BENEFIT-COST ANALYSIS OF MENTAL HEALTH INTERVENTIONS IN GHANA

JUSTICE NONVIGNON
Department of Health Policy, Planning and Management, School of Public Health, University of Ghana, Legon, Ghana

CAROLINE REINDORF AMISSAH
Mental Health Authority, Accra, Ghana

SAMUEL AGYEI AGYEMANG
Department of Health Policy, Planning and Management, School of Public Health, University of Ghana, Legon, Ghana

NATIONAL DEVELOPMENT PLANNING COMMISSION

COPENHAGEN CONSENSUS CENTER

GHANA PRIORITIES

COPENHAGEN CONSENSUS CENTER

info@copenhagenconsensus.com
www.copenhagenconsensus.com

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Ghana Priorities

Justice Nonvignon
Department of Health Policy, Planning and Management, School of Public Health, University of Ghana, Legon, Ghana

Caroline Reindorf Amissah
Mental Health Authority, Accra, Ghana

Samuel Agyei Agyemang
Department of Health Policy, Planning and Management, School of Public Health, University of Ghana, Legon, Ghana

Brad Wong
Copenhagen Consensus Center

Academic Abstract

Background: Substantial proportion of the world's disease burden came from mental, neurological and substance use disorders. This study evaluates the benefit-cost of interventions targeting screening and treatment of depression, anxiety disorders and schizophrenia.

Method: We estimated the cost and benefits of providing screening and treatment to an estimated proportion of the population based on the average disease prevalence rate from 1990 to 2017. Each analysis focuses on a single cohort, first screened in 2019 and followed for 10 years.

Results: The undiscounted cost of depression, anxiety disorder and schizophrenia were GHS 110m; GHS 108m; and GHS36m respectively. The estimated BCRs were around 7.44 for depression, 4.94 for anxiety disorder and 1.66 for schizophrenia at 5% discount rate. All three interventions had positive net-present values (NPVs) and >1 BCRs indicating the benefits from all programs are higher than their respective costs.

Conclusion: The findings strongly reinforce the enormous economic benefits of mental health interventions and the urgent need of governments to invest in mental health interventions.

Key words: Depression, Schizophrenia, Anxiety Disorder, Cost-benefit analysis

POLICY ABSTRACT

The Problem

With a population of nearly 30 million people, WHO estimates that approximately 13% of the population in Ghana suffer from a mental disorder, of which 3% suffer from a severe mental disorder and the other 10% suffer from a moderate to mild mental disorder (WHO, 2007). However, there is a lack of reliable data regarding the prevalence of mental and neurological disorders in the country. Mental disorders are a leading cause of years lived with disability in Ghana, behind iron-deficient anaemia (IHME, 2013a). Among patients seeking treatment for mental health issues, schizophrenia, substance abuse, and mood disorders are the top three diagnoses, although a large percentage of people receive no specific diagnosis. Recent estimates by Ritcher and Roser (2018), indicate that the average prevalence of depression, anxiety disorders and schizophrenia over the period 1990 to 2017 are 3.3%, 2.9% and 0.17%, respectively. The treatment gap for mental health disorders in Ghana is estimated to be more than 98% (WHO, 2007).

Though studies have estimated the costs of mental illness in Ghana, there is paucity of studies assessing the cost-benefit of interventions targeting mental health. With the country transitioning from low-income to middle-income status leading to reductions in official development assistance (Nonvignon et al., 2018), and the Ministry of Health institutionalizing health sector priority setting in Ghana (Hollingworth et al., 2019), the analyses of benefit-cost could inform both health sector and general country-level policy decisions relating to priority setting. Hence, this study evaluates the benefit-cost of interventions targeting screening and treatment of depression, anxiety disorders and schizophrenia.

Intervention 1: Screening and Treatment of Depression

Implementation Considerations

The number of people in Ghana projected to receive treatment for depression within the cases identified is estimated to be about 13,202. It is projected that about 30% (3,961) of those who receive treatment will remain on antidepressants for life.

Costs

Projected total cost for depression was estimated at approximately GHS 110.3 million with indirect cost of treatment constituting 16.2% of total cost for the entire period of 10 years without discounting. The projected discounted total cost for depression is estimated to be approximately GHS 98.2 million, GHS 92.3 million and GHS 82.5 million at 5%, 8% and 14% discount rates, respectively. Direct non-medical cost constituted 45.5% of the total projected cost. Direct medical cost and indirect cost constituted 38.3% and 16.2% of the remaining cost, respectively.

Benefits

The total expected benefits through the impact of a depression programme on employment is estimated at GHS 948 million. The programme benefits in terms of patient productivity loss was relatively higher estimated at GHS 565 million compared to caregiver's benefits derived from caregiver productivity loss also estimated at GHS 271 million. Discounting expected benefits at 5%, 8% and 14% rates, benefits derived were estimated at GHS 730 million, GHS 634 million and GHS 492 million respectively. Self-harm and suicide averted due to a depression programme is estimated at GHS 23 million and GHS 87 million respectively.

Intervention 2: Screening and Treatment of Anxiety Disorder

Implementation Considerations

The number of people in Ghana projected to receive treatment for anxiety disorder within the cases identified is estimated to be about 11,362. Similar to the depression case scenario, it is projected that about 30% (3,409) of those who receive treatment will remain on antidepressants for life.

Costs

The projected total cost for anxiety disorder was estimated at approximately GHS 108.3 million with indirect cost of treatment constituting 20.6% of total cost for the entire period of 10 years without discounting. The projected discounted total cost for anxiety disorder is estimated to be approximately GHS 95.1million, GHS 88.7million and GHS 78.3million at 5%, 8% and 14% discount rates respectively. Direct non-medical cost constituted 39.8% of

the total projected cost. Direct medical cost and indirect cost constituted 39.6% and 20.6% of the remaining cost, respectively.

Benefits

An intervention programme targeting anxiety disorder results in an estimated total benefit of GHS 610 million. When discounted at 5%, 8% and 14% rates, benefits derived were estimated at GHS 470 million, GHS 408 million and GHS 316 million respectively. Self-harm and suicide averted due to anxiety disorder programme is estimated at GHS 20 million and GHS 63 million respectively. The programme benefit in terms of patient productivity loss is estimated at GHS 292 million.

Intervention 3: Screening and Treatment of Schizophrenia

Implementation Considerations

The number of people in Ghana projected to receive treatment for schizophrenia within the cases identified is estimated to be about 667. Schizophrenia patients receive treatment for life.

Costs

The projected total cost for schizophrenia was estimated at approximately GHS 36 million with indirect cost of treatment constituting 12.5% of total cost for the entire period of 10 years without discounting. The projected discounted total cost for schizophrenia is estimated to be approximately GHS 30.6 million, GHS 28.2 million and GHS 24.4 million at 5%, 8% and 14% discount rates respectively. Direct non-medical cost constituted 24.3% of the total projected cost. Direct medical cost and indirect cost constituted 63.2% and 12.5% of the remaining cost respectively

Benefits

The expected benefit of schizophrenia programme was estimated at GHS 66 million. The programme benefit in terms of patient productivity loss estimated at GHS 43 million and GHS 17 million to caregivers. Self-harm and suicide averted due to a schizophrenia programme is estimated at GHS 1 million and GHS 4 million respectively

Table 1: Summary BCR Table from all Interventions

Interventions	Benefit (GHS million)	Costs over 10 years (GHS million)	BCR	Quality of Evidence
Screening and treatment of depression for more than 13,200 people	634	92	6.9	Medium
Screening and treatment of anxiety disorders for almost 11,400 people	408	88	4.6	Medium
Screening and treatment of schizophrenia for 667 people	44	28	1.6	Medium

Notes: All Cost and Benefit figures in millions and assume BCR at an 8% discount rate

1. Introduction

With a population of nearly 30 million people, WHO estimates that approximately 13% of the population in Ghana suffer from a mental disorder, of which 3% suffer from a severe mental disorder and the other 10% suffer from a moderate to mild mental disorder (WHO, 2007). However, there is a lack of reliable data regarding the prevalence of mental and neurological disorders in the country. Mental disorders are a leading cause of years lived with disability in Ghana, behind iron-deficient anaemia (IHME, 2013a). Among patients seeking treatment for mental health issues, schizophrenia, substance abuse, and mood disorders are the top three diagnoses, although a large percentage of people receive no specific diagnosis. Recent estimates by Ritcher and Roser (2018), indicate that the average prevalence of depression, anxiety disorders and schizophrenia over the period 1990 to 2017 are 3.3%, 2.9% and 0.17%, respectively. The treatment gap for mental health disorders in Ghana is estimated to be more than 98% (WHO, 2007).

With inadequate mental health specialists, primary care physicians in Ghana receive little training in mental health—only about 3% of their training. Traditional or faith-based healers are a common first option for those suffering from mental health, neurological, and substance (MNS) disorders because the origin of mental health issues is generally seen as spiritual (Barke et al, 2011). Mental health resources are mostly scarce and investment in mental health is less than 1% of the health budget in many countries, including Ghana. The majority of people with mental disorders do not receive evidence-based care, leading to chronicity, suffering and increased costs of care (Patel, 2007).

It has also been predicted that there will be a projected increase in the number of young people entering the age at risk for onset of certain mental disorders (Flisher et al, 2007), thus worsening the current situation; yet there is low priority given to mental health service delivery in Ghana (Doku et al, 2011). Available evidence on the high social and economic costs of poor mental health has resulted in the need to encourage better mental health as well as prevention of onset mental illness (Commission of the European Communities, 2005; Lopez, Mathers, Ezzati, Jamison, & Murray, 2006; World Health Organization, 2005). Mental illness promotion and prevention strategies reduce the individual and social impacts of poor mental health (Cuijpers, Van Straten, & Smit, 2005). That is, these strategies may not only be effective but potentially cost-effective in an economic sense. There is also some

evidence on the effectiveness of programmes focussing on the early detection and early intervention for severe mental disorders, particularly depression and schizophrenia (Marshall & Rathbone, 2011; Merry, McDowell, Hetrick, Bir, & Muller, 2004; Neil & Christensen, 2007; van Straten A, Smits, & Smit, 2006).

The mental health sector in Ghana largely adopts the pharmacological method of managing mental illness due to the lack of personnel and resources for psychosocial therapies and rehabilitation (Roberts et al, 2014). Primarily, this involves the use of medicines, suitably referred to as psychotropic medications in sustaining patients.

Conservatively the costs of poor mental health have been estimated to account for between 3% and 4% of gross domestic product (GDP) in developing countries (Gabriel & Liimatainen, 2000). The annual economic cost of mental illness globally has been estimated to be $2.5 trillion, with a projected increase to $6 trillion by 2030, more than half of the total costs for all non-communicable diseases. (Bloom et al., 2011). However, estimates in developing countries are scare. A study in Kenya for instance estimated that the total costs per patient for 5,678 individuals with mental health problems hospitalised in 1999 were US$ 2,351. The total economic costs for this group alone were more than US$ 13.3 million, equivalent to 10% of the Ministry of Health's budget (Kirigia & Sambo, 2003). In Ghana, Opoku-Boateng et al. (2017) estimate the total monthly household cost of schizophrenia to be $273.28, accounting for more than a third of reported monthly household earning. Similarly, Addo et al. (2013) estimate the monthly cost of household mental care to be $60.24, also representing more than a third of reported earnings.

Though studies have estimated the costs of mental illness in Ghana, there is paucity of studies assessing the cost-benefit of interventions targeting mental health. With the country transitioning from low-income to middle-income status leading to reductions in official development assistance (Nonvignon et al., 2018), and the Ministry of Health institutionalizing health sector priority setting in Ghana (Hollingworth et al., 2019), the analyses of benefit-cost could inform both health sector and general country-level policy decisions relating to priority setting. Hence, this study evaluates the benefit-cost of interventions targeting screening and treatment of depression, anxiety disorders and schizophrenia.

2. Methods

2.1 Mental health landscape and description of proposed interventions

Historically, mental health services have been delivered by three psychiatric hospitals in Ghana, all located in the southern part of Ghana i.e. Accra (Accra and Pantang Hospitals) and Cape Coast (Ankarful Hospital). The Accra Psychiatric Hospital is a 600-bed hospital commissioned in 1906 as the first psychiatric hospital in Ghana and is located in the Greater Accra Region. Established in 1975 with a bed capacity of 500, the Pantang Psychiatric Hospital is situated in Pantang, also in the Greater Accra Region. Ankaful Psychiatric Hospital, which was built in 1965, is a 350-bed hospital located near the coastal town of Cape Coast in the Central Region of Ghana that serves patients from the Central, Western and Ashanti regions of Ghana and some neighboring countries (Opoku-Boateng et al., 2017). There are also faith-based organizations such as churches which are the primary source utilized by a large proportion of the population with mental illnesses, though these have often been associated with maltreatment of patients.

The 2012 Mental Health Act sought to integrate the provision of mental health care into primary health facilities, and scale up the use of community psychiatric nurses (CPNs), who can be found in 159 of the 216 districts. These CPNs work in the communities, but operate from district or sub-district hospitals. A lack of human resources is often cited as a major barrier to scaling up services in LMICs including Ghana, and this is considered a major challenge to delivery of adequate care in Ghana. The number of psychiatric nurses was estimated at 2.47 per 100,000 in 2011, however, the majority are not in the community or in rural areas (Eaton & Ohene, 2016).

Therefore, this study evaluated three proposed mental health interventions i.e. Population-based screening and subsequent treatment of depression, anxiety disorders and schizophrenia in Ghana. Whereas depression and anxiety disorders ranked first and second mental conditions with highest prevalence between 1990 and 2017, schizophrenia continues to be a public health burden too, given the debilitating effects of the condition and has received the attention of researchers, policymakers and practitioners in recent past. For each condition, we envisage the use of existing structures (such as the community-based health planning and

services – CHPS – and use of CPNs). Once the population is screened, they are expected to be referred to the existing primary facilities for management.

2.2 .1Cost-Benefit Analysis

A. General

All costs were computed in 2019 Ghanaian cedis. The discount rates applied to this analysis are 5%, 8% and 14%. Each analysis focuses on a single cohort, first screened in 2019 and followed for 10 years.

B. Costs

Population Screened and Screening Costs

The projected population for Ghana for 2019 was accessed from the World Bank Database (World Bank, 2019). An average screening rate of 3.15% was determined from literature (Akincigil & Matthews, 2017; Bhattacharjee, Goldstone, Vadiei, Lee, & Burke, 2018; Jha et al., 2019; U.S. Preventive Services Task Force, 2002) and this was multiplied by the projected population to derive the total number of persons screened (approximately 978,800). The unit cost of screening was estimated at US$ 2.815 based on Kuo et. al's study of school-based screening programme in the United States (Kuo, Vander Stoep, McCauley, & Kernic, 2009) and assuming a conservative cost estimate of 25% of that applied to Ghana.

Cases Identified and Treatment Costs

Number of cases identified was estimated by multiplying the average prevalence rate by the total number of persons screened. The disease prevalence rate for each of the conditions represent average prevalence from 1990 to 2017 (Ritcher & Roser, 2018). We assumed a 40% treatment coverage i.e. for all cases identified via screening, 40% would eventually be treated. This accounts for inability (e.g. due to lack of appropriate health infrastructure) of the health system to treat all cases identified or unwillingness to follow through with referrals. The number of individuals assumed to commence treatment were 13,202 for depression, 11,362 for anxiety and 667 for schizophrenia.

Diseases are assumed to be treated with first-line drugs based on the Standard Treatment Guidelines, and are reported for only one cohort. Ongoing treatment costs were split into three categories:

- *Direct Medical Cost* - Direct medical costs were cost incurred on medical services such as consultation, drugs, diagnosis, and other health care interventions. Direct medical cost was estimated as summation of costs of consultation (based on studies by Addo et al., 2013; Opoku-Boateng et al., 2017), drugs (based on Standard Treatment Guidelines and medicines prices from the Public Procurement Agency), and laboratory (based on going prices in Ghana with lab requirements based on expert opinion).
- *Direct non-medical cost* - This is the summation of all travel costs incurred by the persons with mental illness and their caregivers to and from home to the facility. This is the summation of all food and drink costs incurred by the patients and caregivers. It also includes all miscellaneous costs incurred by the patients and caregivers (i.e., telephone calls, etc) related to their conditions. Direct non-medical costs were estimated based on estimates by Addo et al. (2013) and Opoku-Boateng et al. (2017).
- *Indirect cost* - This is the summation of the seeking care cost by an accompanying household member and the cost of the patient and travelling to and from home to the facility as well as time waiting to be attended to at the facility. Indirect cost of seeking mental health care by both the patient and the caregiver estimated based on figures extracted from literature (Addo, Nonvignon, & Aikins, 2013; Opoku-Boateng et al., 2017).

Duration and intensity of treatment assumptions

Based on expert opinion, we determined the average treatment duration for depression and anxiety to be two years, with patients given monthly treatments. Thereafter, 30% of the cases would remain on treatment for life, continuing to receive some consultation, medication as well as incur some indirect costs in year 4, 6 and 8.

All schizophrenic patients would put on medication for life. However, experts advised that the number of tests decline significantly after the initial tests. It was assumed that the cost would reduce by approximately 50% after the first two years.

C. Benefits

It was assumed, based on expert opinion, that the above assumptions lead to a 90% cure rate (i.e. of those who initially start treatment, 90% are cured with ongoing medication). The benefits of the interventions were classified into patient and caregiver productivity losses avoided, averted self-harm and averted suicides.

Productivity losses were estimated for formal sector workers (20%) and informal sector workers (80%) separately based on World Bank data (World Bank Group, 2018). Productivity losses for formal sector workers were estimated using the national daily minimum wage of $1.91 for 2019 (Mywage, 2019), whilst the local wage rate of $8.08 was used in deriving productivity losses to the informal sector following previous studies (Nonvignon et al., 2016). The annual wage for both the caregivers and patients was then estimated.

The proportion of productivity losses attributable to each disease was then multiplied by the estimated annual wage to derive the total benefits. The proportions were extracted from literature, specifically depression causes 50% productivity loss (Chisholm et al., 2016), anxiety causes 30% productivity loss (Chisholm et al., 2016) and schizophrenia causes 70% productivity loss (Evensen et al., 2016). Caregivers of both depression and anxiety disorder patient are assumed to experience 24% productivity loss (Hopps, Iadeluca, McDonald, & Makinson, 2017) and 30% for caregivers of schizophrenia patients (Sruamsiri, Mori, & Mahlich, 2018).

Self-harm averted was estimated as a product of the total number of cases treated and the annual risk of self-harm to determine the unit benefit per harm episode averted. Suicide averted was estimated as a product of the total number of patients treated, the annual risk of suicide, the years of life lost (YLLs) per suicide avoided and the value per DALY.

All benefits are for a 10-year period which is the appropriate timeframe of analysis. Ninety percent% of benefits are assumed to have accrued after the first year. Benefits were also adjusted annually to reflect the real growth in incomes by using the projection of real GDP per capita growth for Ghana.

D. Benefit-cost ratios

Benefit-cost ratios (BCR) for each intervention were derived as a ratio of total benefits to total costs, presented by the discount rates used. All figures are presented in 2019 USD.

2.2. Screening and Treatment of Depression

2.2.1 Costs

The number of people in Ghana projected to receive treatment for depression within the cases identified is estimated to be about 13,202. It is projected that about 30% (3,961) of those who

receive treatment will remain on antidepressants for life. Projected total cost for depression was estimated at approximately GHS 110.3 million with indirect cost of treatment constituting 16.2% of total cost for the entire period of 10 years without discounting (Table 2).

The projected discounted total cost for depression is estimated to be approximately GHS 98.2 million, GHS 92.3 million and GHS 82.5 million at 5%, 8% and 14% discount rates, respectively (Table 3). Direct non-medical cost constituted 45.5% of the total projected cost. Direct medical cost and indirect cost constituted 38.3% and 16.2% of the remaining cost, respectively.

Table 2: Estimated intervention costs to treat depression

Condition	**Undiscounted cost (GHS)**	**Cost profile**
Depression		
Direct medical cost	42,289,194	38.30%
Direct non-medical cost	50,162,534	45.50%
Indirect cost	17,854,284	16.20%
Total cost	**110,306,013**	**100.00%**

Table 3: Estimated cost (discounted and undiscounted) of depression

Depression Cost	**Cost (GHS)**
Undiscounted	110,306,013
5%	98,225,806
8%	92,280,151
14%	82,500,104

2.2.2Benefits

The total expected benefits through the impact of a depression programme on employment is estimated at GHS 948 million. The programme benefits in terms of patient productivity loss was relatively higher estimated at GHS 565 million compared to caregiver's benefits derived from caregiver productivity loss also estimated at GHS 271 million. Discounting expected benefits at 5%, 8% and 14% rates, benefits derived were estimated at GHS 730 million, GHS 634 million and GHS 492 million respectively. Self-harm and suicide averted due to a depression programme is estimated at GHS 23 million and GHS 87 million respectively (Table 4).

Table 4: Benefits of mental health programmes for depression

Condition	Discount	Patient (GHS)	Caregiver (GHS)	Averted self-harm (GHS)	Averted suicide (GHS)	TOTAL (GHS)
Depression	**Undiscounted**	565,574,035	271,475,537	23,896,284	87,217,768	948,163,624
	5%	436,808,958	209,668,300	18,455,782	65,862,106	730,795,146
	8%	379,625,747	182,220,358	16,039,712	56,505,409	634,391,226
	14%	295,171,008	141,682,084	12,471,383	42,883,993	492,208,467

2.3. Screening and Treatment of Anxiety Disorders

2.3.1 Costs

The number of people in Ghana projected to receive treatment for anxiety disorder within the cases identified is estimated to be about 11,362. Similar to the depression case scenario, it is projected that about 30% (3,409) of those who receive treatment will remain on antidepressants for life. The projected total cost for anxiety disorder was estimated at approximately GHS 108.3 million with indirect cost of treatment constituting 20.6% of total cost for the entire period of 10 years without discounting. The projected discounted total cost for anxiety disorder is estimated to be approximately GHS 95.1 million, GHS 88.7 million and GHS 78.3 million at 5%, 8% and 14% discount rates respectively. Direct non-medical cost constituted 39.8% of the total projected cost. Direct medical cost and indirect cost constituted 39.6% and 20.6% of the remaining cost, respectively.

Table 5: Estimated intervention costs to treat Anxiety Disorders

Anxiety Disorder	Undiscounted cost (GHS)	Cost profile
Direct medical cost	42,890,664	39.60%
Direct non-medical cost	43,170,586	39.80%
Indirect cost	22,280,192	20.60%
Total cost	**108,341,443**	**100.00%**

Table 6: Estimated cost (discounted and undiscounted) of Anxiety Disorder

Anxiety Disorder Cost	Cost (GHS)
Undiscounted	108,341,443
5%	95,082,580
8%	88,672,074
14%	78,315,502

2.3.2 Benefits

An intervention programme targeting anxiety disorder results in an estimated total benefit of GHS 610 million. When discounted at 5%, 8% and 14% rates, benefits derived were estimated at GHS 470 million, GHS 408 million and GHS 316 million respectively. Self-harm and suicide averted due to anxiety disorder programme is estimated at GHS 20 million and GHS 63 million respectively. The programme benefit in terms of patient productivity loss is estimated at GHS 292 million (Table 7).

Table 7: Benefits of mental health programmes for anxiety disorder

Condition	Discount	Patient (GHS)	Caregiver (GHS)	Averted self-harm (GHS)	Averted suicide (GHS)	TOTAL (GHS)
Anxiety disorder	**Undiscounted**	292,044,608	233,635,686	20,565,480	63,881,570	610,127,344
	5%	225,554,380	180,443,504	15,883,307	48,239,881	470,121,072
	8%	196,026,772	156,821,417	13,804,003	41,386,684	408,038,876
	14%	152,417,006	121,933,605	10,733,048	31,409,847	316,493,507

2.4. Screening and Treatment of Schizophrenia

2.4.1 Costs

The number of people in Ghana projected to receive treatment for schizophrenia within the cases identified is estimated to be about 667. Schizophrenia patients receive treatment for life. The projected total cost for schizophrenia was estimated at approximately GHS 36 million with indirect cost of treatment constituting 12.5% of total cost for the entire period of 10 years without discounting (Table 8). The projected discounted total cost for schizophrenia is estimated to be approximately GHS 30.6 million, GHS 28.2 million and GHS 24.4 million at 5%, 8% and 14% discount rates respectively. Direct non-medical cost constituted 24.3% of the total projected cost (Table 9). Direct medical cost and indirect cost constituted 63.2% and 12.5% of the remaining cost respectively.

Table 8: Estimated intervention costs to treat schizophrenia

Schizophrenia	Undiscounted cost (GHS)	Cost profile
Direct medical cost	22,773,632	63.20%
Direct non-medical cost	8,744,364	24.30%
Indirect cost	4,512,936	12.50%
Total cost	**36,030,933**	**100.00%**

Table 9: Estimated cost (discounted and undiscounted) of Schizophrenia

Schizophrenia Cost	Cost (GHS)
Undiscounted	36,030,933
5%	30,681,547
8%	28,220,056
14%	24,428,618

2.4.2 Benefits

The expected benefit of schizophrenia programme was estimated at GHS 66 million. The programme benefit in terms of patient productivity loss estimated at GHS 43 million and GHS 17 million to caregivers. Self-harm and suicide averted due to a schizophrenia programme is estimated at GHS 1 million and GHS 4 million respectively (Table 10).

Table 10: Benefits of mental health programmes for schizophrenia

Condition	Discount	Patient (GHS)	Caregiver (GHS)	Averted self-harm (GHS)	Averted suicide (GHS)	TOTAL (GHS)
Schizophrenia	**Undiscounted**	43,344,643	17,154,872	1,027,464	4,690,551	66,217,530
	5%	33,476,304	13,249,197	793,539	3,542,049	51,061,089
	8%	29,093,879	11,514,728	689,656	3,038,848	44,337,111
	14%	22,621,410	8,953,065	536,229	2,306,291	34,416,995

3. Discussion

This analysis confirms that the economic benefits of mental health interventions out-weigh the costs. It adds to the evidence on the importance of governments investing in mental health interventions especially in a resource-constraint setting where there are other competing priorities. It also highlights the opportunities available in terms of increased benefits when interventions are targeted.

In the mental health policy sphere, the goal of cost-benefit analysis is to estimate, in monetary units, the value of benefits and costs associated with implementing a certain mental health intervention. The relevant costs in making such an estimate are the total expenditures to be made, including both the direct service delivery expenditures as well as less obvious costs that is time foregone by the patient or caregiver while receiving treatment. Thus, costs can be seen as the value of resources withdrawn from the economy to implement a particular intervention (Frank, 1981).

In this study, the benefit-cost ratio of investments on screening and treatment for depression, anxiety disorder and schizophrenia were around 7.44 for depression, 4.94 for anxiety disorder and 1.66 for schizophrenia at 5% discount rate. These BCRs were similar to a study on investments to increase treatment rates for common mental disorders which were between 2.3 and 5.7 in the European Union (EU) region (Trautmann, Rehm, & Wittchen, 2016). All three interventions had positive net-present values (NPVs) and >1 BCRs indicating the benefits from all programs are higher than their respective costs. The best BCR was obtained in the screening and treatment of depression intervention followed by the screening and treatment of anxiety disorder.

The analysis for this study has some limitations that require results to be interpreted with care. For instance, due to unavailability of data on cost in LMICs, some data for this analysis were obtained from previous studies in high income countries. We attempted to account for the differences by assuming a proportion of those costs apply to an LMIC setting like Ghana. In addition, some of the parameter estimates are based on clinical interviews, expert opinion and experiences. For instance, assumptions regarding the duration of treatment and the proportion of patients who are likely to remain on treatment for life were largely based on expert opinions. Further, some of the parameter estimates were arbitrary based on the researchers own discretion, for instance, we assumed a 40% take up rate post-screening.

The other limitation of our study is that the assumption in wage rate estimation employed. The analysis used the local agriculture wage rate for all persons in the informal sector (80% corresponding with standard estimates). However, the assumption that everybody in the informal sector works and gets a wage could problematic. Similarly, the national wage rate used for all those in the formal sector is likely an underestimation, given that in reality people's wages are higher than the minimum wage. However, our assumptions are consistent with what has been used previously.

The above limitations notwithstanding, this study provides evidence that screening and treatment for depression, anxiety disorder and schizophrenia represents a worthwhile investment. It adds to the existing literature supporting the economic case for early detection and treatment of mental illness (Marshall & Rathbone, 2011; Merry et al., 2004; Neil & Christensen, 2007; van Straten A et al., 2006).

4. Conclusion

Mental health problems are a major contributor to the global disease burden, they are associated with premature mortality and significant social and economic impacts on individuals and generate substantial costs to the economy. This study sought to estimate the benefit-cost of population-level screening and treatment of depression, anxiety disorders and schizophrenia in Ghana. The study finds each of the proposed interventions to have positive BCRs, indicating higher benefits than costs to the country.

Table 11 below indicates that the BCRs for depression intervention range from 5.97 to 7.44 at 14% and 5% discount rates, respectively. Those for anxiety disorders range from 4.04 to 4.94 at 14% and 5% discount rates, respectively. Finally, the BCRs for schizophrenia range from 1.41 to 1.66 at 14% and 5% discount rates, respectively.

Table 11: Summary Table of Benefit-cost ratios for depression, screening and schizophrenia

Intervention	Discount Rate	Benefit (GHS)	Cost (GHS)	BCR	Quality of Evidence
Screening and treatment of depression	5%	730,795,144	98,225,804	7.44	Medium
	8%	634,391,228	92,280,154	6.87	
	14%	492,208,467	82,500,105	5.97	
Screening and treatment of anxiety disorders	5%	470,121,071	95,082,579	4.94	Medium
	8%	408,038,877	88,672,075	4.60	
	14%	316,493,509	78,315,503	4.04	
Screening and treatment of schizophrenia	5%	51,061,090	30,681,547	1.66	Medium
	8%	44,337,108	28,220,054	1.57	
	14%	34,416,996	24,428,619	1.41	

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