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REDUCING THE IMPACT OF MALARIA IN NIGERIA:
A Public Health Expenditure Conundrum

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ABSTRACT

Malaria mortality and morbidity are aggravated by a variety of factors, including poor laboratory diagnostic capacity, inadequate management, delayed or improper treatment by households, and limited public funding for malaria control and prevention. The importance of public expenditure in the reduction of deaths from malaria is the focus of this paper. The paper seeks to determine the relationship between deaths from malaria and public health and non health expenditure in Nigeria, the impact of malaria deaths on the economy and how much more public health expenditure is required to reduce deaths from malaria. To achieve these objectives, the study adopts the Filmer and Pritchet model (1997), and the gross output transfer models on data from 1975-2001. The study revealed that there is a negative relationship between deaths from malaria, public health expenditure, per capita income, and non-public health expenditure, but a positive relationship between deaths from malaria and political instability. The study further found that between 1975 and 2001, and average of 5.86% of the GDP was lost to malaria deaths annually. It is recommended that in addition to the current ₦14,000 per capita health expenditure, a transfer of an additional ₦45,684.00 per head from other sectors to the health sector could go a long way in averting an additional death from malaria.

JEL classification: I1, I18

1. Introduction

MALARIA is a major disease that has high morbidity and mortality rates. It is however, not taken very seriously, because the majority of deaths occur among the poor and under-five year olds. Likewise, its economic impact has not been properly addressed because the loss of life and the loss of man-hours by individuals with malaria is difficult to assess. Moreover, the equanimity with.

which issues of death are accepted within the African cultural setting has made the combatting of malaria less effective.[1] Therefore the political will necessary to move the government to confront this disease is lacking.

Recent studies have found that an episode of malaria attack takes 10 healthy life days (HLDs).[2] This is illustrated by the estimated man hours reportedly lost to malaria as being ₦11.7 million, ₦10.8 million and ₦18 million in 1980, 1997 and 1998 respectively (Bello, 2004).

The reasons for these huge financial losses can be attributed to the relative paucity of resources available to health programmes for the poor. More importantly, given the available national resources, questions should be raised about government's commitment to health programmes. For example, between 1975 and 2001, the total public expenditure devoted to health care ranged between 0.59 and 3.85 per cent of the annual budget, (except for 1995, 1997, 1999 and 2000 when it attained 5 and 7.32 per cent of the annual budget). In all these years, however, it by no means reached the WHO benchmark of 5 per cent of GDP and 14 per cent of the annual national budget (Federal Office of Statistics, 1992).

The objective of this paper is to find the relationship between reported deaths from malaria and the variables assumed to cause them, on the one hand, and to evaluate the financial implications of morbidity and mortality from malaria and how much more government would need to spend to prevent further deaths from malaria. The rest of this paper is divided into four sections; part two contains the review of literature and conceptual issues; part 3 consists of the methodology and data analysis; and part four presents and discusses the results, while the conclusion and recommendations are contained in part five.

2. Review of the Literature

2.1 Malaria: A description

Malaria is a potentially lethal disease, transmitted by the *anopheles* mosquito (Bruce-Chwatt, 1979; Brinkmann and Brinkmann, 1991). The human malaria exposure rate is determined by the fraction of the mosquito population carrying the parasites – *Plasmodium falciparum, Plasmodium malariae, Plasmodium ovale*

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[1] In most traditions in Africa, deaths from different ailments are attributed to sorcery and witch craft or even Fate. Thus, rather than recognizing the disease for what it is, rituals are performed to appease the gods.

[2] The calculation of HLDs is based on the parameters of estimation by epidemiologists. Formally, expected HLD from acute illness per patient $= \frac{100-Q-C}{100} XT$ where Q = case disability rate of those who get the disease, the percentage who become chronically disabled. C= case fatality rate expressed as a percentage of those who get the disease, the percentage of who die; T = the number of days of total disablement before the cure of those who did not die (Mead, 1992).

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and *Plasmodium vivax*. *Plasmodium falciparum* causes is the most dangerous to human populations. These depend on the life expectancy of the mosquito, relative to the parasites' incubation period; the location of human population; relative to the mosquito flight range of about two miles, and a temperature below 22°C (Snow et al., 1999). Over time, the human immune system adjusts to combatting the malaria parasites, thus, adult mortality in an endemic area is quite low.

A typical bout of malaria lasts from 1-4 days of near-complete incapacitation, and a recuperation period of four to eight days, characterized by fatigue and weakness. A study in Kampala, Luwero and Soroti in Uganda revealed that in a malaria prevalent area, malaria occurs 1-12 times a year in adults and from two times a year to two times a month in children. Mild malaria is characterized by one or two episodes of fever per year, accompanied by headache, nausea, fatigue and diarrhoea, with relative few side effects between episodes (Khuner, 1971). Severe malaria, primarily in *P. falciparum* infection, is the most prevalent in sub-Saharan Africa (especially in Nigeria), and results in impaired consciousness, weakness and jaundice, and accounts for the most fatal cases (Hampel and Najera, 1996; Snow et al., 1999).

2.2 Socio-economic impacts of malaria

The socio-economic impact of malaria has been a subject of animated debate and, sometimes, bitter controversy, especially during recent decades. The true cost of the disease exceeds the cost of seeking treatment for two reasons: there is pain and suffering before treatment is sought, and, there are people who have decided that the cost of seeking treatment is too high, relative to the cost of letting the disease run its course. In contrast to the US10 cents spent on treating malaria previously, it now costs US$1.3 today (2000) (McCarthy et al., 2000).[3]

Many of the programmes of the World Health Organization are designed to help break the vicious circle of poverty-bred sicknesses. Sickness breeds more poverty and the WHO has quoted malaria as one of the most obvious examples. He went further to highlight the correlation between malaria and development and concluded that the efficacy of approaches to social and economic development in countries where malaria is endemic depends on the ability to control the disease. The consensus is that, depending on severity, attacks typically entail a loss of four or more working days, followed by an additional 3-6 days, with reduced working capacity (Brohult et al., 1981; Shepherd et al., 1991; Hampel and Najera, 1996).

Malaria, according to McDonald (1950), Wernsdorfer and MacGregor (1988), is a major cause of school absenteeism and appears to negatively impair long-term learning capacity, reducing the accumulation of human capital over time. This

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[3] Self-treatment for malaria in Nigeria can cost as little at N150.00 ($1.00); while hospitalization could run between N3000 and N6000 (US$20-40).

has, more often than not, increased the indirect links between malaria and productivity. Frequent absenteeism reduces the efficiency of networks, results in greater redundancy and reduces the scope for specialization, labour mobility and the quality of skills (Gallup and Sachs, 1988; Gallup, Sachs and Millinger, 1998).

Wernsdorfer (1988) observed that in tropical agriculture, crucial activities, such as sowing, transplanting and harvesting, are concentrated within a few months of the year. These intense farming periods are characterized by chronic shortages of labour, which means the number of man-hours of work per day increases dramatically per person. This may turn catastrophic when malaria seriously reduces working capacity, as was experienced in Gezira, the irrigated area of Sudan.

Sinton in a study in India in 1938, used the life expectation method to show that each death from malaria was equivalent to an average loss of 20 years' income. At an income of 45 rupees per annum, this amounted to an approximate average annual earnings loss of US$340 million. When the estimate was based on the mortality among adults, he arrived at approximately half this figure.

Bello (2004) employed healthy life days (HLDs) and gross domestic product transfer methods on an adult population of 20 years onset age and concluded that in 1998 alone, ₦20.07 billion was lost to deaths from malaria. The huge costs associated with the effects of malaria on both human and material resources should make the a issue of how much it would cost to avert a single death from malaria a high priority.

2.3 Pattern of public health expenditure

Investment in health is a key ingredient in the formation of human capital and the sustainment of socio-economic development. But expenditure on health in sub-Saharan Africa (Nigeria inclusive) is often deplored as grossly inadequate, inefficient, inequitable and unsustainable. In Nigeria, all the three tiers of government finance health programmes. More than 50 per cent of public sector's health expenditure occurs at the state level, 15.23 per cent at the local level, and about 33 per cent at the federal level.

In the early 1970s, in the wake of the oil boom, huge investments were made on health care infrastructure, especially with the government policy of reconciliation, reconstruction and rehabilitation of post-Civil War Nigeria. The slump in oil prices in the early 1980s brought about a sharp decline in public expenditure on social services, which was more pronounced in the health sector. For example, federal allocation to the health sector was 360.6 million (0.71 per cent of GDP in 1980) it rose to ₦416.2 million (0.82 per cent) in 1981, but began to decline and reached its lowest level of ₦1,240.5 million or 0.07 per cent of GDP in 1992. Comparing the above allocation in terms of budget proportion, it only formed 1.52 per cent in 1980, 1.96 per cent in 1981, and 1.32 per cent in

1992 respectively. Recently, although percentage allocation has increased nominally, it has declined greatly in real value as a result of persistent inflationary pressures which have decreased the purchasing power of the naira. However, when public health expenditure is compared with expenditure in other social services sectors (housing and education, for example), there is a wide disparity. For example, in 1985, when 1.3 per cent was allocated to health, 8.8 per cent was allotted to education and 13.2 per cent to others (Gafar et al., 2003). Further observations revealed that recurrent expenditure dominates total health expenditure, thereby making it difficult for new equipment and drugs to be procured and to ensure normal distribution of facilities and personnel (table 1).

Over the years, public expenditure on health in Nigeria has always been far short of what was required. At the federal level, health care disbursement fell short of budgetary allocations for five consecutive years, especially between 1990 and 1994. In fact, the health ministry only received between 67 and 78 per cent of the amount budgeted. In addition, funds were released late and this resulted in hurried and rash expenditure (Makanjuola, 1996).

From the above we can surmise that the present level of health care funding in Nigeria has contributed to the poor health services, mal-distribution of health facilities and personnel, and inadequate supplies of drugs and equipment. The lack of repair of physical facilities and the high prevalence of communicable parasitic diseases among the rural and peri-urban population can be attributed to poor funding (Erinosho, 1990 and Abel-Smith, 1991). The amount spent on various health inputs is inconsistent with sectoral goals, which is probably responsible for the brain drain in the health sector. For example, population per physician in Nigeria decreased from 4,023 in 1991 to 3,867 in 1992, although it rose a little in 1995 from 3,707 to 4,706 in 1996 (Okorosobo, 1998; WHO, 2000).

2.4 Public health expenditure and malaria

Currently, malaria mortality and morbidity are aggravated by a variety of factors, including poor laboratory diagnostic capacity, inadequate management, delayed or improper treatment by households, and scarce public funding for malaria prevention. The impact, strength and weakness of public health expenditure (capital and current) on malaria are illustrated in The World Bank's Poverty Reduction Strategy Paper (2001). According to this strategy paper, public health expenditure is a source of financial protection that helps to: promote better health; diagnose, prevent and treat illness; protect individuals and households against direct financial losses due to illness; give the poor a voice in their own destiny and make them active participants in the breaking away from the social exclusion in which they are often trapped (Alexander and Carvin, 2004; Cleason et al., 2001; Woolcock and Narayan, 2000).

Table 1. Pattern of Public Expenditure in Nigeria

	Health				Education				Others			
Year	Recu	Capt.	Tot.	% of Bgt	Recu.	Capt.	Tot.	% of Bgt.	Recu	Capt.	Tot.	% of Bgt
1975	62.4	20.4	82.8	1.0	218.9	631.1	850	10.3	6.2	275.9	282.1	3.4
1976	83.5	56.8	140.3	1.45	522.0	529.2	1051.2	10.8	29.1	313.7	342.8	3.5
1977	85.1	38.7	123.8	1.06	248,3	255.8	504.1	4.3	35.0	530.4	565.4	4.8
1978	95.5	59.5	155.0	1.26	394.7	431.9	826.6	6.7	39.4	599.1	638.5	5.2
1979	36.5	41.0	77.5	0.59	360.4	206.7	667.1	5.1	114.1	265.6	379.6	2.9
1980	172.5	188.1	360.6	1.52	509.1	729.4	1238.5	5.23	126.1	406.5	532.6	2.3
1981	111.5	304.5	416.0	1.96	712.8	217.2	930.0	4.4	160.6	858.3	1018.9	5.0
1982	145.6	123.4	269.0	1.75	511.8	412.4	924.2	6.01	129.6	863.9	993.5	6.5
1983	161.5	93.0	254.5	1.95	588.8	367.2	956.0	7.3	78.2	452.6	530.8	4.1
1984	87.0	34.6	121.6	1.04	657.9	87.6	745.5	6.4	23.1	147.8	170.9	1.46
1985	164.3	126.2	290.5	1.3	697.2	126.2	823.4	8.8	270.7	968.7	1239.4	13.2
1986	247.0	391.4	638.4	1.9	483.8	391.4	875.2	5.2	131.2	198.8	330.0	1.96
1987	65.0	94.6	159.6	0.56	354.1	94.6	448.7	2.03	49.9	465.3	5152.2	2.33
1988	422.8	327.9	750.7	2.08	1458.8	327.9	1786.7	6.43	235.6	466.0	701.6	5.31
1989	575.3	387.5	982.8	1.94	3011.8	387.5	3399.3	8.28	643.0	30.4	673.4	5.0
1990	401.1	147.2	548.3	1.01	1964.2	952.6	2865.1	3.46	304.6	1383.9	1688.5	1.3
1991	619.9	128.8	748.7	0.82	1265.1	440.9	1706.0	1.65	808.9	249,6	1038.5	1.3
1992	837.4	130.2	967.6	1.32	1676.3	488.4	2164.7	2.56	567.6	462.0	1029.6	1.17
1993	2331.6	136.0	2467.6	2.8	6436.1	346.6	6782.7	6.94	NA	39.9	39.9	3.8
1994	2066.8	51.1	2117.0	1.8	7878.1	144.9	8023.0	5.86	1169.4	416.0	1585.4	1.74
1995	3,335.7	56.2	3391.9	5.2	9421.3	180.7	9602.0	4.90	NA	392.4	392.4	2.5
1996	3,192.0	81.2	3273.2	3.4	2136.0	442	12578	5.20	1551.1	266.4	266.4	2.3
1997	3,179.2	2623	5802.2	5	12136	3808	15944.0	4.71	2708.9	330.6	3039.5	1.16
1998	4,860.5	7123.8	11984.3	0.66	13928	12793	26721:3	7.70	3187.2	4081.2	7268.4	3.98
1999	8,793.5	7386.8	16180.0	7.32	28047	8516.6	31563.8	14.30	5877.6	1284.4	7162.0	3.24
2000	11612.6	6569.2	18181.8	5.15	44225	25343	69568.1	19.70	8859.6	6843.4	7703.0	4.45
2001	24523.5	20128	44651.2	3.85	39884	19860	59744	5.16	15226.3	13348.0	28574.3	2.5

Source: CBN Statistical Bulletin, 1992, 1994, and 2003.
Note: Recu = Recurrent , Capt. = Capital, Tot. = Total, % of Bgt. = percentage share of the budget.

In general, public health expenditure influences the health status of a society by lowering the effective price of health-enhancing inputs to create a conducive environment for healthy living. However, the effects of public expenditure depend on the composition of public spending, ie, health inputs and the net impact of public sector supply on overall consumption. Even when government funds are available for the provision of the services in question, one must assess whether the

change in the effective price that the consumer has to pay will translate to increased overall consumption (Deon et al., 2000)

3. Methodological Framework

3.1 The model

There are various approaches to the establishment of the relationship between malaria and government expenditure on health (Kuhner, 1971; Conly, 1975; Griffith et al., 1971; Smith and Golladay, 1977). However, we prefer Filmer and Pritchet's aggregate health status determinant model (1997) for its ability to establish the relationships between malaria and public health and non-health expenditure. More important, however, is the possibility of breaking the model into different sectors, which would lead to its predictability strength on how much more government should transfer from non-health expenditure to health expenditure to reduce malaria mortality. In line with the above, we have postulated that malaria mortality is affected by public expenditure, a proxy of the standard of living and government policies.

Thus, the relationship between $Md^* = f(Hi, Nhi, Pcy, A_i)$

where:

Hi = public expenditure on health in country i

Nhi = non health public expenditure in country i

Pcy = per capita income to measure standard of living

A = a country's specific factor (political instability; a dummy variable with value of 1 for civilian administration and 0 for military administration, as a way of measuring the different changing faces of governance.

On transformation, malaria deaths (Md^*) and public expenditure are expressed as:

$$Md^* = \frac{(Hi)^{\alpha}}{(Ni)} \frac{(NHi)^{\beta}}{(Ni)} \frac{(GDPi)^{\cdot}}{(Ni)} e^{Ai} \qquad (1)$$

where:

N = population

Equation 1 is expressed in terms of population to reflect per capita expenditure in each sector (health and non health), while GDP/N is per capita income (Pcy). Furthermore, in order to express public expenditure in each sector as a share of GDP, when the numerators are divided by the GDP and the logs, it is thus:

$$InMd^{*} = \alpha In\frac{(Hi)}{GDP} + (\alpha + \beta)In\frac{(GDP)}{Ni} + Ai \qquad (2)$$

Hence, the log of malaria deaths (Md^{*}) becomes a function of the log of public health expenditure, as a share of GDP, non-health public expenditure and per capita income. Thus a priori:

$$\partial Md/\partial Hi < 0;\ \partial Md/\partial Nhi < 0;\ \partial Md/\partial Pcy < 0;\ \partial Md/\partial Ai > 0$$

Having established the relationship that exists between malaria mortality and public expenditure, we then evaluated the cost of incapacitation by malaria. There are various methods of costing diseases and the disease burden (Cropper, et al., 2000). The appropriateness of each approach, however, depends on the objective(s) of the work, the availability of data, and the ability to measure correctly. For example, death from malaria has to be based on the assumption of onset age and life expectancy, since there is no separate data available by age, gender and location. In view of the above, the gross output method used in costing was adapted from the partial gross output method used for costing road accident fatalities (Arosanyin, 2000a, 2000b; Bello, 2004; Jacobs, 1995; TRL, 1995). The beauty of this method lies in its ability to include output losses both for the year in which the death occurred and then for the future. At this point, the adopted onset age is 20 years because:

i. immunity against malaria is higher at this period and,
ii. it is the beginning of the productive age.

The costs for future years are discounted to give the present value symbolically and is expressed as:

$$Cmd = \sum {}_{i}Y_{t}P_{t}(i + r)^{t} \qquad (3)$$

where:

Cmd = the cost to the economy due to an individual death from malaria.
Y_t = the individuals expected gross earning in year t
P_t = the probability in the current year of the person being alive during the t^{th} year
r = the social rate of discount expected during the t^{th} year.

Given the absence of data on P_t, the estimator is modified thus;

$$Cmd = Y({}^{i}/_{r})\ [1\text{-}1/(i - r)^{t}] \qquad (4)$$

where:

Y = redefined as national output per capita

t = the number of working years lost per death

On transformation, we have:

$$Cmd = Y(^{i}/r)\ [1\text{-}1/\ (i - r)^{n}]\ [Sn] \tag{5}$$

where:

Sn = total number of persons who died of malaria at time n

As part of our objective to know how much should be added to public health expenditure per head to avert a death from malaria, equation (2) is broken into two, health and non-health expenditure, leaving the dependent variable unchanged. Thus:

$$\frac{\alpha(H / GDP)}{\alpha(Hi)} = \frac{(GDP / N)^{*}}{(H)} \frac{(H / GDP)}{(\alpha)} \tag{6}$$

Equation 6 shows the proportion of health expenditure in relation to health status.

On simple transformation of equation 6 to derive the public sector health spending per additional death averted, we have:

$$\frac{\alpha(Hi)}{\alpha(H / GDP)} = \frac{H}{(GDP / N)}^{*} \frac{\alpha}{(H / GDP)} \tag{7}$$

The non-health public expenditure, in relation to health status, is expressed as:

$$\frac{\alpha(Hi)}{\alpha(Nh / GDP)} = \frac{(Nh)}{(GDP / N)}^{*} \frac{(\alpha)}{(Nh / GDP)} \tag{8}$$

An equivalent expression for the non-public health expenditure in relation to health status gives:

$$\frac{\alpha(Nh / GDP)}{\alpha(Hi)} = \frac{(GDP)^{*}}{(Nh)} \frac{(Nh / GDP)}{(\alpha)} \tag{9}$$

The difference between equations 9 and 7 gives the amount that would be needed to be transferred from GDP to the health sector to avert an additional death from malaria.

3.2 Scope of the study and estimation technique

The empirical analysis covers the period 1975-2001(table 3). The model was estimated, using annual data from the Central Bank of Nigeria, the Federal Office of Statistics, the African Development Bank and The World Bank.

The cost of death from malaria (as used in this study) is as follows: The number of working years lost to death from malaria is 40 years (retirement age minus the onset age, fixed at 20 years as the productive age point, on the assumption that if an individual had not died of malaria, he would still be productive till he retired). National output per capita[4] (Y) is US$ 260 at the 1998 price, with an exchange rate of ₦125 = US$1, the naira value of production per/head per annum was ₦32,500, giving a daily per capita product of ₦89.04, while the social rate of discount was 18 per cent.

4. Empirical Estimates and Analysis

A close inspection of equation 2 (table 2) reveals that all the coefficients had their hypothesized signs, and that 56.1 per cent of deaths from malaria are jointly explained by the tested factors. In general, the descriptive statistics for the model (R^2, F-statistic, and DW) are within the accepted bounds. However, the marginal contribution of each of the factors considered showed that there is a significant relationship between death from malaria and non health public expenditure with a t-value of 4.312. The implication is that non-health expenditure, which may not have a direct bearing on malaria deaths, has a greater tendency to reduce malaria deaths. Health expenditure, which we had hypothesized as the main cause of death from malaria, was highly insignificant but showed that if increased, would be capable of reducing the impact of malaria.

Table 2. Factors affecting death from malaria

Variables	Value (t)
Intercept	- 7.830 (1.295)
Health Expenditure	-3.27E-02 (-0.198)
Non-Health Expenditure	-6.93 (-4.312)
Political Instability	.500 (1.406)
Per capita Income	-.392 (-.611)
	R^2 = 56.1, DW=1.74
	F = 6.06, Level of significance=5%

The results can be linked to the behaviour of the other two variables: a) the dummy used as a surrogate for political instability that had an inverse relationship,

[4] Per capita income is used since not every person reported dead was known to be working.

and b) per capita income that has a positive relationship with deaths from malaria. Where per capita income as a measure of the standard of living is high, deaths from malaria are expected to fall. These, however, depend on government commitment to its reduction.

The financial cost of deaths from malaria forms a colossal proportion of the GDP in Nigeria (table 3). In some of the years considered, the financial loss was so high that the amount would have been enough to cover fivefold the expenditure on health at the current prices. For example, in 1980, 1982, and 1985, the cost was recorded as a double digit percentage loss of GDP. In 1983 only, 0.45 per cent of GDP was dedicated to health care, whereas as much as 15.88 per cent of GDP was lost to deaths from malaria in the same year. Noticeable also is that, between 1975 and 1998, except for 1975, 1989, 1996, 1992, 1994, 1995, 1996 and 1998, the share of GDP lost to malaria deaths overshot the WHO benchmark allocation of 5 per cent share of GDP to health expenditure. The above scenario may not be too surprising, given the nature of malaria and the government preference for investing in other social services over the health sector.

Finally, table 4 reveals how much could be transferred from non-health expenditure to public health expenditure to reduce deaths from malaria. The results arising from the difference between equations 9 and 8 showed that if the sum of ₦45,684.00 from non-health expenditure is transferred to health expenditure, a death from malaria would be averted. By the same token, this translates to an increase per capita health expenditure.

5. Conclusion and Recommendations

Malaria has been found to be one of the major health problems facing less developed countries, especially in sub-Saharan Africa, and particularly in Nigeria. Malaria hinders economic development because a significant amount of money is incurred as a result of morbidity and mortality from malaria. Government therefore needs to address this issue since fighting malaria requires significant financial and organizational resources. The cost of deaths from malaria could increase enormously in the near future, if government does not assist to fight the environmental, administrative and financial factors.

Health policy and government interventions do not seem to reflect the needs of the inhabitants. Government expenditure on health has continued to dwindle as against what is allocated to the other social services sectors. If government can add ₦45,684.00 per capita to the present levels of health expenditure by reducing non-health public expenditure, the number of deaths from malaria could be averted convincingly.

Table 3. Loss to the Economy from Malaria Deaths

Year	Health exp.(₦m)	Health share of (%) budget	Health share % of gd	Reported death from malaria	Value of death N m +	%n GDP+
1975	82.8	1.0	0.39	309	200,814,121	0.96
1976	140.3	1.45	0.53	349	2,268,575,949	8.51
1977	123.8	1.06	0.39	418	2,717,019,103	8.62
1978	155.3	1.26	0.45	444	2,886,020,291	8.36
1979	77.5	0.59	0.18	2782.5	22,400,525	7.2
1980	360.6	1.52	0.71	865	5,622,539,531	11.33
1981	416.2	1.96	0.82	675	4,381,030,802	8.68
1982	269	1.75	0.30	800	5,200,036,560	10.83
1983	254.5	1.95	0.45	1544	10,003,602,056	15.88
1984	121.6	1.04	0.19	273	5,024,535,326	7.04
1985	223.4	1.3	0.31	1400	9,100,063,980	12.62
1986	312.2	1.9	0.43	1426	9269065168	8.67
1987	124.2	0.56	0.11	2074	19,348,109,478	7.25
1988	578.2	2.08	0.40	1663	10,010,809,576	4.5
1989	796.8	1.94	0.35	928	6,032,024,410	2.34
1990	823.2	1.01	0.32	2284	11,484,619,438	3.59
1991	771.3	0.82	0.24	1947	10,059,507,449	1.85
1992	1240.5	1.32	0.07	1337	20,072,864,574	2.9
1993	2567.6	2.80	0.31	1046	40,108,028,882	4.4
1994	2843.1	1.8	0.31	1686	10,095,907,705	0.51
1995	4633	5.2	0.25	3268	20,072,864,524	0.73
1996	4834.9	3.4	0.17	6320	40,108,082,882	1.41
1997	7326.1	5.0	0.23	3420	20,268,575,949	7.45
1998	8,965.0-	0.66	0.26	3189	20,072,864,524	0.62
1999	312183.5	7.32	0.28	1252	10,095,936,704	3.24
2000	329177.7	5.15	0.41	2074	18,348,109,473	5.72
2001	344285.8	3.38	0.32	1026	36,108,028,882	10.48

Source: FOS, Annual Abstract of Statistics 1980, 1991, 1992, 1996, and CBN 2003.
Note: columns + author's computation

Table 4. Cost of Averting a Death from Malaria

Source of μ Coefficient In (share of public health in GDP)	Value of μ (f)	Increasing public expenditure on health	Transfer from non health expenditure to health
OLS	7.803 (-0.003)	₦59,684.00	₦45,684.00

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