Fansidar ③ Artemisine ④ Laria ② Weet niet	ACIRCEL ALLE ANTWOORDEN DIE VAN TOEPASSING ZIJN) am © Quinine © Anders
51.HEBT U WEL EENS MALARIA VOORLICHTING GEZ (BV POSTERS, RADIOSPOTJES) ① Ja ② Nee	IEN OF GEHOORD IN SURINAME
52.D.WAAR HEEFT U VOORLICHTING GEZIEN OF GE 1 Radio 2 Posters 3 Televisie spotjes	(In the second s
© Gezondheidswerkers ⑦Kerk ⑧School ⑨Anders	@Weet niet

53. WAS DE INFORMATIE VOOR U TE BEGRIJPEN? ① Ja het was duidelijk ② Nee, het was niet mijn taal ③ Nee, de informatie was moeilijk/verwarrend
Het was deels te begrijpen S Anders © Weet niet
54.WAT IS HET BELANGRIJKSTE DAT U MOET DOEN OM MALARIA TE VOORKOMEN? (OMCIRCEL ALLE GENOEMDE ANTWOORDEN, MAAR LEES DE ANTWOORDEN NIET VOOR) ① Onder een klamboe slapen ② Insmeren met muggencreme ③ Omgeving schoon houden
Preventief medicijn gebruiken © Geen rivierwater/vuil water drinken © Muskietenkaars gebruiken © weet niet
M Anders
55. GEBRUIKT U MUGGENSPRAY? ① Nooit ② Ja, enkele malen per dag ③ Dagelijks ④ Vaak maar niet altijd ⑤ Zelden, bijna nooit
KLAMBOES
56. WEET U WAARV OOR EEN KLAMBOE WORDT GEBRUIKT? ③ Als bescheming tegen muskieten ③ Nee ③ Als bescheming tegen muskieten ④ Als bescheming tegen muskieten ④ Andere
57. WEET U WAAR U EEN KLAMBOE KUNT KOPEN OF KRIJGEN? ① Ja, namelijk ② Nee ③Weet niet
58. HOE VEEL KLAMBOES HEEFT U OP DIT MOMENT IN UW HUIS/KAMP? (INCL. KAPOTTE)
39. WAT IS DE BELANGHIJKSTE REDEN VOOR HET GEBRUIKEN VAN KLAMBOE IN DIT HUIS?
60. ZIJN ER ANDERE REDENEN WAAROM U EEN KLAMBOE GEBRUIKT IN UW HUIS?
61. HOE VEEL MENSEN UIT UW KAMP/HUIS HEBBEN GISTERAVOND ONDER EEN KLAMBOE GESLAPEN?
62. HEEFT U GISTERAVOND ONDER EEN KLAMBOE GESLAPEN? ① Ja ② Nee ③ Weet niet
63.ZO NIET.WAAROM NIET?
64. HOE LAAT GING U GISTERAVOND SLAPEN?
65. HEEFT U GEHOORD VAN EEN GEÏMPREGNEERDE KLAMBOE? ① Ja ② Nee ③ Weet niet
66. HOEVEEL VAN DE KLAMBOES IN DIT HUIS ZIJN GEÏMPREGNEERD?
67. WEET U WAAROM KLAMBOES GEÏMPREGNEERD WORDEN? ① Ja ② Nee ③ Weet niet
68. ZO JA, WAAROM ① Om muggen te doden ② Om de klamboe sterker te maken ③ Om muggen weg te houden ④ Anders

HET INTERVIEW IS NU AFGELOPEN. NEEM A.U.B. DE TIJD OM NA TE GAAN OF ALLE VRAGEN BEANTWOORD ZIJN