



Infectious disease in rural areas: A geopropective look at incidence in the Haut Sassandra Region (Côte d'Ivoire)

Koffi Bouadi Arnaud Ferrand¹, Akpea Essan Charles², Guele Gué Pierre³

¹ Teacher-Researcher, Department of Geography, Jean Lorougnon GUEDE University in Daloa, Côte d'Ivoire

² Department of Geography, Population-Prospective Speciality, Côte d'Ivoire

³ Teacher-Researcher, Department of Geography, Jean Lorougnon GUEDE University in Daloa, Côte d'Ivoire

Abstract

The eradication of infectious diseases such as tuberculosis is one of the main health objectives of the Côte d'Ivoire government. Despite clear improvements since the early 2000s, tuberculosis remains a major public health problem. It continues to have a high incidence, especially in rural areas, and this is raising many concerns about its future. The aim of this research is to provide the political and health authorities with representations of the future incidence of tuberculosis in rural areas of the Daloa health district. To achieve this objective, the study is based on documentary research and field surveys, using questionnaires and interview guides. A tree of possibilities illustrating the starting point and the path of each scenario was drawn up. The 'balcony with a view of the falls' scenario starts today, since it is based on current trends. Two catastrophic scenarios could rapidly emerge, starting at the end of 2025 (the wave of self-medication) and in 2035 (the failed health gamble). In 2030 and 2040, two desirable scenarios (a life without tuberculosis and a breath of fresh air) could occur and lead to the eradication of tuberculosis.

Keywords: Daloa, Health District, Prospective, Rural environment, Tuberculosis.

Introduction

Infectious diseases are diseases caused by the penetration into the body of an infectious agent: bacteria, virus, parasite, pathogenic prion or fungus. Tuberculosis is a contagious disease caused by a bacterium, Koch's bacillus (*Mycobacterium Tuberculosis*), named after the doctor who discovered it in 1924. It is transmitted from one person to another by droplets of saliva that become airborne when a sick person coughs, sneezes, sings or plays a instrument. wind The World Health estimated that in 1997, 7.96 million new cases Organisation of tuberculosis occurred worldwide, half of them highly contaminated (N. Ait-K and D. Enarson, 1999). In addition, the number of deaths worldwide in 1997 was over 1.9 million. Tuberculosis is therefore the second leading cause of death in the world due to a single infectious agent (N. Ait-K and D. Enarson, 1999). In 2015, 1.8 million of the 10.4 million people with died of TB the disease (WHO, 2017). In Côte d'Ivoire, over the past five years, the number of patients has risen from 21,204 in 2006 to 23,210 in 2010, including 14,131 cases of smear-positive pulmonary tuberculosis (the contagious form of the disease), according to the National Tuberculosis Control PProgramme (N.L.T) in their 2012-2015 report entitled 2012-2015 national strategic plan to combat tuberculosis. One of the reasons for this increase in the disease is the impoverishment of constant the population, with its corollary of malnutrition. These factors have been exacerbated by the massive displacement of people as a result of the socio-political crisis that has gripped the country since 19 September 2002. According to the P.N.L.T, in 2012, the incidence of reported cases of all forms of the disease in 2010 was 106 cases per 100,000 inhabitants. The efforts made by the Ivorian government have been wiped out by the various crises the country. has experienced

In response to the scale of the problem, the government has set up facilities and trained competent staff at all levels of the health pyramid. The government's commitment is also reflected in the regular and availability of free essential anti-tuberculosis drugs. According to the P.N.L.T (2012), the support of partners national and international has helped to improve the performance of the National Programme. Tuberculosis Control In 2010, there were 140 functional), including 16 Anti-Tuberculosis Centres (Diagnostic and Treatment Centres (DTCsATCs); 1,642 staff healthcare were trained identify suspected cases and monitor patients undergoing treatment. The combination of all these efforts should lead to the eradication of the disease both urban and rural areas. However, there has been a sharp increase in new cases of tuberculosis in Daloa, especially in rural areas, with around 400 cases in the first half of 2022. So, despite all the attempts to tuberculosis, it remains and continues to wreak havoc, especially in rural areas. Hence the main question: Can the rural populations of the Daloa health district overcome this disease or are they condemned to live with it? The aim of the study is to provide the political and health authorities with representations of the future incidence of tuberculosis in rural areas of the Daloa health district

Method and data

This section is structured around three points: presentation of the study area, data selection and acquisition, and data processing. method

Presentation of the areastudy

Located 141 km from Yamoussoukro and 383 km from Abidjan, the town of Daloa is the capital of the department of the same name and of the region Haut Sassandra in west-central Côte d'Ivoire, covering an area of 38.76 km². Its population, estimated at 245,360 (R.G.P.H, 2014), is cosmopolitan, with nativesBété, non-natives from the four

corners of the country and Cnationals.E.D.E.A.O. (Communauté Economique Des Etats de l'Afrique de l'Ouest). Daloa is one of the country's health districts. 33 health regions and 113 The town is home to one of the

health centres specialising in the treatment tuberculosis: the Centre Antituberculeux (C.A.T). The centre caters for people from villages in the Haut Sassandra region and beyond. Fig 1 shows the health district. Daloa

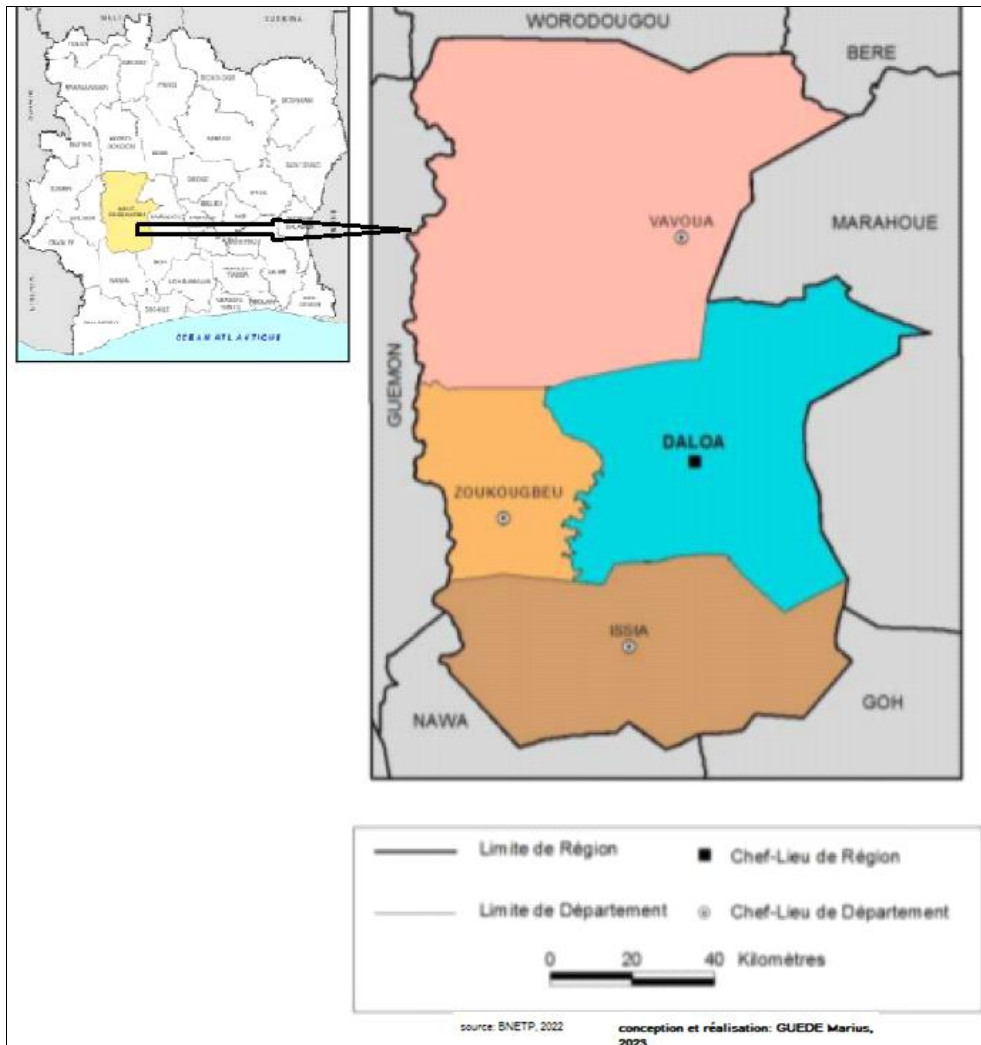


Fig 1: The Upper Sassandra region

Data acquisition method

The data required for this study were collected by administering a questionnaire to a sample of patients who tested positive, and by interviewing nursing and administrative staff at the CAT in Daloa.

As the prospective method used is the scenario method, the questionnaire used in this way enabled us to determine the variables major. 18 variables major were identified.

With regard to the sample design we, accidentally selected patients from rural areas. We did not have at hand any lists enabling us to carry out a random selection of respondents. All patients who tested positive for tuberculosis and who attended the Daloa anti-tuberculosis centre during the period of our survey were included in our sample. 50 patients who attended the CAT were surveyed on five days of the week over a period of six months (Table 1).

It should be noted that the reduction in the number of working hours due to the coronavirus pandemic has led to a lack of patients. As the bacillus is highly contagious, we took sanitary measures such as wearing masks and distancing ourselves by at least 1 metre. Table 1 shows the number of patients interviewed and where they came from.

Table 1: Summary of patients surveyed and their place of origin

Villages from which patients come	Number of patients
Badaguhé	3
Bédiala	5
Bekiprea	2
Bribouo	3
Gboguhé	3
Gbokora	4
Gnanagonfla	1
Toroguhé	6
Zakoua	3
Gonaté	4
Keibla	3
Madoguhé	1
Brohouan	3
Sebraguhé	1
Tagoura	1
Tapéguhé	3
Zerefla	1
Gossia	3
TOTAL	50

Source : surveysfield, 2024

With regard to care staff, we interviewed all the care staff (15) in the various departments of the CAT in Daloa.

Prospective method

Foresight has had to develop different methods, according to Y. Barel (1971) [2] from those developed by the older sciences. The scenario method used in this research paper is a case in point.

The word scenario was introduced into planning and forecasting by Wilson (1978); M. Godet and F. Roubelat (1996) by Hermann Kahn.

According to G. Fatima (2016), there is a consensus on the definition given to scenarios in the literature. According to D. Gould (1996), a simulation of real events, it can be about an individual or a situation and includes important points in the study of perceptions, beliefs or attitudes (E. Hughes, 1998). P. Julien (1975) distinguishes between different types of scenarios. He distinguishes between exploratory scenarios and anticipatory scenarios. Exploratory scenarios describe, on the basis of a present situation and the prevailing trends, a sequence of events leading in a logical (necessary) way to a possible future. As for anticipatory scenarios, their starting point is not the present situation but the image of a possible and desirable future, described by a given set of objectives to be achieved. So while exploratory scenarios go from the present to the future, anticipatory scenarios follow the opposite path. For this reason, the only scenarios that are inherently forward-looking are anticipatory scenarios.

The purpose of scenarios is to activate the imagination and interest (M. Poulou and B. Norwich, 2001). For Alexander and Becker (1978) [1], scenarios contain precise references to what are supposed to be the most important factors in respondents' decision-making or judgement processes. Thus, rather than allowing or requiring respondents to impute such information themselves, in response to a simple, direct and abstract situation (person), the additional detail is provided by the researcher and is thereby standardised for all respondents (Alexander and Becker, 1978) [1]. Scenarios are therefore an effective means of detecting, interpreting and organising information for strategic planning and decision-making (Mandel, 1983) [5].

Hermann Kahn was the author who introduced the scenario

method to foresight and raised awareness of the need and possibility of exploring the future in a way new (J. Lamonde and Latouche, 1975).

The scenario method can be defined as a synthetic approach which, on the one hand, simulates, step by step and in a plausible and coherent manner, a sequence of events leading a system to a future situation, and which, on the other hand, presents an picture of overallthis future situation (P.). Julien, 1975, p254According to P., it is based on Julien (opc)synchronic and analysesdiachronic; the former simulate the state of the system at a given moment and are guided by the need for a coherent description, while the latter look at the sequence of events and emphasise causality and the interrelationships between them

Furthermore, the scenario method is one of the most commonly used methodologies in foresight (J. Lamonde and Latouche, 1975; Mandel, 1983) [5].

The first was to step determine the various major variables. We defined 18 variables that play a role in the evolution past and future of incidence of tuberculosis in the Daloa CAT, and because of their status as the driving force that they play and will play on tuberculosis by 2052. These variables are then grouped into components. Five components were constituted. Component 1 is made up of the following variables: Cote d'Ivoire and its neighbours, Economy and international trade, Geopolitics and international security, National and European drug policies. Component 2 is made up of the following variables: demography and spatial implications, pharmaceutical regulations, campaign against tuberculosis .

Component 3 is made up of the following variables: cost of consultations, cost of medicines, patient income and availability of medicines. Component 4 is made up of the following variables: therapeutic itinerary of the patient, cost of transport, socio-demographic profile of patients, value systems and aspirations of patients, and finally component 5 is the made up of following variables: demography of healthcare personnel, economic and social impact tuberculosis, and safety of healthcare personnel.

We then looked back at each variable. This retrospective enabled us to identify the major trends and uncertainties.

For each variable, we determined the analysis hypotheses as shown in Table 2 for Component 1

Table 2: Analysis assumptions for component 1

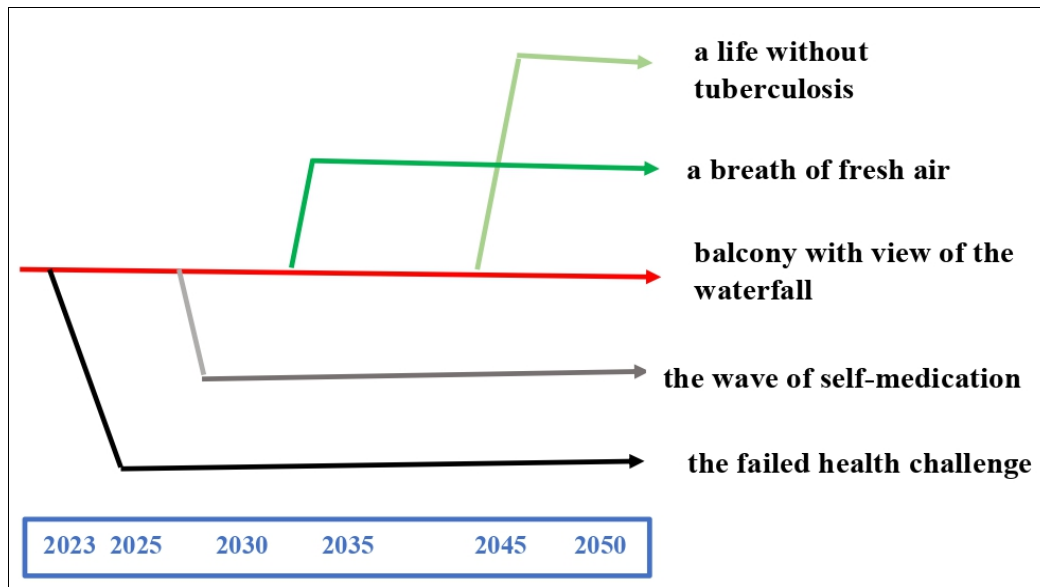
Component 1	
Variables	Assumptions
Ivory Coast and its neighbours	Hypo 1: Pacification of AES-Côte d'Ivoire relations Hypo 2: Deterioration in AES-Côte d'Ivoire relations Hypo 3: Relations between AES and Côte d'Ivoire are a mixed bag
Economics and international trade	Hypo 1: A new world economic order Hypo 2: The global crisis drags on Hypo 3: Global economic recovery
Geopolitics and international security	Hypo 1: World truce Hypo 2: Stalemate and the development of new fronts Hypo 3: A new world order: a Second Cold War
National and European drug policies	Hypo 1: Safety, efficacy and quality of medicines Hypo 2: Ineffectiveness and questionable quality of medicines

Source: Field surveys, 2024

Using the assumptions for each component, we determined 15 micro-scenarios, and using the micro-scenarios we determined 5 scenarios.

Tree of possible futures

The results of our study are presented in the form of a tree of possible futures (Fig 2).



Source: surveysfield, 2024

Fig 2: Tree of possible futures

The Balcony with a view of the fall: tuberculosis trends in rural areas of the Daloa health district

This trend scenario is based on the fact that Côte d'Ivoire is strengthening its cooperation with the Global, with which it has been working since 2008 to eradicate tuberculosis. The funds allocated to this fight will exceed 150 billion CFA francs for the 2021-2023 cycle. The fight against tuberculosis began in the early 1960s, at the Treichville University Hospital. The first milestone in the fight was the opening of a tuberculosis clinic by the government in Abidjan (FundAdjamé) in 1962, and a National Tuberculosis Control Programme (PNLT) in 2001, financed by the Ministry of Health and Public Hygiene and international organisations. Community monitoring, which began in 2005-2006 with the NGO Sapharm, has made significant progress, with the NGO Alliance taking over from Sapharm.

Awareness-raising among the rural population in Daloa remains inadequate. In areas ruralin particular, access to awareness-raising is difficult or even impossible for "workershealth extension ", "village health workers" and NGOs. Access to certain rural areas such as Bediala and Gboghué remains difficult because of the deterioration of the roads. 90% of patients in Bediala and 87% of patients in Gboghué say that they have never taken part in an awareness campaign. This means that people are not aware of the disease and take no steps to prevent it. In the sub-prefecture of Daloa, the least accessible areas are those located more than 28 km away, which are mostly isolated rings due to the poor state of the roads, the scarcity of transport vehicles, the impoverishment of the population and the weakness of the local economy. The presence of healers renowned for curing coughs in certain villages attracts a large number of patients to the detriment of the health centres required.

The frequent failure of its technical facilities means that the CAT in Daloa loses all credibility in the eyes of patients, as services that were supposed to be free, such as X-rays, have become chargeable because patients are obliged to have them done outside the CAT.

The development of illegal gold panning in the villages of the Daloa sub-prefecture is attracting people from

neighbouring countries. These people arrive in these areas without any medical check-up, preferring to self-medicate in order to remain anonymous. This amplifies the chain of contamination and increases the number of cases.

To this must be added the development of the sale of street medicines, which encourages patients to self-medicate in rural areas of the Daloa health district. In all the villages surveyed, 93% of patients used street and/or medicines traditionalas the first resort in their therapeutic itinerary.

The rural environment of the Daloa Health District: areas without tuberculosis

▪ **A life without tuberculosis**

Since the end of the Second World War, the world has experienced other forms of crisis such as terrorism since the 1990s. A global truce initiated by the United States has fostered political around the world. stability Since colonial times (before 1960), Côte d'Ivoire has always enjoyed good relations with ECOWAS countries. Indeed, it has been a centre of migration for the development of agriculture, which is the mainstay of the economy. The arrival of people from Ghana, Mali, Burkina Faso, Guinea, Liberia and other countries has provided a large workforce in agricultural production areas. These relations are currently deteriorating between Côte d'Ivoire and its neighbours. From 2040 onwards, Côte d'Ivoire will re-establish very good relations with its neighbours. It will even have a sub-regional tuberculosis policy. The countries of the sub-region will set up a tuberculosis with substantial resourcesfund.

The migration of people to Côte d'Ivoire is controlled, with medical examinations at on entry to the country and effective treatment of patients.

Côte d'Ivoire is enjoying stability political and an economic boom that ranks among Africa's top three powers. it It is carrying out in-depth reforms to its healthcare system. Health care is effectively free. Tuberculosis patients and their immediate families are covered free of charge by the social security system until they are completely cured. This total coverage includes transport, consultation, medication and hospitalisation

Côte d'Ivoire finances training and research in the health field, with the highest health budget in Africa, and produces

its own medicines to alleviate the various shortages. Funding scientific research in specialised tuberculosis laboratories, with the Jean Lorougnon GUEDE University in Daloa, so that we can return to a tuberculosis-free future as the main focus

Even the most villages remote are becoming accessible, and receive frequent visits from health workers to raise awareness. Social protection is effective, with people satisfied and poverty on the decline. Côte d'Ivoire is forging lasting partnerships with non-governmental healthcare providers.

▪ **A breath of fresh air**

The fight against tuberculosis in 2008 was difficult because very poor patients had difficulty with consultations and paying for medicines that were out of their reach, and this affected the country's economy. Dependence on Côte d'Ivoire's external drugs and stock-outs are a blow to the various TB treatments. Côte d'Ivoire's political stability and cooperation with external and national partners means that the fight against tuberculosis is less financially dependent. This is reflected in the fact that treatment continues to be free of charge and the technical facilities at the CAT in Daloa have been strengthened.

The high standard of living of these populations means that they are able to remove all barriers to effective access to healthcare.

The ECOWAS zone is experiencing troubles that are affecting relations between the various states. Côte d'Ivoire is experiencing strong economic growth, making it one of countries in the world with a good economy. It is implementing an immigration policy that enables it to limit the number of new cases of tuberculosis coming in from abroad, and training and research are at the heart of its health policy.

The new world order, with the war between Russia and Ukraine in 2022, has political and repercussions economic for the rest of the world. This crisis in the long term, which is taking the form of a cold war, could on call the help of the allies for Ukraine, which is no match for its adversary, and require the support of the USA and France to obtain arms to be able to slow down the advance of the Russian army. Russia, for its part, could itself ally with China to confront its allies. Taken together, these factors have made the influence of tuberculosis on the economy virtually non-existent, as security problems are more of a concern, but it has succeeded in opening up remote rural areas to enable them to have unrestricted access to healthcare.

The Ivorian population and tuberculosis: a lifelong cohabitation

▪ **The wave of self-medication**

The crisis between Côte d'Ivoire and its neighbours (Mali, Burkina Faso and Guinea) is escalating. It is facing a stalemate and the development of new fronts. Jihadist threats undermining internal peace. However, Côte d'Ivoire has since 2015, been the target of an attack in Grand-Bassam on 13 March 2016 which killed 19 people, and was the first terrorist attack. After the seaside resort, the north of the country is undergoing new attacks, with the village of on 10 June 2020 Kafolo (Kong) and on 7 June 2021 Tougbo (Bouna). We have also an armed action against Tehini on 12 June followed by 19 October 2021. To these crises we must add the disunity between the parties political, which is

creating a situation of neither peace nor war in Côte d'Ivoire. Partners are reluctant to fund health policy. The State is squeezing the juice by introducing new taxes in all sectors of activity. This is reflected in the neglect of health centres, which has had an impact on patient treatment and follow-up. Medicines to treat tuberculosis, which used to be free, as well as consultations, are now being unofficially charged for, given the high level of racket in our hospitals. Certainly, free care and the fact that the country is able to produce enough of the drugs advocated by the State, may not be effective in hospitals. Patients are subjected to racketeering because when patients, especially those from rural areas, who cannot read or write and are ignorant of the law, go to the health centres, the health workers ask them for money to benefit from the services, making consultations payable on the spot.

Patients with insufficient income cannot afford the luxury of paid treatment lasting 6-8 months. Inadequate health workers in the villages are sometimes threatened and held responsible by patients who are frightened by their "shameful" state of health. The influence of tuberculosis on the economy is steadily declining, as people in rural areas are major players in agricultural activity, and when they are affected by tuberculosis, they give up their work in the fields to regain their health.

The African melting pot that is the Daloa Health District is the result of the remarkable hospitality of the local people. People from faraway places have access to basic social services, just like those from the district itself. A number of patients have fled to save their lives in the face of the crisis. To ensure the safety of its population, the government has put in place a policy to boost its economy. It has introduced a policy of protectionism, which is a system designed to protect national labour and domestic production by applying tariffs to foreign products. As a result, foreign patients in rural areas had to pay exorbitant fees for healthcare. The various crises that have shaken the country during election periods could happen again in 2030, hampering all the progress made in health and making it difficult to receive care. People have no choice but to turn to self-medication, which is considered cheaper and more effective.

▪ **The failed health gamble**

Côte d'Ivoire is sinking into an international and domestic crisis. Disagreement with its neighbours is growing. The 2030 and 2035 elections plunged the country into chaos. All partners external and internal withdrew their funding. Political parties refused to compromise. Tuberculosis patients from the rural areas of the Daloa health district were scattered across the countryside. The main activity of the villagers is agriculture, and the peasants with tuberculosis live in areas that remote are often scattered, hence the lack of spatial homogeneity of the tuberculosis patients. They are therefore obliged to travel long distances to reach the centre health, which is not easy given the exorbitant cost of transport. Rural people, who are to use nature, turn to traditional and religious medicine at the very first symptoms, such as coughs and fevers. For them, it doesn't matter what the treatment is, the most important thing is to take care of themselves. As part of its eradication policy, the government has set up awareness campaigns, but these are proving difficult because they are lacklustre and underfunded.

Côte d'Ivoire's borders are becoming porous, and we are witnessing massive, uncontrolled migration, with its

corollary of disease. Medicines are in very short supply, with faulty technical facilities and discouraged, inadequate staff. The population is turning to traditional medicine and uncontrolled self-medication. Tuberculosis is becoming the leading cause of death in rural areas and continues to decimate the population. The government of Côte d'Ivoire turned to new partners such as China and Russia, but tuberculosis was still present and actively taking root.

Conclusion

In short, after having developed various hypotheses on each of the 18 variables selected beforehand, we constructed 15 micro-scenarios, which then gave rise to 5 macro-scenarios covering the entire field of possibilities with regard to the incidence of tuberculosis in rural areas of the Daloa healthby 2053 district. Finally, we drew up a tree of possible futures illustrating the starting point and the path of each macro-scenario. The scenario entitled "Le Balcon avec vue sur la chuteThe balcony with a view of the waterfall" () starts today, as it is trend-based and therefore follows the current logic. Two desirable scenarios, namely a life free of tuberculosis and a breath of fresh air, which have been drawn up from 2030 onwards, determine a glorious future with tuberculosis in the rural areas of the town of Daloa being sent for total disappearance. Contrary to these glorious scenarios, we have disaster scenarios, namely the wave of self-medication and the failed health gamble, which could emerge rapidly, as early as the end of 2025 (the wave of self-medication) and in 2035 (the failed health gamble).

In this article, we discuss an experience of foresight in the health sector, and draw out a number of lessons: the dependence of the health sector's funding on external sources leaves us uncertain about the eradication of certain diseases such as tuberculosis.

From a methodological point of view, it is clear that other experiments of the same type should be analysed from a comparative perspective, with a view to enriching the lessons we have drawn from them. Nevertheless, this approach, with a few adaptations, can be generalised to other sectors or professions.

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