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Free healthcare provision with an NGO or by the Malian government – Impact on health center attendance by children under five

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Abstract. The provision of free healthcare is increasingly advocated as a way to improve access to health services for vulnerable population groups. However, decision makers are still short of factual data about the effects of payment exemptions (free provision) where they have already been introduced, and on the impact of different forms of implementation in French-speaking countries of West Africa.

In the South of Mali, two types of free healthcare for children under 5 have been introduced: i) initially, a partial exemption, covering only the rapid diagnosis and treatment of malaria, and ii) subsequently total exemption for all primary healthcare. The partial exemption was first implemented by an NGO in a single district, then scaled up by the Ministry of Health on a nationwide scale.

Following the partial exemption, health center attendance increased from 0.3 annual consultations per child, to 0.5, and then to 1.8 when total exemption was introduced. The rises in attendance were immediate and lasting for all health centers, whether implemented by the NGO or by the government. Attendance during the rainy season was multiplied by 1.5 after the government-organized partial exemption. Statistical analysis shows that if the government alone (without NGO) were to bring in 100% free healthcare for children, it could increase health center attendance by a factor in the order of 4.

Keywords: malaria, free healthcare, exemption from payment, NGO intervention, scaling up, health center attendance, children under five

1. Introduction

Several African countries have experimented with or adopted policies implementing the partial or total exemption from the payment of healthcare charges, with the aim of improving access to healthcare for vulnerable population groups. Reliable data on the evaluation of these experiences are scarce, however, particularly for the countries of French-speaking West Africa (Meessen & al., 2011; Ridde & Morestin, 2010).

In the district of Kangaba in the South of Mali, the NGO *Médecins Sans Frontières, Centre Opérationnel de Bruxelles* (MSF-OCB) has initially supported seven out of eleven community health centers (CScom – *Centre de santé communautaire*) by organizing the exemption of healthcare fees for children aged between 0 and 4. The exemption started in 2005 and was initially limited to cases of malaria. It covered a rapid diagnostic test (RDT) and a course of artemisinine-based combination therapy (ACT). We refer to this exemption as "free ACT". At the end of 2006, the exemption was

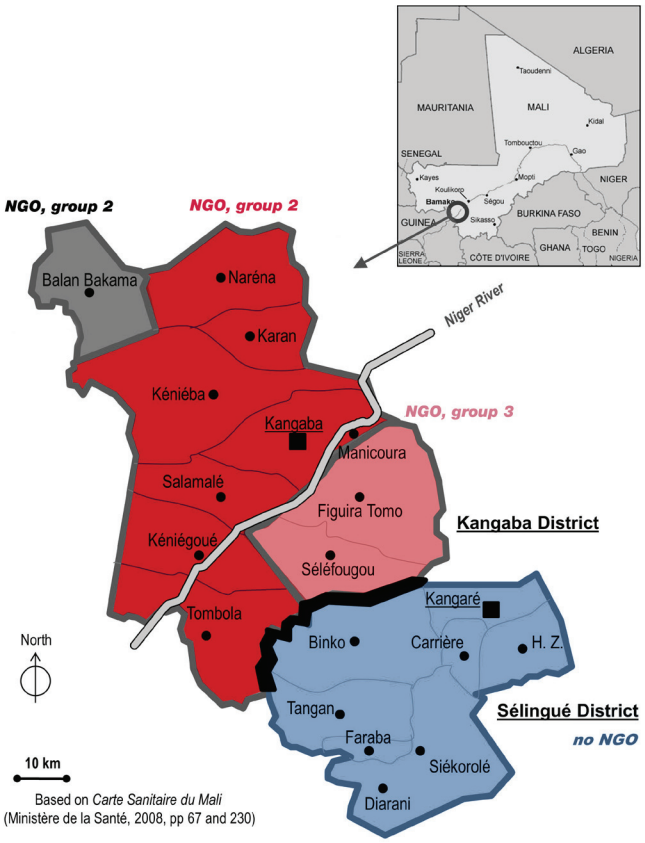

Figure 1. Map of intervention and comparison areas

extended to all healthcare for children under five. Then, in 2007, the Ministry of Health in turn made ACT free for under-fives throughout the country, including the four Kangaba district CScoms not yet covered by the NGO. Finally, in 2008, the NGO extended its activities to include the latter CScom, also dispensing totally free care to under-fives at these centers. At the same time, it modified its way of reimbursing the CScoms.

Evaluating this series of interventions is a challenge, as the interventions overlapped or closely followed one another. At the same time, however, the variations in mode of intervention within the same context provide a rare opportunity for evaluation: they can be used to measure not just the overall effect of the interventions, but also the robustness of the effects when exposed to a range of different factors. This enables us to break down the overall effect into two components: one linked specifically to the exemption from payment, and one linked to the presence of an NGO with a room for maneuver differing from that of the government.

To shed further light on this variation within the intervention district, we have selected a comparison district, namely Selingué. It is situated next to Kangaba and did not benefit from the intervention of the NGO. Thanks to the quarterly statistics reported by each CScom, we have comparative data before and after the intervention as well as with and without intervention.

2. History of interventions

The partial exemption of payment for RDTs and ACT as well as the total exemption were introduced by the NGO as part of

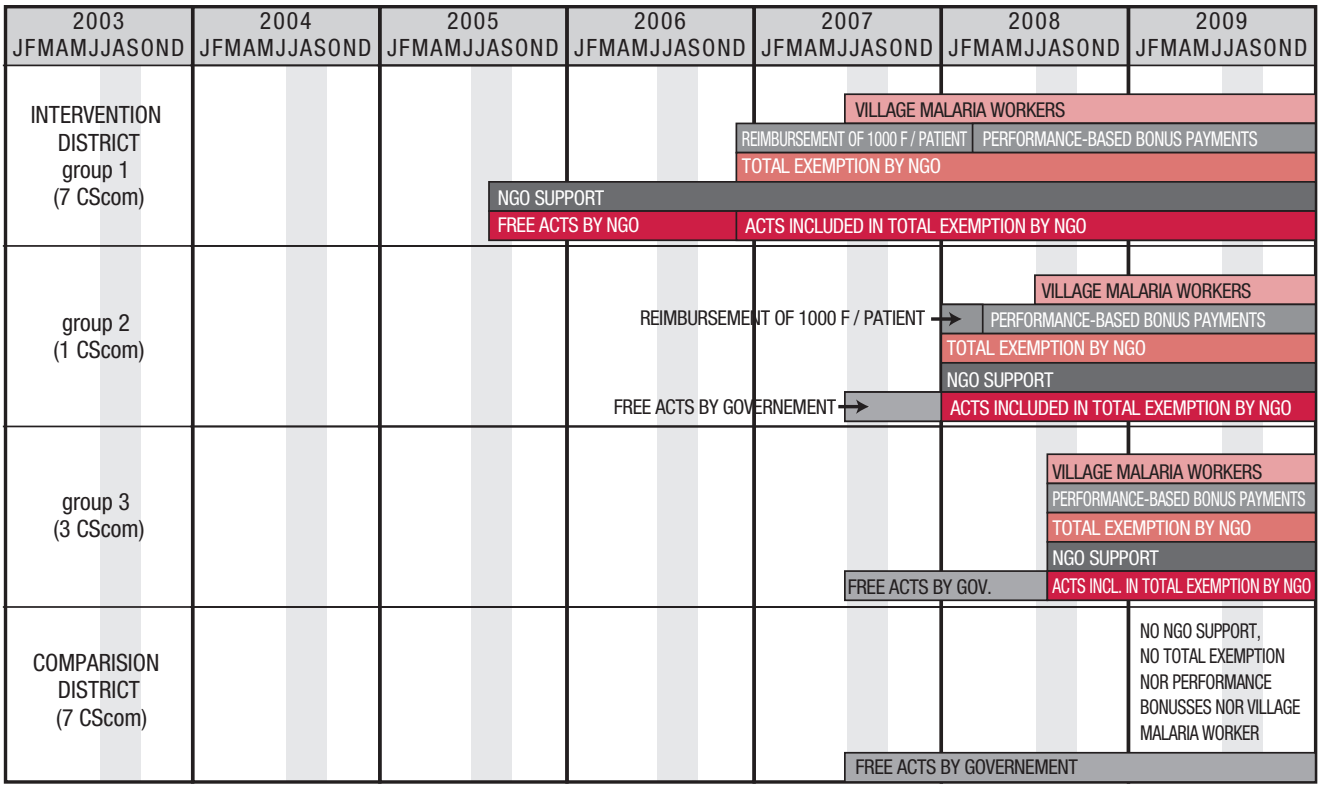

Figure 2. Sequence of interventions by area

The shaded bands mark the 3rd quarters (July to September), i.e. the start of the peak malaria transmission season, and the peak of CScom attendance by children under five.

its "Malaria Project". The project was motivated by the goal of reducing malaria-related mortality and morbidity, rather than experimenting with different forms of free healthcare. However, the partial exemption was subsequently made total when the NGO realized that the partial exemption failed to reach a majority of malaria cases (MSF, 2008; 2010).

We describe below the successive changes that occurred in the CScoms of the intervention and comparison districts (Figure 2). The NGO initially selected only seven out of the eleven Kangaba district CScoms to roll out its interventions, because the remaining four were hard to reach.

2.1 Free ACT provided by the NGO

Faced with heightened resistance to chloroquine, the Ministry of Health decided in March 2005 to adopt artemisinine-based combination therapy (ACT). MSF offered to support the process of change in anti-malaria strategy. Starting in August 2005, the NGO supplied TDRs free of charge for all patients, and ACT treatment for children under five. The consultation itself, however, had still to be paid for and patients aged 5 years and over were charged a fixed tariff of FCFA 85 (USD 0.17) per ACT treatment.

At the start of the intervention in 2005, the permanent MSF team consisted of one doctor and one nurse, but was doubled in 2006 to cope with the increased supervisory workload. The team did not directly dispense healthcare, but organized the training and supervision of health workers, CScom administrative staff and management committees. A protocol was set up for the use of ACT and the healthcare workers were trained in its application. The local population was informed about the innovation at three meetings organized at each CScom, to which two representatives from each village were invited.

The difficulties encountered with this intervention were the understanding of the RDT – the use of which was new to the healthcare workers – and the restocking of CScom pharmacies to avoid shortages of RDTs and ACT treatments.

For the patients, the exemption was conditional on diagnosis. If the RDT was negative, the test remained free of charge, but the patients had to pay for the prescribed treatment. Although the symptoms of malaria are well-known to the population and the probability of a malaria attack is high, at least during the peak transmission season (July to December), the possibility of the patient having a non-malarial febrile illness is very real: 23% of children with fever tested negative during the peak transmission season and 30%, during the low transmission season.[1] Users could therefore not be sure of getting free treatment until they had taken the RDT.

Following this initial intervention, healthcare quality and service utilization improved. However, the NGO became aware that many children suffering from malaria still did not have access to treatment. It therefore decided to remove financial barriers by making all healthcare for children under five free (see next section). It also sought to act on the geographical barrier for certain first-line treatments in the more remote villages (see the "*Agents palu*" section).

2.2 Total exemption provided by the NGO

The objective of the total exemption was to reduce malaria-related mortality and morbidity. As from December 2006, all treatments for children under five became free of charge (MSF, 2010), regardless of the health problem (malaria or otherwise). For these freely dispensed procedures, the management committees ("ASACOs") were given a financial compensation of FCFA 1,000 for each new curative consultation. These measures were still limited to the seven initial CScoms in the program.

Two 3-day workshops were organized to train the healthcare workers, notably in differential diagnosis of malaria and respiratory infections. The ministry's diagnostic and therapeutic protocols were simplified. Supervisory visits to healthcare workers and CScom administrators were organized on a twice-monthly basis, much more frequently than foreseen by the public system (monthly visits for the first six months after the opening of a center, and quarterly visits thereafter). The two main constraints identified for personnel training are, firstly, the large proportion of CScoms directed by nurses who are auxiliary *infirmiers brevetés* rather than by the state-registered *infirmiers d'Etat*, and secondly, the mobility of healthcare workers. The administrative personnel, meanwhile, now had to manage not only the two items required by the partial exemption, but all of the essential first-line drugs for children. Anticipating stock shortages and planning for preventive supplies required a great deal more attention. The ministry's management system was applied, however, the NGO obtained supplies not from the national purchasing agency, but via its own supply chain.

2.3 "Agents palu" for remote villages during the peak transmission season

The accessibility of CScoms for people living in villages more than five km away was limited or even non-existent during the rainy season. In mid-2007, observing a high incidence of advanced-stage malaria among patients who had traveled long distances, the NGO began recruiting villagers who could read and write, to act as "*Agents palu*" (village malaria workers). They were trained to diagnose and treat simple malaria cases with RDTs/ACT and to refer RDT-negative or serious cases to the CScom. The *Agent palu* strategy focused on children under 10 and was limited, on one hand, to the period from July to December (the "peak transmission" season), and on the other, to villages located at least 5 km away from the nearest CScom. On average, each *Agent palu* had to cover three villages and was paid FCFA 25,000 a month ($50).

2.4 Free ACT provided by the government

In July 2007, the Ministry of Health introduced free RDT and ACT provision across the country, including the four CScoms

1 From August to December 2005, 79% of the children were given an RDT and 77% tested positive (thus, 23% were negative, calculation based on MSF, 2006a). From January to June 2006, by contrast, 37% were given an RDT and 70% were positive (MSF, 2006b). The percentage of confirmed malaria cases was therefore 61% during the peak transmission period and 26% during the low transmission season.

in Kangaba district where the NGO was not yet operating. The national strategy is equally aimed at children under five, and uses a diagnostic and therapeutic guide similar to the one deployed by the NGO, and used the experience gained by the NGO. Compared to the NGO implementation, the target population of the national strategy received less information; the message about fee exemption is thought to have been publicized solely on local radio. District pharmacies recorded frequent shortages of RDTs and ACT, often lasting up to 4 months a year. Supervision and training were less intense than with the NGO.

Although the national strategy was implemented in four CScoms of the district where the NGO had been operating for two years, there was little exchange between the district health management team (public system) and the NGO team. The supply chains remained separate and ACT provision in the NGO's seven CScoms remained part of the overall free healthcare plan. For the four remaining Kangaba district CScoms, the implementation of the national strategy was therefore influenced little, if at all, by the presence of the NGO. Only the workload of the district health management team was diminished, because they had to deal with only four of their eleven CScoms.

2.5 Fixed-rate reimbursement, replaced by a performance-related system

Initially, the CScom management committees were given a fixed-rate reimbursement of FCFA 1,000 by the NGO for each free consultation. This compensation was intended to cover the salaries and running costs of the CScoms. The automatic and unchanging amount was agreed before the program began, aiming to keep the CScoms operational. But it was calculated knowing neither the real costs, nor their seasonal variation, nor their variation per volume of patients seen. The amount turned out to have been over-estimated (Jouquet, 2007) and a modification of the CScom compensation system became desirable in order to link compensation to performance.

Starting in February 2008, the compensation payment was broken down into a minimum amount to cover the health center running costs[2] and a set of bonuses awarded on the basis of a monthly performance evaluation. Checks were made on whether health workers had maintained a continuous presence, on whether the prescriptions matched the diagnoses, on the management of the CScom drug store, on proper bookkeeping, on the completeness and regularity of the monthly statistical report, on the management committee's handling of the accounts, and on the record and regularity of internal and community meetings (MSF, 2009). This performance-checking was initially perceived by the personnel as unusual and as a form of "inspection". However, after a process of adaptation, the various staff members were increasingly successful in meeting the criteria and earning their bonuses, and the system came to be accepted.

2 The fixed amount includes the remuneration of CScom staff according to the salaries paid by the ASACOs, plus an amount to cover the running costs, based on the average monthly amount for 2007 augmented by 20%.

2.6 Extension of the program to the remaining CScoms in Kangaba district

In 2008, the NGO integrated the district's four remaining CScoms into its program. The sole "Group 2" CScom (see Figures 1 & 2), located behind a mountain at the western end of the district, began dispensing free healthcare in January 2008. Group 3 – the three CScoms located entirely on the other side of the river – started in July 2008. Due to the barrier of the river, implementation was administered by a new team formed by the NGO and based in Selingué, geographically closer. The new team was made up of a member of the existing team project and a new recruit.

Unlike Group 1, where the innovations were introduced one by one, the whole set of measures was put in place at the same time in the new health centers supported by the NGO: free ACT, until then implemented by the public system, was integrated into the overall free provision offered by the NGO; the RDTs and ACT medications were now sourced from the NGO's stores. Total exemption was brought in with performance evaluation, *Agents palu* were put in place, and training was dispensed at a single workshop.

The health workers and administrators of these CScoms are reported to have complained that they had not benefited beforehand from the fixed-rate compensation of FCFA 1,000 per consultation (which was advantageous for the CScoms). The management committees did not take the initiative of convening meetings additional to those organized by the NGO, unlike what had been observed in Group 1.

3. Method of evaluation

We use the routine data recorded at each CScom. The monthly numbers of consultations of under-fives were extracted from the quarterly reports of the two districts. The data were extracted twice and independently, to correct input errors. The data constitute a time series for each CScom extending from January 2003 to December 2009, based on the reports that could still be retrieved (94%).

The choice of the comparison district was made in 2010, and therefore influenced neither the intervention nor the data collection. One of the CScoms (Karan, Group 1) had to be excluded from the analysis because of its inconsistent population numbers.

The visual and statistical analyses of the graphs follow the recommendations of Shadish et al. (2002). The statistical analysis uses multi-level regression to evaluate the contribution of each form of exemption to health service utilization, and to factor in differences of context between health centers (e.g. presence or absence of the NGO, of a doctor, of a hospital (CSréf), of rural maternity services, and the share of the population living a long way from the CScom). The modeling and interpretation of the results are based on the intervention history and on information from project team members.

We apply negative binomial models with random effects representing unobserved characteristics of the CScoms and control for serial autocorrelation (Snijders & Bosker, 1999; Singer & Willet, 2002; Verbeke & Molenbergh, 2005; Lagarde, 2011). The predicted rates of Figure 4 are obtained

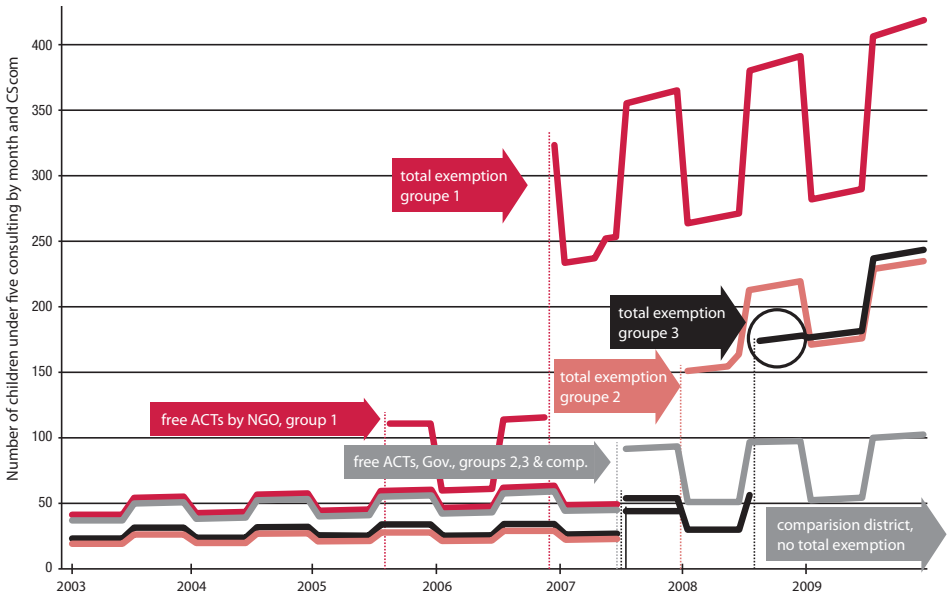

Figure 3. Evolution of health center attendance

Average numbers of monthly consultations of under-fives for the three groups of CScoms in the NGO program and for the comparison district, as predicted by the regression model. The predictions *include* the significant effects described in Section 4.2. The graph of the comparison district is shown in black, those of the NGO intervention areas in color. The long and slimmer arrows indicate the start of free ACT provision, the short and thicker arrows the start of total exemption. The circle represents the slow startup of Group 3 (see text).

using the post-estimation function available in SAS 9.2.

In the negative binomial models, we treat the size of the target population (i.e. the numbers of children under five in each area) as the denominator (offset) of the dependent variable (i.e. the CScoms' monthly consultation numbers). This enables us to simultaneously model these numbers (Figure 3) and the utilization rates (Figure 4). In turn, there is no coefficient produced for the size of the target population; rather its influence on attendance is fully accounted for by the offset and the direct modeling of rates.

4. Results

4.1 Immediate, homogeneous and lasting increases in attendance

The analysis of the graphs shows that *total exemption* has a large effect on health center attendance. Figure 3 presents the monthly averages per group and month, as predicted by the regression model. The complete information is contained in the time series observed per CScom and month (Figure A.1 in the appendix).

The increases occur in the month where total exemption is introduced, i.e. ***immediately***, although the periods of introduction vary from one group to another. This uniformity of reaction, despite the differences in years and seasons of program inception, is a key argument for attributing the increases to the advent of free provision. The other item of evidence is that the comparison district shows no such increase.

One can also observe an immediate effect of *free ACT (as provided by the NGO and by the government)*, although the effect of total exemption largely dominates the picture and determines the scale, making the effect of the partial exemption look small. The effect of the partial exemption is primarily seen during the peak malaria transmission season, from July to December. It is more marked, however, in presence of the NGO in Group 1.

The ***homogeneity*** of these effects is striking. In Figure A.1, there are no CScoms that fail to show an increase as a result of the exemption. When ACT treatments alone are free, attendance falls during the low malaria transmission season (January to June). With total exemption, by contrast, attendance remains up all year round. The homogeneity in showing an immediate reaction does not, of course, prevent the CScoms from differing substantially in terms of the size of that reaction (see Figure A.1; part of these differences between CScoms can be explained by the results of the regression).

Note that Group 3 is the only one that does not show the full upward spike during the first peak malarial season following the introduction of total fee exemption (see the circle in Figure 3). The start of total exemption coincided with the beginning of the peak transmission season in 2008. CScom attendance rises immediately but, in the rainy season, only just reaches the level of the next low transmission season, January to June 2009. However, as from the second year of application of total exemption, the Group 3 attendance behaves like the rest of the district, with a distinct spike during the months from July to December. As mentioned earlier, this group of CScoms is hard to reach, and the implementation was managed by a new team from outside the district.

The rises in attendance are ***sustained*** during the observation period. The effect of *free national ACT treatments* was stable over the two and a half years of monitoring in the *comparison district*, during which time the measure was not incorporated into the NGO's total exemption scheme. As for the *total exemption*, the observed and predicted curves both give the impression of an upward trend.

The *absolute numbers* of children consulted – between 20 and 50 per month before the interventions (Figure 3) – rise by several dozens upon introduction of free ACT and reach at least 200 under total exemption. However, the seasonal highs during the peak transmission season exceed 400, and in the two Group 1 centers with a doctor, the figures approach the 1,000 mark.

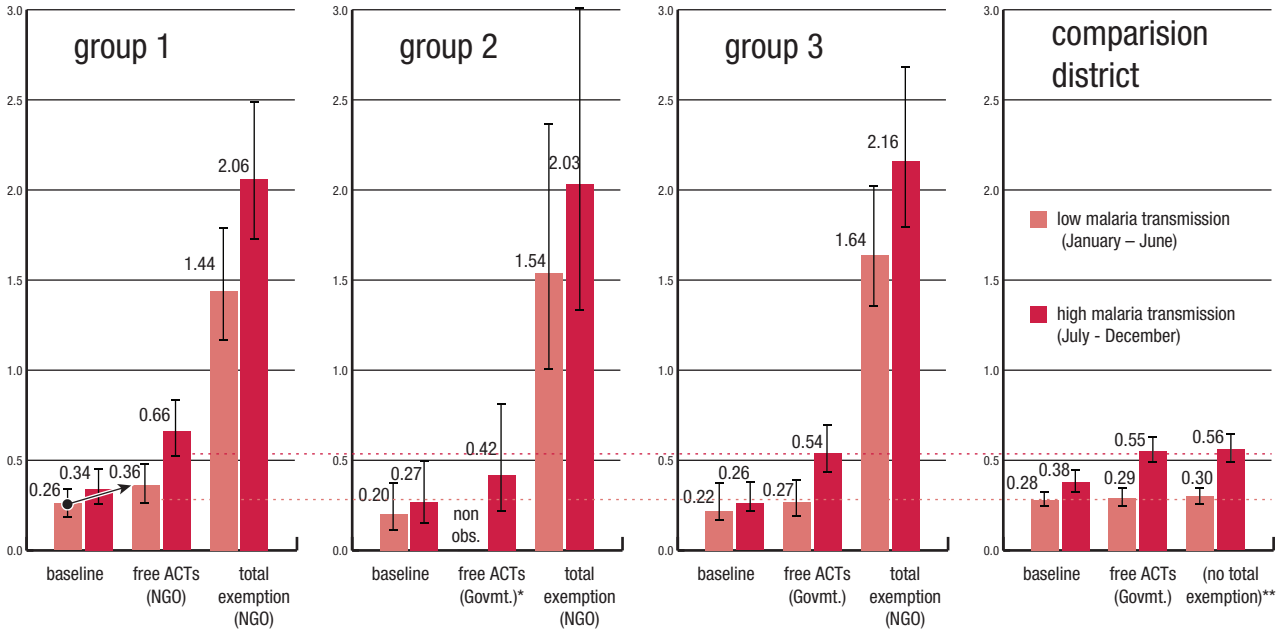

Figure 4. Effects on utilization rates per child and year

Annualized consultation rates per child under five and per half-year, as predicted by the regression model. The predictions *include* the significant effects described in Section 4.2.

*In Group 2, free ACT provision was observed for only one peak transmission period. **In the comparison district, where no total exemption was introduced, the only change after free ACT is due to a weak background trend.

4.2 Determinants of health center utilization

As with the preceding analysis of the graph curves, the effects that stand out from the results of the statistical modeling are that of total exemption (multiplying attendance by between 3.1 and 6.1, see section 4.4) and the seasonal variation on the effect of free ACT (between 1.1 and 1.9). Other effects, less or not at all visible in the curves, are nonetheless statistically significant and were included in the model:

- The peak malaria transmission season multiplies CScom attendance on average by 1.332 (95% confidence interval: 1.201–1.478);
- The presence of a doctor multiplies attendance in the July-December period by a factor of 1.264 (1.030–1.550). This suggests that the capacities and resources available at the corresponding CScoms play a key role, whether in facilitating the management of patient overflows, or in enhancing the relative attractiveness of centers (two CScoms in Group 1 and three in the comparison district had a doctor);
- The presence of a hospital (CSréf) in the area of a CScom diminishes its attendance by a factor of 0.708 (0.523–0.960);
- If the delivery of free ACT is accompanied by the NGO, its effect on attendance multiplies by 1.261 (0.969–1.642)[3], on top of the preceding effects[4].

Other factors were tested, but proved to be non-significant:

- The *proportion* of the target population *living more than 5 km away* from the CScom (on the *size* of the *total* population, see Section 3);
- The presence of a rural maternity service in the area of the CScom;
- The introduction of *Agents palu*;
- The replacement in Group 1 of fixed-rate reimbursement by performance-related bonuses.

4.3 Utilization rates per child, with and without exemption

Figure 4 presents the annualized utilization rates[5] according

3 Unlike the previous estimates, this one is based on short periods: free ACT provision was observed *with* the NGO from mid-2005 to end 2006 in Group 1, and *without* the NGO from mid-2007 in the comparison district (only very briefly in Groups 2 and 3). Whence the relatively large confidence interval.

4 All of the effects apply independently. For example: during the peak season, attendance is multiplied by a factor of 1.33; in the CScoms with a doctor, utilization increases by a further 1.26, so that these CScoms see their attendance multiplied by 1.33 x 1.26 = 1.68. Likewise for the effect of free ACT and its delivery (or not) by the NGO.

5 An *annualized* rate of e.g. 1.44 (Figure 4, Group 1 with total exemption, low season) means that a child in these areas would visit the CScom on average 1.44 times a year, *if* the rate remained constant over the year. But as this rate represents the 1st half-year while the rate for the 2nd half is 2.06, the average *annual* number of consultations per child works out at 1.44/2 + 2.06/2 = 0,72 + 1,03 = 1.75.

to the regression model, for the low and peak malaria transmission seasons. The rate per child represents the *perspective of the target population* and its *effective access to the CScom*, while the absolute number of consultations per CScom (Figure 3) represents the perspective of the service and its workload. The predicted rates account for the influence of the factors identified above and control for the long-term trend in attendance.

With regard to *free ACT*, it is clearer here that it acted mainly on attendance from July to December. Only in Group 1 – with NGO support – do we find a rise in attendance during the *low* transmission season (small arrow). Also, the increase during the peak transmission season is more pronounced. In low and in peak seasons alike, the rates for Group 1 during the free ACT stage are distinctly higher than in the other zones. The latter are situated at the lower confidence limits of Group 1, indicating that the additional effect in Group 1 is almost statistically significant, despite the short period of observation (see note, Section 4.2).

Turning to *total exemption*, we observe a "*catch-up*" effect in Groups 2 and 3. They attain rates *equivalent* to those of Group 1, although their basic rate, and their rate during partial exemption, were distinctly lower. It seems that the "NGO factor" not only made up for the difference observed between national policy and the NGO intervention, it also compensated for the "difficulty" of these areas, which previously recorded rates lower than both Group 1 and the comparison district.

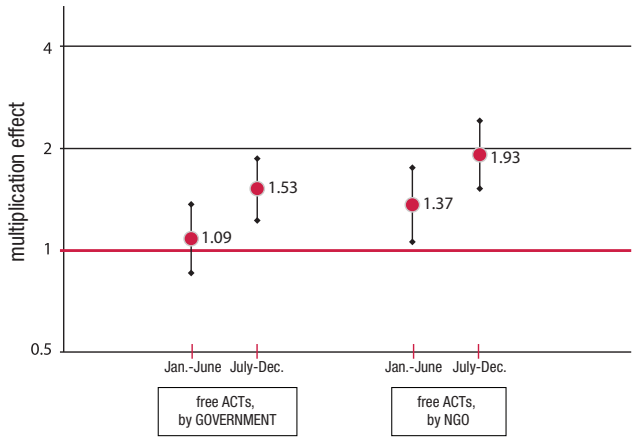

Figure 5. Effects of free ACT with the NGO or by the government

These effects are *controlled* for and net of the significant factors described in Section 4.2.

4.4 Effect of partial and total exemptions with the NGO or by the government

Figure 5 compares the effects of the two ***free ACT*** implementations observed[6]:

- Free ACT provided *solely by the government* (Figure 5, left) multiplied CScom service utilization in the peak transmission season (July-December) by a factor of 1.5 on average. During the low transmission season (January-June), however, we find little or no significant effect (factor of 1.09);
- Free ACT *supported by the NGO* (Figure 5, right) multiplied CScom utilization during the peak period by a factor of approximately 2. Only in the context of NGO support we find a significant effect also during the low transmission season (factor of 1.4).

Figure 6 uses the effect difference found between the two free ACT implementations and compares expected effects of ***total fee exemption*** of underfives' healthcare, according to three scenarios. The three estimates address different practical questions:

- *Additional effect* of total exemption when following on from free ACT provision: we observed the effects of total exemption only when it was added to the exemption from payment for ACT treatment, which was already having an impact on attendance. This transition from partial to total exemption multiplied CScom attendance by a factor of 3.0 during the peak transmission season, and by a factor of 4.4 during the low transmission season (Figure 6, left). The difference of effect between the two seasons may seem surprising, but we should remember that free ACT provision had already increased peak-season attendance by a factor of 1.5 (taking the estimate without NGO). The calculations performed for this first scenario enable us to estimate the increase in attendance expected if the public health system *of Mali* were to extend its program of partial exemption (free ACT is already generalized) to the total exemption for firs-line treatment of children. However, as will be discussed, this estimate represents an *upper bound*. The estimate assumes, of course, that such an extension would use strategies like those observed in Kangaba, notably as regards reimbursement. It excludes the NGO effect in order to provide a more realistic approximation of the impact achievable by the public health system under "normal" conditions of implementation.
- *Overall effect*: the regression model compares the attendance observed during total exemption with the level that would have been found *without any* exemption. This comparison yields an overall increase in attendance by a factor of approximately 4.7 (Figure 6, center). Again, this estimate represents an *upper bound*. This second scenario enables *other countries* to estimate the increase in attendance if they were to organize total exemption *from the outset*, *without an initial phase of partial exemption,* and using similar strategies in a similar context. Once again, the NGO-specific effect is *excluded* from the effect estimate.
- *Overall pilot project effect*: by finally factoring in the NGO effect, we obtain the overall effect of total exemption as observed in Kangaba district in presence

6 All of the effects presented in this section apply to an *average CScom* (based on the 17 CScoms in the study); they apply *on top* of the other effects listed in Section 4.2.

of the NGO. This effect estimate includes aspects that go beyond free healthcare provision, such as the presence of an outside organization capable of focusing substantial human and material resources on a few selected CScoms, without necessarily following national recruitment and supply circuits. The overall pilot project effect is of course greater, increasing CScom utilization by a factor of approximately 6.0 (Figure 6, right). This final scenario may be of interest to NGOs, project sponsors or governments planning a similar program, to demonstrate the effects of exemption in the context of a *controlled pilot project*.

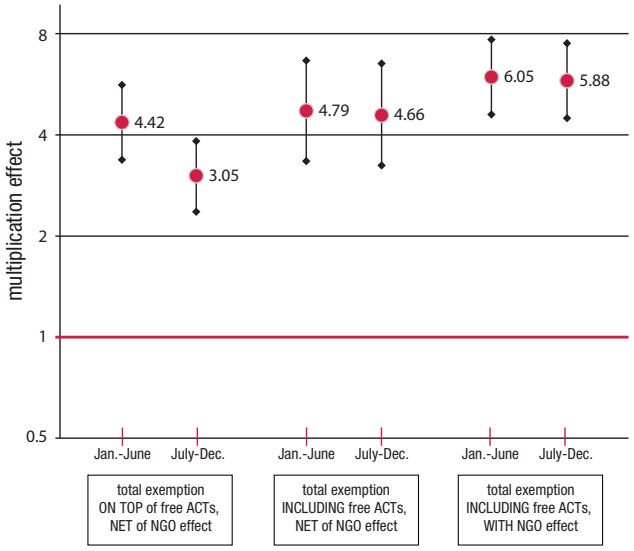

Figure 6. Effects of total exemption under three scenarios

These effects are *controlled* for and net of the significant factors described in Section 4.2.

5. Discussion and conclusions

The immediate and lasting increases in health center attendance following the introduction of both partial and total exemption indicate that the elimination of financial barriers is effective in addressing *previously unmet needs*. This is promising: better health center utilization can be expected to have a positive influence on under-five mortality and morbidity (Rutherford & al., 2010). Additionally, the NGO conducted a study in mid-2008 on under-five mortality in the areas of Group 1, covering six months of free ACT and seven months of total exemption, as well as an area without these interventions. The study found signs of reduced mortality among under-fives in the intervention zone (Ponsar & al., 2011).

The stability of the positive effects of *government-organized* free ACT provision is particularly encouraging, especially during the peak malaria transmission season. It attests to the *viability and relevance* of this intervention within a public health system and without NGO support. It also suggests that the *quality* of public health services as they currently stand is accepted by the population, so long as they are financially accessible: we should not forget that there is a consultation charge – only the ACT treatments are free. Quality is compromised primarily by shortages of RDTs and ACT, which are still locally out of stock for up to four months a year. Even if CScom attendance in the state-run context has increased less than in the context of NGO intervention with total exemption, it is reasonable to assume that relatively more serious malaria cases have benefited, which should result in a positive impact on morbidity and mortality across the nation.

The large effect difference between partial exemption, targeted at malaria, and total exemption highlights the ambiguity inherent in exemptions that are conditional on a diagnosis that cannot be known in advance: potential users are unsure of being exempted from payment, and thus weigh up their chances before they consult, especially when cases do not – or not yet – appear serious enough for the children's mothers to cover several kilometers on foot.

The substantial overall effect of total exemption on attendance confirms the potential of this intervention. With a rate of 2 consultations per year and child during the peak transmission season, and 1.5 during the low season, it not only has the potential to reach a large proportion of malaria cases, but also respiratory infections and severe diarrheas, thus helping to reduce general mortality and morbidity in the target group.

The monthly peaks of up to 1,000 child consultations per CScom (Figure A.1) show that the healthcare personnel was able to cope with the additional workload. In Group 1, the workload in the peak transmission season went from an average of 7 consultations per health worker per day, prior to the intervention of the NGO, to an average of 21 consultations per health worker per day following the introduction of total exemption for under-fives (Jouquet, 2007 & 2008). The staff workload was therefore multiplied by 3. With total exemption, the situation moved from one of under-utilization to normal utilization of medical personnel. The same ability to absorb additional workload has been observed in two districts in Burkina Faso that experimented with total exemption for under-fives (Ly et al., 2012).

The effect of the partial and total exemptions has proved to be *robust* in several ways:

- The homogeneous reaction in all the areas where they were implemented suggests a certain robustness with regard to differing local contexts.
- The effect of total exemption was unchanged after the reform of the compensation system, which abolished a fixed-rate system – one that was very advantageous for the management committees – in favor of performance evaluations, which the personnel had difficulty accepting.
- The effect of total exemption was also robust with regard to accelerated implementation and shorter training times in Groups 2 and 3. The Group 3 implementation, moreover, was managed by a new team working out of a new project office.

The available data do not enable us to assess whether – as was observed in Burkina Faso (Ridde & al., 2011) – the exemption measures benefited poor households or people living

in remote villages.

The "NGO effect" (a factor of 1.26) was found by comparing the two implementations of free ACT provision, in the pilot project of Kangaba and country-wide as far as represented by Sélingué. The aim of the intervention was the same for both sets of actors: to supply RDTs and ACT medications free of charge, to train the CScom personnel in their use and management, and to make sure the local population was informed about the innovation. Consequently, the NGO effect can be explained by the additional resources and greater intensity of the intervention, with more widespread public information, more intensive supervision and training, and the elimination of drug stockouts. Given the prevalence of shortages in the public system, one might actually have expected the NGO effect to be even greater.

In Section 4.4 we applied the same NGO effect to total exemption, to estimate the increase achievable country-wide by the public system (Figure 6, left and center). As *scaling up* general fee exemption poses quantitatively a greater challenge than partial exemption, the NGO factor may turn out greater than 1.26 in this case; therefore, the overall effect estimates for country-wide implementation by the public system (between 3.0 and 4.7 according to the point of departure) represent *upper bounds*. An effect estimate of total exemption on attendance in the absence of an NGO is crucial for the realistic planning of resource requirements for potential government interventions. Our estimates are certainly approximate but may turn out useful in the absence of alternative information. The estimates also assume, of course, that the total exemption measure will –in a context comparable to the districts of Kangaba and Sélingué– adopt similar strategies, notably as regards reimbursement of the management committees and incentives for the personnel.

To further illustrate the NGO effect, let's look again at the effect of free ACT during *low* malaria transmission, observed only in presence of the NGO (Figure 5, right). This effect is astonishing, as the chance of benefiting from free ACT was even lower during this period: only 26% of the children had confirmed malaria (compared with 69% during the peak season, see Section 2.1). The fact that there was nonetheless an effect in the low season suggests that the presence of the NGO had a more general influence: demand was increased despite the high risk of not benefiting from exemption. People must have been attracted by *something else than financial accessibility*. We should ask what this is and if the public system can provide it. One plausible explanation is *a priori* confidence in the quality of care due to the presence of external actors. No-one would expect the public health system to be able to organize, on a national scale, what the NGO was able to achieve in a single district, but there may be some elements that could be reproduced by the public system: for example, reliable forward management of drug stocks, the simplification of manuals, or more effective public information on health service innovations.

The direct cost of the intervention (covering medical personnel, medications and running costs) for total exemption of payment for the treatment of under-fives in Group 1 came to an average of € 2.37 per consultation (US$ 3.24). The indirect cost (for supervision and technical support, if entrusted to a local NGO), was estimated at € 1,240 for 1,000 consultations (US$ 1,695; Jouquet, 2008).

The NGO put in place a number of innovations within a relatively short time, with undeniable success. However, the NGO – as it itself admits (MSF, 2010) – could perhaps have communicated more with the district health management team, for example to identify feasible and reproducible approaches for a public health system under normal conditions. In the meantime, another NGO has taken over the task of providing free healthcare for under-fives in Kangaba district, and the *Agents palu* strategy was recently instated by the government, with UNICEF providing the salaries and the kits in 2012.

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Appendix 1. Monthly numbers of under-fives consultations as reported by each CScom.