

# Cost-effectiveness of an essential mental health intervention package in Nigeria

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*The study aimed to describe the cost-effectiveness of a selected list of interventions for common neuropsychiatric disorders in a developing country. Using depression, schizophrenia, epilepsy, and hazardous alcohol use, a sectoral approach to cost-effectiveness analysis developed by the World Health Organization was contextualized to Nigeria. The outcome variable was the disability adjusted life years (DALYs). We found that the most cost-effective intervention for schizophrenia is a community-based treatment with older antipsychotic drugs plus psychosocial support or case management. The most cost-effective interventions for depression, epilepsy, and alcohol use disorders are older antidepressants, with or without proactive case management in primary care, older anticonvulsants in primary care, and random breath testing for motor vehicle drivers, respectively. Combined into a package, these selected interventions produce one extra year of healthy life at a cost of less than US \$320, which is the average per capita income in Nigeria.*

**Key words:** Neuropsychiatric disorders, cost-effectiveness, interventions, Nigeria

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Mental disorders have a large impact on individuals, families and communities. Recent epidemiological research has shown the considerable (and previously underestimated) burden of these disorders throughout the world (1). They affect about 25% of all people in their lifetime, with about equal prevalence in men and women (2,3). Though usually non-fatal, mental and neurological disorders are highly disabling. Apart from affecting multiple domains of functioning, these disorders start early in life and often go untreated. When treatment is given, it often is inadequate (4). Neuropsychiatric disorders combined contribute no less than 12.3% of the entire global burden of disease, as measured by disability adjusted life years or DALYs. The share of the total burden due to mental illness varies between developed countries; in African countries, primarily due to the disproportionate burden due to communicable, maternal, perinatal and nutritional conditions (70-75% compared with 5% in developed countries) (5), the burden of neuropsychiatric problems is proportionally reduced.

In Nigeria, evidence from general health care settings shows that about 10% of adult attendees meet ICD-10 criteria for definite psychiatric disorders (commonly, major depression, anxiety disorders, somatoform disorders, dysthymia and alcohol abuse) (4). The proportion with significant psychological distress not meeting the criteria for specific psychiatric disorders may be even higher, with one study finding a rate of 25% (6). A recent large scale community study suggests that about 45 of every 1000 persons in the community have experienced at least one depressive episode in their lifetime, while about 12 have done so in the previous 12 months (7). Also, 65 out of every 1000 men reported a substance use disorder in their lifetime.

Despite the existence of a national mental health strategy in Nigeria (8) and the well-documented prevalence of neuropsychiatric disorders in the country (4,6,9,10), resources

currently allocated to meet the needs of persons with these disorders are extremely meager (considerably less than 1% of the total health budget, itself no more than 3% of gross domestic product). For example, recent estimates show that there are only 4 psychiatric beds, 4 psychiatric nurses and 0.1 psychiatrists per 100,000 population (11). The Institute of Medicine estimates that, while about 50% affected persons are reached by mental health services in developed countries, only about 15% are reached in developing countries. This three-fold treatment gap (12) is exemplified by the results of a recent survey in Nigeria, which showed that fewer than 1 of 10 persons with DSM-IV disorders in the previous 12 months had received any form of treatment (13). While political will by the government is one of the factors explaining this grossly inadequate mental health service coverage, a further important constraint relates to the perceived high cost of effective treatment. Given the extreme scarcity of resources, evidence is needed to demonstrate to policy makers both the effectiveness of available interventions and the overall return on an increased investment in the provision of a package of key interventions for neuropsychiatric disorders. Accordingly, the aim of the current study was to generate an evidence-based case for priority-setting, investment and service development in mental health in Nigeria.

## METHODS

We used a sectoral approach to cost-effectiveness analysis, developed by the World Health Organization (WHO). WHO's CHOosing Interventions that are Cost Effective (CHOICE) project has developed standardized methods and assembled sub-regional databases on the cost-effectiveness of an extensive range of interventions for leading causes of disease burden (14). In this approach, and in or-

der to facilitate comparisons between different regions of the world, costs have been initially expressed in international dollars (an international dollar has the same purchasing power as one US dollar has in the USA); effectiveness has been measured in terms of DALYs averted (relative to the situation of no intervention for the disease in question); and cost-effectiveness has been described in terms of cost per DALY averted.

Data on avertable burden at a WHO sub-regional level have now become available for a wide range of diseases, including schizophrenia, depression, alcohol abuse and epilepsy (15-18). However, the existence of these cost-outcome data is no guarantee that findings and recommendations will actually change health policy or practice in countries. There remains a legitimate concern that global or regional cost-effectiveness results may have limited relevance for local settings and policy processes. In order to stimulate change where it may be necessary, there is a consequent need to contextualize existing regional estimates of cost, effectiveness and cost-effectiveness to the setting in which the information will be used, since many factors may alter the actual cost-effectiveness of a given intervention across settings (18). In order to contextualize WHO-CHOICE sub-regional findings down to the level of national or sub-national populations, a range of data are required: a) data on local demography, including mortality rates; b) local epidemiological rates for specified disorders; c) intervention definition, efficacy and adherence; d) treatment coverage and setting; e) resource utilization rates and costs of care for specified disorders.

Based on local clinical experience and health facility admissions/service utilization data, as well as epidemiological data on the prevalence and associated disability of different

neuropsychiatric disorders in Nigeria (6,7), the following four priority conditions were identified: depression, schizophrenia, alcohol abuse and epilepsy. A set of key interventions for these disorders was prepared (Table 1). For each of these priority conditions and interventions, a process of contextualization was carried out as described below.

**Demography.** Regional age- and sex-specific population and mortality data were substituted with national data for Nigeria (total population, 115 million).

**Epidemiology.** Current disease burden figures for schizophrenia, depressive episode, epilepsy and heavy alcohol use, based on WHO's Global Burden of Disease and Comparative Risk Assessment studies for the African sub-region (3), were reviewed and, where supported by good-quality local data, revised. Since no recent population-wide survey was available for schizophrenia, and given the relatively stable estimates found for this particular condition from other African studies, no revision was made to default regional values. For depression and heavy alcohol use, up-to-date prevalence data available from representative sample surveys in the Nigerian population (7) were used to revise epidemiological model parameters. For epilepsy, local data were also used, albeit derived from relatively small community surveys (9).

**Effectiveness.** International data sources used to estimate intervention efficacy or effectiveness at the level of WHO African sub-regions (15-17) were reviewed and altered to better reflect local evidence or expectations. For example, parameters underlying the anticipated impact of increased taxes on alcoholic beverages were tailored to the Nigerian context. The estimated population-level effect of each intervention – expressed as a percentage reduction in disability, case-fatality remission or incidence – is summarized in Table 1.

**Table 1** Interventions considered for reducing the burden of neuropsychiatric disorders in Nigeria

Disorder	Intervention	Primary effects	% improvement*
<i>Schizophrenia</i> (treatment setting: hospital outpatient; treatment coverage, target: 70%)	- Older antipsychotic	Disability	2.8
	- Newer antipsychotic	Disability	3.5
	- Older antipsychotic plus psychosocial treatment	Disability	5.6
	- Newer antipsychotic plus psychosocial treatment	Disability	6.3
<i>Depression</i> (treatment setting: primary health care; treatment coverage, target: 40%)	<i>Episodic treatment</i>		
	- Older antidepressant	Remission/Disability	6.9/7.7
	- Newer antidepressant	Remission/Disability	7.7/8.6
	- Psychosocial treatment	Remission/Disability	5.6/8.8
	- Older antidepressant plus psychosocial treatment	Remission/Disability	7.4/8.3
	- Newer antidepressant plus psychosocial treatment	Remission/Disability	7.8/8.8
	<i>Maintenance treatment</i>		
- Older antidepressant plus psychosocial treatment	Incidence/Remission	7.9/9.0	
- Newer antidepressant plus psychosocial treatment	Incidence/Remission	8.4/9.6	
<i>Epilepsy</i> (treatment setting: primary health care; treatment coverage, target: 80%)	- Older antiepileptic	Remission/Disability	30/21
	- Newer antiepileptic	Remission/Disability	30/21
<i>High-risk alcohol use</i> (as risk factor for disease and injury)	- Increased taxation on alcoholic beverages (50%)	Incidence	5
	- Drink-driving laws and enforcement via breath-testing	Fatal injuries	0.05-0.5
	- Brief counselling in primary care (coverage: 50%)	Remission	3.7

\*Estimated population-level intervention effect

*Coverage and treatment setting.* A primary health care model for mental health care delivery has been proposed and implemented by a number of developing countries. Lack of reliable data, however, makes it difficult to determine the number of persons with psychiatric disorders currently receiving treatment in this setting. Estimates of current coverage, therefore, were mainly based on expert opinion, supplemented where possible by local survey data (7).

*Resource use and costs.* For each disorder included in the analysis, country-specific values were entered into the model concerning the frequency and intensity of health care use. Estimates were based on local expert opinion, including a Delphi consensus panel survey of 24 mental health professionals working in different parts of the country (19). Predicted unit costs in local currency units for primary and secondary care services (20) were validated against locally available hospital data, while other default resource inputs such as salaries of health professionals, psychotropic drugs and laboratory tests were substituted with their corresponding local values.

## RESULTS

Results are presented to show: the estimated or projected coverage of each intervention; the effectiveness of the intervention as indicated by an estimation of the DALYs averted per year by the intervention; the total cost of delivering the intervention per year, as well as a breakdown of its component patient, programme, and training costs; the cost of delivering the intervention to one case of the indicated disorder per year; and the average cost of averting one DALY by the intervention. These indices are provided for the extant situation, represented by the predominant form of intervention for each disorder and the proportion of cases that cur-

rently receive the intervention, as well as for the proposed intervention at a scaled-up level of coverage.

Table 2 provides summary results for different interventions for schizophrenia. At the current coverage of 20%, the DALYs saved per year is 2,615 and the cost per DALY averted is 209,430 Naira (N), corresponding to US\$ 2,013 at the mean official exchange rate for 2000. When coverage is increased to 70% (the maximum level considered feasible in the foreseeable future), the two interventions for schizophrenia that can be considered most cost-effective are community-based interventions which combine older antipsychotic drugs with psychosocial treatment or case management. These two interventions avert more DALYs and at lower costs per DALY (N 66,790 or US\$ 642; N 70,806 or US\$ 680 respectively). On the other hand, when the two forms of interventions are implemented with newer, atypical antipsychotics, the relatively small extra gains in DALYs averted are associated with very considerably higher costs per DALY (N 1,637,168 or US\$ 15,742; N 1,778,509 or US\$ 17,101 respectively).

Table 3 presents the results for different interventions for depression. At the current low coverage of 10%, the DALYs averted is low (11,211) and so is the cost per DALY averted (N 20,181 or US\$ 194). When coverage is increased to 40%, the intervention which combines older antidepressants with psychotherapy and proactive management is most cost-effective because it saves more DALYs (120,357) and at a lower cost than any of the other interventions with the same coverage. With the same type of intervention using the newer antidepressants, though the DALY averted is marginally higher (127,543), the intervention cannot be considered cost-effective, because the cost per DALY averted is almost three times higher.

Table 4 presents the results of the intervention analysis for epilepsy. Two different interventions are compared at

**Table 2** Cost-effectiveness of selected interventions for schizophrenia

Intervention	Coverage	Effectiveness (DALYs averted per year)	Total cost per year (Naira, millions)				Cost per treated case per year	Cost per DALY averted
			Patient	Programme	Training	Total		
Older antipsychotic	20%	2,615	510	37	0	548	9,793	209,430
Community-based service model: older antipsychotic	70%	14,081	1,625	141	31	1,798	9,185	127,676
Community-based service model: newer antipsychotic	70%	16,863	48,427	141	31	48,599	248,293	2,882,052
Community-based service model: older antipsychotic + psychosocial treatment	70%	26,980	1,598	141	62	1,802	9,204	66,790
Community-based service model: newer antipsychotic+ psychosocial treatment	70%	29,774	48,541	141	62	48,744	249,037	1,637,168
Community-based service model: case management with older drug	70%	29,378	17,470	240	93	2,080	10,627	70,806
Community-based service model: case management with newer drug	70%	27,564	48,690	240	93	49,023	250,460	1,778,509

N 104 = US\$ 1 (at the mean official exchange rate for 2000)

**Table 3** Cost-effectiveness of selected interventions for depression

Intervention	Coverage	Effectiveness (DALYs averted per year)	Total cost per year (Naira, millions)				Cost per treated case per year	Cost per DALY averted
			Patient	Programme	Training	Total		
Older antidepressant in primary care	10%	11,211	226	0	0	226	765	20,181
Older antidepressant in primary care	40%	69,608	5,255	70	42	5,367	4,680	77,105
Newer antidepressant in primary care	40%	77,244	23,039	70	42	23,151	20,274	299,714
Brief psychotherapy in primary care	40%	69,101	8,044	70	78	8,192	7,096	118,548
Older antidepressant + psychotherapy	40%	74,269	8,745	70	93	8,908	7,788	119,938
Newer antidepressant + psychotherapy	40%	78,891	25,575	70	93	25,738	22,560	326,246
Older antidepressant + psychotherapy + proactive case management	40%	120,357	9,004	126	102	9,233	5,517	76,710
Newer antidepressant + psychotherapy + proactive case management	40%	127,543	33,435	126	102	33,663	20,242	263,933

N 104 = US\$ 1 (at the mean official exchange rate for 2000)

**Table 4** Cost-effectiveness of selected interventions for epilepsy

Intervention	Coverage	Effectiveness (DALYs averted per year)	Total cost per year (Naira, millions)				Cost per treated case per year	Cost per DALY averted
			Patient	Programme	Training	Total		
Older antiepileptic in primary care	20%	30,928	413	0	0	413	2,637	13,339
Older antiepileptic in primary care	50%	105,946	985	88	40	1,113	2,868	10,507
Older antiepileptic in primary care	80%	169,514	1,676	142	85	1,903	3,065	11,228
Newer antiepileptic in primary care	50%	105,946	3,492	88	40	3,620	9,327	34,169
Newer antiepileptic in primary care	80%	109,514	5,705	142	85	5,932	9,552	34,993

N 104 = US\$ 1 (at the mean official exchange rate for 2000)

two coverage levels. At 50% coverage, both older and newer antiepileptics implemented at primary care settings averted the same number of DALYs per year (105,946). However, the cost per DALY for the newer drugs is as much as three times higher than that of the older drugs (N 34,993 or US\$ 336 compared with N 10,507 or US\$ 101). The results suggest that older antiepileptic drugs in primary care implemented at 80% coverage offer the best value for money: more DALYs are averted but at a minimal increase in cost per DALY saved.

Table 5 shows that, though a 25% increase in the rate of taxation on alcohol will avert more DALYs, the decrease in cost per DALY cannot be considered significant (from N 20,134 or US\$ 193 to N 18,201 or US\$ 175). An increase in

taxation by 50% will achieve little more than 25% taxation increase, improving DALYs saved but with no substantial decrease in cost per DALY (from the initial N 18,201 or US\$ 175 to N 17,125 or US\$ 165). This is because it is anticipated that tax increases would be accompanied by rises in the amount of illicit and therefore untaxed consumption of alcohol (increased production of home-brewed beverages, plus rises in smuggled alcohol). On the other hand, implementation of random roadside breath-testing for alcohol is expected to save considerably more DALYs than the other interventions and will do so at a considerably lower cost per DALY of N 8,873 or US\$ 85.

Using the above data, it is possible to construct a profile of the costs and effects associated with a package of neu-

**Table 5** Cost-effectiveness of selected interventions for heavy alcohol use

Intervention	Coverage	Effectiveness (DALYs averted per year)	Total cost per year (Naira, millions)				Cost per DALY averted
			Patient	Programme	Training	Total	
Current scenario (tax at current rates)	95%	24,988	0	503	0	503	20,134
Increased taxation (current + 25%)	95%	27,641	0	503	0	503	18,201
Increased taxation (current + 50%)	95%	29,378	0	503	0	503	17,125
Brief advice/counseling in primary care	50%	12,866	698	100	30	828	64,400
Roadside breath-testing (including non-fatal injuries)	80%	109,490	0	972	0	972	8,873

N 104 = US\$ 1 (at the mean official exchange rate for 2000)

**Table 6** Costs and effects of an efficient intervention package for neuropsychiatric conditions in Nigeria

Condition	Intervention	Coverage	Effectiveness (DALYs averted per year)	Total cost per year (Naira, millions)				Cost per treated case per year	Cost per DALY averted
				Patient	Programme	Training	Total		
Schizophrenia	Older antipsychotic+ psychosocial treatment (community-based model)	70%	26,980	1,598	141	62	1,802	9,204	66,790
Depression	Older antidepressant in primary care	40%	69,608	5,255	70	42	5,367	4,680	77,109
Epilepsy	Older antiepileptic in primary care	50%	105,946	985	88	40	1,113	2,868	10,507
Hazardous alcohol use	Roadside breath-testing of motor vehicle drivers	80%	109,490	0	972	0	972	-	8,873
Total package			312,024	7,839	1,270	144	9,254	80	29,658

N 104= US\$ 1 (at the mean official exchange rate for 2000)

ropsychiatric care, characterized by the following criteria: a) selection of one intervention for each of the studied neuropsychiatric conditions; b) implementation of a community-based outpatient service model for schizophrenia and primary care treatment for other conditions (depression, epilepsy, heavy alcohol use); c) adoption of combined pharmacological-psychosocial treatments where such approaches are more cost-effective than drug treatment alone; d) reliance on older psychotropic drugs (neuroleptics such as haloperidol for schizophrenia, tricyclic antidepressants such as imipramine for depression, and phenobarbital or phenytoin for epilepsy).

Table 6 provides summary results for such an intervention package. Each of these interventions represents an efficient choice out of all those considered for the particular condition. Schizophrenia has the highest cost per treated case (N 9,204 or US\$ 88 per year), but depression absorbs the highest proportion of total costs (more than half), owing to its considerably greater prevalence in the population (over N 5,000 million per year, equivalent to US\$ 41.2 million). Highest returns in terms of health outcome and cost per unit of outcome are for epilepsy treatment and roadside breath-testing (over 100,000 DALYs averted per year, each at a cost of N 9,000-11,000, corresponding to US\$ 100 or less). The total annual cost of the package amounts to more than 9 billion Naira (US\$ 88 million), equivalent to 80 Naira (US\$ 0.77) per capita across the Nigerian population of 115 million inhabitants.

## DISCUSSION

Unquestionably, there is a wide gap between the burden of neuropsychiatric disorders and available resources to address this burden in Nigeria, just as is the case in many other developing countries. In the context of such a limited resource envelope, there is an even greater need for decisions about what money is to be spent on to be guided by evi-

dence. Cost-effectiveness analysis enhances allocative efficiency and is used to evaluate the cost and health effects of specific interventions. By indicating the interventions that produce best value for money, it could guide policy makers in decision making.

In this study, the relatively greater efficiency of some interventions over others has been demonstrated. It is clear that a modest investment of resources into a range of cost-effective interventions has the potential to markedly reduce the existing burden of neuropsychiatric disorders in Nigeria. In the package herein described, the key inputs consist of patient-level costs (composed mainly of direct costs of medication and health facility visits), programme costs (composed essentially of capital and recurrent infrastructural expenditures) and training costs. Except for preventive interventions aimed at curbing high-risk drinking in the population, much of the total cost is made of patient cost, and the other components constitute a relatively small proportion. At current practice, much of the patient cost comes directly from consumers as out-of-pocket payments, since there is no national health insurance and no social welfare programs. In order to expand coverage from the currently low rates to the target coverage levels employed in this study, at least some of the financial burden on consumers from having to make out-of-pocket payments for service needs to be relieved. Thus, other than the programme and training costs that come from government sources, there is a need for some additional provision for more patient costs to be borne by the government. Even with this proviso, the total financial outlay of government is still likely to be relatively small (less than one US dollar per capita). Without a doubt, an increase in government spending has the potential to produce a more cost-effective set of interventions and save more DALYs than is the current situation. For example and as shown in Table 4, an increase in coverage from the current 20% to 80% in the treatment of epilepsy would increase total spending from 413 million to 1,903 million Naira. At the current situation of 20% cover-

age, what the government spends is relatively negligible, being mainly as part of direct patient cost. If coverage is increased to 80%, spending by government would increase slightly more than 12% of the total cost (being largely money spent on programmes and training). However, there will be a gain in efficiency, as reflected in a decrease in cost per DALY saved from the current N 13,339 to N 11,228.

It is noteworthy, however, that the structure needed to implement the intervention package is a crucial element in the projections and such structure is not currently available in the country. The health system necessary to implement these interventions will require better coordination of the various elements of service delivery, with particular emphasis on the ability of the primary care component to fulfill the projected role. A well-organized primary health care service which can deliver the envisaged interventions is presently not on the ground. The reorganization of the primary care service would involve re-training of the workers at this level of the health care system, provision of essential drugs for specified disorders, and better integration into the other tiers of the system. With this in place, a well-coordinated referral system would be available to serve as support for the primary care program.

We recognize several caveats concerning the use of results from this analysis in formulating policy for the delivery of service to persons with mental and neurological disorders. As good as cost-effective analysis may be in enhancing allocative efficiency, a number of criticisms have been leveled against the methodology. One such criticism is that the process is complicated, expensive and requires a lot of data which are not readily available in many developing countries, including Nigeria. In addition, some estimates (for example, relating to expected resource utilization patterns) are based on the opinion of a group of mental health experts, in which case the opinions of other health care providers, interest groups or beneficiaries may not necessarily be fully reflected.

Also, although cost-effective evidence relating to interventions is informative in itself, it is not the end of the analytic process. Rather, it represents a key input into the broader task of priority setting. Other inputs affect decision making: the needs for equitable distribution of available resources, to attend to the health requirements of special or vulnerable populations, and to attend to emergencies, for example those resulting from an unforeseen disaster, are additional inputs that have to be considered. Also important is a consideration of public expectations. For the task of analysis, therefore, the purpose is to go beyond efficiency concerns only and establish combinations of cost-effective interventions that best address stated goals of the health system, including improved quality of care and reduced inequalities. Other allocative criteria against which cost-effectiveness arguments need to be considered include the relative severity and the extent of spillover effects among different diseases, the potential for reducing catastrophic household spending on health, and protection of human rights. Thus, priority set-

ting implies a degree of trading-off between different health system goals, such that the most equitable allocation of resources is not necessarily the most efficient one.

It is also worthy of note that we have built our estimates on current prices of newer medications. Many of such medications are still on patents and therefore carry high purchase costs. However, should generic forms of the medications become available, the picture could change dramatically in regard to their cost-effectiveness, especially given the low side effect burden and the higher prospect of treatment adherence that some of the newer medications may offer. Therefore, it is essential that our results should not be taken as implying that patients from low-resource countries should be permanently excluded from the benefit that newer medications can offer.

The current level of funding for health (3%) in Nigeria is widely considered to be quite inadequate to meet the identified health needs of the population. Inevitably, what comes to mental health services, which is at the moment not clearly defined, cannot meet the needs of the improved service implied in the intervention package described here. Overall improvement in funding is necessary and a clearer line of funding for mental health service should be available. At the moment, it is difficult to identify any relative neglect of mental health service funding with a view to drawing attention to it. In other words, out of sight, out of mind.

Currently, the organization of the health system in Nigeria is loose and uncoordinated. In particular, the primary care system, an essential tool for the delivery of the interventions described in this report, is incapable of meeting the many challenges implied by a more adequate level of health care delivery. Better training of the staff is required and so is better integration of its service with those provided at the other tiers. A structured link with the secondary tier is required, so that primary care staff can get the supervision and support they need and have a better defined referral system. Of course, provision of essential medication on a regular basis is necessary. In short, a more efficient service that can benefit from the results of cost-effectiveness analysis such as the one presented herein can only come through a process of major reorganization of the health system in Nigeria. What we have described here is practicable and affordable, but only within the context of those changes and reorganization.

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