Simandou Project
RAILWAY DEVELOPMENT
Rio Tinto Iron Ore
Simfer SA
Republic of Guinea
December 2011

Health impact assessment
SCOPING STUDY

SHAPE
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“STRATEGIC HEALTH ANALYSIS PLANNING AND EXECUTION”

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Executive Summary

Introduction
Rio Tinto Iron Ore Atlantic Ltd (Rio Tinto) through their local entity in Guinea, Simfer S.A. is in the process of conducting feasibility studies to develop the world class Simandou Iron Ore Project in the Republic of Guinea. The mining area is located in the Guinée Forestière and Haute Guinée regions of Guinea some 700 km to the east of the capital, Conakry. As part of the Project, Rio Tinto is planning a new railway development project (Project) linking the mine at Simandou with the proposed deep-water port facility on the Guinean coast in western Guinea at Ile Kaback\(^1\). The railway is required in order to transport the iron ore from the mine area to the port for export to demand centres.

As part of the feasibility studies and the social and environmental impact assessment (SEIS) there is a need to assess any health impacts that the Project may have on the community. In assessing any project health impact there is also a requirement to understand and assess the existing health needs of the community. These health assessments may then be used to develop a community health management plan (CHMP) that is based on evidence and stakeholder input and is prioritised based on impacts and needs. This will need to include mitigation and management of health impacts but also opportunities for social investment programmes related to community health. Monitoring and evaluation is a key component and adequate baseline data will need to be available in a format that allows for simple and reproducible monitoring of impacts and interventions related to the Project.

In 2009, a health impact assessment (HIA) scoping study was initiated in the mining area which led to a baseline health survey (BHS) that was conducted in May 2010 in the communities surrounding the proposed mine. In addition a HIA scoping study (November 2010) and BHS (October 2011) were conducted in the area surrounding the proposed Port component of the Project development in Forécariah prefecture. The current HIA scoping study has a focus on the railway development Project linking the mine component with the proposed deep-water port facility.

HIA Methodology

\(^1\) The names of some of the villages mentioned in this report may differ from the official name list established by the project.
HIA seeks to identify and assess the lasting or significant changes of different actions on the health status of a defined population. The objective of a HIA is to deliver evidence-based recommendations to maximize potential positive health benefits and prevent or mitigate any detrimental health impacts that a project may have on the potentially affected communities.

The methodology of the present HIA is based on the Good Practice Note (GPN) for Health Impact Assessments as supported by the International Finance Corporation (IFC). This methodology was chosen as best practice because it supports the Performance Standards on which the project development will be evaluated: Performance Standard 4, which deals specifically with Community Health, Safety and Security. The GPN has been developed to provide guidance on community health for this Standard.

There are no specific legal requirements in the Republic of Guinea that require an HIA; however HIA is regarded as international best practice and recommended by the IFC, which is a partner in the Simandou Project, holding a share of 5% and thus the Project is being developed according to the IFC social and environmental sustainability performance standards as Good International Industry Practice (GIIP). Furthermore, Rio Tinto has a group community relations standard that serves as a framework for each operation to develop its own community relations policy. Additionally, the company has published a statement of business practice entitled: “The Way We Work”, with the stated goal that any community or society affected by Rio Tinto operations will be better off as a result of the presence of the company.

The intention of a HIA is to obtain information on the baseline health status of the communities (where possible) and also to understand and prioritise future project health impacts. Importunately, HIA needs to be a participative process and inputs of various stakeholders are sought throughout. The ultimate deliverable of a HIA is an evidence-based CHMP, which is prioritised according to impacts and needs and has clear indicators to monitor and evaluate project impacts and programmes. A CHMP also facilitates the development of social development programmes linked to health. HIA is essentially an

IFC Performance Standard 4 “Community Health, Safety and Security”
“The client will evaluate the risks and impacts to the health and safety of the affected community during the design, construction, operation, and decommissioning of the project and will establish preventive measures to address them in a manner commensurate with the identified risks and impacts. These measures will favour the prevention or avoidance of risks and impacts over minimization and reduction.”
iterative process with all available additional information being considered to add support to the assessment and recommendations.

**HIA Scoping Study Activities**

The scoping study sought to understand the existing health needs and potential future health impacts of the proposed Project with the following objectives:

- to describe the state of health in project affected communities at present based on (i) the review of existing project documents and health statistics; (ii) stakeholder input, including the consultation of potentially affected communities (PACs); and (iii) direct observations at project, community and health system level. This will allow an understanding of existing health priorities, vulnerabilities and needs;
- to describe high level potential future project-related impacts that the Project may impose on the community and what evidence base there is to inform and monitor these issues. This will be a preliminary description of potential impacts and does not include a detailed impact assessment or modelling of potential impacts (this will be completed under a separate cover);
- to define what additional baseline data may potentially be required to inform a robust baseline and define avoidance/mitigation measures as well as key monitoring parameters; and
- to develop preliminary recommendations for mitigation/management of the identified impacts and define actions to address these in more detail. As this is a scoping phase these will be limited and at a high level with the impact assessment process describing the rationale behind the potential impact and recommended management measures.

The scoping study entailed the collection of data from a variety of sources including:

- **Desktop data:** This included a literature review of health related data in the public domain as well as a review of existing Project documentation and related secondary data. The literature review was completed prior to the field work so that data gaps could be identified and questioning routes for key informant interviews (KII) and focus group discussions (FGDs) prepared. Priority was given to the topics that contribute the most towards the burden of disease in the prefectures affected by the railway development.

- **Health system data:** In total the rail component of the Project will cross 11 prefectures and it was important to obtain morbidity statistics from these areas to assist in describing
a robust baseline. Data was obtained from the health management information system database at the National Health Information Service (‘Service National d’Information Sanitaire’ (SNIS)) at the level of the Ministry of Health and Public Hygiene (MHPH) in Conakry. This comprised monthly case reports by prefecture for the year 2009 (as the latest available data), which provides the best current overview of the most common disease patterns in the Project study area.

- **Field work:** The field work took place from the 8th to the 16th of November 2011.

During restitution meetings as part of the mine HIA the national and regional health authorities were informed about the planned railway HIA scoping study. This was considered the initiation of stakeholder engagement for this element of the Project and future meetings with the MHPH will be related to feedback and on the HIA process.

Selected KII were conducted with prefectural health authorities and health personnel at health post and health centres along the proposed railway corridor. Key informants were interviewed using a semi-structured questionnaire in order to understand what the level and quality of available health services, applied diagnostics, quality of reported data, existing health challenges in the local communities, existing collaborations for community health and potential health impacts of the planned Project.

FGDs were held with women in communities living in proximity of the planned Project. Women were selected as they are the gatekeepers of community health and provide a reliable source of health information and challenges. These FGDs were performed using a semi-structured tool that introduced a topic and promoted open dialogue.

Based on this information and taking into account the proposed Project activities and development requirements a gap analysis of the available data was undertaken to establish if there was adequate evidence available to assess health impacts with the required confidence. In addition to these, considerations of potential Project related impacts and opportunities were evaluated.
Key Findings and Recommendations

Table 1 lists the most important findings of the HIA scoping study and lists specific recommendations to support the HIA process as well as initial management/mitigation measures. Based on the IFC methodology, these are presented in the environmental health area (EHA) framework. These key findings and recommendations will form the basis for updating the HIA as the assessment process evolves. It is noted that some of the recommendations listed below will be discussed in detail in the HIA process.

Of note, the suggested recommendations do not apply to all the PACs as anticipated health impacts may differ based on the sensitivity of the receptor and Project activities. These are defined in section 5. The data gap analysis revealed opportunities for proposed baseline data collection and it is anticipated that these efforts will have a focus on the communities where the logistic supply camps (LSC) and temporary working camps (TWC) will be located. This is outlined in detail in section 7 and 8.
Table 1: Summary of key findings, major risk factors and recommendations

<table>
<thead>
<tr>
<th>Key findings</th>
<th>Risk factors</th>
<th>Recommendations</th>
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<tbody>
<tr>
<td><strong>EHA 1 – Communicable diseases linked to housing</strong></td>
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<tr>
<td>In 2010, acute respiratory infections (ARIs) were the second leading cause of</td>
<td>Traditional housing, poverty and poor nutrition play a role in community</td>
<td>Support knowledge, attitude and practices (KAP) surveys on TB awareness and</td>
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<tr>
<td>morbidity in the prefectures along the rail corridor with 19.74% of total</td>
<td>susceptibility to diseases such as ARIs, TB, measles and meningitis. The</td>
<td>health seeking behaviour.</td>
</tr>
<tr>
<td>consultations at local health facilities.</td>
<td>Project is likely to trigger in-migration, particularly where the LSC and TWC</td>
<td>Health service planning and strengthening to ensure adequate health service</td>
</tr>
<tr>
<td>According to the World Health Organization (WHO), Tuberculosis (TB) is a</td>
<td>will be established. Thus, the risk of overcrowding and housing inflation</td>
<td>capacity for TB diagnosis and management, as well as meningitis diagnosis, in</td>
</tr>
<tr>
<td>serious epidemic in Guinea with an estimated 525 cases per 100,000 population.</td>
<td>exists, which increases the risk of transmission of communicable diseases.</td>
<td>the Project region. The government must be a partner in any initiatives.</td>
</tr>
<tr>
<td>In project affected prefectures TB case detection is a major challenge and</td>
<td>A considerable number of villages will be affected by the Project and related</td>
<td>Establish influx-management plans and partnerships with the local authorities as</td>
</tr>
<tr>
<td>the disease is thus under-reported. It is estimated that 3% of children under</td>
<td>traffic, and thus exposure to dust pollution will increase. This has the</td>
<td>part of the social management plans.</td>
</tr>
<tr>
<td>5 years died from measles in Guinea in 2008. Although no accurate estimate of</td>
<td>potential to negatively impact acute and chronic respiratory tract diseases.</td>
<td></td>
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<tr>
<td>meningitis incidence is available, it is a health concern in the relevant</td>
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<td>prefectures, particularly in children.</td>
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<tr>
<td><strong>EHA 2 – Vector-related diseases</strong></td>
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</tr>
<tr>
<td>A third of consultations at the health facilities in affected communities are</td>
<td>The Project may influence malaria through changes to the environment and</td>
<td>Collect baseline data to establish the malaria prevalence and determine the</td>
</tr>
<tr>
<td>due to malaria and it is thus the most important endemic disease. However,</td>
<td>demographics in the area linked to influx. Moreover, malaria will play a</td>
<td>level of KAP related to malaria.</td>
</tr>
<tr>
<td>rural health facilities generally lack accurate diagnostic equipment for the</td>
<td>significant role in workforce health and related absenteeism.</td>
<td>Improve malaria diagnostics at the local health facilities, which will not only</td>
</tr>
<tr>
<td>disease and thus no precise estimate of the actual malaria burden is available.</td>
<td>Appropriate malaria diagnostics are only available in health centres and</td>
<td>serve as a community intervention but allows also to obtain accurate</td>
</tr>
<tr>
<td>The BHS in the mining and port development area found malaria prevalence in</td>
<td>hospitals and thus case reports provided by health facilities are not</td>
<td>longitudinal data on malaria incidence. Establish partnerships with the local</td>
</tr>
<tr>
<td>children aged 6-59 months at 65.9% and 32.7%, respectively.</td>
<td>accurate.</td>
<td>health authorities for the strengthening of malaria control efforts.</td>
</tr>
<tr>
<td>Yellow fever is the only arboviral disease that was reported for the</td>
<td>The port site at Ile Kaback poses a risk to potentially increasing the risk</td>
<td>Health system strengthening (HSS) to improve the ability of health service</td>
</tr>
<tr>
<td>affected prefectures. There is, however, a potential that dengue fever may</td>
<td>of dengue transmission as the port is likely to receive ships from global</td>
<td>staff to recognise, diagnose, report and manage suspected arboviral diseases</td>
</tr>
<tr>
<td>occur sporadically or be introduced especially with the increasing trends in</td>
<td>destinations such as Asia and South America, where the incidence of dengue</td>
<td>(specifically dengue). Develop outbreak response plans in partnership with the</td>
</tr>
<tr>
<td>West Africa. The weak health system adds to the potential for a delayed</td>
<td>fever is high. The rail component thus may have a role to play with the</td>
<td>local health authorities.</td>
</tr>
<tr>
<td>recognition of any outbreaks.</td>
<td>transport of adult mosquitoes or eggs along the route.</td>
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</table>
### Key findings

#### EHA 3 – Soil-, water- and waste-related diseases

**Diarrhoeal diseases** are one of the major causes for consultations at the health facilities along the rail corridor. Macro-parasitic diseases, such as soil-transmitted helminthiases, were reported as the third leading cause of morbidity in the 11 prefectures affected by the Project. However, due to poor diagnostic capacities, particularly at the rural health facilities, no reliable information could be obtained on the presence and frequency of helminth infections in the communities.

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Recommendations</th>
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</thead>
<tbody>
<tr>
<td>In most rural communities along the rail corridor sanitation services and access to safe drinking water are limited. This poses a considerable risk factor for the transmission of helminthiases and other diseases linked to poor health education, personal hygiene and sanitation practices. There is a risk of polluting the water bodies crossing the railway, especially during the construction phase. Furthermore, the fragile drinking water situation and limited sanitation may be influenced through changes to the environment and demographics related to influx, particularly where the LSC and TWP will be located.</td>
<td>Collect baseline data on water and sanitation practices, including structural indicators at household level and assess the quality of available drinking water sources and discharge from water treatment plants with regards to microbiological contamination. Improve access to safe drinking water in rural communities, particularly where the rail development may negatively impact on drinking water quality (e.g. pollute surface water). Support community health education programmes related to personal hygiene and sanitation.</td>
</tr>
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</table>

#### EHA 4 – Sexually transmitted infections, including HIV/AIDS

**STIs** are the fourth leading cause for consultations at the health facilities along the rail corridor. The last estimate of HIV/AIDS prevalence in the regions affected by the Project dates back to 2005: N’Zérékoré 1.7%; Kankan 1.2%; Faranah 1.6%; Mamou 0.7%; and Kindia 0.9% (Conakry 2.1%). Consistent knowledge and prevention activities for the transmission of STIs/HIV are very limited. Levels of stigma related to HIV positive people are high. Polygamy is common.

<table>
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<tr>
<th>Risk factors</th>
<th>Recommendations</th>
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<tbody>
<tr>
<td>The Project has potential to further raise the risk of HIV/AIDS and STI transmission in the local population, particularly where the LSC and TWC will be located. The linear aspect of the Project will also increase access to communities who may have low HIV prevalence rates and limited knowledge or empowerment for effective prevention. This will extend into operations. Sexual networking and migration have been well described in development projects, as shown by the example of the CBG project in Maritime Guinea (see section 6.4.4.1). Poverty and lack of education and opportunity make the community vulnerable to the effects of high risk sexual practices. Women are a vulnerable group and lack of opportunity and limited negotiating power will also play a role in high risk sexual practices. Weak institutional capacities in terms of HIV diagnosis and prevention.</td>
<td>Develop a HIV/AIDS strategy at workplace and community level, considering different elements of an integrated programme. These should consider education and prevention as well as care and treatment, covering both workplace and community aspects. Establish partnerships with national and regional partners to expand HIV activities to the broader community, including strengthening of health service capacity for HIV testing and management. Consider assessing HIV/AIDS prevalence and KAP related to the transmission of HIV/AIDS and STIs in communities and high-risk groups in any baseline health data collection.</td>
</tr>
</tbody>
</table>
### Key findings

#### EHA 5 – Food- and nutrition-related issues

Only a few cases of malnutrition in children under the age of five years were reported for the affected prefectures for 2009. However, the number of malnourished children is likely to be greatly underestimated as generally no nutritional programmes are in place and thus children are not routinely weighed and measured at health facilities. The surveillance is also generally focussed at acute malnutrition linked to food security rather than growth monitoring.

The BHS in the mining and port development area found 76.4% and 88.6% of children aged 6-59 months to be anaemic (i.e. haemoglobin of <11g/dl), respectively.

The poor socio-economic status of many families living in the wider project area is clearly a significant risk factor for malnutrition.

Malnutrition and anaemia levels are likely to improve with economic upliftment in areas where the Project will create income.

Access to land and loss of traditional practices may play a short and long term role in food availability in communities affected by the Project.

Food inflation will also need to be considered, itself consequent upon in-migration and changes to supply and demand.

### Risk factors

The BHS in the mining and port development area found 76.4% and 88.6% of children aged 6-59 months to be anaemic (i.e. haemoglobin of <11g/dl), respectively.

#### Recommendations

- Perform baseline nutritional and anaemia studies in the project region.
- Equip local health facilities with height and weight scales and provide training for the implementation of a basic nutritional programme, which targets children under the age of five years. This will not only serve as a community intervention per se but will support accurate longitudinal data surveillance on the nutritional status of children.
- Develop social management plans in terms of food inflation and access to land.

### EHA 6 – Non-communicable diseases

According to WHO estimates, it is estimated that NCDs account for 32% of all deaths in Guinea, with cardiovascular diseases (CVD), cancers, respiratory diseases and diabetes as the major contributors.

The BHS that were carried out in the mining (2010) and port area (2011) found a hypertension prevalence (blood pressure >140 mm Hg) of 25.6% and 17.7%, respectively.

Non-communicable diseases are not well known or recognised in the community.

With improved economic status and organised settlement a degree of urbanism may result with associated changes in lifestyles and related diseases such as obesity, diabetes, hypertension and dental caries.

The health care facilities do not have a focus on the management of these diseases, nor do they have the diagnostic capabilities to appropriately recognise and manage the conditions.

### Risk factors

Non-communicable diseases are not well known or recognised in the community.

With improved economic status and organised settlement a degree of urbanism may result with associated changes in lifestyles and related diseases such as obesity, diabetes, hypertension and dental caries.

#### Recommendations

- Support KAP surveys on determinants that are related to non-communicable diseases.
- Consider health system strengthening to support improvement of local diagnostics for non-communicable diseases.
- Implement wellness programmes in the workforce, with the aim that these are extended to the family unit.

### EHA 7 – Accidents and injuries

With 3.13% of the total morbidity in 2009, trauma related injuries and accidents ranked as the seventh most important cause for morbidity in the statistics of the 11 affected prefectures.

Due to the very limited traffic load in some rural communities in the rail corridor, work related accidents were reported to be by far more important than traffic accidents.

During the development phase of the Project, communities along the rail corridor will be exposed to increased road traffic loads, followed by rail traffic in the operation phase. Both have the potential to cause traffic accidents.

Improved incomes in the area of LSC and TWC, as well as potential in-migration, will also lead to increased traffic loads. Thus, there will be an

#### Recommendations

- Develop community security and safety management plans for the Project.
- Develop and implement a traffic and vehicle movement management plan.
- Request for separate reporting of traffic related accidents at the local health facilities.
- Develop and implement a traffic and vehicle
<table>
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<tr>
<th>Key findings</th>
<th>Risk factors</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>increased risk for RTA in affected communities. The local health services have limited capacity to respond to and manage traffic accidents and cases of polytrauma/multiple casualties.</td>
<td>movement management plan. Conduct information and education campaigns on road and rail safety. Support the emergency management capacities and skills of the local health care providers.</td>
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**EHA 8 – Veterinary medicine and zoonotic issues**

No cases of zoonotic diseases, which are caused by infectious agents that can be transmitted between animals and humans, were reported for prefectures affected by the Project in 2009.

- The clearing of forest and bush land in the frame of the project development has the potential to change the pattern, and lead to an increase in the number of endemic rodents. Consequently, there is a theoretical risk for Lassa Fever transmission along the rail corridor.

- Consider conducting a rodent survey in order to determine whether the reservoir host, a rodent of the *Mastomys* species complex, is present in the rural communities along the rail corridor. This may be relevant along selected communities near the TWP and LSC.

**EHA 9 – Exposure to potentially hazardous materials, noise and malodours**

The potential exposure to changes in water, air and soil quality as well as impacts from noise and vibration all have the potential to impact the local communities.

- Communities residing along the rail corridor live in close contact to their environment and are thus vulnerable to any changes in water and air quality, as well as to noise pollution.

- The Project has the potential to create significant environmental health concerns if such areas are not well managed. Concerns relate mainly to noise, water and air quality, but also to visual impacts.

- At present there is limited capacity at the local authorities to effectively monitor environmental health determinants linked to development projects of this nature.

- Integration of the results of specialist studies into the health impact assessment with a focus on associated health risks.

- Establish surveillance of health outcomes that may be linked to environmental health risks through routine health facility statistics.

- Develop and implement an environmental monitoring programme that applies WHO thresholds and IFC standards.

**EHA 10 – Social determinants of health**

Many social determinants of health (SDoH) are not well understood in the communities affected by the Project as limited baseline data on health seeking behaviour, health inequalities, health education, gender based domestic violence (GBDV), mental health and health related lifestyles were available at the time of the present study.

- In view of the magnitude of the Project, various social-determinants will be impacted by the development. Thus, it will be essential to describe and understand the baseline situation, particularly in the areas where the LSC and TWC will be located.

- Gender rights and provision of basic services to the general population in Guinea is limited.

- Programmes and interventions should support vulnerable groups as required, both in terms of impact mitigation and community development. Vulnerable groups should be consulted in stakeholder forums.
### Key findings

<table>
<thead>
<tr>
<th>EHA 11 – Cultural health practices</th>
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</table>
| The role of traditional healers seems to vary within the communities residing along the rail corridor.  
Traditional medicine plays an important role in health seeking behaviour and in spirituality/belief structures in affected communities. | Potential project induced in-migration may lead to an increase in services provided by the informal medicine sector due to an increased demand and lack of ability of the formal health sector to meet the demands through the size of staff complement and services offered. | Health systems strengthening. |

### EHA 12 – Health systems issues

| Quality and capacity of health care services | The capacity and quality of health care services is limited in the rail corridor. At prefectural and sub-prefectural level, the required health care services as per the Guinean health standards is adequate but the facilities are poorly staffed and equipped, and can often not deliver an adequate level of care to the local communities.  
In rural communities, local transport and referral to the larger health facilities is a serious challenge, especially in an emergency. Transportation is very limited and as it takes a long time it may not be the immediate priority of the family and can delay care. The ability to afford transport is also a major determinant. | The Project has the potential to increase the burden on the already limited health care infrastructure, particularly where LCS and TWC will be established. Lack of consultation and planning may mean that the future needs may outstrip already limited services.  
There is a real opportunity to raise the standards of health care along the rail corridor through simple and relatively inexpensive interventions including improved diagnostics, improved emergency care, support with logistics and equipment. | Establish a baseline profile of the capacity and quality of services provided at the health facilities in proximity to the rail corridor.  
Perform baseline studies on accessibility, acceptability and affordability of maternal and child health services.  
Regularly consult the DPS of the 11 prefectures affected by the Project as key partners in health service planning. This should include health service planning so that health services can manage any influx into affected areas.  
Establish partnerships with regional and local NGOs for supporting community health in affected populations. |
| Health information systems | The routine health information system is functioning in the affected prefectures but does have significant gaps in diagnosis (e.g. no RDTs at rural health posts). | Recognition, recording and reporting of certain diseases is limited. Most health information that originates from the health centres in the Project area will need to be interpreted with these limitations in mind. | Improve and support health information management systems to generate longitudinal data sources and thus support the monitoring of management/mitigation plans. This should include capacity building efforts for correct diagnoses and reporting. |
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**Acronyms**

ACT  Artemisinin-based Combination Therapy  
AFRO  WHO African Region  
AGEAD  Association Guinéenne d'Education et d'Aide aux Diabétiques  
AIDS  Acquired Immune Deficiency Syndrome  
ANC  Antenatal Care  
ARI  Acute Respiratory Infection  
ART  Anti Retroviral Therapy  
BCG  Bacillus Calmette-Guérin Vaccine  
BHS  Baseline Health Survey  
BU  Buruli Ulcer  
CHMP  Community Health Management Plan  
CBG  Compagnie des Bauxites de Guinée  
CEDAW  Convention on the Elimination of all forms of Discrimination Against Women  
CHIS  Community Health Information System  
COPD  Chronic Obstructive Pulmonary Disease  
CSI  Corporate Social Investment  
CSW  Commercial Sex Workers  
CVD  Cardiovascular Diseases  
DALY  Disability Adjusted Life Years  
DPS  Direction Préfectorale de la Santé  
DPT  Diphtheria, Pertussis, Tetanus Vaccine  
EHA  Environmental Health Area  
EIA  Environmental Impact Assessment  
ENENSE  Enquête Nationale sur l'Etat Nutritionnel et Survie de l'Enfant 2007/08  
SEIS  Social and Environmental Impact Study  
FAO  Food and Agriculture Organization  
FGD  Focus Group Discussion  
FGM  Female Genital Mutilation  
FP  Family Planning  
GBDV  Gender Based Domestic Violence  
GDHS  Guinea Demographic and Health Survey 2005  
GDP  Gross Domestic Product  
GIIP  Good International Industry Practice  
GPN  Good Practice Note  
HAT  Human African Trypanosomiasis  
HBV  Hepatitis B Virus  
HDI  Human Development Index  
HepB3  Hepatitis B vaccine  
HIA  Health Impact Assessment  
Hib  Haemophilus Influenzae Type b  
HIV  Human Immunodeficiency Virus  
HKI  Helen Keller International  
HMP  Health Monitoring Plan
HRA  Health Risk Assessment
HSS  Health Systems Strengthening
HT   Hypertension
ICMM International Council of Mining and Metals
IFC  International Finance Corporation
IPIECA International Petroleum Industry Environmental Conservation Association
ITN  Insecticide-Treated Net
KAP  Knowledge, Attitude and Practices
KPI  Key Performance Indicator
KII  Key Informant Interview
LF   Lymphatic Filariasis
LSC  Logistical Supply Centres
LTO  Leprosy, TB and Onchocerciasis Programme
LV   Lassa Virus
MDG  Millennium Development Goal
MHPH Ministry of Health and Public Hygiene
MMR  Maternal Mortality Rate
MOU  Memorandum of Understanding
NCD  Non-Communicable Disease
NGO  Non-Governmental organization
PAC  Potentially Affected Community
PLWHA People Living with HIV/AIDS
PNLS Programme National de Lutte Contre le Sida
PS   Performance Standard
PSI  Population Services International
RDT  Rapid Diagnostic Tests
RHIS Routine Health Information System
RTA  Road Traffic Accidents
SDoH Social Determinants of Health
SIA  Social Impact Assessment
SNIS Service National d'Information Sanitaire
STH  Soil-Transmitted Helminthiasis
STI  Sexually Transmitted Infection
TB   Tuberculosis
TD   Truck Drivers
TM   Traditional Medicine
ToR  Terms of Reference
TWC  Temporary Work Camp
UNGASS United Nations General Assembly Special Session
UNICEF United Nations Children's Fund
USAID United States Agency for International Development
VCT  Voluntary Counselling and Testing
WHO  World Health Organization
YLL  Years of Life Lost
1 Project Description

The railway will link the proposed mine in the east of the Republic of Guinea to the port at Kaback Island, approximately 70km south of the capital Conakry. The railway will comprise a heavy haul rail system, with an approximate length of 670km. The Project passes through a variety of landscapes and land uses along its route. Figure 1 shows the route of the rail corridor, linking the mine concession area with the port location [1].

For the current feasibility studies the railway development was divided into 9 separate sections, which cover 9 distinct geographical regions of the corridor. Starting at the mine location in the east of the country and moving west towards the port on the west coast, these are:

- the mine region in and around the Simandou mountain range, which comprises the Beyla section;
- the eastern plateau region which covers most of eastern Guinea and comprises the Kérouané, Kankan, Kouroussa, Faranah and Dabola sections;
- the mountainous region of Mamou which comprises the Mamou section;
- the coastal region which covers western region of Guinea between Mamou mountains and the coast and comprises the Kindia section; and
- the port section which comprises the coastal section of Forécariah.

There are a number of important settlements along the railway route as well as numerous small villages and hamlets. Beyla, a town of approximately 25,017 people, is located at about
20km from the start of the railway to the south east of the mine. Kérouané (population 35,738) is located in close proximity to the railway to the northwest of the mine. The largest city in the eastern plateau section between the mine and the mountainous region of Mamou is Faranah which has a population of 87,083 and is located just to the north of the railway corridor. The Mamou section of the railway is named after the town of Mamou (population 76,269). The coastal plain is the most heavily populated area of Guinea and there are numerous settlements along the Kindia and Forécariah sections of the railway which are located in this area. The largest city/town in close proximity to the railway corridor is Forécariah, approximately 5km south of the rail corridor in the Forécariah Port section of the railway, with a population in the region of 21,710. The city of Kindia is Guinea's third largest with a population of 181,126 and is located approximately 50km to the north of the rail alignment. Located approximately 70km to the north of the proposed rail stockyard is the capital of Guinea, Conakry. The city is the political, administrative and economic capital of the country and with a population of over 1.9 million people is by far the largest [2].

In order to facilitate construction of the railway and ancillary structures a number of quarries and boreholes will be needed. A total of 15 temporary work camps (TWC) will be established from which construction workers will be housed and operations based on the 13 different work fronts. In addition, there will be an estimated 5 Logistical Supply Centres (LSC) to facilitate logistics and supply of the work camps. There will be an additional undetermined number of temporary camps as construction progresses along the rail alignment. Key pieces of infrastructure associated with the rail component include [2]:

- track and sleepers;
- tunnels;
- road, river and other bridges;
- maintenance facilities at port;
- ore dumper;
- passing loops;
- crew home station;
- staging facilities for track maintenance;
- radio masts for communications; and
- signalling equipment.

To ensure that environmental and social constraints were included in the design process, desired minimum offset (buffer) requirements (“avoidance criteria”) were used in engineering the rail alignment as outlined in
Table 2.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Minimum Offset (Buffer) in meters</th>
<th>Community</th>
<th>Protected environmental features</th>
<th>Cultural heritage sites</th>
<th>Agricultural land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainline track and passing sidings</td>
<td>1000m, 500m, 100m, 50m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment maintenance facility, material storage depot, freight load/unload, and train stabling</td>
<td>1800m, 500m, 100m, 50m</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
2 Legal Requirement

2.1 Country

The Code for the Protection and Development of the Environment, under Ordinances 045/PRG/87 and 022/PRG/89 (Environmental Code), sets out the fundamental legal principles to be complied with to ensure the protection of environmental resources and the human environment. Article 82 of Title V of the Environmental Code imposes an obligation on developers of projects which are likely to have a significant impact on the environment, to conduct an Environmental Impact Study and submit this to the Minister for the Environment prior to the commencement of a project, allowing evaluation of the direct and indirect impacts of the Project on the ecological equilibrium of the environment of Guinea, the quality of life of the people and the protection of the environment. However, there were no specific references found that legally require the assessment of community health or use of health impact assessment as a specific requirement to mining project developments in the Republic of Guinea. The inference to quality of life and human well-being within communities will however substantially be addressed by the CHIA.

Additional legislation pertaining to the Social and Environmental Impact Study (SEIS) is described in the relevant sections of that report and includes sections that reference the TWP and LSC that will be established to support the mine, port and rail components of the Project. These references are of relevance as they have specific overlap into the HIA.

The Guinean labour laws and mining codes will need to be assessed during the on-going HIA process and development of a community health management plan (CHMP). The requirement to support health care provision to the workforce as well as dependents of the workforce will be important to consider as both these groups needs to be considered as potentially affected populations. This is important in terms of equality and disparities between those who have a family member who is employed and those who are not.

In addition, the health and safety regulations will need to be evaluated specifically related to the workplace health and safety mitigation measures. However, the evaluation of health and safety regulations will be limited to their influence on community health within this HIA. Occupational health and safety is addressed under a separate heading and is specifically out of the scope of the HIA. However, as actions that occur within the workforce have the potential to influence community health these need to be considered [3].
2.2 Rio Tinto Management Standards

Rio Tinto has a Group Community Relations Standard that serves as a framework for each operation to develop its own community relations policy. The Simandou Project has used this framework to develop its own community relations strategy and plans [4].

The Community Relations Standard addresses the need to support health initiatives in communities through assistance programmes. It does not specifically describe the methods or tools to assess these needs. It does describe the need to undertake specific baseline assessments so that significant changes can be assessed.

In addition to the communities standard Rio Tinto has published a Rio Tinto Statement of Business Practice; “The Way We Work”. The stated goal is that any community or society in which Rio Tinto operates should be better off for the presence of the company [5]. Occupational Health requirements are detailed in the Rio Tinto Group Health Standards; however, as occupational health is specifically out of scope of this HIA, they are not applicable to this assessment.

The International Finance Corporation (IFC) is a partner in the Simandou Project with a 5% share. Thus the Project is being developed according to the IFC Social and Environmental Sustainability Performance Standards as Good International Industry Practice (GIIP). The IFC has recently developed a good practice note on health impact assessment that supports performance standard 4: Community health, safety and security.

2.3 International Management Standards

There are a number of international guidelines or best practice guidelines that refer to community health related to the development of projects.

The IFC is a partner in the Simandou Project, with a 5% share. Rio Tinto thus applies the IFC Social and Environmental Sustainability Performance Standards (PS) and World Bank guidelines to the Project to support its partner compliance and to follow GIIP. The IFC has recently developed a good practice note on health impact assessment that supports Performance Standard 4 which addresses community health, safety and security [6]. These performance standards have recently been updated and the latest versions were approved by the IFC Sustainability Framework Board of Directors in May 2011. These standards become effective in January 2012 and PS4 will be followed for the purposes of the Project.
PS 4 requires the client to evaluate the risks and impacts to the health and safety of the affected community during the design, construction, operation and decommissioning of the Project and establish preventive measures to address them in a manner commensurate with the identified risks and impacts. It recognises the public authorities’ role in promoting health and safety of the public but addresses the client’s responsibility to avoid or minimise the risks and impacts on community health that may arise from project-related activities. A specific element focuses on vulnerable groups and post conflict areas.

Other PSs such as PS1 (Assessment and Management of Social and Environmental Risks and Impacts); PS2 (Labour and working conditions); PS3 (resource efficiency and pollution prevention); and PS5 (land acquisition and involuntary resettlement) where these are applicable will also be considered to ensure the appropriate integration of any overlap [8].

The IFC and World Bank Group (WB) have developed guidelines with respect to environment, health and safety (EHS), which are also considered GIIP. These include EHS Guidelines for industry sectors including mining, which includes open pit mining and milling (December 2007); Guidelines for Ore Processing, including power generation (April 2007). The General EHS Guidelines cover a range of indicators such as air quality (which include standards for PM$_{10}$and PM$_{2.5}$) and noise for all industries [9].

Guinea is a signatory to certain international conventions that may be applicable to the Project and these may be seen to provide additional direction in the absence or limitation of local legislation or policy. Those relevant to health include the following (not exhaustive):

- The International Labour Organization Conventions (ILO). Guinea has been a member of the ILO since 1959 and is a signatory to 59 ILO Conventions with 50 in force [10];
- The United Nations Declaration on Rights of the Indigenous Peoples;
- Other United Nations declarations and agencies;
- International Health Regulations as promulgated by the World Health Organisation. Updated regulations for 2005 [11];
- Stockholm Convention on Persistent Organic Pollutants;
- Rotterdam Convention on chemical and pesticides [12];
- Basel Convention on the Control of trans-boundary movements of hazardous waste and their disposal; and
3 HIA Framework and Methodology

3.1 Introduction and Definitions

A HIA seeks to identify and estimate the lasting or significant changes of different actions on the health status of a defined population. HIA may be defined as “a combination of procedures, methods and tools by which a project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population”. The HIA identifies appropriate actions to manage those effects [13, 14]. Thus, HIA has an important role as a key decision-making tool in development planning at project level.

The World Health Organisation (WHO) defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. This is influenced by a complex interaction of social, economic, genetic, and environmental factors [15].

The HIA will assist the Project by understanding the existing health needs of the community and considering the future consequences of different project options on human health. These consequences will be formulated into a CHMP so that the negative health effects are avoided or mitigated and potential positive effects are enhanced.

HIA needs to be a participative process and inputs of various stakeholders are sought throughout. The participative process allows the views of different groups, including vulnerable ones, to be considered and to ensure that the proposed CHMP is respectful of local cultures, perceptions and requirements. The potential for sustainable development is significantly increased through this process. HIA is essentially an iterative process with all available additional information being considered to add support to the assessment and recommendations.

The holistic model of health used in the HIA process acknowledges that the health status of a population is affected by factors known as health determinants. All of these are closely interlinked and differentials in their distribution lead to health inequalities. These include both biophysical and social determinants of health (SDoH) as well as and not just purely health outcomes. The methodology allows HIA practitioners to consider how a project affects these determinants of health, as well as health outcomes.
To support IFC Performance Standard 4 [7], which deals with community health and safety, the IFC developed both detailed “Good Practice Notes” (GPNs) [16] and an HIA toolkit [6] that presents the framework that is commonly used for HIA. The newly developed guidelines of the International Council of Mining and Metals (ICMM) guidance note [17] were also used in this scoping HIA, where applicable, as these are seen as a particular reference for the mining sector.

3.2 HIA Methodology
To ensure compliance with the IFC performance standards the methodology outlined in the GPN for HIA from the IFC was followed. The main elements of the GPN are discussed briefly, so the context and methodology of the HIA process is understood.

It is important that a distinction is made between HIA and Health Risk Assessment (HRA). HRA is concerned with the identification of hazards and risks to the workforce which relate to occupational health and safety and engineering design. Generally, HRA is “within the fence” while HIA is “outside the fence” but there are distinct overlaps with HIA often taking a central position as workplace activities can effect community health and existing community health needs or disease burdens can effect workplace health. It is thus important that these assessments should not be placed into individual elements but integrated to support an overall strategic plan for the Project as described in Figure 2.
3.2.1 Form and Nature of HIA

Figure 3 presents the major framework that is commonly used for HIA and which follows a 6-step process:

(i) Screening (preliminary evaluation to determine the necessity of an HIA);

(ii) Scoping (identifying the range of potential project-related health impacts and defining the terms of reference for the HIA, based on published literature, local data and broad stakeholder consultation); This is the current phase of the Simandou Project railway HIA.

(iii) Risk assessment (qualitative and quantitative appraisal of the potential health impacts in relation to defined communities and the Project development, including stakeholder participation);

(iv) Appraisal and mitigation (development of a CHMP) based on the findings of the risk assessment);

(v) Implementation and monitoring (realisation of the CHMP including monitoring activities that allow for adaptation); and

(vi) Evaluation and verification of performance and effectiveness (key step to analyse the HIA process as a whole).

Figure 3: HIA flow chart
Figure 4 outlines the central role that scoping plays in the HIA process [18]. Scoping thus outlines the potential health impacts of concern and analyses the data available to inform the HIA process. If the required evidence is available in sufficient quality for the identified health outcomes and determinants of concern, the HIA can proceed with the subsequent phases of the impact assessment process. If significant data gaps are identified within the scoping process, further baseline health data collection is indicated.

This HIA is being undertaken as part of the feasibility studies and as a prospective assessment. It will thus be available to influence design and inform construction, operation and the decommissioning phases of the Project. As HIAs are dynamic iterative processes they do require flexibility in their methodologies and tools – so that they can be fit for purpose for different projects.

Besides company standards, lender requirements and local legislation, the following variables need to be taken into account when selecting the level of HIA for a specific project:

(i) the range and magnitude of potential health impacts;
(ii) the social sensitivity of the potentially affected communities; and
(iii) the Project footprint.

A basic risk matrix has been developed as illustrated in Figure 5 [6], to link these variables and assist in deciding the level of HIA required. The scoping phase also assists in defining what level of HIA may be appropriate for the Project. The decision making process for the level of HIA for the Project is described in section 8.
3.2.2 Environmental Health Areas (EHAs)

The IFC methodology uses twelve Environmental Health Areas (EHAs) to support the systematic analysis of health considerations. These are summarized in Table 3. The set of EHAs provides a linkage between project-related activities and potential positive or negative community-level impacts and incorporates a variety of biomedical and key SDoH. In this integrated analysis, cross-cutting environmental and social conditions that contain significant health components are identified instead of an HIA focusing primarily on disease-specific considerations – as is frequently done in many biomedical analyses of potential project-related public health impacts. The EHA framework is based on an analysis performed and published by the World Bank [19, 20].

A World Bank analysis demonstrated that an almost 50% improvement in major health outcomes could be achieved by improvements in four sectors: (i) housing and urban development; (ii) water, food and sanitation; (iii) transportation; and (iv) communication. Building upon this sectoral analysis and incorporating a broad perspective on “environmental health” led to the development of a defined set of EHAs (see Table 3), which have been adopted in the IFC Notes for Performance Standard no. 4 “Community Health” [7] the 2005 IPIECA (International Petroleum Industry Environmental Conservation Association) HIA guidelines [21] and the IFC HIA toolkit [6].
### Table 3: Environmental health areas

<table>
<thead>
<tr>
<th>Environmental Health Areas (EHAs)</th>
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<tbody>
<tr>
<td>1. <strong>Communicable diseases linked to housing design</strong> – Transmission of communicable diseases</td>
</tr>
<tr>
<td>(e.g. acute respiratory infections, pneumonia, tuberculosis, meningitis, plague, leprosy, etc.)</td>
</tr>
<tr>
<td>that can be linked to inadequate housing design, overcrowding and housing inflation. It also</td>
</tr>
<tr>
<td>considers indoor air pollution related to use of biomass fuels.</td>
</tr>
<tr>
<td>2. <strong>Vector-related diseases</strong> – Mosquito, fly, tick and lice-related diseases (e.g. malaria,</td>
</tr>
<tr>
<td>dengue, yellow fever, lymphatic filariasis, rift valley fever, human African trypanosomiasis,</td>
</tr>
<tr>
<td>onchocerciasis, etc.)</td>
</tr>
<tr>
<td>3. <strong>Soil-, water- and waste-related diseases</strong> – Diseases that are transmitted directly or</td>
</tr>
<tr>
<td>indirectly through contaminated water, soil or non-hazardous waste (e.g. diarrheal diseases,</td>
</tr>
<tr>
<td>schistosomiasis, hepatitis A and E, poliomyelitis, soil-transmitted helminthiases, etc.)</td>
</tr>
<tr>
<td>4. <strong>Sexually-transmitted infections, including HIV/AIDS</strong> – Sexually-transmitted infections</td>
</tr>
<tr>
<td>such as syphilis, gonorrhoea, chlamydia, hepatitis B and, most importantly, HIV/AIDS.</td>
</tr>
<tr>
<td>Linkages of TB will be discussed where relevant under HIV, but often linked to EHA1.</td>
</tr>
<tr>
<td>5. <strong>Food- and nutrition-related issues</strong> – Adverse health effects such as malnutrition, anaemia</td>
</tr>
<tr>
<td>or micronutrient deficiencies due to e.g. changes in agricultural and subsistence practices, or</td>
</tr>
<tr>
<td>food inflation; gastroenteritis, food-borne trematodiases, etc. This will also consider feeding</td>
</tr>
<tr>
<td>behaviours and practices. Access to land plays a major role in developing subsistence farming</td>
</tr>
<tr>
<td>contexts</td>
</tr>
<tr>
<td>6. <strong>Non-communicable diseases</strong> – Cardiovascular diseases, cancer, diabetes, obesity, etc.</td>
</tr>
<tr>
<td>7. <strong>Accidents/injuries</strong> – Road traffic or work-related accidents and injuries (home and project</td>
</tr>
<tr>
<td>related); drowning</td>
</tr>
<tr>
<td>8. <strong>Veterinary medicine and zoonotic diseases</strong> – Diseases affecting animals (e.g. bovine</td>
</tr>
<tr>
<td>tuberculosis, swinepox, avian influenza) or that can be transmitted from animal to human (e.g.</td>
</tr>
<tr>
<td>rabies, brucellosis, Rift Valley fever, Lassa fever, leptospirosis, etc.)</td>
</tr>
<tr>
<td>9. <strong>Exposure to potentially hazardous materials, noise and malodours</strong> – This considers the</td>
</tr>
<tr>
<td>environmental health determinants linked to the project and related activities. Noise, water</td>
</tr>
<tr>
<td>and air pollution (indoor and outdoor) as well as visual impacts will be considered in this</td>
</tr>
<tr>
<td>biophysical category. It can also include exposure to heavy metals and hazardous chemical</td>
</tr>
<tr>
<td>substances and other compounds, solvents or spills and releases from road traffic and exposure</td>
</tr>
<tr>
<td>to mal-odours. There is a significant overlap in the environmental impact assessment in this</td>
</tr>
<tr>
<td>section. Ionizing radiation also falls into this category.</td>
</tr>
<tr>
<td>10. <strong>Social determinants of health</strong> – Including psychosocial stress (due to e.g. resettlement,</td>
</tr>
<tr>
<td>overcrowding, political or economic crisis), mental health, depression, gender issues, gender</td>
</tr>
<tr>
<td>based domestic violence, suicide, ethnic conflicts, security concerns, substance misuse (drug,</td>
</tr>
<tr>
<td>alcohol, smoking), family planning, health seeking behaviours, etc. There is a significant</td>
</tr>
<tr>
<td>overlap in the social impact assessment in this section.</td>
</tr>
<tr>
<td>11. <strong>Cultural health practices</strong> – Role of traditional medical providers, indigenous medicines,</td>
</tr>
<tr>
<td>and unique cultural health practices</td>
</tr>
<tr>
<td>12. <strong>Health systems issues</strong> – Physical health infrastructure (e.g. capacity, equipment, staffing</td>
</tr>
<tr>
<td>levels and competencies, future development plans); programme management delivery systems (e.g.,</td>
</tr>
<tr>
<td>malaria-, TB-, HIV/AIDS-initiatives, maternal and child health, etc.)</td>
</tr>
</tbody>
</table>

While every EHA may not be relevant to a given project, it is still important to systematically analyse the potential for project-related impacts (positive, negative or neutral) across the various EHAs.
3.2.3 Community Profiling

To identify and quantify potential health impacts, an accurate population profile is required and it is important to distinguish between differences in exposure and susceptibility. Besides a demographic profile of the at-risk population and the identification of the most vulnerable groups, it is crucial to understand how the development and operational activities are likely to impact at both household and community level. Impacts caused by resettlement, shifts in the social structures or influx triggered increases in population density need to be considered within the overall assessments. IFC performance standards and safeguard policies related to resettlement are extremely stringent and require a detailed household analysis before and after resettlement/relocation [22]. For these reasons the HIA must be considered in conjunction with other assessments that are required, including social impact assessments and resettlement planning frameworks.

In the HIA, the population is stratified into potentially affected communities (PACs). A PAC is a defined community within a clear geographical boundary where project-related health impacts may reasonably be expected to occur. PACs are inherently prospective and simply represent best professional judgments. Defining PACs can be a challenge because:

- the Project concessions have a vast footprint;
- PACs are likely to change over the course of Project implementation and life cycle; and
- there may be changes in the Project design, so longer term implications are often not fully known.

The definition of PACs may need further adaptation as the Project evolves. Findings of social and economic assessments, resettlement plans and migration management plans also need to be carefully updated and integrated to allow linkage between the PACs and key demographic determinants such as age structure and population numbers. This will need to be done as the HIA progresses and such information will be used to update the HIA scoping and any recommendations made for data collection or surveillance.
4 HIA Scoping Study for the railway development

4.1 Key Considerations

The scoping phase is a vital step in the HIA process as it identifies the impacts that are most likely to be significant and outlines the blueprint for the HIA and how, when and where future activities should be conducted. This in turn will provide input into the development of the final environmental, health and social management plan.

The objectives of the HIA scoping study are as follows:

- to describe the state of health in project affected communities at present based on (i) the review of existing project documents and health statistics; (ii) stakeholder input, including the consultation of affected communities; and (iii) direct observations at project, community and health system level. This will allow an understanding of existing health priorities, vulnerabilities and needs;
- to describe high level potential future project-related impacts that the Project may impose on the community and what evidence base there is to inform and monitor these issues. This will be a preliminary description of potential impacts and does not include a detailed impact assessment or modelling of potential impacts;
- to define what additional baseline data is required to be collected to inform a robust baseline and define avoidance/mitigation measures as well as key monitoring parameters; and
- to develop preliminary recommendations for mitigation/management of the identified impacts and define actions to address these in more detail. As this is a scoping phase these will be limited and at a high level.

The scoping HIA exercise will be used to inform the Terms of Reference (ToR) for the HIA process. The intention is to ensure that potential impacts are evidence based and mitigation/management recommendations are prioritised into management plans based on priority and stakeholder input. The HIA key considerations for the Project are summarised in Table 4.

The scoping exercise was supported by Ms Catherine Garcia (Rio Tinto Communities Manager), Mr Frédéric Chenais (Rio Tinto Superintendent Communities) and Dr Kékoura Camara (Rio Tinto Community Liaison Officer).
### Table 4: Key Considerations for HIA Process

<table>
<thead>
<tr>
<th>Key Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What stage of the Project?</strong></td>
</tr>
<tr>
<td>The railway development of the Simandou Project is at the feasibility study stage. This is to support the planned rapid development of the mine component of the Project.</td>
</tr>
<tr>
<td><strong>What is the objective of the HIA/ Community Health Assessment?</strong></td>
</tr>
<tr>
<td>• Analysis of environmental health areas that include health determinants and health outcomes. This will incorporate both the health impacts as well as health needs and inform an understanding of the state of health in the community at present (baseline).</td>
</tr>
<tr>
<td>• Identification of relevant data gaps that may exist in the baseline data at Project level. This will present an opportunity to highlight data that may warrant collection as the Project moves ahead into the next phase in order to support the health baseline and surveillance function.</td>
</tr>
<tr>
<td>• Consideration of indicators which should be assessed in the baseline health survey to allow measurement of identified high level health concerns. These should be conducted prior to construction activity in order to obtain a true baseline.</td>
</tr>
<tr>
<td>• Understand potentially affected communities and then stratify the community for health survey purposes in collaboration with the social and resettlement teams.</td>
</tr>
<tr>
<td>• Define potential health impacts of concern that will be caused directly or indirectly by the Project. These mandate management/mitigation.</td>
</tr>
<tr>
<td>• Define potential community health interventions as part of strategic social development initiatives.</td>
</tr>
<tr>
<td>• Identify potential key stakeholders.</td>
</tr>
<tr>
<td><strong>Who will the HIA be targeting?</strong></td>
</tr>
<tr>
<td>Project and broad stakeholders in community: ☑</td>
</tr>
<tr>
<td>Financing institutions: ☑</td>
</tr>
<tr>
<td>General public: ☑</td>
</tr>
<tr>
<td>Media: ☑</td>
</tr>
<tr>
<td>Others: Government</td>
</tr>
<tr>
<td>Broad stakeholders in form of “Publish what you Pay”.</td>
</tr>
<tr>
<td><strong>Form and content of the outputs</strong></td>
</tr>
<tr>
<td>Publishing: ☐</td>
</tr>
<tr>
<td>Copyright: ☑</td>
</tr>
<tr>
<td>Confidentiality: ☑</td>
</tr>
<tr>
<td>Others:</td>
</tr>
<tr>
<td>The report will eventually be published on the Simandou Project website. Any external reporting will need to be subject to approval and input from the Rio Tinto communication departments.</td>
</tr>
<tr>
<td><strong>The geographical boundaries of the HIA</strong></td>
</tr>
</tbody>
</table>
**Key Considerations**

| What are the time boundaries (temporal) of the HIA? | The HIA will eventually need to consider the Project life span, plus years for closure. This is important to comply with dependency/legacy of community health assistance programmes. |
| Project steering group post scoping | Will the Project have its own steering group? Yes. Internally it will consist of: Catherine Garcia and Frederic Chenais. Externally: • SNC Lavalin • SHAPE • Other specialist studies as relevant • Government officials at national and district level • Any community health implementation partners **Objectives of steering group?** Guide the HIA process. Define ToR for the HIA and ToR for stakeholder meetings. Review and comment on documents. Provide key updates on project developments. |
| Involvement of interested and affected parties (IAP) | Will the steering group identify the IAP? Yes, this will be supported by the steering group so that parties are involved in an appropriate manner. Health will be included in public consultation meetings, as required. Will the IAP be able to provide information to guide the HIA? |
| Have specific health complaints relating to the Project been addressed? | None known. |
| Timelines | No clear timelines were defined at the time of the scoping study as the schedule of the HIA is partially dependant on the final definition of the railway design as well as findings of the SEIS. The impact assessment phase will be integrated into the social and environmental assessments. A final SEIS will be compiled for the Project. The final community health plan will be developed after the impact assessment phase. |
4.2 Completed Activities

4.2.1 Literature Review
An extensive literature review was performed for the health profiling of the communities along the rail corridor. The literature review focussed on the national, regional, and prefectural, in a step down fashion where information was available. Based on a systematic review of the 12 EHAs, the broad health status of the population was described. It must be noted that there is limited information in the public domain regarding the health situation in Guinea.

Some core documents were consulted in the literature review. These included (i) the 2005 Guinea Demographic and Health Survey (GDHS) [23]; (ii) the National Survey on the Nutritional Status and Key Indicators of Child Survival (Enquête Nationale sur l'Etat Nutritionnel et le Suivi des Principaux Indicateurs de Survie de l'Enfant (ENENSE)) was conducted in 2007/08 [24] (iii); and reports from the World Health Organization (WHO) and UNICEF. Other sources are available in the references.

4.2.2 Health System Data
In order to obtain morbidity statistics for the 11 prefectures that will potentially be affected by the Project, routine health information system (RHIS) data was retrieved from the National Health Information Service ('Service National d'Information Sanitaire' (SNIS)) from the Ministry of Health and Public Hygiene (MHPH) in Conakry. These datasets were collected from the monthly case reports collated and returned from the different prefectures updated until the end of 2009 (the latest available datasets). These datasets provide the best possible overview of disease patterns along the Project corridor. The statistics were obtained, collated and finally reported by Dr Lamine Keita (Public Health Doctor) and Mr Célestin Tamba Millimono prior to the field activities.

4.2.3 Field Work and Stakeholder Engagement
The field work took place from the 8th to the 16th of November 2011. This was conducted by Dr Mirko Winkler (Epidemiologist) and Dr Kékoura Camara (Rio Tinto Community Liaison Officer and Medical Doctor). Dr Camara facilitated the field work by arranging and translating focus group discussions (FGD), as well as supporting the identification of, and facilitating arrangements for key informant interviews (KII). Dr Mark Divall supported the team in a strategic role.
Broad stakeholder engagement is an important element to consider throughout the HIA process and thus the national and local (prefecture and sub-prefecture) health authorities were consulted to support this during the scoping study. The objectives of these meetings, in particular with the Prefectural Health Directors (‘Directeur Préfectoral de la Santé’ (DPS)), were to inform the health authorities about the proposed Project, the overall objectives and process of a HIA, the activities in scoping as well as those as part of the more comprehensive assessment. During these meeting it was emphasised that Rio Tinto and SHAPE view the relationship with the health authorities as important and that consultation and activities in the area would occur with due consideration of respected protocols and where possible in partnership with the local health actors.

An important element of the field visit was to consult stakeholders who have special knowledge of the health status as well as socio/cultural behaviours and norms of the PACs. The objective was to gain a comprehensive picture of the general health situation and to better understand potential health impacts of the Project.

During restitution meetings as part of the mine HIA the national and regional health authorities were informed about the planned railway HIA scoping study. This was considered the initiation of stakeholder engagement for this element of the Project and future meetings with the MHPH will be related to feedback and on the HIA process.

Figure 6: Locations along the rail corridor where KII's and FGDs were carried out
4.2.3.1 Key Informant Interviews

Prefectural health authorities (e.g. DPS) and health personnel (e.g. nurses working at rural health posts and centres) were visited along the proposed railway corridor. Key informants were interviewed using a semi-structured questionnaire. This included specific questions about health, social and environmental determinants but with a different emphasis, depending on the level and role of each key informant being interviewed. Moreover, the KII aimed at understanding the level and quality of available health services, applied diagnostics, quality of reported data, existing health challenges in the local communities, existing collaborations for community health and potential health impacts of the planned Project. Interviews were open and conducted in French. The full list of key informants consulted during the field visit is shown in Table 5 and Figure 6 provides an overview of the location of these KII.

<table>
<thead>
<tr>
<th>Prefecture, location</th>
<th>Name of key informant</th>
<th>Function of key informant</th>
<th>Contact details</th>
<th>Date of interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kérouané, Kérouané</td>
<td>Dr Diakité Adama</td>
<td>Agent administratif de l'hôpital de Kérouané</td>
<td>64927632</td>
<td>10.11.2011</td>
</tr>
<tr>
<td>Kérouané, Kérouané</td>
<td>Drame Amadou</td>
<td>Pharmacien de l'hôpital de Kérouané</td>
<td>64801888</td>
<td>10.11.2011</td>
</tr>
<tr>
<td>Kankan, Kankan</td>
<td>Dr Daff Boubakar</td>
<td>DPS de Kankan</td>
<td>64885009 65242431</td>
<td>10.11.2011</td>
</tr>
<tr>
<td>Kankan, Tokounou</td>
<td>Dr Abulaj Djam</td>
<td>Directeur du Centre de Santé de Tokounou</td>
<td>66141374 62313165</td>
<td>11.11.2011</td>
</tr>
<tr>
<td>Kissidougou, Kissidougou</td>
<td>Dr Ali Badara Cissé</td>
<td>DPS de Kissidougou</td>
<td>60582361 63385373</td>
<td>12.11.2011</td>
</tr>
<tr>
<td>Faranah, Tiro</td>
<td>Kalo Amara</td>
<td>Adjoint du Chef de Centre de Santé de Tiro</td>
<td>66 283354</td>
<td>12.11.2011</td>
</tr>
<tr>
<td>Faranah, Layasando</td>
<td>Karmy Oularé</td>
<td>Chef du Poste de Santé de Layasando</td>
<td>66 017967</td>
<td>12.11.2011</td>
</tr>
<tr>
<td>Faranah, Faranah</td>
<td>Dr Elhadj N’Faly Bangoura</td>
<td>DPS de Faranah</td>
<td>60581617 66247824</td>
<td>12.11.2011</td>
</tr>
<tr>
<td>Faranah, Marélla</td>
<td>Oye Koivogui</td>
<td>Adjoint du Chef de Centre de Maréllia</td>
<td>66707389</td>
<td>13.11.2011</td>
</tr>
<tr>
<td>Faranah, Marélla</td>
<td>Yéré Touré</td>
<td>Chef de Centre de Maréllia</td>
<td>66578042</td>
<td>13.11.2011</td>
</tr>
<tr>
<td>Mamou, Oulé Kaba</td>
<td>Mariama Camara</td>
<td>Matrone du Centre de Santé de Oulé Kaba</td>
<td>66118551</td>
<td>13.11.2011</td>
</tr>
<tr>
<td>Mamou, Oulé Kaba</td>
<td>Aycha Sanoh</td>
<td>Matrone du Centre de Santé de Oulé Kaba</td>
<td>66521310</td>
<td>13.11.2011</td>
</tr>
<tr>
<td>Mamou, Mamou</td>
<td>Dr Mariama Kankalabé Diallo</td>
<td>DPS de Mamou</td>
<td>60390728 67390728</td>
<td>13.11.2011</td>
</tr>
<tr>
<td>Kindia, Bas Simbaraya</td>
<td>Coné Bintou Diallo</td>
<td>Chef du Poste de Santé de Layasando</td>
<td>65246824 60327830</td>
<td>14.11.2011</td>
</tr>
<tr>
<td>Kindia, Simbaraya</td>
<td>Aboubé Karsila</td>
<td>Agent communautaire de Simbaraya</td>
<td>65246824</td>
<td>14.11.2011</td>
</tr>
<tr>
<td>Kindia, Kindia</td>
<td>Dr Sakoba Kalissa</td>
<td>DPS de Kindia</td>
<td>60292606</td>
<td>14.11.2011</td>
</tr>
<tr>
<td>Kindia, Kindia</td>
<td>Dr Bary Abdulai</td>
<td>Planification formation et recherche de Kindia</td>
<td>65316954</td>
<td>14.11.2011</td>
</tr>
</tbody>
</table>
4.2.3.2 Focus Group Discussions

In addition to visiting the local health facilities and authorities, FGDs were conducted in communities along the rail corridor (Table 6 and Figure 6). It was decided to only include women groups at this stage of the assessment as they are considered to be the gatekeepers to family health and usually have a good understanding of critical issues that influence health at the community and household level. This allows for a high level of understanding of the health challenges, from both a biophysical and social health perspective.

Table 6: Location, number of participants and date of the FGDs

<table>
<thead>
<tr>
<th>Prefecture, location</th>
<th>Date of Focus Group Discussion</th>
<th>Number of participants</th>
<th>Age range of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kérouané, Farakobadala</td>
<td>10.11.2011</td>
<td>14</td>
<td>18-60</td>
</tr>
<tr>
<td>Kankan, Samadou</td>
<td>11.11.2011</td>
<td>20</td>
<td>18-65</td>
</tr>
<tr>
<td>Kankan, Koroni Koro</td>
<td>11.11.2011</td>
<td>12</td>
<td>17-45</td>
</tr>
<tr>
<td>Kouroussa, Difindala</td>
<td>12.11.2011</td>
<td>13</td>
<td>22-65</td>
</tr>
<tr>
<td>Faranah, Layadoula</td>
<td>12.11.2011</td>
<td>14</td>
<td>18-80</td>
</tr>
<tr>
<td>Mamou, Laya</td>
<td>13.11.2011</td>
<td>9</td>
<td>15-50</td>
</tr>
<tr>
<td>Mamou, Pensy</td>
<td>13.11.2011</td>
<td>11</td>
<td>15-55</td>
</tr>
<tr>
<td>Kindia, Simbaraya</td>
<td>14.11.2011</td>
<td>9</td>
<td>18-32</td>
</tr>
</tbody>
</table>

In contrast to 'classical' FGDs, the groups were interviewed using a semi-structured questionnaire which allows issues of concern to be addressed in a more efficient way. The discussions were left open after the initial question was posed. The questions were asked in French and translated into the predominant local language. The information obtained in this manner does not substitute quantitative data but serves to triangulate with other data that had been collected (methodological triangulation). The FGDs also served as an opportunity to understand how the community forms opinions on health, as well as providing an idea about the health status in the villages and health knowledge of the local people. Furthermore, information on health development needs and priorities of communities could be obtained.
Figure 7: Women FGD in Pensy

Figure 8: Women FGD in Simbaraya
4.3 Limitations of the Scoping Study

The following are recognised limitations of the scoping study:

- Due to the length and extensive linear feature of the rail corridor only a limited number of communities that will directly be impacted by the Project could be consulted. Therefore, the current scoping study provides a broad picture of the health situation and challenges along the corridor but has significant limitations for the description of the baseline health status at district and community level.

- This scoping study mostly refers to prefectural level data that is based on routine health facility statistics. While this information source is invaluable to understand the health challenges along the rail corridor, it has some limitations that need to be understood and respected:
  - the available statistics are summaries of data from all the covered health facilities and thus provide a prefectural average and may not represent the health realities of the districts and villages that will affected by the Project;
  - there are minimal diagnostic facilities and most of the diagnoses would be made either based on symptoms or by exclusion. This is exacerbated by shortages of staff and at times (especially in the rural areas) the lack of requisite skills in health staff to recognise certain conditions; and
  - reporting of the data is also completed manually and while commendable efforts are made by those recording the data (i.e. health personnel at health facilities) it is likely that the recording will lack required accuracy.

- Limited initial information about the detailed potential project designs and timeframes. This is a minor concern as the HIA scoping can simply be updated as such information becomes available. The same applies to information from the socio-economic and environmental baseline studies. This limitation and the time available to complete the HIA has resulted in the need to follow a rapid appraisal approach in the HIA.
5 Community Profiling

5.1 Potentially Affected Communities

Based on the linear nature of the railway development, a rather schematic definition of PACs is proposed, which will also allow stratifying potential health impacts according to the respective phase of the development (i.e. construction or operation phase):

• **PAC 1** covers the communities that are located in proximity to the proposed railway, i.e. within a corridor of 5 kilometres (adapt to the definition of the SEIS once available) (construction and operation phase);

• **PAC 2** includes the communities that will have to be resettled due to the railway construction (approximately 800 households) (construction phase);

• **PAC 3** considers the communities where the LSC will be established (construction and operation phase);

• **PAC 4** is the communities that will be impacted by the TWC (construction phase); and

• **PAC 5** covers the broader community that will indirectly be impacted by the Project due to increased traffic loads and/or socio-economic effects linked to the railway development (construction and operation phase).

This is seen as a preliminary draft that should assist defining the terms of reference (ToR) for the HIA but might need further adaption as more information becomes available through the socio-economic and environmental baseline studies currently underway. This is also important in order to ensure both consistency in approach and minimise overlaps in any mitigation/management. While health impacts may differ spatially from the social context, these can be revised to reflect the potential health impacts which may differ by geographical location.

5.2 Vulnerable or Indigenous Groups

These groups were evaluated in the different social and environmental studies and when including those vulnerable from a health perspective include:

• women and young girls;

• the elderly;

• disabled people;
• children who may be more vulnerable to certain health effects such as infectious diseases and acute and chronic respiratory tract infections from exposure to dust and other airborne pollutants;
• poor households; and
• those without access to or ability to own land. It was mentioned in a preliminary baseline study that many communities depend on agriculture production to provide for all their family needs and produce most of their own food and trade the surplus to obtain cash for purchasing other household needs and services. Poverty was likened to the amount of surplus that a family can, or cannot, produce [46]. This can have an impact on food security and nutrition, but also ability to afford services such as health care. It may also influence generally perceptions of well-being as ownership of land is central to the local traditional structures. In-migration and the need for resettlement due to Project activities are thus important.

Refugees and displaced people from the civil wars in Liberia, Côte d’Ivoire and Sierra Leone also need to be considered vulnerable to some extent but in general they have either returned to their country of origin or have integrated into the local communities. Beyla Prefecture was estimated to have received around 30,000 refugees during the second wave of influx in 1990. Due to the ethnic roots some of the refugees were termed returnees [25].
6 Baseline Health Status

6.1 General Socio-economic Context

Guinea is facing a challenging development situation. The country ranks 178th out of 187 countries on the Human Development Index (HDI) as measured by the United Nations Development Programme's Human Development Report which was released in November 2011 based on estimates for 2011. The HDI is a comparative measure of life expectancy, literacy, education and standards of living for countries worldwide. It is a standard means of measuring well-being, especially child welfare. It is used to distinguish whether the country is a developed, a developing or an under-developed country, and also to measure the impact of economic policies on quality of life. Guinea is classified as one of 46 countries with ‘low human development’ [26]. Poverty is widespread across the country and it has been calculated that the Gross Domestic Product (GDP) amounted to US$1,046 per capita per year in 2011. Norway, ranking first place in the HDI, has a GDP of US$52,012 per capita per year. In 2010 Guinea ranked 164th (out of 178) in the Transparency International Corruption Index [27].

Despite the fact that Guinea is rich in minerals (bauxite, gold, iron ore, diamonds) and acquires most of its income in exporting natural resources, mainly bauxite, the inflation rate is at 16.56% [28] and 70% of the population lives on less than a dollar per day [29].

As with many other developing countries, Guinea has a young population and high population growth rate which was above 2.3% from 2000-2008. The total population is 10,069,000 inhabitants [29].

6.2 General Health Profile of the Country

The country suffers from gross under financing in the health sector where in the decade from 1998-2008 only 3% of the central government expenditure was allocated to health.

Under the umbrella of a strategic plan called ‘Horizon’, the Guinean health system has been undergoing reforms since 2002 with the aim of improving maternal and child health, intensifying the fight against HIV/AIDS, decreasing gender inequities and integrating environmental sustainability [30]. This is an on-going process and no evaluation of the implemented reforms was available at the time of the present study.
The health indicators for Guinea describe a challenging situation and most of the health data is similar to the average for other sub-Saharan African countries [31]. Life expectancy at birth was 49 years for males (regional average: 52; global average: 66), 55 years for females (regional average: 56; global average: 71) and the average for both sexes is 52 (regional average: 54; global average: 68). Infant mortality rate per 1,000 live births was 142 (regional average: 127; global average: 60) in 2009. An estimate of the health workforce in Guinea is shown in Figure 9 (WHO 2008) [32].

![Figure 9: Health workforce in Guinea compared to the average of the African Region](image)

Although the infant mortality rates are very high there has been a gradual downward trend in recent years. This is shown in Figure 10 based on figures collected from the recent Guinean Demographic and Health Survey (GDHS) and when the latest UNICEF rate of 142/1000 for under-five mortality is taken into consideration, it would appear that these gains are being sustained [33, 34]. In comparison to the region, Guinea is faring better than two of its neighbours with Guinea Bissau and Sierra Leone having under-five mortality rates of 192 and 193/1000 live births respectively. However, Liberia and Senegal with rates of 112 and 93/1000 live births remain the best in the immediate region [34].

![Figure 10: Trends in Childhood Mortality in Guinea](image)
The disability-adjusted life year (DALY) also outlines a challenging situation. The DALY is a measure of overall disease burden. It is designed to quantify the impact of premature death and disability on a population by combining them into a single, comparable measure. The DALY is an important indicator and it is a health gap measure that extends the concept of potential years of life lost (YLL) due to premature death to include equivalent years of ‘healthy’ life lost by virtue of (being in a state of) poor health or disability. According to the last estimate of disease burden, the total DALY in Guinea in 2004 was almost 4 million as shown in Table 7 [35].

Communicable diseases remain the main health problem in Guinea. 67.6% of the DALYs were attributable to communicable diseases with the remainder divided between non-communicable diseases (24.4%) and injuries (8.0%). In comparison, communicable diseases only contribute 5.6% of DALYs in high income countries.

Overall, malaria accounted for the most DALYs with 13%, followed by peri-natal conditions (e.g. prematurity and low birth weight; neonatal infections) (11.9%), respiratory infections (11.5%), and diarrhoeal diseases (8.6%). Almost a quarter of the DALYs of the non-communicable diseases are due to neuro-psychiatric conditions and mental illness. Road injuries contribute substantially to total injuries.
Table 7: Estimated DALYs (‘000) by cause, estimates for 2004

<table>
<thead>
<tr>
<th>Cause</th>
<th>High income countries</th>
<th>Sub-Saharan Africa</th>
<th>Republic of Guinea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(000)</td>
<td>(%)</td>
<td>(000)</td>
</tr>
<tr>
<td>TOTAL DALYs</td>
<td>117 841</td>
<td>100.0</td>
<td>390 800</td>
</tr>
<tr>
<td>I. Communicable diseases, maternal and peri-natal conditions and nutritional deficiencies</td>
<td>6 579</td>
<td>5.6</td>
<td>276 438</td>
</tr>
<tr>
<td>Infectious and parasitic diseases</td>
<td>2 513</td>
<td>2.1</td>
<td>165 196</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>156</td>
<td>0.1</td>
<td>11 431</td>
</tr>
<tr>
<td>STDs excluding HIV</td>
<td>190</td>
<td>0.2</td>
<td>3 488</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>609</td>
<td>0.5</td>
<td>47 296</td>
</tr>
<tr>
<td>Diarrhoeal diseases</td>
<td>343</td>
<td>0.3</td>
<td>33 235</td>
</tr>
<tr>
<td>Childhood diseases</td>
<td>51</td>
<td>0.0</td>
<td>13 523</td>
</tr>
<tr>
<td>Meningitis</td>
<td>97</td>
<td>0.1</td>
<td>5 448</td>
</tr>
<tr>
<td>Hepatitis B (d)</td>
<td>77</td>
<td>0.1</td>
<td>379</td>
</tr>
<tr>
<td>Hepatitis C (d)</td>
<td>151</td>
<td>0.1</td>
<td>158</td>
</tr>
<tr>
<td>Malaria</td>
<td>4</td>
<td>0.0</td>
<td>32 172</td>
</tr>
<tr>
<td>Tropical diseases</td>
<td>2</td>
<td>0.0</td>
<td>6 412</td>
</tr>
<tr>
<td>Leprosy</td>
<td>0</td>
<td>0.0</td>
<td>25</td>
</tr>
<tr>
<td>Dengue</td>
<td>0</td>
<td>0.0</td>
<td>9</td>
</tr>
<tr>
<td>Trachoma</td>
<td>0</td>
<td>0.0</td>
<td>719</td>
</tr>
<tr>
<td>Intestinal nematode infections</td>
<td>23</td>
<td>0.0</td>
<td>1 581</td>
</tr>
<tr>
<td>Respiratory infections</td>
<td>1 263</td>
<td>1.1</td>
<td>44 514</td>
</tr>
<tr>
<td>Maternal conditions</td>
<td>577</td>
<td>0.5</td>
<td>15 365</td>
</tr>
<tr>
<td>Peri-natal conditions</td>
<td>1 521</td>
<td>1.3</td>
<td>39 239</td>
</tr>
<tr>
<td>Nutritional deficiencies</td>
<td>704</td>
<td>0.6</td>
<td>12 125</td>
</tr>
<tr>
<td>II. Non-communicable conditions</td>
<td>100 843</td>
<td>85.6</td>
<td>81 448</td>
</tr>
<tr>
<td>Malignant neoplasms</td>
<td>17 618</td>
<td>15.0</td>
<td>6 179</td>
</tr>
<tr>
<td>Other neoplasms</td>
<td>358</td>
<td>0.3</td>
<td>339</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>3 496</td>
<td>3.0</td>
<td>2 165</td>
</tr>
<tr>
<td>Nutritional/endocrine disorders</td>
<td>1 815</td>
<td>1.5</td>
<td>3 134</td>
</tr>
<tr>
<td>Neuropsychiatric disorders</td>
<td>30 796</td>
<td>26.1</td>
<td>19 736</td>
</tr>
<tr>
<td>Sense organ disorders</td>
<td>8 916</td>
<td>7.6</td>
<td>9 475</td>
</tr>
<tr>
<td>Cardiovascular diseases</td>
<td>17 307</td>
<td>14.7</td>
<td>14 971</td>
</tr>
<tr>
<td>Respiratory diseases</td>
<td>7 138</td>
<td>6.1</td>
<td>7 308</td>
</tr>
<tr>
<td>Digestive diseases</td>
<td>4 605</td>
<td>3.9</td>
<td>5 751</td>
</tr>
<tr>
<td>Diseases of the genito-urinary system</td>
<td>1 198</td>
<td>1.0</td>
<td>2 272</td>
</tr>
<tr>
<td>Skin diseases</td>
<td>212</td>
<td>0.2</td>
<td>939</td>
</tr>
<tr>
<td>Musculoskeletal diseases</td>
<td>5 129</td>
<td>4.4</td>
<td>2 483</td>
</tr>
<tr>
<td>Congenital abnormalities</td>
<td>1 473</td>
<td>1.2</td>
<td>6 049</td>
</tr>
<tr>
<td>Oral diseases</td>
<td>784</td>
<td>0.7</td>
<td>649</td>
</tr>
<tr>
<td>III. Injuries</td>
<td>10 420</td>
<td>8.8</td>
<td>32 913</td>
</tr>
<tr>
<td>Unintentional injuries</td>
<td>6 926</td>
<td>5.9</td>
<td>21 647</td>
</tr>
<tr>
<td>Intentional injuries</td>
<td>3 494</td>
<td>3.0</td>
<td>11 265</td>
</tr>
</tbody>
</table>
More recent statistics of the WHO (2008) on the distribution of causes of deaths in children under the age of 5 years present a similar picture as shown in Figure 11, with malaria, respiratory and diarrhoeal diseases accounting for almost two thirds of mortality [32].

![Figure 11: Distribution of causes of deaths in children under the age of 5 years (2008)](image)

### 6.3 General Health Profile along the Rail Corridor

The most common diseases that were most frequently reported at the health facilities in the 11 prefectures (total population 3.3 million) along the rail corridor in 2009 are presented in Table 8 [36]. Furthermore, Table 8 presents population estimates, the number of health facilities (including public hospitals, health centres and rural health posts) and the number of consultations for the different prefectures.

Overall, malaria (32.42%), acute respiratory infections (ARI) (19.74%), helminthiases (intestinal parasites) (9.84%) and sexually transmitted infections (STIs) (8.08%) accounted for more than two thirds of the 893,945 consultations at the 149 health facilities. This was followed by non-bloody diarrhoea, anaemia, traumata, and gastritis, which were responsible for approximately 16% of the additional total burden. Of note, due to limited diagnostics at rural health facilities and the fact that not the entire population has access to health care these statistics have clear limitations. This is further addressed under the respective diseases in the following chapters under the different environmental health areas.
Table 8: Most important diseases in the 11 prefectures affected by the railway in 2009

<table>
<thead>
<tr>
<th>Reason for consultation</th>
<th>Prefectures affected by rail development (annual statistics for 2009)</th>
<th>Portion of all consultations per Prefecture</th>
<th>Total</th>
<th>Total Consultations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaria</td>
<td>30.55% 37.62% 25.11% 41.86% 29.67% 27.46% 35.90% 23.98% 32.34% 28.93% 43.23% 32.42%</td>
<td></td>
<td></td>
<td>283'702</td>
</tr>
<tr>
<td>Acute respiratory infections</td>
<td>20.26% 24.25% 20.33% 20.77% 24.13% 18.63% 20.89% 18.72% 10.23% 14.63% 18.82% 15.74% 174'929</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helminthiases</td>
<td>12.76% 7.58% 11.94% 11.60% 7.99% 9.29% 14.94% 8.17% 7.95% 9.90% 6.09% 9.84% 88'183</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sexually transmitted infections</td>
<td>10.34% 5.55% 10.58% 3.94% 6.67% 10.41% 3.46% 12.36% 7.82% 13.65% 4.13% 8.08% 75'525</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-bloody diarrhoea</td>
<td>8.42% 4.59% 6.08% 6.01% 8.28% 5.28% 7.90% 7.19% 5.62% 9.99% 5.59% 6.81% 62'888</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaemia</td>
<td>1.90% 3.50% 2.42% 2.85% 2.52% 6.19% 2.50% 8.25% 1.73% 2.70% 1.12% 3.28% 33'133</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trauma</td>
<td>2.54% 2.30% 2.20% 2.38% 4.48% 2.99% 1.55% 2.27% 5.59% 5.39% 2.72% 3.13% 27'078</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastritis</td>
<td>2.51% 2.11% 2.34% 1.27% 3.46% 2.41% 0.76% 1.87% 3.34% 2.20% 2.86% 2.28% 19'677</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dermatologic conditions</td>
<td>1.31% 1.55% 1.35% 1.25% 1.65% 0.57% 1.65% 1.49% 2.25% 1.46% 2.11% 1.52% 13'634</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye diseases</td>
<td>1.56% 0.58% 1.95% 1.16% 0.75% 1.68% 2.05% 0.91% 1.14% 1.17% 1.00% 1.27% 11'042</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>0.00% 0.18% 5.41% 3.85% 0.00% 4.16% 0.11% 0.00% 0.01% 0.00% 0.00% 1.25% 9'378</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bloody diarrhoea</td>
<td>0.41% 0.96% 1.04% 0.98% 0.63% 0.53% 0.90% 1.73% 0.83% 0.51% 0.38% 0.81% 8'233</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.49% 0.81% 0.31% 0.73% 0.38% 0.32% 0.13% 0.63% 0.13% 0.52% 0.82% 0.64% 5'314</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intestinal schistosomiasis</td>
<td>0.51% 0.15% 0.97% 0.10% 0.27% 0.72% 0.13% 1.96% 0.11% 0.98% 0.36% 0.57% 6'409</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arthritis</td>
<td>0.35% 0.26% 0.47% 0.15% 1.70% 0.63% 0.10% 0.42% 0.79% 0.62% 0.19% 0.52% 4'491</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malnutrition</td>
<td>0.96% 0.27% 0.87% 0.58% 0.60% 0.44% 0.26% 0.18% 0.28% 0.21% 0.24% 0.44% 3'623</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total 94.88% 92.27% 93.34% 95.95% 93.62% 92.21% 93.30% 90.16% 90.36% 92.85% 89.66% 92.60% 826'529
6.4 **Environmental Health Areas**

The following section will describe the baseline health status in relation to the proposed Project with reference to the EHA framework. This is based on the national and regional health data that was identified in the desktop review and retrieved from routine health facility statistics via the SNIS. These statistics are supplemented with the information that was obtained through KIIs and FGDs as well as direct observation during the field mission.

The reporting under the EHAs is stratified into:

- **National level** (i.e. national figures and statistics); and
- **Rail corridor** (i.e. information and statistics that account for the prefectures affected by the Project).

### 6.4.1 EHA #1 – Communicable Diseases linked to housing design

Communicable diseases (e.g. acute respiratory infections, pneumonia, tuberculosis, meningitis, plague, leprosy, etc.) rely on fluid exchange, contaminated substances, or close contact to travel from an infected carrier to a healthy individual. Therefore, they are directly linked to housing design, overcrowding and housing inflation.

According to the 2005 Guinea Demographic Health Survey (GDHS), on average 6.3 people live together in a household in urban Guinea and 6.1 in rural areas. Only 2.8% of households in rural Guinea benefit from electricity compared to 64% in urban areas. 74.6% of houses have natural flooring material such as sand or dirt.

#### 6.4.1.1 Tuberculosis

Tuberculosis (TB) is an infectious bacterial disease caused by *Mycobacterium tuberculosis*, which most commonly affects the lungs. Individuals with active pulmonary TB produce airborne droplet nuclei containing infectious *M. tuberculosis* in the course of speaking, sneezing, and particularly coughing. Crowding, poor ventilation, and duration of exposure increase the risk of transmission. People infected with TB bacilli will not necessarily become sick with the disease. The immune system ‘walls off’ the TB bacilli which, protected by a thick waxy coat, can lie dormant for years. This is known as ‘latent tuberculosis infection’. On average, 10% of immune-competent adults infected with *M. tuberculosis* develop active TB during their lifetime. When someone’s immune system is weakened, the chances of becoming sick are greater. Hence, HIV and poverty are important risk factors for development of active TB disease. In fact, the chances of an HIV infected person developing...
TB is 10% per annum. Malnutrition and alcohol abuse also increase the risk of active TB infection.

**National level**

- TB is endemic in Guinea and while Guinea is not one of the 22 high burden TB countries the incidence of the disease is increasing. The WHO defines a rate of >200 cases/100,000 population as a serious epidemic and in the year 2000 the prevalence and incidence of TB was estimated at 304 and 200 per 100,000 population, respectively. In 2010 this has increased to 525 and 334 per 100,000 population, respectively [37]. The incidence rate has doubled since 1995.

- In 2010, 51% of TB patients in Guinea had a known HIV+ status [37].

- Case detection rates and treatment success rates are considered to be key TB indicators and were reported to be 33% and 79% respectively, in 2009 [37]. In contrast, the WHO recommends that these rates be at 70% and 85% respectively to slow an epidemic.

- There has been a consistent increase of 0.6% per year in the number of patients reported with multi-drug-resistance (MDR) over the past few years [37].

- A national strategic TB plan was launched in 2008 for an initial phase (2008-2012) [38].

- The directly observed treatment strategy (DOTS), as recommended by the WHO, has numerous challenges in the country. There are regional variances in the success of the programme but the major initial challenge is case detection.

**Rail corridor**

- In all the prefectures along the rail corridor, sputum of suspected TB cases is supposed to be sent to the national leprosy, TB and onchocerciasis (LTO) programme for laboratory testing. However, many health centres and health posts do not have facilities to collect and ship samples for analysis so require the patient to travel to the prefectural capital city which is costly and thus a hindrance for many suspected cases.

- When a case is confirmed treatment is sent to the health centre/post that referred the patient. The patient will collect treatment every two weeks in the intensive phase (2 months) and monthly for the continuation phase. In reality there is no DOTS in place in the region of the Project.

- As the results of the TB testing are not reported in a systematic way back to the health statistics at prefectural level, no precise information on the TB incidence could be obtained at a regional level.
• Overall, the lack of a well organized TB diagnosis and treatment system in the project area is concerning. TB is likely to be under-reported in the region and access to treatment for confirmed cases, especially for the people living in remote rural villages, is difficult. In addition to this, intake of TB drugs without supervision holds the danger for development of multi-drug resistance or of treatment failures.

• TB statistics could be obtained from the DPS Kissidougou, which reported 67 new TB cases out of 526 suspected cases (12.7%) for the first term 2011. In 44 of these TB cases (65.7%) symptoms resolved, though only 16 (23.9%) completed the full course of treatment, which is alarmingly little. Two (3%) of the 67 cases died, four (6%) relapsed and three (4%) were referred [39].

• **Case detection rates** and **treatment success** rates are considered to be key TB indicators and were reported to be 33% and 79% respectively, in 2009 [37]. In contrast, the WHO recommends that these rates be at 70% and 85% respectively to slow down an epidemic.

### 6.4.1.2 Acute Respiratory Infections

Acute respiratory infections (ARI) (e.g. pneumonia) are an abnormal inflammation of the lung and have a variety of causes including bacteria, viruses, fungi or parasites. The most serious cases are bacterial (e.g. *Streptococcus pneumonia, Haemophilus influenza, Staphylococcus aureus*). ARI are the most common cause of death in children and kills about 3 million children every year in the developing world. Children under the age of 5 years, and especially those under 2 years, constitute the greatest risk group. Other risk groups include the elderly, people exposed to tobacco smoke and other indoor air pollution, immune-compromised individuals and malnourished children [40].

**National level**

• In Guinea, ARI were responsible for 17% of deaths among children under 5 years of age in 2008 [41].

**Rail corridor**

• In 2009, ARI were the second leading cause of morbidity in the prefectures along the rail corridor at 19.74% (n=174,929; range: 14.63% (Macenta)-24.25% (Dabola)) [36].

• When asked for the three major health concerns in the FGDs in local communities, ARI were mentioned frequently.
6.4.1.3 Measles

Measles is a highly contagious, serious disease caused by a paramyxovirus. Transmission follows inhalation of airborne respiratory droplets from an infected person coughing or sneezing. Infection confers lifelong immunity. In 2008, there were 164,000 measles deaths globally and thus this illness still contributes approximately 1% of global childhood mortality [42]. Unvaccinated children, living in overcrowded conditions and those visiting or admitted to health facilities are at increased risk of measles. Among populations with high levels of malnutrition and a lack of adequate health care, up to 10% of measles cases result in death. Most of the deaths occur in developing countries where coverage of the safe and cost-effective measles vaccine is low.

The fourth Millennium Development Goal (MDG 4) aims to reduce the under-five mortality rate by 75% between 1990 and 2015 [43]. Considering the potential for measles vaccination to reduce child mortality, and given that measles vaccination coverage can be considered a marker of access to child health services, routine measles vaccination coverage has been selected as an indicator of progress towards achieving MDG 4.

National level

- For the year 2009, the WHO estimated the immunization coverage with measles vaccine between 50-79% in Guinea (see Figure 12). According to WHO-UNICEF estimates, it was at 51% in 2009.
- 3% of children under 5 years died from measles in Guinea in 2008 [42].

![Figure 12: Immunization coverage with measles containing vaccines in 2008](image-url)
Rail corridor

- Measles vaccination coverage ranged between 30.6% in Mamou to 70.2% in Macenta in 2007/08 [44]. Not surprisingly, 1,211 measles cases were reported for the 11 prefectures along the rail corridor, which accounts for 0.2% of total morbidity [36]. Deaths were not reported, but mortality from measles in the developing country setting is estimated at 2-15% (i.e. an estimated 24-182 deaths out of the 1,211 reported cases).

6.4.1.4 Meningitis

Meningitis is an infection of the thin lining around the brain and spinal cord. Even when meningitis is diagnosed early and adequate therapy is available, between 5-10% of patients die, typically within 24 to 48 hours of experiencing the first symptoms. Many thousands of survivors are left with brain damage, hearing loss or learning disabilities. The transmission is through direct contact with respiratory droplets. Infections caused by *Haemophilus influenzae type b* (Hib), *Streptococcus pneumoniae* and *Neisseria meningitidis* are responsible for high morbidity and mortality among children in sub-Saharan Africa. Hib causes an estimated 100,000 to 160,000 child deaths each year in the WHO African Region. *S. pneumoniae* causes 250,000 to 400,000 child deaths per year [35].

![Figure 13: African 'Meningitis Belt'](image)

National level

- The highest burden of meningococcal disease (*Neisseria meningitides*) occurs in a region in sub-Saharan Africa, which is known as the 'Meningitis Belt', an area that stretches from Senegal and Guinea in the west to Ethiopia in the east, affecting an estimated total population of 300 million people (see Figure 13) [45, 46].
- In 2010, 148 cases of meningococcal disease were registered in Guinea, of which 14 died [47].
Rail corridor

- 182 meningitis cases (causing agent not specified) were reported for the 11 prefectures along the rail corridor in 2009, 108 of which (59.3%) occurred in Macenta prefecture [36].

6.4.1.5 Leprosy

Leprosy is caused by the slow-growing bacillus *Mycobacterium leprae*. It is transmitted via droplets from the nose and mouth of untreated patients with severe disease, but it is not highly infectious. If left untreated, the disease can cause nerve damage, leading to muscle weakness, atrophy and permanent disabilities [48, 49]. Leprosy is a disease of poverty and overcrowding. The WHO is targeting leprosy elimination and defined a goal of registered prevalence rate of less than 1 case of leprosy per 10,000 population [50]. In 2003, the United Republic of Tanzania, Brazil, India, Madagascar, Mozambique and Nepal accounted for 83% of the leprosy cases in the world.

National level

- Leprosy is decreasing in Guinea and during 2006 the goal of less than one new leprosy case per 10,000 inhabitants per year was achieved [49].
- Nevertheless, in 2009 there were still 636 new leprosy cases registered in Guinea (Figure 14) [49].

![Figure 14: Leprosy incidence trend 2004-2008 in Guinea](image)

Rail corridor

- 147 cases of leprosy were reported for the 11 prefectures along the rail corridor in 2009, 95 of which (64.6%) occurred in Kankan prefecture [36]. Diagnostic services for leprosy are available at the reference hospitals with the national LTO programme. However, this programme relies on recognition and referral from health centres/posts and thus many leprosy cases may go unrecognised.
6.4.2 EHA #2 – Vector-related Disease

6.4.2.1 Malaria

Malaria, a protozoan infection transmitted by anopheline mosquitoes, is the most important parasitic disease in humans. Malaria is one of the most serious public-health issues in many parts of the developing world, but especially so in sub-Saharan Africa. As many as 3 billion people in endemic areas are at risk of malaria and ~ 500 million clinical cases occur annually with between 1 and 3 million deaths [51]. A summary of the global malaria incidence in 2008 is shown in Figure 15 [52].

![Figure 15: Global malaria prevalence map for 2008](image)

Malaria claims an enormous toll in lives, in medical costs and in days of schooling or labour lost [53]. Malaria-endemic countries are not only poorer than non-malarious countries, but the highly malaria-endemic countries also have significantly lower rates of economic growth [54].

Control activities, such as artemisinin-based combination therapy (ACT), working with partners (NGOs and international and national actors) to strengthen case management, surveillance, prevention (e.g. insecticide treated nets (ITNs)) and health promotion (training and health education), will all contribute towards the achievement of the MDG4 (reduce child mortality), Millennium Development Goal 5 (improve maternal health) and Millennium Development Goal 6 (combat malaria, HIV/AIDS and other diseases) [55].

National level

- Malaria is the biggest public health challenge in Guinea. Health statistics for the year 2002 indicated a national malaria prevalence of 18% for the entire population and 21%
in pregnant women [23]. This is based on a national average and modelling based on surveys and trends. While there will be areas, for example in Guinée Forestière where the prevalence may exceed 60%, it is probably between 2 and 5% in Conakry, where the bulk of the population resides.

- According to WHO/UNICEF estimates, 24% of deaths of children under 5 years were due to malaria in 2008 [56].
- 164 per 100,000 adults died from malaria in 2006 [56].

**Rail corridor**

- With a third of consultations (32.42%; n=283,202) at the health facilities in the prefectures along the rail corridor due to malaria (range: 23.98% (Macenta)-43.23% (Mamou)), the disease is clearly one of the biggest health concerns in local communities [36]. However, usually only the reference hospitals and major health centres have microscopes for accurate malaria diagnostic and rapid diagnostic tests (RDTs) are often unavailable. Thus, these figures need to be challenged, as most of the reported cases of malaria would be notified based on a syndrome of clinical symptoms.

- An accurate estimate of malaria prevalence in children aged 6-59 months was produced in the BHS that were carried out in the Project mining area (Beyla and Macenta prefectures; 13 communities sampled; May 2010) and the port development area (Forécariah prefecture; 8 communities sampled; October 2011) [57, 58]. Some key findings of these surveys are presented in Table 9.

<table>
<thead>
<tr>
<th></th>
<th>Malaria prevalence in children aged 6-59 months</th>
<th>Children under the age of 5 years that slept under an ITN</th>
<th>Percentage of adults (aged &gt;15 years) that had consistent knowledge on malaria transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beyla and Macenta</td>
<td>65.9% (n=536; range: 48.2-85.9%)</td>
<td>50.3% (n=529; range: 22.1-86.6%)</td>
<td>5.9% (n=444; range: 2.6-15.0%)</td>
</tr>
<tr>
<td>prefectures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forécariah prefecture</td>
<td>32.7% (n=376; range: 12.2-67.4%)</td>
<td>50.1% (n=372; range: 11.1-66.1%)</td>
<td>9.1% (n=373; range: 4.0-19.0%)</td>
</tr>
</tbody>
</table>

- It was found that the national average for children’s use of mosquito nets increased from 12% in 2005 to 16.9% in 2007/08, [23, 44]. Of note, only 4.3% of these nets were actually ITNs and thus complied with international standards. Regional estimates for 2005 are presented in Figure 16. However, national and regional ITN distribution programmes could significantly increase ITN coverage in Guinea, which was confirmed by the BHS carried out in the mining and port development area (see Table 9) [57, 58].
• Despite national ITN and community sensitization efforts, knowledge and awareness of malaria transmission and prevention methods is generally still poor. This was not only a finding of the BHS in Beyla, Macenta and Forécariah prefectures but also confirmed in the FGDs that were carried out in local communities along the rail corridor. For example, few women mentioned nets as malaria prevention measure although the majority acknowledged owning an ITN. Also misconceptions on malaria transmission, such as ‘cold temperatures’, ‘humidity’ and ‘maternal milk’ as possible causes, were very common and only a minority of the women reported mosquito bites in this regard.

6.4.2.2 Arboviruses
The most important Arboviral (arthropod borne viruses) diseases that may occur in the Project area are dengue fever and yellow fever. These viruses are transmitted through the day-biting *Aedes* mosquitoes – domestic mosquitoes that breed in man-made containers [59].
Dengue fever had a dramatic increase in global distribution in the past 30 years with more than 2.5 billion people at risk of epidemic transmission [60]. Dengue fever is widely distributed in the tropics and Guinea is also at risk of dengue transmission as depicted in Figure 17 [46].

**National level**
- There have been reported outbreaks of dengue fever in Senegal, Cameroon and Ivory Coast recently but no reported cases in Guinea. However, Guinea is clearly at risk for dengue transmission [61, 62].
- In August 2009, Guinea experienced an epidemic of yellow fever, particularly in the region of Faranah (centre of the country), where investigations have revealed 21 suspected cases including three deaths. Samples were analysed in the laboratories of hemorrhagic fevers in Conakry and the Institute Pasteur in Dakar, Senegal. These were the first new reported cases of yellow fever since the last detected case in N’Zérékoré prefecture in August 2008 [63]. On 4 January 2010, the MHPH in Guinea reported a case of yellow fever to the WHO [64]. The case occurred in the prefecture of Mandiana in the Kankan region in the east of the country, near the border with Côte d'Ivoire. Thus yellow fever along the rail corridor is unlikely to be a major concern.

### 6.4.2.3 Human African Trypanosomiasis

Human African Trypanosomiasis (HAT) is a protozoan disease (commonly referred to as sleeping sickness) caused by *Trypanosoma brucei* spp. which enters the blood-stream via the bite of blood-feeding tsetse flies (*Glossina spp.*). The parasite that occurs in Guinea is *T. b. gambiense* which is endemic in Western Africa and is the less aggressive variant. This variant is frequently associated with foci of infection and is associated with particular sites within villages that are usually located near riverine vegetation, river crossings, water collection points, washing sites and sacred forests. After an asymptomatic period of months to years, the early stage of HAT is characterized by irregular fevers with fatigue, muscle and joint pain, and headaches. The invasion of the central nervous system by the trypanosome results in changes in personality, apathy and forgetfulness. Patients ultimately die of starvation, bacterial super-infections and/or convulsions.

**National level**
- In 2008, less than 100 cases of HAT (*T. b. gambiense*) were reported for Guinea [65, 66]. Guinea is one of only two countries in the horn of West Africa reporting cases.
• Figure 18 highlights the West African distribution of HAT. Based on this modelling and active case detection surveys it would appear that the disease is endemic in Maritime Guinea, Labé and N’Zérékoré region [67].

![Figure 18: Foci for HAT transmission in West Africa](image)

**Rail corridor**

• According to the prefectural health facility statistics, cases of HAT were reported for Kindia (n=22), Kissidougou (n=12), Kérouané (n=7) and Mamou (n=4) prefectures in 2009. Of note, it is not known how these cases were diagnosed [36].

• Research activities and active case detection campaigns have been carried out in Forécariah and Boffé prefectures. The campaigns had the aim of providing treatment to patients infected with *T. b. gambiense* and eliminating the disease from these areas in the long term [68]. The HAT prevalence within the studied population was found to be 0.5% and 0.6% for Forécariah and Boffé prefectures, respectively [68].

6.4.2.4 *Filariasis*

The filarial diseases result from infections with vector borne tissue dwelling nematodes called *filariae*. Lymphatic filariasis is endemic in Guinea but due to community directed Ivermectin® mass-treatment that is provided every six months as part of the national vaccination programme, transmission is low. Dracunculiasis (Guinea worm), a disease that is contracted when a person drinks stagnant water or walks unprotected in waterways contaminated with fresh-water arthropods, is no longer endemic in Guinea [69]. Also *Loa Loa* and *Mansonella perstans* do not occur in Guinea. In 2002 onchocerciasis was officially eradicated in Guinea as a result of the intensive effort of the WHO's Onchocerciasis Control Programme [70, 71]. In summary, the most important filarial diseases are well controlled in Guinea and thus do not represent a major concern from a project's point of view.
6.4.3 EHA #3 – Soil-, Water- and Waste-related Diseases

The prevalence of soil-, water- and waste-related diseases depend highly on sanitation facilities and access to safe drinking water, factors which often indicate high variations at continental (see Figure 19) and regional level [72].

![Figure 19: Improved drinking water sources/sanitation facilities, Africa, 2006](image)

In Guinea in 2008, 71% of the population was reported to use improved drinking water sources with more people benefiting from an improved source in urban areas (89%) than rural areas (61%) [56]. Only 19% of the population used improved sanitation facilities, again more in urban areas (34%) than in rural areas (11%) [56]. The ENENSE survey 2007/08 assessed drinking water sources used and sanitation facilities at household level. A summary of the findings for the four administrative regions that will be affected by the Project as well as for urban and rural living environments is provided in Table 10 [24].

<table>
<thead>
<tr>
<th>Administrative-Region</th>
<th>Drinking water sources</th>
<th>Sanitation facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Protected well (%)</td>
<td>Unprotected well (%)</td>
</tr>
<tr>
<td>Faranah</td>
<td>70.8</td>
<td>12.0</td>
</tr>
<tr>
<td>Kankan</td>
<td>9.7</td>
<td>45.9</td>
</tr>
<tr>
<td>Kindia</td>
<td>33.7</td>
<td>17.4</td>
</tr>
<tr>
<td>Mamou</td>
<td>51.4</td>
<td>5.8</td>
</tr>
<tr>
<td>N’Zérékoré</td>
<td>59.7</td>
<td>14.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Living environment</th>
<th>Drinking water sources</th>
<th>Sanitation facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Protected well (%)</td>
<td>Unprotected well (%)</td>
</tr>
<tr>
<td>Urban</td>
<td>21.3</td>
<td>10.7</td>
</tr>
<tr>
<td>Rural</td>
<td>58.6</td>
<td>16.0</td>
</tr>
</tbody>
</table>
These results emphasize again that drinking water infrastructure and sanitary conditions are generally poor in rural settings when compared to urban environments, which is of particular importance as the railway will mostly affect rural settlements. This was confirmed in the FGDs held in rural villages along the rail corridor, where approximately half of the women reported that they get their drinking water from the river/creek and a minority stated to have their own latrine.

6.4.3.1 Diarrhoeal Diseases

Infective diarrhoea is the 3rd highest cause of death due to infection in the world. Global deaths from diarrhoea in children aged under 5 years were estimated at 1.87 million, approximately 19% of total child deaths [73]. Ninety percent of the ~4 billion annual global episodes of diarrhoea can be attributed to three major environmental causes; poor sanitation, poor hygiene, and contaminated water and food [74].

Diarrhoea is usually a symptom of gastrointestinal infection and can be caused by a variety of bacterial, viral and parasitic organisms. Diarrhoea control and prevention takes place at different levels: vaccination against rotavirus and measles, early and exclusive breastfeeding for at least the first 6 months (preferably 2 years), vitamin A supplementation, hand washing with soap, improved water quality and sanitation.

National level
- In the 2008 ENENSE, 19.2% of children had symptoms of diarrhoea in the two weeks preceding the survey. This proportion was highest in Kindia region, where a quarter (24.5%) of children showed symptoms [24].
- Cholera is caused by the bacteria Vibrio cholerae and is the main cause of dehydrating diarrhoea in adults. Over the past years half a dozen cholera epidemics occurred in Guinea and thus future outbreaks are likely [29, 36, 41].

Rail corridor
- Non-bloody diarrhoea was ranked as the 5th most common cause of morbidity at 6.81% (n=62,888) in the 11 prefectures affected by the Project and was highest in Macenta prefecture at 9.99% [36]. Again, it is likely that these figures are considerably higher in rural areas when compared to urban settings. Furthermore, diarrhoea cases are likely to be considerably underreported as health facilities will not always be consulted for this condition.
Also bloody diarrhoea, with *Shigella*, *Campylobacter*, *Salmonella* spp. and intestinal parasites as the most common causing agents, were also frequently reported in the prefectural health statistics with 0.81% of total morbidity (n=8,233) [36].

A cholera outbreak occurred in Faranah in 2009 with 259 cases [36].

### 6.4.3.2 Soil Transmitted Helminthiasis

Soil Transmitted Helminthiasis (STH) or intestinal worm infection is the most common parasitic infection worldwide, affecting the most deprived communities. The common helminths are roundworm (*Ascaris lumbricoides*), whipworm (*Trichuris trichiura*) and hookworm (*Necator americanus*). Estimates suggest that *A. lumbricoides* infects 1.2 billion people globally and *T. trichiura* and hookworms amount to ~700–800 million infections each [75]. *Giardia intestinalis* is the most common human protozoan intestinal pathogen, having a worldwide distribution, with infection being highest in infants and children.

Infection is caused by ingestion of eggs from contaminated soil (*A. lumbricoides* and *T. trichiura*, *Giardia*) or by active penetration of the skin by larvae in the soil (hookworms). STH produce a wide range of symptoms including intestinal manifestations (diarrhoea, abdominal pain), general malaise and weakness, which may affect working and learning capacities and impair physical growth. Hookworms cause chronic intestinal blood loss which results in anaemia.

![Figure 20: Predicted prevalence of STH in Africa (2006)](image)

**National level**

- As outlined by the modelled STH prevalence in Africa for 2006 in Figure 20, STH infections are prevalent in Guinea [76]. This was based on comparisons between
observed prevalence of infection among school-aged children, satellite data and altitude obtained from the Global Land Information System [75].

Rail corridor

- In 2009 helminthiases were the third leading cause of morbidity in the health statistics of the 11 prefectures affected by the Project, with a proportion of 9.84% (n=174,929) of total morbidity (n=893,945). There was considerable variation between the different prefectures as shown in Table 8. However, STH are mostly diagnosed on a purely syndromic approach and are thus likely to be over-diagnosed, particularly at the rural health posts where most cases are reported.
- Mebendazole, the recommended antihelmintic drug in Guinea, was available at most of the health facilities that were visited. Mebendazole is also given to young children as part of the national vaccination programme, but the high incidence rate of helminthiases at the local health facilities underscores the fact that these programmes have limited functionality outside of the larger regional centres.

6.4.3.3 Schistosomiasis

Schistosomiasis, also known as Bilharzia, is a disease caused by parasitic trematode schistosome worms. Worldwide, an estimated 779 million people are at risk of schistosomiasis [77]. Estimates indicate that more than 200,000 deaths result from schistosomiasis each year. According to previous estimates, the disease causes the annual loss of between 1.7 and 4.5 million DALYs [78].

WHO estimated that 3.2 million people, in sub Saharan Africa, were infected with schistosomiasis in 2008 and an estimated 9.7 million people live in endemic areas and require preventive chemotherapy [78]. The presence of the disease is a good indicator of the level of sanitation in the area as the disease is acquired through exposure to water bodies that have been polluted by urine or faeces.

National level
- According to WHO estimates, 2.6 million people were infected with schistosomiasis in Guinea in 2010, and thus they concluded that the entire population is in need of preventive chemotherapy in order to interrupt the transmission cycle [79].

Rail corridor
- A total of 6,864 cases of Schistosomiasis were reported in the 11 prefectures affected by the rail corridor for the year 2009, most of which (n=3,476) were identified in Kissidougou.
prefecture [36]. Intestinal schistosomiasis (caused by *S. mansoni*) was most common and showed considerable variation among the different prefectures (see Table 8). However, as for helminthiases, the diagnosis of schistosomiasis in the rural health facilities relies on presumptive techniques (i.e. purely symptomatic). While this may be acceptable for urinary schistosomiasis with the presenting sign of bloody urine, it is a challenge for intestinal schistosomiasis, as symptoms are often non-specific. Thus, the real burden of schistosomiasis is unknown in the regions affected by the Project.

### 6.4.3.4 Buruli Ulcer

This is a chronic disease that presents with a nodule that progresses to a painless skin ulcer. The infectious agent is *Mycobacterium ulcerans* which is a slow growing mycobacterium. The disease can progress and be extremely disfiguring and can lead to bone and joint complications, and even skin cancer. Most lesions are located on extremities and occur in children. People living near wetlands in rural tropical environments are especially at risk. Transmission is usually through a small area of trauma.

**National level**

- The disease is reported to be endemic in Guinea but there are limited diagnostic facilities to clearly define the true burden of disease. A national programme to fight Buruli Ulcer (BU) was launched in 2001 [80]. In a 2006 WHO report 205 cases of BU were reported in 2005 and most of these originated from the Guinée Forestière (e.g. 35 cases in Macenta prefecture [81]). The disease is challenging to recognise and formally diagnose.
6.4.4 EHA #4 – Sexually-transmitted Infections, including HIV/AIDS

Mining and related developments in developing countries have a well described legacy of increasing transmission of these diseases as a consequence of various social and economic impacts.

6.4.4.1 HIV/AIDS

There are an estimated 33 million people living with HIV globally, with sub-Saharan Africa accounting for 67%. [82]. In 2007, the southern African region accounted for almost a third (32%) of all new HIV infections and AIDS-related deaths globally. The 2005 national adult HIV prevalence exceeded 15% in eight countries (Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe) (Figure 21) [82]. Southern Africa has experienced a strong increase in prevalence rates over the past 2 decades.

![Figure 21: Development of HIV adult prevalence from 1990 to 2007](image)

**National level**

- In the 2005 GDHS 6,836 men and women were tested for HIV. Results from the survey indicated that 1.5% of Guineans aged 15-49 (reproductive years) were HIV-positive positive (Figure 22). HIV prevalence was highest in Conakry (2.1%), Labé (1.8%) and Nzérékoré (1.7%) [83].
- In 2007, HIV/AIDS prevalence in Guinea was estimated at 1.7% by WHO [41]. Vulnerable groups such as truck drivers, professional sex works, fishermen, soldiers and miners have a higher prevalence (9%) [84] in four natural regions in Guinea. Professional sex workers remain particularly vulnerable to HIV, even though exposure to HIV counselling has improved [85]. Illiteracy in especially women is another challenge.
- In the United Nations General Assembly Special Session (UNGASS) Country Progress Report 2008 for Guinea, the HIV prevalence amongst high risk groups was compared for the years 2001 and 2007. A decrease was observed in commercial sex workers (from...
42% to 34.4%), truck drivers (from 7.3% to 5.5%) and men in uniform (from 6.6% to 6.5%). A slight increase was found for miners; from 4.7% in 2001 to 5.2% in 2007 [86].

- In 2009 a German consultancy company carried out an HIV situation analysis in the Boké corridor, where a railway links the mining area of the ‘Compagnie des Bauxites de Guinée’ (CBG) with the refinery and port facilities in Kamsar. They targeted specific at-risk groups, including commercial sex workers (CSW), truck drivers (TD) and a sub-sample of the general population living in rural villages. The average HIV prevalence for the 100 CSW that were tested was at 33%. TD (n=125) were found to have an average prevalence of 6%. The average HIV prevalence rates found in 20 rural villages was 6% (n=795), ranging from 1-11%. In summary, the prevalence rates that were found for CSW and TD correspond roughly to the national figures found in the UNGASS report of 2008. However, the prevalence rates in the general population are clearly above national and regional averages found in previous studies. This is alarming and should be well considered for the rail development aspect of the Project [86, 87].

Figure 22: HIV prevalence by region in Guinea

Rail corridor
- Besides the data from the GDHS 2005, little is known on HIV/AIDS prevalence in the communities along the rail corridor. HIV rapid diagnostic tests are only available at the prefectural hospitals and some health centres. The number and outcome of those people that took an HIV test in 2009 in the 11 prefectures along the rail corridor is shown in Table 11. Of note, this does not represent local HIV prevalence’s as people who suspect they are HIV positive are more likely to consult a testing centre. Furthermore, accessibility to HIV testing services is low, particularly in rural areas, and thus the given
statistic does not represent rural communities. The great variation in the number of people that have taken an HIV test in the different prefectures (range: 0-1,038) clearly shows that voluntary counselling and testing services (VCT) are not equally integrated in the public health programmes among the different regions.

Table 11: HIV prevalence in people that took a voluntary HIV test in 2009

<table>
<thead>
<tr>
<th></th>
<th>Beyla</th>
<th>Dabola</th>
<th>Faranah</th>
<th>Forécariah</th>
<th>Kankan</th>
<th>Kérouané</th>
<th>Kindia</th>
<th>Kissidougou</th>
<th>Kouroussa</th>
<th>Macenta</th>
<th>Mamou</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of people</td>
<td>0</td>
<td>102</td>
<td>383</td>
<td>0</td>
<td>82</td>
<td>1038</td>
<td>0</td>
<td>933</td>
<td>10</td>
<td>918</td>
<td>203</td>
</tr>
<tr>
<td>that took a voluntary HIV test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of people</td>
<td>0</td>
<td>3</td>
<td>32</td>
<td>7</td>
<td>7</td>
<td>27</td>
<td>0</td>
<td>26</td>
<td>0</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td>tested positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of people</td>
<td>0.0%</td>
<td>2.9%</td>
<td>8.4%</td>
<td>0.0%</td>
<td>8.5%</td>
<td>2.6%</td>
<td>0.0%</td>
<td>2.8%</td>
<td>0.0%</td>
<td>2.5%</td>
<td>7.4%</td>
</tr>
<tr>
<td>that tested positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

- Anti-retroviral therapy (ART) is provided through the national programme. For patients coming from rural areas, the ART is sent to the health centre at sub-prefectural level where the patient is supposed to collect the treatment on a regular basis. However, the number of people that receive ART is low, particularly in rural communities. This is related to the fact that availability, and thus accessibility, of voluntary testing and counselling services is generally poor and also ruptures in drug supplies are common.
- Knowledge related to HIV/AIDS transmission was moderate in the villages that were visited as part of the field mission. While many women stated sexual intercourse and prostitution as causes for HIV/AIDS transmission, only few reported the use of objects contaminated with blood as another option. Also misconceptions such as ‘share the same toilet’, ‘drink from the same cup’ and changing clothes were mentioned in the FGDs. Consequently, stigma towards people living with HIV/AIDS (PLWHA) was found to be high; e.g. not a single women participating in the FGDs confessed that she would buy fruit from a person with HIV.
- Availability and use of condoms was found to be literally non-existent in the rural villages visited during the field visit and most of the women in the FGDs have never seen a condom.
6.4.4.2 STIs

Sexually transmitted infections (STIs) such as gonorrhoea, syphilis or chlamydia are an important global health priority because of their devastating impact on women and infants and their inter-relationships with HIV/AIDS. STIs and HIV are linked by biological interactions and because both infections occur in the same population cohorts. Infection with certain STIs can increase the risk of HIV acquisition and transmission as well as alter the course of HIV disease progression. In addition, STIs can cause long term health problems, particularly in women and infants. Some of the health complications that arise from STIs include pelvic inflammatory disease, infertility, tubal or ectopic pregnancy, cervical cancer, and peri-natal or congenital infections in infants born to infected mothers. STIs are linked to high risk sexual behaviour which is usually defined as having sexual intercourse with any person other than a spouse or a regular partner.

National level

• In the 2005 GDHS, 32% of women and 8% of men declared having had either an STI or the symptoms of an STI during the past 12 months. Among them, 69% of women and 81% of men sought some sort of advice or treatment [23].

Rail corridor

• As the 4th most common cause of consultations at health facilities (8.08%; n=75,525; range: 3.46-13.65%), STIs are an important cause of morbidity in the prefectures along the rail corridor. Of note, these case reports are mostly based on syndromic diagnosis as only the prefectural hospitals and a few health centres have tests for STI diagnosis.

6.4.4.3 Hepatitis B

Hepatitis B virus (HBV) infection is the most common cause of acute and chronic liver disease in the world. Global figures estimate 600,000 deaths due to HBV in 2002, approximately 30% of the world’s population are infected with HBV and more than 350 million people are chronic carriers of the virus [88]. HBV vaccine coverage was estimated at 69%. 92% of countries integrate HBV in routine vaccination. Nevertheless, many poor countries still have a high risk for HBV infection.

HBV is predominantly transmitted through sexual contact, contaminated blood products, or trans-placentally from mother to child; in a similar manner to HIV. In fact, HBV is more infectious than HIV. The re-use of needles and other sharps including vaccination needles may be a significant route of transmission in developing countries. In rural areas traditional
birth attendants, who deliver children in the home, are at particular risk themselves and also present risk to the mother and child as they may not have access to protective equipment/gloves (or re-use).

National level

- WHO and UNICEF estimated immunization coverage among 1-year-olds for the third dose of Hepatitis B vaccine (HepB3) at 58% for 2008 [41, 56]. These figures are based on data provided by the MOHH. The ENENSES 2007/08 (i.e. population based survey) found an average HepB3 coverage of 16.6%, which is in stark contrast to the WHO estimates but is likely to be the more accurate figure [24].
- Generally no diagnostic tests are available for HBV at the health facilities in Guinea.
6.4.5 EHA #5 – Food- and Nutrition-related Issues

It is essential to consider the role that agricultural activities play in the communities as different communities may change their livelihood practices from more traditional subsistence farming to alternative sources. Moreover, the rail development will affect not only households, but also areas of natural fertile land resources that are important for the local communities [2]. This makes nutritional impacts on the communities very likely, though both negative and positive impacts need to be considered. In this regard, nutritional status can provide insights into the health of a community and is a valuable indicator to track general well-being. Having good baseline data related to food- and nutrition-related indicators is thus essential.

6.4.5.1 Malnutrition

Malnutrition is one of the greatest concerns in public health and the largest contributing factor to child mortality in less developed countries, where the majority of malnourished children are found. Socio-economic, climate, geography, agricultural and many other factors all contribute. Malnutrition develops due to a combination of anorexia, poor intake, mal-absorption and increased requirements. There is often interplay between malnutrition and ill health. Deficiencies (e.g. Zinc and Vitamin A) suppress host immunity, impair growth and development, and have a negative influence on pregnancy outcome. These conditions favour diseases such as persistent diarrhoea, intestinal parasites, measles, pneumonia, TB and HIV/AIDS, which in turn are important causes of malnutrition. Consequently, malnutrition is one of the important indicators for monitoring a given population’s health status and provides a reliable snapshot on the burden of disease within a community [89].

Undernourishment refers to a condition where dietary energy consumption is continuously below a minimum dietary energy requirement needed to maintain a healthy life and carry out light physical activity. Undernourishment can be measured both by anthropometric indices (underweight, stunting and wasting) and as micronutrient deficiencies in poor quality diets.

The importance of ensuring that mothers and their babies are well-nourished is widely recognized. A pregnant woman’s nutritional status influences the growth and development of her foetus and forms the foundation for the child’s later health [90].

A recent study estimated the impact of malnutrition on mortality and disease and found that maternal and child under-nutrition is the underlying cause of 3.5 million deaths, 35% of the
disease burden in children younger than 5 years and 11% of total global DALYs [91]. Deficiencies of vitamin A and zinc were estimated to be responsible for a combined 9% of global childhood DALYs.

![Figure 23: Worldwide map of undernourished population (2004-2006)](image)

**National level**

- The United Nations Food and Agriculture Organization (FAO) reported that 16% of the population in Guinea was undernourished in the period 2004-2006 as shown in Figure 23 [92].

- In the GDHS it was found that children’s nutritional status has not improved since the first survey in 1999. Stunting (being too short for age), which indicates chronic malnutrition, has actually increased from 26% in 1999, to 35% in 2005. The level of wasting (too thin for height), a sign of acute malnutrition, has remained static at 9% over the past 6 years. 25% of children were reported as underweight in 2005 [23]. Stunting, wasting, and underweight were most common in rural areas and among families of lower socio-economic status. The situation was found to be very similar in the ENENSE 2007/08 study [24].

- 68% of children under the age of five years received vitamin A supplements in 2005. The proportion of children who received the supplements varies according to place of residence with 82% percent in urban areas and 64% in rural areas. Nationally, 33% of women received vitamin A supplements for their child two months after birth [23].

- In Guinea, Ethiopia, and Malawi, HIV-positive women were found to be at a far higher risk of being underweight than their HIV-negative counterparts [93].
In the prefectural health statistics only few cases of malnutrition were reported for 2009 (n=3,623 for the 11 prefectures affected by the Project) [36]. However, the number of malnourished children is likely to be greatly underestimated as no nutritional programme is in place in the concerned prefectures and thus children are not routinely weighed and measured at the health facilities. In fact, only a few of the rural health posts visited during the field visit had a height beam and/or a scale available. Consequently, no data is available about the nutritional status of the project affected populations.

In only one FGD malnutrition was mentioned as a major health concern and about half of the communities reported that malnutrition is a problem when asked specifically. Poor yields, poor birth spacing and lack of food with proteins were stated as the main cause for malnutrition in the visited villages.

6.4.5.2 Anaemia

Anaemia is a severe health concern for several reasons. Firstly, in children, anaemia retards normal mental and physical development and therefore is a real handicap to language development and performance at school. Secondly, in women, anaemia increases fatigue and reduces resistance to infections. Consequently, anaemic mothers are more likely to die in childbirth or give birth to a child with low weight which itself increases the risk of infant mortality.

A reduction in the number of red blood cells and level of haemoglobin concentration characterize anaemia. Anaemia may be caused by malnutrition, in particular iron deficiency.
Parasitic infections are also important, with malaria the main contributor in this setting. Children in areas of stable transmission are more prone to chronic anaemia as a manifestation of complicated malaria, rather than cerebral malaria. Bleeding, congenital disorders and chronic diseases are also causative factors for anaemia.

While anaemia cannot be ascribed to any one condition in the project affected communities, the fact that it can be influenced by a number of variables makes it a valuable indicator to monitor the health of communities.

**National level**
- In 2004-2005, 77% of children under the age of 5 years were anaemic. 47% had moderate anaemia, 23% had mild anaemia, and 7% were severely anaemic. Anaemia levels were particularly high among children living in the poorest households (80%).
- More than half of the women (53%) were anaemic in 2005 (35% mild; 15% moderate; 3% severely) [23].
- Anaemia has been considered as a high risk factor for maternal mortality in Guinea [94]. According to Helen Keller International (HKI) anaemia contributes to an estimated 18% of maternal deaths and 23% of perinatal deaths; the survey results indicated that 70% of pregnant women and 75% of children under 5 years old are anaemic in Guinea [95].

**Rail corridor**
- Anaemia was the 6th leading cause for consultations (3.38% of total consultations) at the health facilities in the prefectures affected by the Project (n=99,433) [36]. This statistic is generally based on syndromic diagnosis as only the hospitals and some health centres have a haemoglobinometer.
- A more accurate estimate of anaemia prevalence in children aged 6-59 months in local communities was produced in the BHS in the mine and port area of the Project. Summary findings for Beyla, Macenta and Forécariah prefectures are presented in Table 12 [57, 58].

<table>
<thead>
<tr>
<th>Prefecture</th>
<th>Level of anaemia (%)</th>
<th>Total number of children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mild (10-10.9g/dl)</td>
<td>Moderate (7-9.9 g/dl)</td>
</tr>
<tr>
<td>Beyla and Macenta (year 2010; n=536)</td>
<td>21.9</td>
<td>48.3</td>
</tr>
<tr>
<td>Forécariah (year 2011; n=376)</td>
<td>14.1</td>
<td>60.1</td>
</tr>
</tbody>
</table>

Table 12: Proportion of children (6-59 months) with anaemia in the mine and port area
6.4.6 EHA #6 – Non-communicable Diseases

The high burden of non-communicable diseases (NCDs) in many of the sub-Saharan countries has focused the attention of policy makers and health care services. Lack of data in many countries is often mistaken as an absence of non-communicable disease and this has resulted in little attention being paid to NCDs. NCDs have not been included in surveillance programmes in many countries and there has been limited policy dialogue or decision making as a result.

Morbidity-mortality burden attributable to NCDs is on the increase. In 1990, morbidity from NCDs reached 41% of the overall disease burden worldwide, and will reach 60% in 2020. In sub-Saharan Africa it is predicted that NCD and injuries may cause up to 60% of morbidity and 65% of mortality by 2020. Poverty, urbanization and changes in lifestyle will all play a role in the increase of the NCD in Africa. This increasing burden of NCD threatens to overwhelm already over-stretched health services. The risk factors underlying the main chronic NCD are well documented and include: unhealthy diet, physical inactivity, alcohol consumption and smoking. Against this background, it is important to mention that the relative importance of NCDs compared to communicable diseases is likely to vary greatly between different socio-economic groups. The main stakeholders at risk are relatively wealthy or elderly and these currently form a small percentage of the community.

For Guinea it is estimated that NCDs account for 32% of all deaths, with cardiovascular diseases (CVD), cancers, respiratory diseases and diabetes as the major contributors as shown in Figure 25 [96].

![Figure 25: Proportional mortality due to NCD in Guinea (% of all death, all ages)](image-url)
6.4.6.1 Cardiovascular Disease

CVD accounted for 9% of deaths in the sub-Saharan African region in 2004 [97]. Hypertension (HT) is the most frequent and important risk factor for CVD which manifests as myocardial infarction, stroke, renal disease, heart failure, or peripheral vascular disease [98]. HT is an increasing problem in the tropics, particularly in urban areas, where lifestyles are becoming similar to those in developed countries. HT prevalence ranges from 25-35% in adults aged 25-64 years and it is estimated that 250,000 deaths could be avoided each year through the prevention and control of HT. Of note, exposure to modifiable risk factors accounts for at least 75% of all cardiovascular diseases [99].

National level

- According to WHO estimates, CVD account for 14% of total mortality in Guinea [96].
- Obesity as a risk factor for cardiovascular diseases was diagnosed in 3% of Guinean women in 2009 [41].
- A study conducted in Boké region in 2004 has shown a HT prevalence of 29% among the male and female population. Very few patients were aware of their conditions [100].

Rail corridor

- In 2009, HT accounted for 0.64% of consultations at the health facilities in the Project affected prefectures (see Table 8). However, adults are not systematically screened for HT and tensiometers were unavailable or non-functional at many of the health facilities visited during the field mission.
- The BHS that were carried out in the mining (2010) and port area (2011) found a HT prevalence (blood pressure >140 mm Hg) of 25.6% and 17.7%, respectively [57, 58].

6.4.6.2 Cancer

Approximately 60% of global cancer occurs in developing countries, which is about 10 million new cases per year [101]. The number is likely to double by 2020 with most of the increase occurring in developing countries. Geographical variation in the prevalence of some cancers is high. Lung cancer is the most common cancer worldwide, followed by stomach, liver, colon and rectum, oesophagus, and breast cancers. In Africa, it is estimated that infectious agents cause 40% of cancers in men and 29% of cancers in women. It must be noted that many cancers are avoidable. Effective preventive measures for liver (from Hepatitis B) and cervical cancers (from human papiloma virus), for example, are available through immunization and general prevention of sexually transmitted diseases. The estimated proportion of preventable
cancer is 40% and there are 9 leading modifiable risk factors, which are shown in Figure 26 [102].

National level

- According to WHO, the estimated proportional mortality for cancer in Guinea is 4.7% for men and 4.4% for women [103].

- In 2002 there were an estimated 5,500 new cases of cancer in Guinea [104]. The most frequent types of cancer and differences between men and women are shown in Figure 27. Interestingly, the most common cancers in men and women are associated with AIDS related complex diseases. Moreover, cervical cancer has a link to sexually transmitted disease.

Figure 26: Modifiable risk factors for cancer prevention

Figure 27: Distribution of cancer cases in Guinea (2002)
6.4.6.3 Chronic Respiratory Disease

The most common non-infectious respiratory diseases are asthma, chronic obstructive pulmonary disease (COPD), respiratory allergies and pulmonary hypertension. COPD caused more than 3 million deaths in 2005, mostly in low- and middle-income countries [105]. COPD is predicted to be the third most common cause of death in 2030. Risk factors include tobacco smoking, indoor air pollution, outdoor pollution (for example from burning domestic waste), allergens and occupational exposure (asbestos, silica, certain gasses). Prevalence of these risks is increasing throughout the region, as a result of urbanization, industrialisation, smoking and air pollution.

National level
- The prevalence of tobacco use in Guinean adolescents was reported at 31% for young men and 20% for young women (13-15 years) between 2000-2009 [41]. For adult males it has been estimated at 58.9% for males and 47.3% for females [106].

Rail corridor
- In most parts of Guinea there is a minimal supply of electricity to houses and people rely on biomass fuels such as wood and charcoal for cooking. This is a concern for the proposed Project, in particular where construction and maintenance camps will be established; use of wood and charcoal has significant environmental concerns and influx may play a role in increasing the pressures on biomass fuels. Thus, for health as well as environmental reasons alternative sources of fuel or improved combustion for heating and cooking needs to be evaluated.

6.4.6.4 Diabetes Mellitus

The prevalence of diabetes in the African region is estimated to vary between 1–5% and is increasing significantly due to changes in diet and lifestyle, directly associated with increasing trends in obesity, unhealthy diets and physical inactivity. The number of diabetes cases is expected to double by 2025, this increase being most marked in developing countries, and thus there is a pressing need for action to address this problem in sub-Saharan Africa [107]. The health consequences of ill-managed diabetes such as kidney failure, coronary heart disease, blindness, diabetic foot and coma add significantly to national health care budget requirements.

National level
- According to WHO estimates, diabetes account for 2% of total mortality in Guinea [96].
• In a recent study (2009) the adult diabetes prevalence rate for Guinea was estimated at 2.0% [108].

• The World Diabetes Foundations together with the Association Guinéenne d'Education et d'Aide aux Diabétiques (AGEAD) is working on improving access to and quality of diabetes care in Conakry and Labé, training health staff and supporting diabetes clinics [109].

Rail corridor

• In the prefectures along the rail corridor 9,378 patients were diagnosed for diabetes [36]. As only the prefectural hospitals and some health centres have diagnostic equipment for diabetes, this figure does not represent remote, rural communities, where diabetes often goes undetected.
6.4.7 EHA #7 – Accidents/Injuries

The rates of road traffic death vary considerably between regions and between countries within regions as shown in Figure 28 [110]. In general, rates are higher in low-income countries than in high-income countries. Altogether, low-income and middle-income countries accounted for 90% of all road traffic deaths in 2002. While South-East Asia has the highest proportion of global road fatalities with one-third of the 1.4 million occurring each year in the world, the road traffic injury mortality rate is highest in Africa at 28.3 per 100,000 population compared with 11.0 in Europe [111].

Road traffic injuries in developing countries mostly affect pedestrians, vehicle passengers, and cyclists. The age groups most affected are the productive age group (15-44 years) and children [112].

![Figure 28: Road traffic injuries mortality rate (per 100,000 population) (2002)](image)

As in other developing countries, gender based domestic violence (GBDV) is a health concern and public health issue in Guinea [113]. Violence against women is tolerated culturally and is usually carried out with the greatest discretion. It is more widespread in the rural areas compared to urban areas. The police do not generally intervene in cases of GBDV unless serious blows and injuries have been inflicted. There are generally no shelters for women who are victims of GBDV in these settings. Cases of GBDV are usually settled within the extended family. Guinea has ratified the Convention on the Elimination of all forms of Discrimination Against Women (CEDAW) but has not yet ratified its optional protocol. Furthermore, although the Protocol to the African Charter on Human and Peoples’ Rights on the Rights of Women in Africa (Maputo Protocol) was signed in 2003 and has been ratified...
by the National Assembly, the formal ratification instruments have never been deposited with the African Union and remain with the Ministry of Foreign Affairs [114].

National level

- In 2004, 8% of the total DALYs in Guinea were due to accidents and injuries [35]. Three quarters (75.6%) of injuries were unintentional (i.e. any injury caused by accidental means) and the remaining quarter were intentional injuries (24.4%) (i.e. resulting from purposeful human action, whether directed at oneself or others).
- Road traffic accidents (RTA) accounted for 91 DALYs (29% of all DALYs of this group) [35].
- Violence accounted for 57 DALYs in Guinea (18.1% of all DALYs in the injuries category) [35].
- In the 2005 GDHS it was found that 85.6% of women agreed that a man would be permitted to hit or beat her for a specific reason (such as burned food, refusing sexual intercourse, neglecting the children or others) [23].

Rail corridor

- With 3.13% of the total morbidity in 2009, trauma related injuries and accidents ranked seventh among the most important causes for morbidity in the statistics of the 11 prefectures affected by the Project [36].
- In all the FGDs GBDV was reported to be common, in both the rural and more urban communities. It appeared that there is a lot of stigma associated with this practice and it is often taken as a common occurrence.
- Due to the very limited traffic load in the rural communities along the rail corridor, work related accidents were reported to be by far more important than traffic accidents. With the development of the Project this situation is likely to change and thus potential traffic accidents is an important health concern along the major transport routes during construction phase and along the railway per se once it is operational.
6.4.8 EHA #8 – Veterinary Medicine and Zoonotic Diseases

Zoonotic diseases are diseases caused by infectious agents that can be transmitted between animals and humans. Many factors lead to the emergence of zoonotic diseases. Environmental changes, human and animal demography, pathogen changes and changes in farming practice are examples. Social and cultural factors such as food habits and religious beliefs also play a role, for example in avian influenza and Lassa fever. Some zoonoses such as brucellosis and dog rabies are re-emerging in certain regions, although they seem to attract less public awareness. Emerging zoonotic diseases have potentially serious human health and economic impacts and their current upwards trends are likely to continue.

6.4.8.1 Rabies

Rabies is a viral infection which causes around 55,000 deaths per year (95% of deaths in Asia and Africa), a number which is very likely to be under-reported due to limited diagnostic ability [115]. Most deaths are caused by a bite from an infected dog. Pre- and post-exposure immunization can prevent rabies. Once symptoms appear, there is no effective treatment and rabies is always fatal. The most cost-effective measure for preventing rabies in humans is animal vaccination – mainly of dogs.

National level

- Guinea is regarded as high risk for rabies as per Figure 29 [115].

![Figure 29: Countries at risk from rabies (2008)](image)

Rail corridor

- No cases of rabies were reported in the statistics of the 11 prefectures affected by the Project in 2009 [36]. However, rabies is likely to occur due to limited public veterinary...
health services and cases of rabies are likely to go undetected by the regional health system.

6.4.8.2 Leptospirosis

Leptospirosis is a bacterial disease that affects both humans and animals. Rodents and other wild and domesticated species are most commonly affected. Rodents are most often implicated in human cases. Infection in man is contracted through skin abrasions and the mucosa of the nose, mouth and eyes. It occurs through direct contact with the urine of infected animals or by contact with a urine-contaminated environment.

The disease was not known at a local level but is likely to occur.

6.4.8.3 Lassa Fever

Lassa fever is a severe, often fatal, hemorrhagic fever that is caused by the Lassa virus (LV). Most infections are mild, although 20% of all those infected develop a serious illness that may lead to severe side effects such as bleeding, deafness and coma. 20% of those with severe effects may die from the disease. Rodents, particularly the *Mastomys natalensis* mouse is the enzootic host of the Lassa virus. Humans can become infected through contact with excretions from infected rodents. Contact occurs when a person touches, consumes, or inhales these excretions. Risks factors are associated also to collecting, handling and cutting dead rats and consumption of rat meat especially in rural areas [116, 117].

Lassa fever is known to be endemic in Guinea, but is rarely recognised [118]. The disease was not described at a local level, but recognition and diagnosis may be a challenge. In a study performed across 5 hospitals in Guinea in 2001 a surveillance system was established to evaluate the epidemiology of the disease. 7% of the suspected cases were confirmed with LV and 14% as having past exposure. The disease was reported to be more common in the Guinée Forestière region [119].

National level

- Figure 30 shows the mean predicted Lassa fever risk map with positive localities indicated by stars. The reservoir mouse is two to three times more infected in the rainy season than in the dry season [120].
Rail corridor

- The clearing of forest and bush land has the potential to change the pattern, and lead to an increase in the number of endemic rodents. At present it is not known whether the reservoir host, a rodent of the *Mastomys* species complex, is present along the rail corridor.
### 6.4.9 EHA #9 – Potentially Hazardous Materials, Noise and Malodours

These may also be listed as environmental health determinants and include items such as pollution of air, soil and water as well as possible exposure to pesticides or other organic or inorganic pollutants, noise and malodours. The pathway to human exposure to pollutants can be complex and can occur from a variety of sources such as ambient air, drinking water and nutrition.

Water, noise and air pollution are crucial environmental factors related to the Project development. The major potential environmental impacts linked to the Project that are related to human health include:

- **Construction work**, particularly of bridges, and later railway operation activities could potentially lead to changes in **water quality** due to increased amounts of total suspended solids in the water and potentially also spills from the mobile equipment. This has significant ecological risks but also for humans that rely on the water bodies for domestic water use. These will be discussed in more detail in the relevant sections in the SEIS.

- **Noise pollution** is recognised as a significant determinant in health due to disturbed sleep patterns and stress. Potential noise and vibration impacts relating to human receptors from the construction and operational phases of the railway are assessed in chapter 8 of the SEIS.

- There is also a potential risk that the Project will affect **air- and soil quality**, which may impact on health through (see chapter 9 of the SEIS):
  - inhalation of harmful substances such as particulate matter and combustion products;
  - loss of amenity caused by dust soiling; and
  - deposition of harmful substances resulting from combustion to land resulting in changes in soil chemistry.

These environmental health determinants will be addressed in more detail in the HIA with specific links to the respective chapters in the SEIS once available.
6.4.10 EHA #10 – Social Determinants of Health

6.4.10.1 Mental Health

Neuropsychiatric conditions are an often neglected public health problem, accounting for 12.7% of the global burden of disease [101]. In general, it is extremely challenging to understand the broader burden of disease caused by mental health and perceived well-being. Depression is the most common neuropsychiatric disease. Epilepsy, especially, is a health issue in developing countries, where it is estimated that 85% of the worldwide 50 million cases are found [121].

National level

- Reliable information on the prevalence of mental disorders in Guinea is scarce. According to the WHO Global Burden of Disease Statistics for Guinea, mental health related ailments contributed 5% of the DALY in 2004 [35].

Rail corridor

- It was challenging to understand the broader burden of disease caused by mental health and social stress factors during the field mission. However, these health issues are important for the Project as quality of life and well-being are powerful indicators as to the community’s perception of their health and the role that the Project has/will play in influencing it.

6.4.10.2 Health Seeking Behaviour

The manner in which people choose a health provider and at which stage of an illness they actually attend for consultation depends on a variety of factors. It is essential to understand these factors in order to gain an understanding of why and how entry is made into the health care system. Culture and spirituality influence health seeking behaviour. People may believe that western medicine may be effective in curing their ailment but their conviction is that mystical causes have also intervened; this obliges them to combine visits to the health care facilities with visits to traditional healers.

National level

- A recent study in Guinea has showed that 93% of health expenditure takes place outside the state sector. Mothers of 1,150 infants who were interviewed preferred spending money on private pharmacies, traditional healers, herbal brews and local drugs, rather than attending a public health facility [122].
Rail corridor

- A large majority of the women that participated at the FGDs along the rail corridor stated that they usually go directly to the local health facility in case of illness, especially if the disease is serious. The few that reported not doing so reported that distance, affordability and the lack of drugs and consumables at the health facilities are an issue.
- In most villages, acceptability of health care appeared to be high, which has a positive impact on health-seeking behaviour. This was confirmed by the health workers at the local health facilities.
- The proportion of women that attended antenatal care (ANC) and obtain delivery care at the local health facilities was high in the villages visited during the field mission.

6.4.10.3 Life Style

Substance misuse such as alcohol, tobacco or other drugs is not only an important health determinant but also closely linked to mental health [123]. Misuse is associated with crime, prostitution and GBDV.

National level

- Between 2000-2008 it was reported that 30% of young men and 20% of young women (aged 13-15 years) regularly consume tobacco [41].
- Alcohol consumption was reported at 0.2 litres of pure alcohol per person per year in 2005 [41].

Rail corridor

- Cigarette smoking is common in the communities along the railway, particularly in men. Alcohol consumption appeared to be far less common in the rural communities visited, which is mostly linked to religious rules.
- FGD revealed that prostitution is not an issue in the rural villages visited during the field mission, with the exception of Samadou (Kankan prefecture) and Simbaraya (Kindia prefecture). The latter is located along a major transport route to Sierra Leone.

6.4.10.4 Inequalities

General inequalities in the community may impart some distinct health impacts on communities and sections within communities.

As Guinea has ratified the CEDAW there are a number of laws aimed at protecting women but women are still discriminated and do not enjoy the same rights as men. Gender has been
found to have a strong correlation with poverty in rural Guinea [124]. In the project area, women cannot inherit land and have limited power and influence at village level decision making [125]. Raising children, taking care of the household and serving the husband are the women’s main tasks. Arranged marriages are common and marriage age is normally between 15 and 17 years old. Women tend to have their first child at age 16.

6.4.10.5 Education

Education is a key determinant to support and uplift the health status and well-being of an individual in a society and, indeed, communities. Many studies have shown that educational attainment has a strong effect on reproductive behaviour, contraceptive use, fertility, infant and child mortality, morbidity, and attitudes and awareness related to family health and hygiene. Education is related to gender, poverty and social practices since females have less access to education then males [126]. Many of the health indicators recorded in the GDHS are linked to levels of education.

National level

- 72% of women and 55% of men have never attended school (GDHS 2005 - Figure 31) [23]. Although 28% of girls and 45% of boys start primary school, only 7% and 18% actually complete primary school respectively. Only one percent of girls and four percent of boys complete secondary school. Only a very small portion actually completes a tertiary education. The ENENSE 2007/08 found that 62% had never attended school [24], showing an improvement from the GDHS but the methodologies will need to be accessed to determine any significance.

- Gender parity indices also show a bias against girls with regard to attendance of both primary and secondary schools. The gender parity index for primary school attendance (or the ratio of girls attending primary school compared to boys) is 0.83. This ratio shows an even greater disparity for secondary school attendance at 0.55 [23].
6.4.11 EHA #11 – Cultural Health Practices

6.4.11.1 Traditional medicine

Traditional medicine (TM) plays an important role in many African countries, especially in rural areas. For a number of reasons this is often the primary route of health consultation. The way communities perceive illness has a deep-rooted cultural basis. Where access and cost is a major determinant of access to modern health care this only serves to reinforce the use of TM.

Rail corridor

- In about half of the FGDs performed, women stated that they first consult a traditional healer when their child is sick before visiting a health facility due to financial reasons.

6.4.11.2 Female Genital Mutilation

Female Genital Mutilation (FGM) is a common practice in many societies in Africa. In some societies, the procedure is routinely carried out when a girl is a few weeks or a few months old, while in others, it occurs later in childhood. In the case of the latter, FGM is typically part of a ritual initiation into womanhood that includes a period of seclusion and education about the rights and duties of a wife. FGM is classified by WHO in 4 types [127]:

- Type I: referred to as clitoridectomy
- Type II: referred to as excision
- Type III: referred to as infibulations
- Type IV: All other harmful procedures to the female genitalia for non-medical purposes, for example: pricking, piercing, incising, scraping and cauterization

National level

- In the 2005 GDHS it was found that 95.6% of women age 15-49 have been circumcised. One in three women was circumcised during infancy. There was practically no difference according to place of residence (urban and rural), region, or educational levels. Only 10% of women were circumcised by trained medical personnel (doctor, nurse, or midwife) [23].
- 69% of women believed that the practice of FGM should be continued, while 19% believed it should be abandoned. Social acceptance (64%) and religious approval (32%) were the principal reasons given by women for the continuation of female circumcision [23].
6.4.12 EHA #12 – Health Systems Issues

Human resources (quantity and quality of health personnel) and health infrastructure are the most important pillars of a health system. The World Health Report released in 2006 highlighted that while Africa is plagued with 24% of the world’s disease burden, it only has 3% of the world’s health workers [60].

6.4.12.1 Health Infrastructure

National level

- In order to meet the United Nations Millennium Development Goals the WHO determined that 23 skilled clinical health workers per 10,000 population is the minimum ratio required to provide a basic standard of health care [60]. In 2004, the number of skilled health workers in Guinea was almost 9 per 10,000 population (i.e. 9,000 in the entire country). Thus, health care services are in short supply and Guinea would need an additional 12,000 health personnel to meet minimum international standards for health worker coverage (i.e. 23,000 health workers in total for Guinea).

- The Ministry of Health standards regarding health infrastructure indicate that there should be (i) at least one hospital in each prefecture; (ii) a health centre or community medical centre in each sub-prefecture, and (iii) a health post in districts and large villages, i.e. if there are more than 3,000 people who are further than 10 km from a health centre.

Rail corridor

- The number of health facilities in the prefectures along the rail corridor is provided in Table 8. The major challenges of the health facilities that were visited can be summarized as follows:
  - difficulties in referring patients to the larger health facilities, particularly from rural areas;
  - lack of basic diagnostic equipment (e.g. RDTs, weight and height scales);
  - difficulties in medical waste disposal (no incinerators at the rural health posts);
  - poor equipping of the health facilities (e.g. electricity and safe water supply);
  - disruption in the supply of essential drugs such as anti-malarial drugs; and
  - no ITN distribution programme at health facility level.

- Health oriented NGOs and government programmes that are active in the prefectures along the rail corridor and their respective activities are listed in Table 13. The FGDs in the rural villages along the rail corridor revealed that these NGOs generally act through the local health system and do not have their own community health outreach
programmes, as all the women reported that the vaccination programme is the only health service reaching their village.

Table 13: Health oriented NGOs and government programmes and areas of activity

<table>
<thead>
<tr>
<th>Prefecture</th>
<th>NGO or governmental programme and area of activity</th>
</tr>
</thead>
</table>
| Kérouané   | **Faisons Ensemble**: Assistance to mothers and children living with HIV/AIDS  
             **Helen Keller International (HKI)**: Support health facilities for care of STI, HIV/AIDS and malnutrition  
             **UNICEF**: Provision of general medical equipment and vaccination programme |
| Kankan     | **HKI**: Support health facilities for care of STI, HIV/AIDS and malnutrition  
             **UNICEF**: Provision of general medical equipment and vaccination programme  
             **Raul Foero**: activity unknown  
             **Faisons Ensemble**: Provision of general medical equipment  
             **Kossi Mankan**: Formation of community health agents and provision of material for clean water  
             **ESB**: Distribution of condoms  
             **Population Services International (PSI)**: Social marketing of condoms |
| Kissidougou| **UNICEF**: Provision general medical equipment, vaccination programme and nutritional programme  
             **Agenda F (USAID)**: Fistula surgery programme and malaria control programme  
             **Plan Guinée**: Construction of wells and health facilities |
| Faranah    | **HKI**: Nutritional programme  
             **UNICEF**: Vaccination programme  
             **Faisons Ensemble**: Construction of latrines for health facilities and support of vaccination programme  
             **GIZ**: Establishment of community based health insurance programmes |
| Mamou      | **UNFPA**: Reproductive health, gender equality and population and development strategies  
             **UNICEF**: Provision of general medical equipment and vaccination programme  
             **GIT**: Reproductive health |
| Kindia     | **Fédération Mounafanyi de Kindia**: Maternal and child health and malnutrition  
             **UNICEF**: Provision of general medical equipment and vaccination programme |

- There are no existing collaborations/partnerships with private sector companies for supporting public health programmes in the prefectures affected by the Project.

6.4.12.2 Reproductive Health

Reproductive health implies that women and men have the right to and the possibility of experiencing a satisfying and safe sex life and that they can decide if, when and how often to reproduce. Family planning should be provided in addition to access to health care services for ANC, childbirth, and child health.

Achieving universal access to reproductive health by 2015 is one of the two targets of MDG No. 5. Reproductive and sexual ill-health accounts for 20% of the global health burden in women and 14% in men. Sub-Saharan Africa remains the region with the poorest indicators
for reproductive health. An estimated 55% of women do not have sufficient ANC and 24% have no access to family planning services [128].

**Fertility and its determinants**

**National level**

- In 2005, Guinea women had an average of 5.7 children in their lifetime. Fertility was higher in rural areas with an average of 6.3 children, than in urban areas with an average of 4.4 children [23].
- Fertility decreases with education and wealth. Women with secondary or higher education on average have 3.3 children, compared to 6.2 children amongst those with no education. Similarly, women from the poorest households (6.5 children per woman) have more children than women from wealthier households (4.2 children per woman) [23].

**Family Planning**

Family planning (FP) is an essential component of reproductive health and in recent decades there have been tremendous advances in the development of safer and more effective contraceptives and in the provision of affordable and accessible FP services. The method of contraceptive effectiveness depends on both the mechanism of action and acceptance and practice of adherence by the user [129].

**National level**

- More women in Guinea are gaining knowledge related to at least one contraceptive method (92% in 2005 compared to 72% in 1999) and, in particular, modern contraceptive methods (92% in 2005 compared to 71% in 1999). In spite of this, very few women use contraception. The contraceptive prevalence rate for all methods is only 9%; and for modern methods, the rate is 6% [23].
- According to USAID, 24% of married women of reproductive age can be classified as having an unmet need for family planning services. About 16% of women of reproductive age in union would like to space their next birth for at least two years, while 8 percent would prefer not to have any more children [130].

**Rail corridor**

- Despite the fact that most of the women had heard about FP, there was a worrying lack of use of FP in the visited communities. None of the women in the FGDs reported ever having used a modern FP method.
Breast Feeding
The role of breastfeeding in child nutrition and subsequent survival in rural Africa cannot be overstated. Breastfed children suffer fewer episodes of common childhood infections with resultant decrease in morbidity and mortality. It is recommended that breastfeeding be continued up to 2 years of age with supplementation of appropriate complimentary feeds in order to ensure proper growth and development [131]. In terms of weaning practices it has been established that exclusive breastfeeding provides adequate nutrition to the child up to the age of 6 months.

National level
- The GDHS 2005 found that only 16.7% of children were exclusively breastfed until the age of 6 months compared to 42.3% in 2007/08 (ENENSE) [23, 24]. The reason for this significant increase was not reported.
- The percentage of children exclusively breastfed until the age of 6 months was reported by WHO at 48% between the period between 2000 and 2009 [41].

Rail corridor
- All women in the FGDs reported that they breastfed their children. Most made the effort to continue for 1-2 years since they used breastfeeding as a family planning method. However, none of the women declared to exclusively breastfeed for more than 2 months. Most of them start feeding the child with water from the beginning. This is an alarming situation that underpins the poor health education in the local communities.

6.4.12.3 Maternal Health
Maternal health refers to the health of women during pregnancy, childbirth and the postpartum period. The main direct causes of maternal morbidity and mortality include haemorrhage, infection, high blood pressure, unsafe abortion and obstructed labour. Every day, 1,500 women die from pregnancy or childbirth related complications. In 2005, there were an estimated 536,000 maternal deaths worldwide. 99% of these deaths occurred in developing countries, and most were avoidable [132].

To achieve the MDG 5, improving maternal health and reducing maternal mortality rate (MMR) by 75%, an annual decline of the MMR by 5.5% is necessary. In sub-Saharan Africa, the annual rate of decline between 1990 and 2005 has only been 0.1%. Most countries in sub-Saharan Africa are therefore unlikely to achieve MDG 5, by 2015. The first step in
avoiding maternal deaths is to ensure that women have access to family planning in order to avoid unwanted pregnancies and unsafe abortions [132].

![Figure 32: Maternal mortality ratio, by country in 2005 [133]](image)

**National level**
- Maternal mortality remains very high in Guinea. In 2005, the rate of maternal mortality was estimated to be 980 maternal deaths for every 100,000 live births, which is slightly below the average for sub-Saharan Africa of 900 maternal deaths for every 100,000 live births (see Figure 32) [23].
- Similar numbers were reported by WHO for the period 2000-2009 with 910-980 maternal deaths respectively for every 100,000 live births [41].

**Rail corridor**
- Most of the women in the FGDs reported to regularly attend ANC services at one of the nearest health facilities in pregnancy.
- With the exception of Simbaraya (village in Kindia prefecture having a health post), the large majority of the women in the rural villages visited during the field mission reported that, if no complications are indicated, they deliver at home assisted by family members or a traditional birth attendant. The distance to the next health facility and lack of any ambulance service is the main reason for this practice.

**6.4.12.4 Child Health**

Child health is very important since children represent the future. Their healthy development and growth has the potential to influence economic growth. Many human resources are lost, not only due to infant and child deaths, but also through poor development in the formative years. Infant and child mortality rates are basic indicators of child health and reflect a
country’s socio-economic situation and quality of life. Identifying children most at risk assists policymakers and programme planners in targeting resources and programmes.

![Figure 33: Trends in early childhood mortality rates in Guinea](image)

### National level

- The national childhood mortality rates have fallen in recent years as shown in Figure 33, but it is still extremely high [23]. Every tenth child died before its first birthday. For every 1,000 children who reached their first birthday, 79 died before reaching the age of five. Overall, in 2005, 163 children per 1,000 live births died before reaching their fifth birthday.

- According to the WHO World Health Statistics, malaria (25%), pneumonia (17%) and diarrhoea (14%) were the most common health problems with fatal outcomes for children under 5 years in 2008 [41].

### 6.4.12.5 Immunization

Childhood immunization is important to child growth and development as episodes and severity of many common infections are reduced. Such vaccine preventable infections would otherwise lead to significant mortality and morbidity [134, 135].

#### National level

- In 2005, 79% of children aged 12-23 months received Bacillus Calmette-Guérin Vaccine (BCG) vaccine, 51% had received three doses of diphtheria, pertussis, tetanus (DPT) vaccine and 50% had received three doses of polio and measles vaccination. In total, 37% received the entire series of vaccines and all the recommended vaccines as prescribed in the national expanded programme of immunisation schedule. By contrast, only 14% of children aged 12-23 months had had no vaccines. Since 1999, there had
been a slight increase in vaccination coverage (32% of children were completely vaccinated in 1999). Regional variation in percentage of children aged 12-23 months who had received all vaccines in 2005 is shown in Figure 34 [23].

- According to the world health statistics 2010, 64% of children under 1 year were vaccinated against measles in 2008, 66% received three doses of DPT and 71% received all the doses of Hepatitis B vaccination [41].

### Rail corridor

- In 2007/08 ENENSES, only 38% of the children (aged 12-23 months) had received the complete set of required vaccinations. The percentage of children that had received the full set of required vaccinations is shown in Figure 34 [24].

![Figure 34: Vaccination coverage (%) in children (12-23 months)](image-url)
7 Health Impacts of Concern and Gap Analysis

To support the scoping study and to define the terms of reference (ToR) for the HIA two specific elements are considered:

- What are the potential health impacts of concern?
- Is there adequate data/evidence to inform these potential impacts and allow for monitoring of potential mitigation/management measures?

**Potential Health Impacts of Concern:**

The occurrence and importance of the different health outcomes and determinants were assessed based on the existing baseline health conditions and needs in the communities. This was based on data collected in the field and through desktop studies, as well as the analysis of the project location, design and planned activities. The different activities and components used to gather the required and available evidence were analysed to stratify and summarise the health outcomes and determinants (i.e. absent; rare/insignificant; occasional/minor importance, and frequent/major importance).

Involvement of prefectural health authorities in the discussion of potential project-related health impacts was a central element of the present HIA scoping study. A summary of anticipated health impacts that were outlined in this process is given in Figure 35, with aspects that were most frequently mentioned in bold. Details on anticipated pathways of potential project-related impacts are outlined in sections 7.1-7.12.
Gap analysis:
A gap analysis was performed as the next step in order to establish whether sufficient data is available to proceed directly with the risk/impact analysis and mitigation phase, or, in case of inadequate or insufficient data, whether the collection of additional baseline health data is warranted. In practice, the gap analysis has a focus on the health outcomes and determinants of major concern as described above. This includes critical appraisal of data quality of identified sources. Importantly, data on major health outcomes and determinants of concern require a high level of accuracy on a regional and/or local level allowing for evidence-based risk and impact assessment and subsequent monitoring and surveillance. Based on these requirements, the available quantitative and qualitative information was ranked as follows: (i) low level of fidelity, (ii) moderate level of fidelity, and (iii) high level of fidelity.
If important data gaps are identified then primary data collection activities are generally required and support the ToR for the overall HIA. These strategies and activities need to be highly focussed and linked to specific key performance indicators (KPIs) and include:

- **Baseline health surveys (BHS):** This can entail the collection of qualitative and quantitative data to inform representative KPIs that can be utilised to monitor mitigation and management strategies. These surveys will need to be repeated based on a similar methodology for surveillance purposes. A modular approach is thus generally recommended.

- **Health service data and health system strengthening (HSS):** This can support the collection of longitudinal data from the local health facilities that serve the PACs. The HSS can occur through reinforcing the diagnostic accuracy and reporting systems of these local health facilities. This is not only an important means to obtain longitudinal data, but also the preferred strategy for indicators that are difficult to assess in a cross-sectional study (e.g. incidence of respiratory disease and number of traffic accidents).

- **Health Information Systems (HIS):** This includes accessing, collection reviewing and analysing secondary data which is generated through routine health information systems in a systematic manner. This may be linked to HSS in order to obtain accurate data for longitudinal monitoring. This is only likely to be established as an on-going process as a continuum of the BHS and impact assessment process.

These last two elements can be supported with the development of a community health information system (CHIS), which is a data base that supports the management and analysis of the information gathered through HSS and the HIS.

A summary table of health outcomes and determinants of major concern, adequacy of data and their inclusion in additional baseline data collection is described in Table 14. Specific community, project and institutional risk factors that were considered for the most relevant health impacts of major concern are described in the following sub-chapters. In addition, high level recommendations are provided, including strategies on how to fill identified data gaps.

Due to the fact that there is considerable variation in anticipated project-related health impact among the different PACs (see section 3.2.3), it is specified for which PAC the recommendations apply. Of note, recommendations on where to potentially collect baseline health data mostly include PAC 4 (TWC), as it is considered representative for PAC 1 and 2 at baseline.
### Table 14: Health outcomes and determinants of major concern

<table>
<thead>
<tr>
<th>Environmental Health Areas</th>
<th>Health outcomes and determinants</th>
<th>Available data sources</th>
<th>Occurrence/ importance</th>
<th>Health outcome/determinant of major concern</th>
<th>Quality ranking of available evidence (level of fidelity)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EHA #1 – Communicable diseases linked to housing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>RHI-S</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>Low level</td>
<td></td>
</tr>
<tr>
<td>Acute respiratory tract infections</td>
<td>RHI-S</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>Moderate level</td>
<td></td>
</tr>
<tr>
<td>Overcrowding/poverty</td>
<td>GDHS/ENENSE</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>Low level</td>
<td></td>
</tr>
<tr>
<td>Meningitis</td>
<td>RHI-S</td>
<td>No cases reported</td>
<td>No</td>
<td>Moderate level</td>
<td></td>
</tr>
<tr>
<td>Leprosy</td>
<td>RHI-S</td>
<td>No cases reported</td>
<td>No</td>
<td>Moderate level</td>
<td></td>
</tr>
<tr>
<td>Measles</td>
<td>RHI-S</td>
<td>No cases reported</td>
<td>No</td>
<td>Moderate level</td>
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</tr>
<tr>
<td><strong>EHA #2 – Vector-related diseases</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaria</td>
<td>RHI-S</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>Moderate level</td>
<td></td>
</tr>
<tr>
<td>Human African Trypanosomiasis</td>
<td>RHI-S</td>
<td>No cases reported</td>
<td>No</td>
<td>Low level</td>
<td></td>
</tr>
<tr>
<td>Arboviruses</td>
<td>RHI-S</td>
<td>No cases reported</td>
<td>Yes</td>
<td>Low level</td>
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</tr>
<tr>
<td>Filariaasis</td>
<td>RHI-S</td>
<td>No cases reported</td>
<td>No</td>
<td>Moderate level</td>
<td></td>
</tr>
<tr>
<td>Endemic disease vectors</td>
<td>None</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>N. a.</td>
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<tr>
<td><strong>EHA #3 – Soil-, water- and waste-related diseases</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Drinking water quality</td>
<td>None</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>N. a.</td>
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</tr>
<tr>
<td>Hygiene and Sanitation practices</td>
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<td>Frequent/major importance</td>
<td>Yes</td>
<td>Moderate level</td>
<td></td>
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<tr>
<td>Diarrhoeal diseases</td>
<td>RHI-S/GDHS</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>Moderate level</td>
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</tr>
<tr>
<td>Schistosomiasis</td>
<td>RHI-S</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>Low level</td>
<td></td>
</tr>
<tr>
<td>Soil-transmitted helminthiasises</td>
<td>RHI-S</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>Low level</td>
<td></td>
</tr>
<tr>
<td>Hepatitis A and E</td>
<td>RHI-S</td>
<td>Not known</td>
<td>No</td>
<td>Low level</td>
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<tr>
<td><strong>EHA #4 – STIs, including HIV/AIDS</strong></td>
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<tr>
<td>HIV/AIDS</td>
<td>RHI-S/GDHS</td>
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<tr>
<td>STIs</td>
<td>RHI-S/GDHS</td>
<td>Frequent/major importance</td>
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<td>Moderate level</td>
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<tr>
<td>KAP related to HIV and STIs</td>
<td>GDHS</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>Low level</td>
<td></td>
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<tr>
<td>Hepatitis B</td>
<td>RHI-S</td>
<td>Not known</td>
<td>Yes</td>
<td>Low level</td>
<td></td>
</tr>
<tr>
<td><strong>EHA #5 – Food- and nutrition-related issues</strong></td>
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<td></td>
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<td></td>
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<tr>
<td>Malnutrition</td>
<td>RHI-S/GDHS/ENENSE</td>
<td>Not known</td>
<td>Yes</td>
<td>Low level</td>
<td></td>
</tr>
<tr>
<td>Anaemia</td>
<td>RHI-S/GDHS/ENENSE</td>
<td>Not known</td>
<td>Yes</td>
<td>Low level</td>
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<tr>
<td>Socio-economic aspects related to malnutrition</td>
<td>GDHS/ENENSE</td>
<td>Frequent/major importance</td>
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<td>Low level</td>
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<tr>
<td><strong>EHA #6 – Non-communicable diseases</strong></td>
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<td></td>
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</tr>
<tr>
<td>Cardiovascular diseases</td>
<td>RHI-S</td>
<td>Occasional/minor importance</td>
<td>Yes</td>
<td>Moderate level</td>
<td></td>
</tr>
<tr>
<td>Chronic respiratory disease</td>
<td>RHI-S</td>
<td>Occasional/minor importance</td>
<td>Yes</td>
<td>Moderate level</td>
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<tr>
<td>Diabetes</td>
<td>None</td>
<td>Not known</td>
<td>Yes</td>
<td>N. a.</td>
<td></td>
</tr>
<tr>
<td>Cancer</td>
<td>None</td>
<td>Not known</td>
<td>No</td>
<td>N. a.</td>
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</tr>
<tr>
<td>Oral health</td>
<td>None</td>
<td>Occasional/minor importance</td>
<td>No</td>
<td>N. a.</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: ENENSE- Enquête Nationale sur l’Etat Nutritionnel et le Suivi des Principaux Indicateurs de Survie de l’Enfant 2007/08; GDHS- Guinean demographic and health survey 2005; N.a.- Not available; RHI-S- Routine health information system
### Environmental Health Areas

<table>
<thead>
<tr>
<th>Health outcomes and determinants</th>
<th>Available data sources</th>
<th>Occurrence/ importance</th>
<th>Health outcome/determinant of major concern</th>
<th>Quality ranking of available evidence (level of fidelity)</th>
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<tr>
<td><strong>EHA #7 – Accidents/Injuries</strong></td>
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<td>Traffic accidents</td>
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<td>Moderate level</td>
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<tr>
<td>Work related accidents</td>
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<td>No</td>
<td>Moderate level</td>
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<tr>
<td><strong>EHA #8 – Veterinary medicine and zoonotic diseases</strong></td>
<td></td>
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<tr>
<td>Lassa fever</td>
<td>None</td>
<td>Not known</td>
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<td>N. a.</td>
</tr>
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<td>Leptospirosis</td>
<td>None</td>
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<td>Brucellosis</td>
<td>None</td>
<td>Not known</td>
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<td>N. a.</td>
</tr>
<tr>
<td>Epizootic diseases</td>
<td>None</td>
<td>Not known</td>
<td>No</td>
<td>N. a.</td>
</tr>
<tr>
<td><strong>EHA #9 – Hazardous materials, noise, malodours A #4 – STIs, including HIV/AIDS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>None</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>High level*</td>
</tr>
<tr>
<td>Air quality</td>
<td>None</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>High level*</td>
</tr>
<tr>
<td>Water quality</td>
<td>None</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>High level*</td>
</tr>
<tr>
<td>Soil quality</td>
<td>None</td>
<td>Occasional/minor importance</td>
<td>Yes</td>
<td>High level*</td>
</tr>
<tr>
<td><strong>EHA #10 – Social determinants of health</strong></td>
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<td>Health seeking behaviour</td>
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<td>Moderate level</td>
</tr>
<tr>
<td>Mental health</td>
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<td>Not known</td>
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<td>N. a.</td>
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<tr>
<td>Life style and well-being</td>
<td>GDHS</td>
<td>Frequent/major importance</td>
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<td>Low level</td>
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<tr>
<td>Inequalities</td>
<td>GDHS/ENENSE</td>
<td>Frequent/major importance</td>
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<td>Low level</td>
</tr>
<tr>
<td>(Health) education</td>
<td>GDHS/ENENSE</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>Low level</td>
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<tr>
<td>Gender based domestic violence</td>
<td>None</td>
<td>Occasional/minor importance</td>
<td>Yes</td>
<td>Low level</td>
</tr>
<tr>
<td><strong>EHA #11 – Cultural health practices</strong></td>
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<td></td>
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</tr>
<tr>
<td>Traditional medicine</td>
<td>None</td>
<td>Occasional/minor importance</td>
<td>Yes</td>
<td>N. a.</td>
</tr>
<tr>
<td>Informal medicine</td>
<td>None</td>
<td>Occasional/minor importance</td>
<td>Yes</td>
<td>N. a.</td>
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<tr>
<td>Female genital mutilation</td>
<td>GDHS</td>
<td>Frequent/major importance</td>
<td>No</td>
<td>High level</td>
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<tr>
<td><strong>EHA #12 – Health systems issues</strong></td>
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<tr>
<td>General health infrastructure</td>
<td>RHIS</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>Moderate level</td>
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<tr>
<td>Health management delivery systems</td>
<td>None</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>N. a.</td>
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<tr>
<td>Reproductive health</td>
<td>GDHS/ENENSE</td>
<td>Frequent/major importance</td>
<td>No</td>
<td>Moderate level</td>
</tr>
<tr>
<td>Maternal and child health</td>
<td>RHIS/GDHS/ENENSE</td>
<td>Frequent/major importance</td>
<td>Yes</td>
<td>Moderate level</td>
</tr>
</tbody>
</table>

* once specialist reports are available as part of the SEIS

Abbreviations: ENENSE- Enquête Nationale sur l’Etat Nutritionnel et le Suivi des Principaux Indicateurs de Survie de l’Enfant 2007/08; GDHS- Guinean demographic and health survey 2005; N.a.- Not available; RHIS- Routine health information system
7.1 **EHA #1 – Tuberculosis and Acute Respiratory Tract Infections**

**Community risk factors:**
Housing is quite basic in the villages along the rail corridor. It generally consists of traditional structures made from wood and mud with grass roofing and also more formal brick houses with corrugated iron roofs. Poverty and poor nutrition play a role in community susceptibility to diseases such as ARIs, measles, meningitis and TB. ARI are already a major health concern in the 11 prefectures affected by the Project and TB is a challenge due to difficulties in recognition and management of the disease.

**Project risk factors:**
A considerable number of villages will be affected by the Project, as well as increased road traffic during construction, and thus exposure to dust will increase. This has the potential to negatively impact acute and chronic respiratory tract diseases along the rail corridor.

The overall development is likely to trigger in-migration, particularly where the LSC and TWC will be located, and the risk of overcrowding and housing inflation exists, which increases the risk of transmission of communicable diseases.

The origin of any incoming workforce needs to be understood so that respiratory conditions (especially TB) are not introduced to the area. These may include viral infections, with pandemic or seasonal influenza a major risk to vulnerable communities, especially with travellers from different hemispheres where a different seasonal virus strain will circulate. TB may present a major risk amongst workers who originate from areas where TB is more prevalent. The presence of multidrug resistant (MDR-TB) strain from these sources is also important as these can be introduced into communities that have not been exposed to these strains. If the semi-skilled construction work force is supported by third country nationals (TCNs) then it will be vital to assess the burden of disease in these locations and the potential risks from the incoming workforce. It is likely that these may be Chinese where the prevalence of TB, and especially MDR TB may be higher than in Guinea.

**Institutional risk factors:**
The ability of the local health care services to recognise and manage chronic and acute respiratory diseases is limited. For example, currently TB can only be diagnosed in the prefectural reference hospitals and therefore adequate case detection and cure of TB patients is inadequate. Consequently, many TB cases are undiagnosed and untreated which
will promote the spread of TB in the region. Treatment and compliance to the long treatment courses required in TB (at least 6 months) is also poor.

### Table 15: Recommendations pertaining to TB and ARI

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>PAC 1</th>
<th>PAC 2</th>
<th>PAC 3</th>
<th>PAC 4</th>
<th>PAC 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish influx-management partnerships with the local authorities and monitor housing in the communities.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Support knowledge, attitude and practices surveys on TB awareness and health seeking behaviour.</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health service planning and strengthening to ensure adequate health service capacity for TB diagnosis and management, as well as meningitis diagnosis. The government must be a partner in any initiative.</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pre-employment screening of employees that may be at high risk of TB or MDR-TB. The actions if an employee is found positive will be addressed in the occupational health and fitness to work plan.</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Seasonal and pandemic flu management plans.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
7.2 **EHA #2 – Malaria and Arboviral Diseases**

### 7.2.1 Malaria

**Community risk factors:**
Malaria is a major public health challenge in the communities along the rail corridor. It accounts for the bulk of consultations in the health care sector. Many households are in possession of a mosquito net but knowledge on transmission and prevention of the disease is limited. Thus, the success of current malaria control efforts is limited.

**Project risk factors:**
The Project may influence malaria through changes to the environment and demographics where the construction and logistical camps will be located. Moreover, malaria will play a significant role in workforce health and related absenteeism.

**Institutional risk factors:**
Appropriate malaria diagnostics are only available in health centres and hospitals and thus case reports provided by health facilities are not accurate. Furthermore, this bears the risk that patients are frequently misdiagnosed and consequently receive the wrong treatment. Support with appropriate diagnostics and treatment could be a powerful intervention to conduct in association with the current activities. At the level of rural health posts, there is no systematic distribution of ITNs to pregnant women and children under the age of 5 years, never mind universal coverage. Stock-outs in anti-malarial drugs are frequent.

In summary, there is scope for improving malaria related services at local health facilities, which would support a more accurate longitudinal data description on malaria incidence.
Table 16: Recommendations pertaining to malaria

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>PAC 1</th>
<th>PAC 2</th>
<th>PAC 3</th>
<th>PAC 4</th>
<th>PAC 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect baseline data to establish the malaria prevalence in communities and determine the level of knowledge, attitudes and practices (KAP) related to malaria.</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Improve malaria diagnostics at the local health facilities (i.e. assure the availability of RDTs) which will not only serve as a community intervention per se but allows also to obtain accurate longitudinal data on malaria incidence.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Establish partnerships with the local health authorities for the strengthening of malaria control efforts.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

7.2.2 Arboviral diseases

Community risk factors:
Yellow fever is the only arboviral disease that was reported for the affected prefectures. There is, however, a potential that dengue fever may occur sporadically especially with the increasing trends in West Africa. The environment is conducive for the proliferation of the most common vector species.

Project risk factors:
The port site at Kaback poses a risk to potentially increasing the risk of dengue transmission as the port is likely to receive ships from global destinations such as Asia and South America, where the incidence of dengue fever is high. Consequently also the railway has the potential to spread the risk of dengue transmission as mosquitoes or eggs can be transported in water receptacles such as tyres and open containers. This is theoretical but may need to be mitigated.

Yellow fever may be influenced by the Project through migration of people with the disease (e.g. from neighbouring countries) into areas that are disease free- thus if anything the project may be affected by the urban cycle of the disease rather than the forest cycle. While this is unlikely the lack of an effective early surveillance system may compound this. The potential haemorrhagic component of the disease may also mimic other viral haemorrhagic fevers which may in turn create business continuity concerns.
Institutional risk factors:
There are good epidemiological surveillance systems in Guinea but there is limited human resource and diagnostic ability to recognise the emergence of arboviral diseases quickly.

Table 17: Recommendations pertaining to arboviral diseases

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>PAC 1</th>
<th>PAC 2</th>
<th>PAC 3</th>
<th>PAC 4</th>
<th>PAC 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>• HSS to improve the ability of health service staff to recognise, diagnose, report and manage suspected arboviral diseases (specifically dengue).</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• Develop outbreak response plans in partnership with the local health authorities- these should include case definition, ability for the hospital to recognise and send samples off to a reference laboratory to confirm suspected cases, emergency vector control and business continuity planning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>• Based on surveillance and risk support yellow fever prevention activities in the communities.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
7.3 EHA #3 – Soil-, Water and Waste-related Diseases

Community risk factors:
In most rural communities along the rail corridor sanitation services and access to safe drinking water are limited with the majority of the community not having access to any form of improved sanitation facility. This poses a considerable risk factor for the transmission of helminthiases and other diseases linked to poor health education and personal hygiene and sanitation practices.

Helminthiases (i.e. macroparasitic diseases, typically in the gastrointestinal tract) were reported as the third leading cause of morbidity in the prefectures affected by the Project. However, due to poor diagnostic capacities, particularly at the rural health facilities, no reliable information could be obtained on the presence and frequency of helminth infections in the communities.

Project risk factors:
There is a risk of polluting the water bodies crossing the railway, especially during the construction phase. Furthermore, the fragile drinking water situation and limited sanitation may be influenced through changes to the environment and demographics related to influx, particularly where LSC and TWC will be located.

Institutional risk factors:
There is limited institutional capacity to support health education related to personal hygiene and sanitation in local communities.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Applies to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect baseline data on water and sanitation practices, including structural</td>
<td>PAC 1</td>
</tr>
<tr>
<td>indicators at household level and assess the quality of available drinking</td>
<td>X X</td>
</tr>
<tr>
<td>water sources and discharge from water treatment plants with regards to</td>
<td></td>
</tr>
<tr>
<td>microbiological contamination.</td>
<td></td>
</tr>
<tr>
<td>Improve access to safe drinking water in rural communities, particularly</td>
<td>X X X X X X</td>
</tr>
<tr>
<td>where the rail development may negatively impact on drinking water quality</td>
<td></td>
</tr>
<tr>
<td>(e.g. pollute surface water).</td>
<td></td>
</tr>
<tr>
<td>Support community health education programmes related to personal hygiene</td>
<td>X X X X</td>
</tr>
<tr>
<td>and sanitation.</td>
<td></td>
</tr>
</tbody>
</table>
7.4 EHA #4 – HIV/AIDS and Sexually Transmitted Infections

Community risk factors:
The spread of HIV/AIDS has been raised as one of the major concerns related to the Project.

The current prevalence of HIV infection along the rail corridor is unknown. The level of knowledge on the disease is limited and stigma seems to be high.

STIs are frequently reported at the local health facilities and preventative measures appear limited.

Poverty, lack of education and opportunity make the community vulnerable to the effects of high risk sexual practices. Women are a vulnerable group and lack of opportunity and limited negotiating power will also play a role in high risk sexual practices especially in local women who may be encouraged to engage in more opportunistic commercial sex.

Project risk factors:
The Project has the potential to further raise the risk of HIV/AIDS and STI transmission in the local population, particularly where the construction and logistics camps will be located. Sexual networking and migration have been well described in development projects, as shown by the example of the CBG project in Maritime Guinea (see section 6.4.4.1).

The 4 M’s will need to be considered in managing HIV/AIDS and STIs:
- Men – Transport and construction work-force;
- Money – Increased disposable income in area through employment, indirect benefits and outsider influences;
- Mobility – Transport workers. Improved roads in area will increase access to more rural communities; and
- Mixing – Improved access. In-migration. Mixing of people with high prevalence with those with low prevalence of disease. This is of concern where there is a low reported prevalence and where job seeking migrants will in all likelihood come from areas where prevalence is higher (e.g. Conakry).

Institutional risk factors:
The capacities for VCT are limited in the prefectures along the rail corridor, particularly in rural communities. Thus options to support and extend VCT services, including access to
ART, will have to be considered in collaboration with the national programme and regional partners.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>PAC 1</th>
<th>PAC 2</th>
<th>PAC 3</th>
<th>PAC 4</th>
<th>PAC 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop a HIV/AIDS management strategy considering different elements of an integrated programme. These should consider education and prevention as well as care and treatment, covering both workplace and community aspects.</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Establish partnerships with national and regional partners to expand HIV activities to the broader community, including strengthening of health service capacity for HIV testing and management.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Consider assessing HIV/AIDS prevalence and KAP related to the transmission of HIV/AIDS and STIs in communities and high-risk groups in any baseline health data collection.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
7.5 **EHA #5 – Nutritional Status of Local Communities**

**Community risk factors:**
The extent of malnutrition in affected communities was hard to quantify in the present scoping study as there are no active surveillance programmes in place. However, the poor socio-economic status of many families living in the wider project area is clearly a significant risk factor for malnutrition.

Malnutrition and anaemia levels are likely to improve with economic upliftment and a number of other variables that can be associated with the Project. It can thus be very powerful as a surveillance tool. This can also track over-nutrition that may lead to an increased incidence of non-communicable diseases in adults and children.

**Project risk factors:**
Access to land and loss of traditional practices may play a short and long term role in food availability and balanced nutrition in communities along the rail corridor. This includes potential impacts on food security linked to the resettlement of households. Food inflation will also need to be considered, itself consequent upon in-migration and changes to supply and demand.

**Institutional risk factors:**
The lack of nutritional programmes or effective surveillance systems in the prefectures affected by the Project is an important institutional risk factor.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>PAC 1</th>
<th>PAC 2</th>
<th>PAC 3</th>
<th>PAC 4</th>
<th>PAC 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Perform baseline nutritional and anaemia studies.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Equip local health facilities with height and weight scales and provide training for the implementation of a basic nutritional programme, which targets children under the age of five years. This will not only serve as a community intervention <em>per se</em> but will support accurate longitudinal data surveillance on the nutritional status of children.</td>
<td></td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>• Develop social management plans in terms of food inflation and access to land.</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

* Depending on location of the households to be resettled
7.6 **EHA #6 – Non-communicable diseases**

**Community risk factors:**
These diseases are not well known or recognised in the community. There is very little information related to NCD in the area which makes risk assessment and impact analysis challenging.

**Project risk factors:**
With even minimal levels of improved economic status and organised settlement a degree of urbanism may result with associated changes in values and behaviour. This may lead to an increase in lifestyle diseases such as obesity, diabetes, hypertension and dental caries. In the context of the rail development, these issues need to be considered in the area of the LSC due to long-term (construction and operation phase) employment of local workforce (although limited). Access to the area is likely to improve trade opportunities and lead to potential economic development which can have similar ultimate effects.

**Institutional risk factors:**
The health care facilities do not have a focus on the management of NCD, nor do they have the diagnostic capabilities to appropriately recognise and manage the conditions. The potential cost implication of managing these diseases into the future can play a major role in health-care budgeting and spending. Drugs are required chronically and are relatively expensive. Screening for and managing complications is challenging and requires regular follow-up and special investigations by skilled personnel.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Applies to</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Support knowledge, attitude and practices surveys on determinants that are related to non-communicable diseases.</td>
<td>PAC 1</td>
</tr>
<tr>
<td>• Consider health system strengthening to support improvement of local diagnostics for non-communicable diseases.</td>
<td>PAC 2</td>
</tr>
<tr>
<td>• Implement wellness programmes in the workforce, with the aim that these are extended to the family unit.</td>
<td>PAC 3</td>
</tr>
<tr>
<td>• Health education support on NCD into the local schools with the aim to raise awareness and present preventative activities to reduce the risk in the generation which may be most exposed to these risks. This group also represents the possible future workforce for Rio Tinto.</td>
<td>PAC 4</td>
</tr>
</tbody>
</table>
7.7 **EHA #7 – Accidents**

**Community risk factors:**
In most rural communities that will be affected by the Project, road traffic accidents (RTA) are not a concern due to poor road conditions and inability for vehicles to speed. Therefore, the more rural communities may be particularly vulnerable to RTA because of the activities of the Project with mobile equipment, particularly during construction phase. Also the passage of the train, with its potential risk for accidents, will be new to the local communities and sensitization activities will be required.

**Project risk factors:**
During the development phase of the railway, communities along the rail corridor will be exposed to increased road traffic loads, followed by rail traffic in the operation phase. Both have the potential to cause traffic accidents. Access roads are likely to improve that may allow vehicles to travel faster.

Improved income in the area of LSC and TWC, as well as potential in-migration, will also lead to increased traffic loads and the ability to buy cheaper motorcycles. Licensing of vehicles or drivers, adherence to road rules and effective policing are unlikely to occur in parallel to this potential increase. Thus, there may be an increased risk for RTA in affected communities.

**Institutional risk factors:**
The local health services have limited capacity to respond to and manage traffic accidents.
Table 22: Recommendations pertaining to road traffic accidents

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>PAC 1</th>
<th>PAC 2</th>
<th>PAC 3</th>
<th>PAC 4</th>
<th>PAC 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Develop community security and safety management plans for the Project related to the different activities. This should include emergency response plans for both community related accidents and also for the workplace.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• Develop and implement a traffic and vehicle movement management plan. This will allow for mitigating the risk of traffic accidents along the rail corridor.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• Request for separate reporting of traffic related accidents at the local health facilities.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• Management of mobile equipment and machinery within the framework of the occupational health and safety plan. This may include drug and alcohol programmes.</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• Conduct information and education campaigns on road and rail safety.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>• Support the emergency management capacities and skills of the local health care providers.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
7.8 **EHA #8 – Lassa Fever**

**Community risk factors:**
There is a theoretical risk for Lassa fever transmission in the communities along the rail corridors, though no cases have been reported for the affected prefectures in the past 3 years.

**Project risk factors:**
The clearing of forest and bush land for the Project development has the potential to change the pattern, and lead to an increase in the number of endemic rodents. At present it is not known whether the reservoir host, a rodent of the *Mastomys* species complex, is present in the rail corridor.

The LSC and TWC will generate waste from domestic sources which may attract vermin such as rats. These will need to be closely managed.

**Institutional risk factors:**
No institutional capacities exist for the detection and management of Lassa fever in local health facilities.

<table>
<thead>
<tr>
<th>Table 23: Recommendations pertaining to Lassa Fever</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recommendation</strong></td>
</tr>
<tr>
<td>• Consider the conduct of a rodent survey in order to determine whether the reservoir host, a rodent of the <em>Mastomys</em> species complex, is present along the rail corridor. This can be performed by the ecologists supporting the environmental aspects. If the species is present decisions will need to be made on whether to determine if the rodents harbour the virus.</td>
</tr>
</tbody>
</table>
7.9 **EHA #9 – Environmental Health Determinants**

**Community risk factors:**
Communities residing along the rail corridor live in close contact to their environment and are thus vulnerable to any changes in water and air quality, as well as to noise pollution.

**Project risk factors:**
The Project has the potential to create significant environmental health concerns if such areas are not well managed. Concerns relate mainly to noise, water and air quality, but also to visual impacts.

**Institutional risk factors:**
There is limited capacity in the local authorities to effectively monitor environmental health determinants linked to industrial projects. This will have to be covered under the Project's environmental monitoring programme.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Applies to</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Integration of the results of specialist studies into the health impact assessment with a focus on associated health risks.</td>
<td>X X X X X</td>
</tr>
<tr>
<td>• Collect baseline data on the perception of environmental determinants of health (e.g. noise, air quality).</td>
<td></td>
</tr>
<tr>
<td>• Establish surveillance of health outcomes that may be linked to environmental health risks through routine health facility statistics.</td>
<td>X X X X X</td>
</tr>
<tr>
<td>• Develop and implement an environmental monitoring programme that applies WHO thresholds and IFC standards.</td>
<td>X X X X X</td>
</tr>
</tbody>
</table>
7.10 EHA #10 – Social Determinants of Health

Community risk factors:
Many SDoH are not well understood in the communities affected by the Project as limited baseline data on health seeking behaviour, health inequalities, health education, GBDV, mental health and health related lifestyles was available at the time of the present study.

Any changes in traditional norms and the social fabric of the communities will be very important to consider as a contributor to the SDoH and general perceptions of well-being.

Project risk factors:
In view of the magnitude of the Project, various social determinants may be impacted by the development. Thus, it will be essential to describe and understand the baseline situation, particularly in the areas where the LSC and TWC will be located. Importantly, any community assistance programmes need to be spread equally amongst communities so that inequalities do not emerge or encourage more in-migration created to benefit from improved services. It is also important that traditional values and social cohesion in and between communities is not eroded.

Institutional risk factors:
Gender rights and provision of basic services to the general population in Guinea is limited. The country has faced significant political turmoil over recent times and development of the country and its people has lagged.

Table 25: Recommendations pertaining to social determinants of health

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>PAC 1</th>
<th>PAC 2</th>
<th>PAC 3</th>
<th>PAC 4</th>
<th>PAC 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform baseline studies on SDoH.</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programmes and interventions should support vulnerable groups as required, both in terms of impact mitigation and community development. Vulnerable groups should be consulted in stakeholder forums.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
7.11 EHA #11 – Traditional and Informal Medicine

Community risk factors:
The role of traditional healers seems to vary within the communities residing along the rail corridor. However, the role of TM, including self-treatment based on local herbal remedies, is likely to play an important role in health seeking behaviour and in spirituality/belief structures in the community.

The informal health sector is similarly poorly understood as drugs are sold at local boutiques and clandestine pharmacies.

Project risk factors:
Potential project induced in-migration may lead to an increase in services provided by the informal medicine sector due to an increased demand and lack of ability of the formal health sector to meet the demands through the size of, staff complement and services offered.

Institutional risk factors:
As health care is not provided for free at the local health facilities, people are often tempted to buy treatment from the informal medicine sector in order to save costs. However, there is the risk that people get the wrong treatment and thus delay the initiation of appropriate treatment. Furthermore, the informal health sector is an indirect risk for the development of drug resistances as often (cheap) drugs are sold that are not recommended by the national programme (e.g. chloroquine for the treatment of malaria although resistance to this drug is increasing all over Africa).

Table 26: Recommendations pertaining to traditional medicine

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>PAC 1</th>
<th>PAC 2</th>
<th>PAC 3</th>
<th>PAC 4</th>
<th>PAC 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Perform baseline studies on the role of traditional medicine and the informal health sector.</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7.12 EHA #12 – Health Care Services and Reporting Systems

7.12.1 Health Care Services

**Community risk factors:**
The capacity and quality of health care services is limited in the rail corridor. At prefectural and sub-prefectural level, the required health care services as per the Guinean health standards is adequate but the facilities are poorly staffed and equipped, and can often not deliver an adequate level of care to the local communities.

In rural communities, local transport and referral to the larger health facilities is a serious challenge, especially in an emergency. Transportation is very limited and as it takes a long time it may not be the immediate priority of the family and can delay care. The ability to afford transport is also a major determinant related to access to health care.

**Project risk factors:**
The Project has the potential to increase the burden on the already limited health care infrastructure, particularly where LCS and TWC will be established. Lack of consultation and planning may mean that the future needs may outstrip already limited services.

**Institutional risk factors:**
There is a real opportunity to raise the standards of health care along the rail corridor through simple and relatively inexpensive interventions including improved diagnostics, improved emergency care, support with logistics and equipment.

It will be essential to establish relationships with the provincial and district authorities and opportunities to partner in these areas should be explored at this early stage as discussed above. Where possible the communities should be partners in these initiatives.
### Table 27: Recommendations pertaining to health care services

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>PAC 1</th>
<th>PAC 2</th>
<th>PAC 3</th>
<th>PAC 4</th>
<th>PAC 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish a baseline profile of the capacity and quality of services provided at the health facilities in proximity to the rail corridor.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Perform baseline studies on accessibility, acceptability and affordability of maternal and child health services.</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Regularly consult the DPS of the 11 prefectures affected by the Project as key partners in health service planning. This should include health service planning so that health services can manage any influx into affected areas.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Establish partnerships with regional and local NGOs for supporting community health in affected populations.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
7.12.2 Routine Health Information Systems

Institutional risk factors:

The routine health information system is functioning in the affected prefectures but does have significant gaps in diagnosis (e.g. no RDTs at rural health posts). Consequently, recognition, recording and reporting of certain diseases is limited. Most health information that originates from the health centres in the project area will need to be interpreted with these limitations in mind. Good reliable information will assist health service planning at a district and local level and will allow for the on-going surveillance of disease burden. This will be useful to inform and allow adjustment of health interventions and enable Rio Tinto to monitor and evaluate health impacts and the effects of any interventions undertaken.

Table 28: Recommendations pertaining to existing health information system

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>PAC 1</th>
<th>PAC 2</th>
<th>PAC 3</th>
<th>PAC 4</th>
<th>PAC 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Improve and support health information management systems to generate longitudinal data sources and thus support the monitoring of management/mitigation plans. This should include capacity building efforts for correct diagnoses and reporting.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
8 Terms of Reference for the Health Impact Assessment

The terms of reference for the HIA needs to consider the life cycle of the Project and include the key considerations as described in Table 4 and Table 14.

The scoping study has described the high level health issues and potential impacts, the location of the PACs and evaluated what health data is available to support the impact assessment and to support the monitoring and evaluation of mitigation/management plans.

8.1 Health Impact Assessment Form and Risk

Based on the project type and the potential health impact the Project was classified as requiring a comprehensive health impact assessment. This assessment was made using the HIA decision matrix as described in Figure 5 and considered the following elements:

- **Potential Health Impacts:** Medium  
  Potential for in-migration; resettlement of communities with potential changes in social structures; construction of the railway with the potential to increase the burden of diseases such as HIV/AIDS, STIs, TB, malaria, traffic related accidents and respiratory diseases; linear routes and increased income may promote access to services but also to communicable disease (such as influenza, HIV/AIDS).

- **Project Footprint:** High  
  The footprint of the Project will result in complex public health challenges due to its sheer scale and related activities. The Project will exist for an extended period and potential project-related health impacts will change over time (i.e. construction and operation phase).

- **Social Sensitivity:** High  
  There are stakeholder concerns, vulnerable communities and groups within the communities, potential for in-migration and the potential to adjust the prevailing socio-economic conditions. There are also stakeholder expectations in the community and from the authorities.

The levels of HIA are described in Table 29 and it can be noted that by definition a comprehensive assessment requires new specific data collection. However, as the timeframes for completion of the HIA and the inability to collect new data before the final Project designs are complete and the submission of the SEIS is complete, the initial HIA will follow a rapid appraisal approach. Baseline data that is recommended for collection will be made in the management/mitigation measures of the HIA and it is recommended that these are collected as the final project designs are completed and prior to two key considerations:
• initiation of construction activities that may directly or indirectly affected communities; and;
• physical resettlement of communities.

The HIA process is an iterative process so any new specific data collection, that is either primarily collected or acquired through secondary sources, will thus complement the final evidence-based impact assessment modelling and ranking.

### Table 29: Levels of health impact assessments

<table>
<thead>
<tr>
<th>Level of HIA</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop/Scoping HIA</td>
<td>• Provides a broad overview of possible health impacts.</td>
</tr>
<tr>
<td></td>
<td>• Analysis of existing and accessible data.</td>
</tr>
<tr>
<td></td>
<td>• <strong>No new project specific survey data collection.</strong></td>
</tr>
<tr>
<td>Rapid Appraisal HIA</td>
<td>• Provides more detailed information of possible health impacts.</td>
</tr>
<tr>
<td></td>
<td>• Analysis of existing data.</td>
</tr>
<tr>
<td></td>
<td>• Stakeholder and key informant analysis.</td>
</tr>
<tr>
<td></td>
<td>• <strong>No new project specific survey data collection.</strong></td>
</tr>
<tr>
<td>Comprehensive HIA</td>
<td>• Provides a comprehensive assessment of potential health impacts.</td>
</tr>
<tr>
<td></td>
<td>• Robust definition of impacts.</td>
</tr>
<tr>
<td></td>
<td>• <strong>New project specific survey data collection.</strong></td>
</tr>
<tr>
<td></td>
<td>• Participatory approaches involving stakeholders and key informants.</td>
</tr>
</tbody>
</table>

### 8.2 Primary Health Data Collection

Based on the findings of the current HIA scoping study the collection of primary health data is recommended. The scope of any baseline health data collection should be adapted to the anticipated health impacts in the different PACs along the rail corridor, with a primary focus on PAC 3 (communities where the LSC will be located) and PAC 4 (communities where TWC will be established), as per the recommendations given in section 7. It is proposed that the data collection exercise will follow a similar methodology as the BHS that were performed in the mining and port area, although a less extensive study design will be required.

In summary the proposed BHS will have the following objectives:
• add to and amend information at a local level to more fully describe the health status of the communities based on the collection of selected indicators. This will support the final modelling of health impacts; and
• establish a solid baseline to enable future monitoring and evaluation of defined health issues across a broad sample of the Project concession and potentially impacted communities. This will allow for interventions to be monitored and adapted if/when required.

Furthermore, it is recommended that longitudinal health data is collected through the routine health information system of health facilities located in proximity to the rail corridor. This will allow monitoring of project-related health impacts in communities that may not be covered by a BHS. In this regard opportunities for the improvement of the health reporting system of local health facilities, and related elements, should be evaluated.

A detailed study methodology will need to be produced to support the proposed BHS. This will need to be submitted for ethical approval once Rio Tinto and other stakeholders (e.g. DPS of concerned prefectures) have approved the content. The scope of the BHS is outlined in the section below.

### 8.2.1 Scope of a Baseline Health Survey

A number of key elements are considered within the scope of the proposed BHS. While these will be included in the study protocol it is important that they are presented for discussion at this stage, and include:

- what health data is recommended for collection;
- where samples need to be collected from;
- who can support data collection; and
- when this data collection should occur.

The information obtained from the scoping study has allowed certain rough considerations to be developed for potential baseline health data collection. Table 30 highlights these potential elements and the different PACs where they may be relevant. However, it is recommended that the final sampling strategy including the sample sizes, locations and form be concluded once the final project design is complete and the social and environmental baseline studies are at least broadly completed. It is anticipated that the data collection activities in these communities may require a degree of flexibility to ensure that they are useful to support the baseline and the surveillance systems of the Project.
### Table 30: Data to be collected in the respective PAC

<table>
<thead>
<tr>
<th></th>
<th>PAC 1</th>
<th>PAC 2</th>
<th>PAC 3</th>
<th>PAC 4</th>
<th>PAC 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biomedical data:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Malaria prevalence in children aged 6-59 months</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of anaemia in children aged 6-59 months</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Potentially HIV/AIDS and STI prevalence in the adult population</td>
<td></td>
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<tr>
<td>Nutritional indicators in children aged 6-59 months</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data on KAP related to:</strong></td>
<td></td>
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<td></td>
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<tr>
<td>Malaria</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV/AIDS and STIs</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TB</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Water and sanitation practices</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Health seeking behaviour</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional medicine and informal health sector</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Perception of environmental determinants of health</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Life style</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Services and infrastructure assessment:</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Health facility assessment</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Drinking water quality at household and community level</td>
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<tr>
<td><strong>Entomological survey</strong></td>
<td></td>
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<tr>
<td>Identify endemic disease vectors</td>
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<tr>
<td>Determine resistance status of <em>Anopheles</em> mosquitoes</td>
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</tbody>
</table>

### 8.2.1.1 Planning and Timelines

The timelines for additional baseline health data collection are still to be determined but should commence prior to the major construction activities so the baseline is not disturbed more than it already is. A BHS of this nature will take on average 4-5 months to complete once the approvals are provided. This will include planning, developing the final study protocol, planning of logistics, ethical approval, community sensitisation, field work and reporting. The duration of the field work for the proposed data collection is anticipated to be approximately 4-6 weeks with a team of about 10-12 people (including drivers).

### 8.2.1.2 Special Considerations

Any baseline studies that are performed must be conducted with local partners if available and willing. Ethical approval is required. Community sensitization prior to any survey activities will be crucial.
8.3 Modelling and Ranking of Health Impacts

Once the recommended baseline health information has been collected, the modelling and ranking of potential health impacts will be updated in the comprehensive HIA.

8.4 Community Health Management Plan

Based on the HIA modelling and ranking the community health management plan will be developed. This will consider pure mitigation measures at community and workplace level as well as opportunities for social investment.

8.5 Health Monitoring Plan

A health monitoring plan (HMP) with a broad set of cross-sectional and longitudinal key health performance indicators will be developed to support the monitoring and evaluation of health mitigation and management programmes.
9 Key Next Steps

The following are regarded as the key next steps to support the HIA:

- discuss the scope and timing of baseline health data collection based on the findings and recommendations of the present HIA scoping study and information that will become available through social and environmental baseline studies;
- an initial rapid appraisal HIA will be completed for the Project before April 2012. Due to time constraints this will not allow for the completion of primary baseline data collection before the HIA is due for completion. However, the BHS can inform a comprehensive HIA which can update the rapid HIA as required, although the major benefit of this will be for the monitoring and evaluation system;
- development of a study protocol and budget for a BHS;
- baseline health data collection in the field for selected indicators and locations;
- analysis of additional data collected and reporting;
- development of the CHMP in collaboration with key stakeholders;
- development of a CHIS for the capturing of longitudinal data based on routine health information system data; and
- development of a HMP which integrates information generated through the CHIS.
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