GLOBAL BUSINESS COALITION
ON HIV/AIDS, TUBERCULOSIS AND MALARIA

BENCHMARKS FOR MALARIA PROPHYLAXIS IN THE MINING AND OIL INDUSTRIES

A project commissioned by the
Global Business Coalition on HIV/AIDS,
Tuberculosis and Malaria

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Executive Summary

The survey was conducted in collaboration with the Global Business Coalition on HIV/AIDS, Tuberculosis and Malaria to gain information about malaria chemoprophylaxis in oil and mining companies which have employees working in malaria-endemic countries. An initial question was whether a company should make malaria chemoprophylaxis mandatory for its employees. This question was broadened to cover other aspects of chemoprophylaxis and malaria prevention. Twelve oil and mining companies were identified as being likely to have employees to have similar risks of malaria, and therefore to have relevant policies. One company approached the Global Business Coalition on HIV/AIDS, Tuberculosis and Malaria for help in commissioning the survey. Ten of the twelve companies agreed to co-operate.

Information about policies on malaria chemoprophylaxis was collected by a questionnaire, telephone interviews with five companies, and a review of documents and training materials. From the responses, a series of benchmarks for chemoprophylaxis policies was developed, and examples of good practice were identified.

It is recommended that

1. Mandatory chemoprophylaxis should not be adopted until other measures to improve compliance have been tried.
2. Malaria policies should be reviewed at 1 - 2 year intervals, with documents marked with the dates of the reviews.
3. Industry-wide collaboration should be continued, in particular to share the best training materials and methods.
4. Malaria policies should consider the local communities in the countries with endemic malaria, as the risk to non-immune employees can be reduced by protecting the whole community.
5. Subcontractors should be required to have malaria control policies that are consistent with the companies in this survey.
6. Companies should ensure that their policies are applied to the families of employees if they visit or live in countries with endemic malaria.
7. Training on malaria awareness and prevention should be a condition of employment in endemic areas and a requirement for visitors pre departure to malaria risk regions. Knowledge should be tested and updated periodically.
8. Individual risk assessments should include the length of time working in an endemic area.
9. The incidence of malaria in employees should be monitored.
10. The compliance with chemoprophylaxis should be measured in reliable ways.
11. A target should be set for compliance by non-immune employees.
12. Employees should be encouraged to give feedback on chemoprophylaxis.

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Introduction

Malaria is a significant global problem, causing many deaths and much suffering and economic loss through illness. It has always been a hazard for people going from temperate climates to work in tropical countries. Despite the availability of chemoprophylaxis and other methods of preventing malaria, fatal infections continue to occur in the employees of companies operating in malarial areas. Whilst the long-term goals of eliminating malaria are being pursued through vaccines, new drugs and environmental control, we also need to make the best use of the available methods of preventing deaths from malaria. A question that triggered this study of the malarial policies in the extractive industries – oil, gas and mining companies – was whether there is a place for making chemoprophylaxis compulsory, at least for non-immune employees going from non-malarial regions to the tropics. The question was expanded into an analysis of current malaria chemoprophylaxis policies within the extractive industry in order to identify best practice, success factors and challenges.

Methods

We searched the medical literature for papers on mandatory chemoprophylaxis for malaria. We found one paper which dealt with the topic, and gave a good overview of the actions that a company could take to prevent malaria in its employees (1). Using this paper, our own experience and the guidance of an industry expert, we developed a questionnaire which was tested with one company. The companies that might participate in the survey were identified and recruited by the Global Business Coalition on HIV/AIDS, Tuberculosis and Malaria from amongst its membership. Twelve companies were identified as being in the mining, oil and gas industries and operating in countries with endemic malaria. Ten companies agreed to send us their written policies on malaria chemoprophylaxis, six companies agreed to complete the questionnaire and five agreed to telephone interviews. Three companies supplied training materials relevant to analysis of their policies, and two companies gave statistics on malaria rates in their employees.

The written policies were reviewed independently by two of us (IH and DM-W). If our questions were not directly answered by the written policies, they were asked again in the interviews. If there was insufficient information from the companies that were not interviewed, the questions were left unanswered. Differences between our assessments were discussed and resolved. The interviews were conducted by IH, using the questionnaire as a framework for explore the reasons for the policies. Copies of interview reports were returned to participants for approval before analysis. The analysis made counts of answers when these were in a simple “yes/no” format. The more detailed answers were transcribed and quotations were selected to show the range of style and content of the policies. After an initial analysis of the key features of the 10 policies, we chose benchmarks of good practice based on what was done by two or more companies in the survey. The analyses were checked by IH and DM-W, and the report was written by all three authors.

Key features in ten policies

All ten participating companies were global businesses, 3 in mining and 7 in oil and gas, and all operated in sub-Saharan African countries that are endemic for falciparum malaria. The survey did not specify the type of malaria, but the references to sub-Saharan Africa and to fatal infections, plus the choices of anti-malarial drugs, indicated that the policies were designed to address the risks from falciparum malaria.

The key features of the policies of the 10 companies are summarised in Table 1. In four of the 10 companies, malaria chemoprophylaxis was mandatory for non-immune employees who are required by their contracts of employment to take their anti-malarial drugs while they are working in malarial-endemic areas. The opposite of a mandatory policy is one that is autonomous, allowing employees to decide whether to take chemoprophylaxis. One company had had a mandatory policy for chemoprophylaxis, but had changed to an autonomous policy following expert advice. Another company with an autonomous policy was considering a mandatory approach.

All companies regarded their policies to prevent malaria in their employees as being rigorously applied. In explaining the reasoning for their policies, the common theme was that malaria is a significant risk to the non-immune employees who had grown up in countries free of malaria, but were now working in malaria-endemic areas. This was reflected in the business cases for the policies, which were expressed in terms of preventing illness and loss of time at work and not in financial costs.

A decision to make chemoprophylaxis mandatory or autonomous appeared to be based on the perceived attitudes of employees within the company. On the one hand was a view that a strict mandatory policy was accepted as part of the essential health and safety culture of the company. On the other hand was a view that enforcement of chemoprophylaxis would make recruitment difficult. There was less difference between the companies on the importance of awareness and education about malaria and several companies had policies that made the pre-travel training and in-country induction mandatory. Usually these mandatory requirements were written into the employees' contracts, but one company was still developing the legal details.

The policies had been in place for 3 to 7 years. When stated, they were reviewed at 1 or 2 yearly intervals, but this was not apparent from the documents supplied to us. Many had dates that were 3 or more years old. Documents that were written earlier were marked as being updated regularly in the first few years and then unchanged. It is possible that the documents had been reviewed and found not to need changing.

All six companies answering the specific questions said that they had participated in industry wide discussions and were cooperating with other bodies, including health officials in the countries where they were operating. Most extended their policies to include the families of employees and at least two had programmes to control malaria in the local communities.

All policies covered the four main aspects of controlling malaria: awareness, mosquito bite prevention, chemoprophylaxis, and diagnosis with treatment. The extent of the coverage varied considerably, with some

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having sophisticated training programmes, and some providing malaria curative kits. One company had a resident expert in vector control at its main site in Africa. As the non-chemoprophylaxis control measures were not the purpose of the study, these differences were not explored. However it is likely that the control measures are related to the type and size of the companies' operations in the areas with endemic malaria.

The companies were asked if their policies applied to people other than those directly employed by the company. Five companies required sub-contractors to have policies that were similar to their own, and to provide the same level of protection. However, it was not clear whether sub-contracted employees were included in the mandatory chemoprophylaxis. In four other companies, the policies were not applied to sub-contractors. Only two policies did not cover the families of employees in any detail. The survey did not explore whether mandatory chemoprophylaxis was applied to family members in any way. In one company with an active in-country education programme, the training sessions were designed to include families.

All companies distinguished between non-immune and semi-immune employees, although the definition of non-immune differed in that some companies included people who had grown up in an endemic area but had been out of the area for 12 months. Five companies said that their policies took account of the length of stay in endemic areas, presumably modifying the checks on compliance and the conduct of annual medical examinations, including tests for toxicity.

Eight companies used their own data on the incidence of malaria amongst their employees to measure the effectiveness of the policies. The methods used included direct questions to employees, urine testing and monitoring the stocks of chemoprophylactic drugs. The estimated levels of compliance ranged from nearly 100% to 50%. The most credible estimate was given by a company that had invested in an in-country educational programme that had lifted compliance from around 50% to 82%. Another interesting estimate was that compliance was 80% in short-term visitors and 50% in non-immune people working long term in endemic areas. It is possible that the figure of nearly 100% compliance is correct in a company with a mandatory policy and urine testing, but this does not accord with the view in other companies that urine testing is unreliable, and cheating will occur. Only two companies used urine testing.

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Table 1. Summary of key aspects of malaria prevention (y = yes, n = no, blank= no information)

Aspects of policy	Company									
	A	B	C	D	E	F	G	H	I	J
Type of Industry?	oil	oil	oil	mine	mine	oil	oil	oil	mine	oil
TYPE OF POLICY										
Mandatory prophylaxis?	y	y	y	n	n	n	n	n	y	n
Policy applied rigorously?	y	y	y	y	y	y	y	y	y	y
Policy explained?	y	y	y	y	y	y				
Policy updated 1-2 yrs?		y	n	y	y	y		y		
Years of policy in place?		9	9	5	3	7	3	5		7
Industry-wide discussion?		y	y	y	y	y				y
Community co-operation?		y	y	y	y	y				y
Covers subcontractors		y	y	y	n	y	y	y		y
Includes families?		y	y	y	?	y	y	y	n	y
DETAILS IN POLICY										
Site specific assessment?	y	y	y	y	y	y			y	y
Bed-nets/screens?	y	y	y	y	y	y	y	y		y
Chemoprophylaxis?	y	y	y	y	y	y	y	y	y	y
Diagnosis of malaria?	y	y	y	y	y	y	y	y		y
Treatment of malaria?	y	y	y	y	y	y	y	y		y
Awareness training?	y	y	y	y	y	y	y	y		y
Training enforced?	n	y	y	n	n	y	y			
Repellents?	y	y	y	y	y	y	y	y		y
Environmental controls?	y	y	y	y	y	y	y	y		y
Sub-contractors?	n	y	y	n	n		y	y	n	y
Local employees?	y	y	y	n	y	y	y		n	y
Families of employees?	y	y	y	y	n	y	y	y	n	y
Adjacent community?	y	y	y	y	y				n	y
Pregnant women?	y	y	y	y	y	y		y	y	y
	A	B	C	D	E	F	G	H	I	J

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Table 1 continued. Summary of key aspects of malaria prevention

Company	A	B	C	D	E	F	G	H	I	J
Type of Industry?	oil	oil	oil	mine	mine	oil	oil	oil	mine	oil
DOES THE CHEMOPROPHYLAXIS POLICY VARY ACCORDING TO										
immune status?	y	y	y	y	y	y	y	y	y	y
length of stay?	y	n	y	n	n		y	y	y	
IS CHEMOPROPHYLAXIS POLICY SUPPORTED BY										
Pre-travel consultation?	y	y	y	y	y	y	y	y		y
Pre-travel education?	y	y	y	y	n	y	y	y		y
In-country induction?	y	y	y	y	y	y	y			y
Employee's contract?	n	y		n	n	y	y	y		
Free supply of drugs?	y	y	y	y	y	y	y	y	y	y
EVIDENCE USED TO DESIGN & APPLY POLICY										
International guidance?	y	y	y	y	y	y	y	y	y	y
Own statistics?	y	y	y	y	n	y	y	y		y
Measured compliance?	y	y	n	y	n	y		y		
Estimated compliance	50 – 80%	100%	95%	50 - 70%		82%				
Urine testing?	n	y	n	n	n	y	n			
Feedback from staff?	y	n	y	y	n	y				
MONITORING OF EMPLOYEES ON LONG-TERM CHEMOPROPHYLAXIS										
Medical examinations?	n	y	n	y	n	y		y	y	
Liver function tests?	n	n	y	n	n			y	y	
Rotation of drugs?	n		n	n	n				n	

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Benchmarks for malaria chemoprophylaxis policies

The responses to the questionnaire, the telephone interviews and the submitted documents gave many examples of how to prevent malaria in people working in areas with endemic malaria. The benchmarks derived from these responses are listed in Table 2 and described in more detail in the following sections.

Type of malaria chemoprophylaxis policy

Whether a company decides to make malaria chemoprophylaxis mandatory or autonomous, the policy should be rigorously applied. All ten companies met this standard. The interviews revealed that the differences between the two types of policy were not very wide. In all companies, the policies included awareness, bite prevention, and early diagnosis as well as chemoprophylaxis. The companies that took a mandatory approach used it to enhance awareness. Only one enforced compliance by drug testing.

The reasons for the policy should be clear, and were apparent in six companies (all the five interviewed and one other). The duty of care to employees was central, but there was also a wider view of extending the benefits of malaria prevention to local communities.

"Initially the policy was intended as a Health and Safety standard. Once we began working in ...., we realised it was an excellent opportunity to control vectors and impact on malaria transmission in a broader sense."

The reasons for an autonomous policy included both difficulties associated with mandatory rules and benefits from letting employees to decide for themselves on chemoprophylaxis.

"People do not like to feel boxed in and controlled by the company, so we decided not to enforce mandatory chemoprophylaxis and urine testing. There would be a significant cost implication in having a disciplinary procedure and doing drug tests".

"We also felt that we wanted to encourage early diagnosis and treatment of malaria, and felt that disciplinary measures for non-compliance with a chemoprophylaxis policy could adversely affect early diagnosis".

Mechanisms to ensure that the policy is up to date

Two companies kept their malaria policies under constant review; four others undertook periodic reviews, three at 1-2 year intervals, and one at 3 yearly intervals. In the four companies for whom this question was not answered, documents appeared to be updated at about 3 yearly intervals. As a standard, we recommend 1-2 year reviews with the dates recorded on all current policy documents.

Table 2. Benchmarks 1. Type and coverage of policies

Feature	Benchmark	Comments
Policy on chemoprophylaxis	Rigorous	Style may vary from directive to educational, but the policy should be strongly applied.
Policy updated 1-2 yrs?	Yes	Updates must be recorded in policy documents
Industry-wide discussion?	Yes	Five out of six valued industry-wide policy discussions
Local Community involvement?	Yes	Partly depends on the duration of the operation at a fixed site.
Wider than employees?	Yes	Should cover families, sub-contractors and, at long-term sites, local communities.
Site-specific assessment?	Yes	Where risks of malaria are high, site-specific assessments should be used.
Bed-nets or screens to all at risk?	Yes	Best practice is to supply bed-nets or screens to semi-immune employees and families
Diagnosis of malaria?	Yes	Supplies of self-testing kits or supporting local labs., depending on the site and operation
Treatment of malaria?	Yes	Supplies of self-treatment kits or supporting local clinics, depending on the site and operation
Awareness training?	Yes	Best examples were worth sharing across the industry
Training enforced?	Yes	Enforced by tests and “no training – no travel”
Insect Repellents?	Yes	Supplies of insect repellent creams and advice
Environmental controls?	Yes	Best practice= scientist on site supervising and monitoring efficacy, but not applicable in all places
Sub-contractors?	Yes	Where appropriate, sub-contractors should have the same level of protection.
Local employees?	Yes	Should consider semi-immune employees, e.g. for bed-nets and diagnosis and treatment
Families of employees?	Yes	Chemoprophylaxis for families of non-immunes; bed-nets for local employees’ families
Adjacent community?	Yes	Extent of malaria control in adjacent area depends on the operation
Pregnant women?	Yes	Policies should refer to risks in pregnancy
Policy sensitive to risk	Yes	The policy should define non-immune and semi-immune, and should take account of the length of stay

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Participation in inter-corporate, industry wide policy setting.

Six companies (all those answering the question) took part in discussions on malaria with other companies. Two companies participated in guidelines developed by the International Council on Mines and Minerals. One referred to the Global Business Coalition on HIV/AIDS, Tuberculosis and Malaria research into business engagement on malaria in Africa. One response described an informal coalition between the medical staff of several companies in the region to share information. One company has shared its malaria prevention programme with more than 20 other organisations within and outside the oil and gas industry. One company expressed mixed views about the value of industry-wide discussions in which it had participated. As we concluded that there was benefit in sharing ideas and materials, we set this participation as a benchmark of good practice.

Inclusion of local communities and the host country in co-operative policies

None of the companies had formally included the local community in their chemoprophylaxis policies, but all five of those interviewed had some form of planned community engagement. Most companies contributed to local health programmes to educate and raise awareness of malaria. Other participation included helping to distribute treated bed nets, training health-care employees, and assistance with supplies and other logistics. One company provided chemoprophylaxis to semi-immune pregnant women in line with the national policy. It also provided laboratory equipment and training to District Health Offices. The responses emphasised the large financial grants by the industries to international malaria campaigns, which often included partnerships with national governments.

"We have had to work hard with the government to bring the level of health care systems and education up to a standard. There was no pharmacy system. The programme was initiated by the company and was one of the areas to which we could lend our supply chain expertise and bring to bear our business management skills to ensure the desired results were achieved".

Other people not directly employed by the company

All the written guidelines in the review could be improved by greater clarity on whether they applied to people who not directly employed by the companies. It is reasonable to require sub-contractors to have similar malaria control policies, but the issue of mandatory or autonomous chemoprophylaxis should be explicit. Chemoprophylaxis should be provided to the non-immune families (if living in or visiting endemic areas) of employees, without a mandatory requirement. Short-term visitors, including those from other companies, should also be covered by the policy.

Chemoprophylaxis in pregnancy

Malaria is more severe in pregnancy than at other times in adult life. Not only are pregnant women more likely to have severe and complicated attacks than other women, but also the foetus may be harmed. This is the reason why national and international policies consider extending chemoprophylaxis to semi-immune pregnant

women. However the choice of prophylactic drugs in pregnancy is not easier, because some have harmful effects on the foetus. Most companies with a policy for prophylaxis in pregnancy recommended proguanil for both non-immunes and semi-immunes, but one suggested that Malarone may be safe in the first trimester. A policy of repatriation for pregnant employees was applicable to non-immune people, but might be impracticable for semi-immunes. In our view, the risks of malaria in pregnancy are such that it must be a specific part of a good policy.

Site specific assessments

Most of the companies operated in more than one country, and all companies used international guidelines from the World Health Organisation (WHO) and the US Centres for Disease Control for their risk assessments at the national level. As stated by several companies, they use more specific site data where the malaria risk is critical, particularly vector control programmes.

Malaria control measures in addition to chemoprophylaxis

Chemoprophylaxis cannot provide certain protection against malaria and should be combined with other measure. All companies, on whom we had information, had policies on nets, repellents, chemoprophylaxis, diagnosis and treatment, and provided awareness and training to employees. They also operated environmental controls. Examples of best practice are illustrated in table 3.

One company also issued self-treatment kits to semi-immune employees when working in very remote locations or when leaving their native country for training, vacation or transfer.

On awareness and training, only one company did not run their own travel clinics but advised non-immune personnel to visit health facilities for advice in their home country prior to travelling to the malarial area. However this company did provide information and its own leaflets.

On-site, all the companies operate a site induction programme which covers the specific site malaria programme and local control methods.

One company developed a two-level malaria training programme in 2003. Level 1 was a mandatory basic awareness package for all employees worldwide and Level 2 was more advanced for employees visiting high risk countries. This training included knowledge of malaria risk, patterns in fatal incidents, prevention measures, diagnosis techniques and treatments. It was reported that 75% of the non-immune company population had received Level 2 training and that an audit indicated a compliance level above 65%.

Some of the training materials (leaflets and videos) were of a high standard, having been professionally designed and produced. Companies seeking to develop their training materials would be helped if the best examples were shared across the industry.

One company logs each employee's training, which includes a questionnaire to test understanding:

"90% of non-immune people come from the US or UK. Everyone is required to report to a medical facility prior to travel for advice and chemoprophylaxis. If people come from other locations, they must report to the on-site clinic on arrival. This is not as airtight as we would like".

The industry standard is that all types of malaria control are used. These control measures should be extended to people beyond the directly employed non-immune expatriate workers. Preventing malaria in the semi-immune local community will reduce the risk of transmission to non-immune employees.

Chemoprophylaxis policy and malaria risk assessment.

Whilst all companies made some adjustments to their policies according to the level of risk from malaria, some were more detailed than others. Chemoprophylaxis is necessary if the employee is non-immune to malaria, and the terms "non-immune" and "semi-immune" are often used in policies. The definition of these terms can be simple, e.g. non-immune means not having resistance to malaria because the person was not born and raised in a malarial area; semi-immune as having a certain level of immunity. However a more detailed definition would be used in best practice.

The most complete definition was:
Non- immune - A person who was not been born and raised in an area with stable malaria transmission, or a person who has been considered semi-immune in the past, but has not been exposed to malaria for a continuous 12-month period (or longer) preceding the current exposure, or if pregnant.

Semi-immune - Semi-immunity is specific to a type of malaria and its transmission intensity, therefore a person should be considered semi-immune if he or she was born and raised (at least to the age of 5 years) in an area with stable malaria transmission of the same type of malaria as found in the malarial area in question, and he or she has resided in a location that has similar intensity of transmission and type of malaria found in the malarial are in question for at least the last 12 months prior to their current exposure.

All the companies agreed that their policies applied for all non-immune people visiting or living in a malarial country, including short term visitors and permanent staff including dependents. The only differences between non-immune and semi-immune employees lay in the provision of regular chemoprophylaxis and the 'stand-by emergency packs' given to non-immunes when they travelled outside the base camps to ensure that they can diagnose and treat malarial symptoms promptly. One company recognised semi-immunes were at risk when travelling away or working remotely and supplied self-treatment kits.

One company with a voluntary approach to malaria chemoprophylaxis stated that it was considering a mandatory policy in the construction phase of new projects until a full malaria management plan had been implemented. This was because of the presence of standing water, the lack of screened accommodation while the site was being built and the time for mosquito breeding to be controlled.

Table 3. Examples of good practice of additional measures

Intervention	Examples of Good Practice
Nets	Employees receive free treated bed-nets which are replaced every 3 years. In one company, employees must stay in houses which are screened and air conditioned. One company distributes nets to every employee working in a high risk zone, whether non-immune or semi-immune, plus two additional nets for family use (6,000 nets in 2007). It is also mandatory for managers to ensure that the nets are installed in houses managed by the company.
Insect Repellent	Repellents are freely available in company areas and insecticides given out to employees routinely by all of the companies surveyed. At least four companies provide repellents in travel kits, which could easily be replaced at the on-site clinic.
Diagnosis	Three companies issued a travel pack with a rapid diagnostic kit for personal use in an emergency to all non-immune employees.
Treatment	One company was working with the national government to improve malaria treatment for the community who live in the area adjacent to the site.
Awareness and Education	Two conducted online training to be completed before arriving in a malaria zone. One provided a pre-departure malaria tutorial, in which employees answered a questionnaire to check their understanding of chemoprophylaxis and bite prevention. These employees were asked to sign to say that they were fully aware of the malaria risk, knew how avoid mosquito bites, and were willing to take chemoprophylaxis.
Environmental Controls	One company applied controls up to 1.5 kms around the work site, protecting houses with screens and eliminating breeding sites. Other measures included indoor residual spraying and air conditioning.
Sub-contractors	One company offers to inspect living conditions of sub-contractors and makes recommendations to improve environmental controls.
Local employees	Malaria education programmes for local employees, with specific guidance for semi-immune people. Free bed nets, access to treatment, spraying, repellents and appropriate clothing.
Family members	Malaria prophylaxis, and training, provided to non-immune family members. Semi-immune family members are provided with bed nets, insecticides and repellents.
Adjacent communities	One company has a specific community malaria programme, which encourages people to seek early diagnosis and treatment for malaria. It provided residual spraying of all housing and current estimate that 60 – 75% of all local houses have been treated.
Pregnant women	The better policies covered pregnancy in non-immune employees and dependents, because of the increased risks and precautions on chemoprophylaxis. One company offered repatriation to non-immune pregnant women in the 2nd trimester. Another gave chemoprophylaxis to semi-immune pregnant women in line with the national policy.

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Methods of supporting the policies on chemoprophylaxis

A company's policy on chemoprophylaxis requires support in various forms: by training, by contractual arrangements, by scientific evidence and by information on how the policy works in practice. Whilst all companies surveyed had policies which were so supported, there were some methods that appeared to work well, and are worthy of attention. Benchmarks for this support are shown in table 4, and examples of good practice are shown in table 5.

As all companies arrange for employees going to malarial endemic countries to have pre-departure consultations with health-care professionals, it is good practice to use these consultations as opportunities for training on malaria prevention. As noted above, the best methods and materials should be shared between companies.

Table 4. Benchmarks 2: Support for the policy

Feature	Benchmark	Comments
SUPPORT FOR POLICY		
Pre-travel consultation?	Yes	An essential element
Pre-travel education?	Yes	Very good leaflets, videos and methods used by some companies are worth sharing with others.
In-country induction?	Yes	Value in looking at methods used in other companies
Employee's contract?	Yes	Formal recording that employee is aware of malaria risks and prevention
Free supply of drugs?	Yes	An essential element
EVIDENCE USED TO DESIGN & APPLY POLICY		
International guidance?	Yes	Refer to WHO and US Centers for Disease Control
Own statistics?	Yes	Minimum = record of incidence in all employees
Measured compliance?	Yes	Minimum = stock control of anti-malarials
Estimated compliance	>80%	Standard based on compliance with other long term drugs, e.g. TB, leprosy and HIV
Urine testing?	No	Lack of evidence on accuracy and effectiveness
Feedback from staff?	Yes	Survey may have under-estimated this obvious source of information on problems and success with chemoprophylaxis
MONITORING OF EMPLOYEES ON LONG-TERM CHEMOPROPHYLAXIS		
Medical examinations?	Yes	Examinations may not yield much, but consultations permit feed-back and renewed advice
Liver function tests?	No	Lack of evidence of effectiveness
Rotation of anti-malaria drugs?	No	Lack of evidence of need or effectiveness

Table 5. Examples of good practice of supporting chemoprophylaxis

Intervention	Examples of Good Practice
Pre-travel education	Three companies used online training materials. Another has information on malaria on its intranet intended for frequent business travellers but available to all. One employer issues a malaria visa after the pre-travel consultation, and non-immunes will not be given a flight ticket without the malaria visa. A survey in one company found that the introduction of the malaria awareness training and treatment kits significantly increased compliance to malaria prophylaxis.
In-country induction	Departmental meetings are used for annual updates on malaria. A malaria consultant for a company talks to the non-immune families on site once a year. A comprehensive 'Arrival and Departure Package Induction and Quiz' gives every newcomer a audiotape message from the manager about malaria while travelling from the airport to the site. The newcomer must attend a malaria induction at which a brochure, chemoprophylaxis, a self-treatment kit, and insect repellents are distributed.
Own statistics	Three companies undertook parasite-sensitivity testing in the local population to detect resistance to anti-malarial drugs. The man-hours lost to malaria were used by two companies to measure the effectiveness of their programmes. Others counted cases of malaria and calculated the incidence in non-immune and semi-immune employees. A company also analysed malaria incidence against the rainfall patterns throughout the year. One company had commissioned malaria research projects, including the value of self-treatment kits. A company monitored malaria in the local community by annual prevalence surveys in primary schools near its site. All children that were found to have malaria were treated. As a result, prevalence rates fell from over 50 % to less than 3%.
Measured compliance	Monitoring that drugs are collected from the pharmacy by employees and their dependants. An on-site clinic tracks the chemoprophylaxis doses dispensed. Non-immune people are interviewed, to ask if they are taking chemoprophylaxis and if not, why not.
Feedback from staff	*"We have feedback and know it is an issue for many people to take chemoprophylaxis – there is much less resistance from business travellers. We are developing a video to address .... reasons for non compliance"*. The company that issues malaria visas said that the results are really positive, and had raised awareness.

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One company tracked both non-immune and semi-immune malaria infection rates at their site from 2006 – 2010. Figures are monthly infection rates and include all (non-immune and semi-immune) employees as well as contractors, including those living outside the control zone (see table on next page).

Table 6: Example of case-monitoring by one company

Year	Monthly infection rates	No. of cases in non-immune employees Jan-Oct
2006	8%	Not known as before programme started
2007	4.2%	25
2008	3.3%	54
2009	1.7%	13
2010	1.6%	27

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The business case for the policies on chemoprophylaxis

None of the companies described a formal business case for their chemoprophylaxis policies. The main argument for the policies rested on the duty of care, to prevent illness and possible death from malaria and to promote productivity. The cost of chemoprophylaxis and other control measures were often spread across departments within the company:

"In endemic countries, it is difficult to cost our policy as malaria management is tied into different budgets. We know that when the Business Traveller programme was standardised, it saved a considerable amount of money. Going from a programme of individual exams to an intranet programme with risk based exams saves approximately US $1 million per year".

" The control programme has an annual budget of US $300 - 400,000 dollars for vector control. However lots of things are not able to be costed, for example re-engineering of dams, and personnel costs are not included".

All companies agreed that the main purpose was to prevent harm and death to employees: "*We do all we can to protect employees from the threat of malaria; chemoprophylaxis is part of this approach".*

Other factors were the risk to corporate reputation, the importance of retaining employees and recruitment of people to work in malarial areas. The companies needed to show they are doing all they can to safeguard their employees' health and wellbeing.

Corporate leadership

In the companies interviewed, the malaria policies benefitted from high level support. This was shown by a broad range of activities to combat malaria in employees, local communities and wider population. Some of the large companies had invested up to US$80 million over 10 years in partnerships to provide bed nets, anti-malarial drugs and treatment programmes. They gave their business expertise to setting goals, measuring results and establishing accountability for efforts aimed at eradicating malaria.

"For us this passes the word down to national employees that our malaria programme is endorsed and supported by our most senior staff".

"There is support at board level. The leadership is excellent, with the corporate Vice-President for Health and Safety being a strong advocate of the malaria programme and actively participates and attends site meetings to highlight malaria as an ongoing concern".

Key factors and challenges in the success of policies

The interviews showed that policies on chemoprophylaxis were not easy to apply:

> *"With a constant stream of people coming and going and large numbers of contractors, giving people enough information and motivating them to take malaria chemoprophylaxis can be problematic".*
>
> *"We prescribe chemoprophylaxis but the evidence is not as robust as it could be. We need to listen to people's ideas, myths and fears. A lack of evidence around prescribing long-term chemoprophylaxis and epidemiology leads to people holding different opinions and views on best the way forward".*
>
> *"We have a goal of zero harm. We are still getting cases of malaria in non-immune employees living in malaria risk regions. We want to eliminate all cases of malaria and believe improved compliance with chemoprophylaxis will help us achieve this".*

Emphasis on personal responsibility for health was viewed as helpful:

> *"As a company, we have really worked on embedding our standards. These were not well disseminated throughout the company in 2000, but the situation has steadily improved. It is understood that it is your responsibility to know about the standards required by the company and your responsibility to follow them".*
> *"We do not underestimate the importance of making people aware of the risks. Creating easy ways for all employees to access advice and chemoprophylaxis is extremely important. We are promoting empowerment. We hope the standard we have set, making managers and individuals more accountable, will change things for the better. As people pro-actively engage with the malaria programme, compliance rates will increase dramatically".*

Thinking laterally can work:

> Malaria discussions held on site once or twice a year were *"A good way to get the information across to non-immune families, especially with regard to advice and latest thinking on chemoprophylaxis. Women are the 'gatekeepers' for the family and ensure compliance. We find it harder to get the message through to single employees".*

A broader view was that chemoprophylaxis is just one part of a wider malaria prevention programme:

> *"We think it wrong to focus solely on chemoprophylaxis rather than all the other additional strands which help reduce the incidence and risk of malaria for our workforce, subcontractors and the wider population in the areas where we work".*

For one company, the altruistic goal of impacting on malaria levels for the greater good of the community was of key importance:

"Improving living standards of the general population in this region through permanent work has reduced poverty and child mortality has dropped as much as 60% since our community programme started. The lives saved in the community far out-weigh any productivity gains or savings made by reducing the numbers malaria cases of non-immunes and associated medical costs".

Clear communication in important:

"One thing we do, we turn the complex epidemiology into easy to understand steps. A = Awareness, B = Bites (personal protection and Vector Controls), C = Chemoprophylaxis, D = Diagnose early'.

Improving compliance remains a challenge:

"Trying to convince people to take their chemoprophylaxis, by giving them the right level of information, is an especially important area with subcontractors".
"Maintaining compliance will always be a challenge. We would like to set up a long term chemoprophylaxis monitoring programme to look at expat attitudes, behaviours, incidence of malaria and side effects".

There was concern that existing chemoprophylactic drugs and insecticides may not work in future:

"There is a need to develop new long-acting chemical agents (as people forget to take their drugs) and to bring down the cost, as well as looking at insecticide resistance for bed nets and vector control programmes".
"The on-going scientific challenge of looking for new products to combat resistance. As a company we will be testing a new family of sprays and impregnated housing cladding and paints".

For some companies, the challenge goes beyond anti-malarial drugs:

"Moving forward, the challenge is to effectively contribute to the anti malarial efforts beyond our business by employing our management know-how and logistical expertise. Companies are individually taking various initiatives but we believe we would achieve more with a collective will and combined effort".

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Conclusions

Mandatory or not?

The initial question on whether a malaria chemoprophylaxis policy should be mandatory or voluntary appeared to divide the companies into two camps, with 4 taking a mandatory approach and 6 favouring autonomy for their employees. Each camp had strong arguments for their policies. The interviews revealed that the differences between the two types of policy were not wide. In all companies, the policies included awareness, bite prevention, and early diagnosis as well as chemoprophylaxis. The companies that took a mandatory approach used it to enhance awareness, and only one described how compliance was enforced by testing.

The statistical evidence in support of the policies was limited and was insufficient to make an assessment if a mandatory approach made a difference. This would have required much more data to take account of the malaria risks in every operating site, and the other factors that prevent malaria. Our impression was that even in the companies with mandatory policies, non-compliance was as high as 30% amongst non-immune employees working long-term in places with endemic malaria.

We advise companies with autonomous policies to take other actions to improve compliance before using a mandatory approach.

Who is covered by the policy?

There was uniformity across the companies in applying chemoprophylaxis to non-immune employees (and their families if resident in the endemic areas). The definitions of who would be counted as non-immune differed, in that some companies included people who had been previously semi-immune. In practice, this difference may be reduced by occupational health departments taking a full travel history as part of the pre-employment health check.

There were bigger differences in the approach taken with semi-immune employees, who might be termed “local staff”. The more comprehensive approach was to include these employees and their families in diagnosis and treatment services, and to extend vector control to the communities near the site. These differences may be related to the scale and duration of the operation at a site, as a minimal approach would be all that was feasible in a short-term exploratory site.

Training

All the companies tried to maximise the opportunities to train employees on malaria and its prevention before they went to an endemic area. This policy is effective for new non-immune employees, and we were impressed by the training materials that we were shown, both leaflets and videos. Some companies formally monitor the up-take of training, which could include existing employees who have periodic medical examinations. The on-

site annual up-dates given in one company to employees and families was another example of a good initiative. There would be value in an industry-wide sharing of good training materials and methods.

Feed back on compliance and long-term chemoprophylaxis

In contrast to the well-organised pre-employment training, we found little evidence of a structured approach to asking employees of their views and experience of chemoprophylaxis, whether mandatory or voluntary. It is very likely that, as said, there are false beliefs and myths about malaria and its prevention amongst the workforce. It is important that those who make policies have a means of testing their plans against the opinions of employees.

We were not surprised to find that few companies screened for the side-effects of long-term prophylaxis, as such screening has not been shown to be effective or necessary with modern drugs.

Is it worth it?

In the competitive world of the extracting industries, we might have found that companies had used a detailed business case based on financial costs for their malaria policies. This was not the case, probably because the basic elements of malaria prevention for non-immune staff are inexpensive compared to the costs of the disease. A good malaria policy is very worthwhile because it meets the ethical standard of minimising the risks of harm to employees and their dependents. It also enhances the reputation and social standing of a company that is exploiting the natural resources of an area. The commitment by senior people in the companies to the global initiatives to control malaria may explain the readiness shown in some of our interviews to extend malaria control to the communities around operating sites. We agree with the ethical reasons for this commitment but do not have enough information to comment on the business case for providing the semi-immune employees and their families with the same level of malaria prevention and treatment as given to the expatriate non-immune employees.

What works and what doesn't?

Unsurprisingly, there were no simple answers to what helped and what hindered the companies' policies as the control of malaria is complex. Leadership from the top and the engagement of the employees were obvious factors for success. Given the technical nature of the industries, there might have been more emphasis on monitoring malaria rates and measuring compliance, which would direct attention to where improvements were most needed. A technical approach was shown by the one company that employed an entomologist to check on the vector controls in and around the operating site. Whilst the education policies and training materials looked good, there is scope for a formal evaluation of what works best. Some companies have assessed their own training as single "before and after" evaluations, but we did not find any continuous quality control or rigorous testing of different methods of education.

The future

Several companies have embraced the concept that effective malaria control requires partnerships, between different companies, and with local communities and their governments. Indeed, this small survey is an example of this willingness and we are grateful for the co-operation given. In our view, improvements in chemoprophylaxis policies are more likely to come from companies working together than from individual efforts. We hope that we have contributed to this goal.

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Rio Tinto sees employees as its most important assets, so promoting and enhancing their health and wellbeing is as vital as protecting their safety. By supporting the Global Business Coalition on HIV/AIDS, Tuberculosis and Malaria benchmarking project for Malaria Prophylaxis in the Mining and Oil Industries is one way Rio Tinto can help build knowledge to improve the health and wellbeing of its people working in environments where malaria is present.

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