Scaling up child and adolescent mental health services in South Africa: Human resource requirements and costs

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Background: Children and adolescents with mental health problems have poor service cover in low- and middle-income countries. Little is known about the resources that would be required to provide child and adolescent mental health services (CAMHS) in these countries. The purpose of this study was to calculate the human resources and associated costs required to scale up CAMHS in South Africa. Methods: A spreadsheet model was developed to calculate mental health service resources, based on an estimation of the need for services in a given population. The model can be adapted to specific settings by adjusting population size, age distribution, prevalence, comorbidity, levels of coverage, service utilisation rates, workloads, length of consultations and staff profile. Steps in the modelling include population identification; estimates of prevalence, service utilisation and staffing; and costing. Results: Using a nominal total population of 100,000 (of which 43,170 would be children and adolescents under 20 years of age), the following full-time equivalent staff are required at minimum coverage level: 5.8 in PHC facilities, .6 in general hospital outpatient departments (OPDs), 1 in general hospital inpatient facilities, 1.1 in specialist CAMHS OPDs, .6 in specialist CAMHS inpatient facilities, .5 in specialist CAMHS day services, and .8 in regional CAMHS teams. This translates into roughly $21.50 and $5.99 per child or adolescent per annum nationally for the full coverage and minimum coverage scenarios respectively. When comparing the results of this model with current realities in South Africa, there remains a substantial shortfall in existing levels of CAMHS provision. Conclusions: The model can be used as an advocacy tool to engage with planners and policy makers on a rational basis. It can also be adapted for use in other countries, and is intended to support wider calls for a global scaling up of mental health services. Keywords: Developing countries, mental health services, planning, policy, children, adolescents, public health. Abbreviations: CAMHS: Child and adolescent mental health services; DPV: Daily patient visits; FTE: Full-time equivalent; LMICs: Low- and middle-income countries; PMHCs: Provincial mental health coordinators.
Little is known about the resources that would be required to provide child and adolescent mental health services in low and middle-income countries (LMICs). Recently, a series on ‘global mental health’ concluded with a call to scale up services for mental health in LMICs (Lancet Global Mental Health Group, 2007), and included a methodology for calculating the resources and costs required to scale up adult services only (Chisholm, Lund, & Saxena, 2007). South African studies have developed methodologies for calculating staffing needs for adults with severe psychiatric conditions (Lund, Flisher, Lee, Porteus, & Robertson, 2000; Lund & Flisher, 2006). However, in preparation for the current study, we were not able to locate any attempts to calculate the service resource needs for mental health services for children and adolescents specifically.

The purpose of this study was to calculate the human resources and associated costs required to scale up mental health services to an acceptable level of care for children and adolescents in South Africa, based on needs identified from epidemiological data.

Methods

Defining CAMHS

CAMHS were defined as all public sector mental health services provided to children and adolescents with psychiatric disorders that are managed by the nine provincial Health Departments in South Africa. This choice was made because public sector services provide care to the vast majority of the population, and are particularly important for addressing the needs of poor marginalised communities, where mental health needs are often greatest (Saraceno & Barbui, 1997). Services for children and adolescents with intellectual disabilities, social services, pre-schools and education systems were excluded. A focus on the health sector facilitated a calculation of the human resources and costs required for the Department of Health.

Situation analysis

A situation analysis was conducted of existing CAMHS provision in South Africa. A purpose-designed survey instrument was distributed to all provinces, using the designated provincial mental health coordinators (PMHCs) as data collection agents. PMHCs are programme managers responsible for the coordination of mental health services at the provincial level and normally function at a Director or Deputy Director level within the Department of Health.

Respondents were asked to report the numbers of children and adolescents receiving inpatient and outpatient services, the number and types of CAMHS and the number of generic and specialized full-time equivalent (FTE) staff employed in such services. The research process revealed that much of these data were not routinely collected and needed to be sourced from district health services. The survey was followed by field visits to all provinces, which included interviews with provincial and regional mental health coordinators.

The situation analysis was used to inform the service framework and staffing levels recommended in this paper. For example, the existence of regional CAMHS teams in urban areas in two provinces led to their inclusion in the service framework. Existing staff provision per population in these examples was used to calculate the staffing numbers required for the teams in the model. Full results of this situation analysis have been reported elsewhere (Dawes, Lund, Kafaar, Brandt, & Flisher, 2004).

Model

A spreadsheet model was developed as a tool for calculating mental health service resource needs, based on an estimation of the need for services in a given population. The measure of need used was epidemiological data (12-month prevalence rates), adapted to the demographic profile of the population (in this case people under 20 years of age in each province). The purpose of the model was to provide a rational and transparent framework for calculating the mental health resource needs of children and adolescents with mental disorders in a province during an average year. Together with data on current service utilisation and current staff resources (from the service indicators), and consultation with mental health stakeholders (from the provincial visits), the model was designed as a tool to aid target setting for local planning.

The model that was used to develop norms for mental health services for South Africans with severe psychiatric conditions (Lund et al., 2000) was adapted for use in this study. A model developed by the World Health Organisation (WHO) (WHO, 1996) was used as a framework. We also drew on South African health service literature and guidelines as well as data from the provincial questionnaires to produce an estimate of the mental health service needs of children and adolescents (Lazarus, Freeman, & Rispel, 1995; Monitor Company, 1996; Rispel, Price, & Cabral, 1996).

The model was developed using Microsoft Excel and can be adapted to specific settings by adjusting any of the following assumptions or variables: population size; age distribution; prevalence; comorbidity; levels of coverage; attendances at ambulatory care facilities; ambulatory care utilisation rates; ambulatory care workloads; length of consultations; and staff profile. To clarify how the results of the model were calculated, the broad steps in the modelling process are set out below. Details of these
steps and the formulae are set out in the electronic appendix to this paper.

**Step 1.** The modeling process began with the population of the province. Disaggregation to provincial level was important, as planning and budgeting decisions for CAMHS are made by provincial Departments of Health. Next the age distribution of the population was considered. In keeping with WHO and national Department of Health guidelines, the 2001 census was used to determine the number of persons under age 20 in each province. Nationally this is 43.17% of the South African population.

**Step 2.** Epidemiological data were used to measure the service needs of children and adolescents with mental disorders. No representative psychiatric epidemiological studies of children and adolescents have been conducted in South Africa. In the absence of representative South African epidemiological data, best estimates of the 12-month prevalence of mental disorders were developed by an expert consensus group in the Western Cape, based on existing South African, African and wider international epidemiological data (Kleintjes et al., 2006). The study by Kleintjes et al. included consideration of several small non-representative epidemiological studies conducted in the country (Cherian & Cherian, 1999; Ensink, Robertson, Zissis, & Leger, 1997; Peltzer, 1999; Robertson, Ensink, Parry, & Chalton, 1999). This approach has been recommended in the absence of existing primary epidemiological data (Thornicroft & Tansella, 1999; WHO, 2003).

Mental disorders carry a high rate of comorbidity (Kessler et al., 1994). For this reason, it was necessary to adjust the rates of individual disorders to prevent an overestimate of the likely burden on services. To make this adjustment, a hierarchy of disorders was created in which severe chronic disorders were thought to require service priority (schizophrenia, bipolar affective disorder). To allow for comorbidity with these priority disorders, the prevalence rates of the remaining disorders were reduced in proportion to their weighting relative to the total disorders.

To provide for variety in budgetary scenarios, two levels of service coverage were calculated: Minimum and Full coverage. Minimum coverage is the minimum recommended service provision for children and adolescents estimated to have mental disorders. Calculations were based on a weighted percentage of each disorder in terms of burden (and thus probable staff cover needs and service demand). Under minimum cover levels, services would cover between 15 and 30% of all children and adolescents with diagnosable disorders. Full coverage is 100% service provision for children and adolescents estimated to have mental disorders.

Twelve-month prevalence rates, with adjustments for comorbidity and coverage in a nominal population of 100,000 are set out in Table 1.

**Step 3.** The next step was to calculate the likely service utilisation of the identified cases. Service utilisation was located within an overall service framework for CAMHS (see Figure 1).

This model fits within the existing healthcare system in South Africa, which is based on primary healthcare principles. In this system, Types A1 and A2 would fit within the district health system and Types B1 and B2 would be provided in secondary and tertiary services. The only service structure which is not fully established is Type C (regional CAMHS teams). Only the Western Cape and Gauteng

### Table 1
12-month prevalence of child and adolescent mental disorders, with adjustments for comorbidity and coverage in a nominal population of 100,000 people

<table>
<thead>
<tr>
<th>Disorder</th>
<th>12-month prevalence (%)</th>
<th>Comorbidity adjustments (%)</th>
<th>Total number expected in population #</th>
<th>Minimum coverage ##</th>
<th>Full coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD</td>
<td>5.0</td>
<td>1.24</td>
<td>535</td>
<td>161</td>
<td>535</td>
</tr>
<tr>
<td>Conduct disorder</td>
<td>4.0</td>
<td>.99</td>
<td>428</td>
<td>86</td>
<td>428</td>
</tr>
<tr>
<td>ODD</td>
<td>6.0</td>
<td>1.49</td>
<td>642</td>
<td>128</td>
<td>642</td>
</tr>
<tr>
<td>Enuresis</td>
<td>5.0</td>
<td>1.24</td>
<td>535</td>
<td>54</td>
<td>535</td>
</tr>
<tr>
<td>Separation anxiety disorder</td>
<td>4.0</td>
<td>.99</td>
<td>428</td>
<td>43</td>
<td>428</td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>.5</td>
<td>.50</td>
<td>216</td>
<td>108</td>
<td>216</td>
</tr>
<tr>
<td>Depression &amp; dysthymia</td>
<td>8.0</td>
<td>1.98</td>
<td>856</td>
<td>257</td>
<td>856</td>
</tr>
<tr>
<td>Bipolar disorder</td>
<td>1.0</td>
<td>1.00</td>
<td>432</td>
<td>216</td>
<td>432</td>
</tr>
<tr>
<td>OCD</td>
<td>.5</td>
<td>.12</td>
<td>70</td>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td>Agoraphobia</td>
<td>3.0</td>
<td>.74</td>
<td>321</td>
<td>32</td>
<td>321</td>
</tr>
<tr>
<td>Simple phobia</td>
<td>3.0</td>
<td>.74</td>
<td>321</td>
<td>32</td>
<td>321</td>
</tr>
<tr>
<td>Social phobia</td>
<td>5.0</td>
<td>1.24</td>
<td>535</td>
<td>54</td>
<td>535</td>
</tr>
<tr>
<td>Generalised anxiety disorder</td>
<td>11.0</td>
<td>2.73</td>
<td>1178</td>
<td>118</td>
<td>1178</td>
</tr>
<tr>
<td>PTSD/Acute stress disorder</td>
<td>8.0</td>
<td>1.98</td>
<td>856</td>
<td>171</td>
<td>856</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>64.0</strong></td>
<td><strong>17.0</strong></td>
<td><strong>7356</strong></td>
<td><strong>1466</strong></td>
<td><strong>7356</strong></td>
</tr>
</tbody>
</table>

# Population in this table is a nominal population of 100,000 children, adolescents and adults for illustrative purposes. Children and adolescents (age <20 years) comprise 43.17% of the population.

## See text for explanation of coverage.

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provinces have informal arrangements for CAMHS teams that service parts of Cape Town and Johannesburg respectively. On the whole, therefore, the proposed model does not require the establishment of new service structures (apart from regional CAMHS teams) but the scaling up of existing services.

**Step 4.** The next step was to calculate the staff required for these services. In keeping with the WHO model (WHO, 1996), resources were calculated only for clinical staff, based on a formula that included workload and staff time per year. Values for consultations per day were obtained from South African workload studies at primary care level (Rispel et al., 1996).

For inpatient facilities and day programmes, staffing was based on staff/patient ratios gathered from the questionnaire and consultations with service providers in provincial services.

For CAMHS teams, the main task is supervision, support and training. These teams do not have direct patient contact except in the context of supervising PHC staff in clinic settings. Staffing estimates for teams were based on the recommendations of the South African PHC package: every clinic should have at least one monthly visit from a mental health specialist (i.e. 12 annual visits) (Rispel et al., 1996).

**Step 5.** On the basis of the service utilisation and staffing needs calculated by the model, it was then possible to calculate the following indicators:

- number of children and adolescents attending outpatients per facility type;
- professional/population ratio for all facility types;
- staff/patient ratio for all facility types.

**Step 6.** The next step was to attach a cost to the staffing needs described. This was done by multiplying the calculated numbers per staff category by the average cost to company salary package earned by a full-time employed individual in a provincial health department.

All estimates are quoted in 2005 US dollars, adjusted for purchasing power parity, and represent the total annual financial bill that will be incurred in the employment of clinical staff involved in the provision of CAMHS in all nine provinces at minimum and full coverage levels. Total salary costs were prepared using salary scales and job grade classifications taken from the KwaZulu-Natal provincial salaries database.

**Results**

Table 2 shows the recommended staffing at a minimum coverage level by province and by service type. The results reflect a strong emphasis on the provision of CAMHS staff at PHC level and on outpatient service provision, with specialist services, supervision and support being provided at secondary and tertiary levels. Using a nominal total population of
Table 2 Human resource requirements for CAMHS in South Africa

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Eastern Cape</th>
<th>Free State</th>
<th>Gauteng</th>
<th>KwaZulu-Natal</th>
<th>Limpopo</th>
<th>Mpumalanga</th>
<th>North West</th>
<th>Northern Cape</th>
<th>Western Cape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provincial population &lt;20 years</td>
<td>3,181,692</td>
<td>1,136,033</td>
<td>2,839,385</td>
<td>4,397,236</td>
<td>2,772,354</td>
<td>1,463,396</td>
<td>1,537,458</td>
<td>3,336,413</td>
<td>1,683,053</td>
</tr>
<tr>
<td>Primary healthcare FTE staff #</td>
<td>424.0</td>
<td>151.4</td>
<td>378.8</td>
<td>586.0</td>
<td>369.4</td>
<td>195.0</td>
<td>204.9</td>
<td>44.8</td>
<td>224.4</td>
</tr>
<tr>
<td>Gen hosp. OPD FTE staff Ω</td>
<td>44.3</td>
<td>15.8</td>
<td>39.5</td>
<td>61.2</td>
<td>38.6</td>
<td>20.4</td>
<td>21.4</td>
<td>4.7</td>
<td>23.4</td>
</tr>
<tr>
<td>Gen Hosp. Inpatient FTE staff §</td>
<td>4.1</td>
<td>1.5</td>
<td>3.7</td>
<td>5.7</td>
<td>3.6</td>
<td>1.9</td>
<td>2.0</td>
<td>4.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Specialist CAMHS OPD FTE staff †</td>
<td>79.8</td>
<td>28.5</td>
<td>71.4</td>
<td>110.3</td>
<td>69.5</td>
<td>36.7</td>
<td>38.6</td>
<td>8.4</td>
<td>42.3</td>
</tr>
<tr>
<td>Specialist CAMHS Inpatient FTE staff ‡</td>
<td>46.2</td>
<td>16.5</td>
<td>41.3</td>
<td>63.9</td>
<td>40.3</td>
<td>21.3</td>
<td>22.3</td>
<td>4.9</td>
<td>24.5</td>
</tr>
<tr>
<td>Specialist CAMHS day services FTE staff ¶</td>
<td>40.0</td>
<td>14.3</td>
<td>35.8</td>
<td>55.3</td>
<td>34.8</td>
<td>18.4</td>
<td>19.3</td>
<td>4.2</td>
<td>21.2</td>
</tr>
<tr>
<td>Formal CAMHS Teams FTE staff</td>
<td>5.2</td>
<td>3.6</td>
<td>4.7</td>
<td>8.4</td>
<td>4.8</td>
<td>3.2</td>
<td>3.6</td>
<td>4.4</td>
<td>6.4</td>
</tr>
</tbody>
</table>

# Primary healthcare staff include psychiatric nurses (17% of PHC staff), general nurses (42%), occupational therapists (4%), occupational therapy assistants (13%), social workers (8%), psychologists (8%) and medical officers (8%).

Ω General hospital outpatient staff include psychiatric nurses (17% of OPD staff), general nurses (42%), occupational therapists (6%), occupational therapy assistants (13%), social workers (8%), psychologists (8%) and medical officers (6%).

§ General hospital inpatient staff include psychiatric nurses (8% of inpatient staff), medical officers/registrar (3%), social workers (6%) and general nurses (83%).

† Specialist CAMHS outpatient staff include psychiatric nurses (25% of CAMHS OPD staff), general nurses (13%), occupational therapists (6%), occupational therapy assistants (19%), social workers (13%), psychologists (13%), psychiatrists (3%) and medical officers/registrar (9%).

‡ Specialist CAMHS inpatient staff include psychiatrists (10% of CAMHS inpatient staff), medical officers/registrar (7%), social workers (13%), general nurses (20%), psychiatric nurses (40%) and psychologists (10%).

¶ Specialist CAMHS day service staff include psychologists (20% of CAMHS day service staff), social workers (30%), psychiatric nurses (30%) and psychiatrists (20%).

Formal CAMHS teams include psychiatric nurses (25% of CAMHS teams), social workers (25%), psychologists (25%) and psychiatrists (25%).
100,000 (of which 43,170 would be children and adolescents <20 years of age), the following FTE staff are required at minimum coverage level: 5.8 in PHC facilities, .6 in general hospital OPDs, .1 in general hospital inpatient facilities, 1.1 in specialist CAMHS OPDs, .6 in specialist CAMHS inpatient facilities, .5 in specialist CAMHS day services, and .8 in regional CAMHS teams.

Table 3 shows that there are large differences in costs between the minimum and full coverage scenarios. In keeping with the differential need estimates for each, the costs for the minimum coverage scenario represent less than 30% of the costs for the full coverage scenario. This translates into roughly $21.50 and $5.99 per child or adolescent per annum nationally for the full coverage and minimum coverage scenarios respectively. Given the manner in which costs were estimated, results being driven mainly by the size of the child and adolescent population in each province rather than provincial differences in the quality or type of service offered, provincial costs per child or adolescent range between a low of $21.45 (minimum: $5.96) in Limpopo and a high of $22.00 (minimum: $6.46) in the Northern Cape.

To put these figures into perspective, if fully implemented, the CAMHS full coverage scenario would have cost approximately 20% of the national Department of Health's 2005/6 budget (approximately 5.5% at minimum coverage). Given the annual real increases in government spending on health and the manner in which CAMHS staff resource needs are derived, one would expect that this percentage would be marginally lower in the 2008/9 financial year. Although inadequate in terms of meeting estimated needs, the minimum coverage package therefore appears to be more realistically attainable within current budget constraints.

Perhaps more importantly than the cost implications, implementing CAMHS under the full coverage scenario would have required 4,570 general nurses and 2,859 psychiatric nurses or roughly 7.5% of the 98,490 registered nurses in South Africa at the time of the situation analysis. The significant inter-provincial differences that this figure masks are worth noting. As an example, CAMHS nursing requirements represented 4% of the nurses in Gauteng yet 15% of the nurses in Limpopo province.

In terms of staffing requirements, nurses form the backbone of the staff required to provide CAMHS. This is reflected in the cost estimate. For the full cover scenario, costs are incurred mainly in the employment of general and psychiatric nurses, who comprise 53% of the staff complement but 47% of staff costs. The relatively large individual salaries of psychiatrists, registrars and medical officers are reflected in their over-representation amongst total costs. For example, psychiatrists comprise 3% of the total staff complement for those delivering CAMHS services yet constitute 8% of costs.

In relation to costs per facility type, Table 4 indicates that the overwhelming proportion of costs (93%) is incurred in the provision of services in outpatient as opposed to inpatient facilities.

Table 4 Total staff costs (FTE) by facility type in 2005 US dollars, adjusted for purchasing power parity

<table>
<thead>
<tr>
<th>Facility type</th>
<th>Minimum coverage</th>
<th>Full coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total outpatient facilities</td>
<td>105,190,063</td>
<td>387,031,129</td>
</tr>
<tr>
<td>Type A1: Gen Hosp</td>
<td>7,291,627</td>
<td>22,595,765</td>
</tr>
<tr>
<td>Type A2: PHC</td>
<td>71,469,003</td>
<td>250,387,613</td>
</tr>
<tr>
<td>Type B1: Specialist</td>
<td>14,906,436</td>
<td>63,667,770</td>
</tr>
<tr>
<td>CAMHS</td>
<td>9,668,943</td>
<td>48,525,927</td>
</tr>
<tr>
<td>Type B2: Day Programme</td>
<td>1,854,054</td>
<td>1,854,054</td>
</tr>
<tr>
<td>Type C: CAMHS Team</td>
<td>1,854,054</td>
<td>1,854,054</td>
</tr>
<tr>
<td>Total inpatient facilities</td>
<td>10,671,910</td>
<td>29,299,546</td>
</tr>
<tr>
<td>Type A1: Gen Hosp</td>
<td>623,214</td>
<td>1,246,627</td>
</tr>
<tr>
<td>Type B1: Specialist</td>
<td>10,048,596</td>
<td>28,052,919</td>
</tr>
<tr>
<td>CAMHS</td>
<td>115,861,973</td>
<td>416,330,676</td>
</tr>
</tbody>
</table>

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but depend on the presence of staff in other health settings, with open channels for referral and communication between these settings.

It is striking that, when comparing the results of this model with current realities in South Africa, there remains a substantial shortfall in existing levels of CAMHS provision. This is so for even the minimum coverage level. For example, the ratio of mental health practitioners to children and adolescents currently ranges from 1 per 5,099 (Mpumalanga Province) to 1 per 103,276 (Free State Province) (Dawes et al., 2004). This compares poorly with even the minimum coverage level which recommends 1 mental health practitioner per 4,544 children and adolescents, and is considerably below the full coverage level of 1 mental health practitioner per 1,316 children and adolescents.

A number of challenges face the Department of Health in scaling up CAMHS. Firstly, the substantial differences between provinces in existing staffing levels imply that provincial level strategies to attract and retain necessary CAMHS staff might be more appropriate than a national level approach, or at the very least may need to supplement a national approach. Secondly, the finding that 93% of costs are incurred in outpatient facilities follows logically from the activities involved in the provision of CAMHS and the settings in which they are conducted. It also reflects the spirit of much of the recent health legislation promulgated in South Africa which aims at the devolution of services towards the lowest possible service level, i.e., the PHC level. Given the centrality of service delivery at the PHC level, infrastructure needs in these facilities are likely to be a key factor in the successful rollout and provision of CAMHS. Thirdly, factors specific to South Africa may inhibit the scaling up of these services in townships and remote rural areas. These include the historical lack of resources and infrastructure in these settings; and the reluctance of professional staff to work in township areas for reasons of personal safety, given high levels of violent crime. In implementing the targets described here, there is also the unanswerable question regarding whether mental health needs among children and adolescents may in fact increase further given indications of increasing levels of interpersonal violence and growing socio-economic inequality in South Africa (Bhorat & Kanbur, 2005). Added to this are general difficulties encountered in many other countries, such as the difficulty of attracting mental health personnel to remote rural areas and reluctance among general primary healthcare staff to take on mental health-care roles (WHO, 2001).

The limitations of this study need to be acknowledged. Firstly, the study focused on public sector health services and did not include services for children and adolescents with intellectual disabilities, or services provided within the social development or education systems. Future studies would need to be undertaken in the area of intellectual disabilities, and the social development and education systems.

Secondly, the manner in which costs were estimated has a number of implications for the interpretation of results for planning purposes. The greatest effect is undoubtedly due to the calculation of the financial or budgetary costs of the employment of clinical staff only and the exclusion of any other costs. These additional costs include staffing requirements for administrative and coordination functions; infrastructure and operational expenses. Depending on the split between types of resources used, this has a number of implications for the interpretation and use to which results are put. This rider does not preclude results from being used for staff budgeting or budgetary planning exercises. We would argue that overhead costs and infrastructure costs are not typically considered to be part of these costs as they cannot be directly attributed to a specific programme function. They are generic functions that are necessary for the site to function more generally and the proportion attributable to the presence of CAMHS in a general health facility may vary substantially according to uncontrollable variables such as the scale of the facility, the total number of support staff, accessibility in urban versus rural settings, and specific challenges related to medication supply and information systems.

Thirdly, another shortcoming of calculating total staff costs in this way is that the incremental staff costs of CAMHS service provision are not calculated. Arguably, for the purpose of resource allocation, incremental costs are a truer reflection of need. Incremental costs take current capacity and endowments into account. They only estimate the costs of that portion of staff resources for which additional expenditure is required to bring service delivery into line with acceptable norms and standards, as in previous studies (Chisholm et al., 2007). Different initial endowments of healthcare and other systemic resources across provinces may mean that some provinces already enjoy better levels of coverage than others. Should coverage levels be different, the additional resources necessary to scale up services to full coverage levels may be lower in better resourced than in poorly resourced provinces, in proportional terms at least. Therefore, in the interests of equity across provinces, it is argued that the gap between current levels of coverage and target levels of service provision be accounted for by policymakers when deciding upon the allocation of resources and rollout of services.

Fourthly, it is assumed that it is possible to obtain personnel in the required numbers with no consideration given to the supply side of the market for skilled health sector personnel. As the large number

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of vacancies in many public sector facilities attests, there is a shortage of skilled clinical staff in South Africa. It is therefore important to draw attention to the significant adjustments in the healthcare sector as a whole that will be entailed in the introduction and scale-up of CAMHS. In order to attain these targets, a systematic training programme would need to be implemented nationally, particularly for in-service primary care staff.

There are two possible avenues of exploration for expanding the workforce. If the majority of CAMHS staff are sourced from outside of the healthcare sector, there will be significant upfront costs associated with the provision of training. This effect is magnified in the training of staff for which there are long lead times between selection or enrolment and qualification. On the other hand, the majority of CAMHS staff could be drawn from other areas within the healthcare sector. This is most likely to be the case in practice. Arguably, this strategy is appropriate when filling posts which are dependent upon the incumbent having suitable levels of experience as well as qualifications. This may, however, compromise the quality of service delivery in other parts of the healthcare system.

In order to develop the model further, it would be worthwhile validating it by applying it to the planning and development of services. This process was set in motion in South Africa with the introduction of the model to provincial Departments of Health and discussion of the findings in a national workshop. Provincial Departments have now undertaken to use the model for their own service planning, but this process has not yet been evaluated. Furthermore, it would be useful to validate the model in other country contexts. The generalisability of this process will vary according to the level of resources. For other African countries, it may be necessary to shift the staff profile away from scarce mental health professionals (such as psychiatrists), towards nurses, clinical officers and community health workers. In other middle-income country settings, such as Chile and Thailand, a similar staff profile to that proposed in this paper may be possible. Regardless of resources, validation in these settings would require, among other steps: conducting a situation analysis of these countries, matching the model to the health systems, making necessary adjustments for a range of variables (from epidemiological data to service typologies to human resource profiles to costs) and calculating the results. We hope that this exercise could be used to motivate for the scaling up of CAMHS in these and other country settings. To facilitate this process, the template and spreadsheet model are available from the authors on request.

**Conclusion**

The results of this study provide a target for CAMHS development in South Africa. In doing so, they highlight how far current service realities are from even the minimum coverage recommended in this model. The model can be used as an advocacy tool and a basis for engaging with planners and policymakers on a rational basis. It can also be adapted for use in other countries, and is intended to support wider calls for a global scaling up of mental health services (Lancet Global Mental Health Group, 2007). As stated above, the model needs to be refined according to specific scenarios, as new data emerge on current service provision, and methods for estimating mental health service needs among children and adolescents are developed further.

**Supporting Information**

Additional Supporting Information may be found in the online version of this article:

Appendix: Scaling up child and adolescent mental health services in South Africa: Human resource requirements and costs (Word document).

Please note: Wiley-Blackwell are not responsible for the content or functionality of any supporting materials supplied by the authors. Any queries (other than missing material) should be directed to the corresponding author for the article.

**Acknowledgements**

We would like to acknowledge financial support from the South African Department of Health and the Department for International Development (DFID), United Kingdom. The opinions expressed are those of the authors and not necessarily those of the funders. We would like to thank the provincial mental health coordinators for their assistance in data collection, and Rene Brandt for her contributions to the literature review and situation analysis which informed this paper. We would also like to thank Vikram Patel for his comments on a late draft of the paper.

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Key points

- Children and adolescents with mental health problems have poor service cover in low- and middle-income countries.
- Little is known about the resources that would be required to provide child and adolescent mental health services (CAMHS) in these countries.
- This paper presents a model to calculate the human resources required to scale up CAMHS in South Africa. According to this model, the annual cost is US$21.50 and US$5.99 per child or adolescent for full and minimum coverage scenarios respectively.
- The model can be used as an advocacy tool to engage with policy makers on a rational basis. It can be adapted for other countries, and is intended to support wider calls for the global scaling up of mental health services.

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Manuscript accepted 22 December 2008