A MODEL FOR ESTIMATING MENTAL HEALTH SERVICE NEEDS IN SOUTH AFRICA

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Objective. To develop a model for estimating the services and the human resources needed to care for people with severe psychiatric conditions in a hypothetical population of 100 000 people in South Africa.

Method. Annual mental health service needs were estimated in terms of numbers of daily patient visits (DPV) in ambulatory care, the number of beds required, and staffing. Developed within a spreadsheet format, the model allows for the adjustment of key service variables according to estimated or existing service data.

Results. At 100% coverage, 87 DPV, 28 acute beds, and 10 medium-long stay beds are necessary for a population of 100 000 people. This would require 35.2 full-time equivalent mental health staff: 21.3 for inpatient care, 12.0 for ambulatory care, and 1.9 for management.

Conclusion. Because the model can produce a range of service recommendations, the assumptions that inform it should be clearly stated and justified. This method makes the assumptions on which services are planned explicit and allows for a rational approach to decision making.

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Tolkien Report, the World Health Organisation (WHO) developed a method to calculate service needs for national mental health programmes for people with ‘severe mental disorders’ by drawing exclusively on epidemiological data.

In post-apartheid South Africa, large-scale national projects have estimated mental health service needs for primary health care (PHC) and hospitals. However, no attempts have been made to estimate the service needs of people with severe psychiatric conditions in keeping with current health policies. These policies emphasise the short-term management of patients in inpatient settings and the concerted rehabilitation and treatment of patients in the community.

In this paper we present a modification of the WHO method that addresses South African realities. This model is the first attempt to calculate annual mental health service needs for South Africans with severe psychiatric conditions.

**METHODS**

There are few generally accepted assumptions about mental health service needs. It has been shown elsewhere that the adjustment of service assumptions significantly affects the outcome of any modelling process. For this reason assumptions need to be stated clearly and justified in models used for service planning and management. We adopted a spreadsheet format for this model to allow for adjustment of assumptions regarding population size, age distribution, prevalence, levels of coverage, annual attendances at ambulatory care facilities, daily patient visits (DPV) at ambulatory care facilities, ambulatory care workloads, beds (acute and medium-long stay), staff/patient ratios, staff/bed ratios, lengths of stay, admission rates, and bed occupancy rates. These variables can be adjusted using hypothetical or existing service data. The model therefore allows for a combination of existing service data and estimates of need or service provision to calculate beds and staffing requirements.

At this stage no community residential facilities have been considered. The goal of this model is the provision of minimal hospital inpatient beds and concerted community-based ambulatory care rehabilitation programmes.

**Step 1.** The modelling process begins with a hypothetical population. The WHO model specifies that the population should fall within an authentic ‘natural’ or administrative area; should be large enough to make services cost effective while providing a range and variety of services; should be small enough to be managed easily; and should be such that services are easily accessible to the entire population, with ease of transport a priority.

Using these criteria, we selected a hypothetical population of 100,000 people for the following reasons. First, the population of 500,000 suggested by the WHO is too large for areas in South Africa with low population densities where access to services and transport are limited. Second, preliminary guidelines for the catchment population of health services in South Africa recommend 10,000 for clinics and between 100,000 and 180,000 for major health centres providing 24-hour care. Although exact sizes of districts vary considerably, the figure of 100,000 approximates a district in many instances. Third, a population of 100,000 is large enough to make services cost effective and to provide a range of services, with the possible exceptions of medium-long stay and forensic inpatient services. Fourth, numerically, the figure of 100,000 is easy to convert to exact district, regional and provincial figures in the use of this model as a planning and management tool. Fifth, most of the literature on psychiatric bed needs and much of the literature on staffing and admission rates report figures per 100,000 population.

The population aged 15 years and over is particularly important in the study of severe psychiatric conditions since the peak age of onset for many such conditions is 15 - 25 years. In South Africa, 63.65% of the population is aged 15 years or older, corresponding to 63,650 people in a hypothetical population of 100,000.

**Step 2.** Prevalence estimates for severe psychiatric conditions associated with severe functional impairment and disability are necessary. We obtained prevalence estimates from the National Co-morbidity Survey (NCS) because suitable South African data are not available; the WHO model recommends using these figures; the NCS findings report 12-month prevalence rates; the NCS study is recent; and it has high-quality methodology in terms of instrumentation, sampling strategy and sample size. In our hypothetical population, mental health services for severe psychiatric conditions should be available to at least 3,004 people (3%) in a year (Table I).

This 3% prevalence rate is an underestimate since conditions such as substance-induced psychotic disorder, brief psychotic disorder, mental disorders due to a general medical condition, post-traumatic stress disorder (PTSD) and obsessive-compulsive disorder are excluded. Nevertheless, this figure is in keeping with other findings in the developing world which report prevalence rates for severe psychiatric disorder of 1 - 3% among the general population.

**Step 3.** In keeping with the guidelines for PHC services in South Africa, we recommend two levels of service delivery: a minimum level of 30% coverage, below which services would be unacceptable; and a goal of 100% coverage. Each of these levels is applicable for ambulatory (or outpatient) and inpatient care.

Expected annual attendances at ambulatory care facilities were calculated using the following formula: Annual visits = prevalence × target population × coverage × minimum annual visits/person; where the minimum annual visits/person is 12 visits per annum, as recommended by the South African Guidelines for PHC services.
DPV, namely the average number of patients who make use of an ambulatory care service per day, were calculated using the following formula: DPV = total annual visits + working days per year.

In keeping with the WHO model, we divided inpatient services into acute beds and medium-long stay beds. Acute beds are intended for short-term management of patients in a state of crisis or relapse, with a view to stabilising patients to a point where treatment can be continued on an outpatient basis. We assume that a limited number of medium-long stay psychiatric beds are necessary for the management of severe chronic conditions. The number of beds required was calculated using the following formula: Beds = No. of severe cases × % needing hospitalisation × (ALOS + 365) × rotation factor, where ALOS = average length of stay, calculated as the median days of admission, and the rotation factor allows for a period when the bed is unoccupied between discharge and a new admission. The WHO model recommends a rotation factor of 1.15 for acute beds, and 1.05 for medium-long stay beds, implying bed occupancy rates of 85% and 95% respectively.

The WHO model conceives that the percentage of patients that will require hospitalisation during a year can be adjusted according to local findings, and does not give a source for its own figures. The estimated percentage of patients that would require hospitalisation during a year is broadly consistent with the prevalence rates for disorders and services.

Workload for psychiatric staffing has been calculated by some researchers according to standard time estimates for specific treatment procedures. This approach has received criticism in South Africa (and Gray AL. Staffing Norms Research Project: Pilot Study Report. Durban: unpublished report prepared for the Interim Pharmacy Council of South Africa, 1988) because of the variability of the procedures, skill level and experience of staff in clinical work. Instead, we based calculations on workload, i.e. numbers of beds covered and numbers of patients seen. Although this method is relatively crude compared with those developed elsewhere, it is the most feasible within the constraints of South African mental health service information systems at present.

For ambulatory care services, human resources can be calculated using the following formula: FTE staff = (DPV × staff working days per year) + (consultations per day × actual working days per year).

We obtained values for these calculations from South African workload studies at primary care level. We calculated staff working days per year after holidays and sick leave. Consultations per day were calculated assuming, from observations of work patterns, that 44.3% of staff time is spent in direct patient contact. These estimates do not cover home visits, follow-ups of missed appointments or outreach. This work is essential within the framework of community-based care with an emphasis on rehabilitation of patients with severe psychiatric conditions. We have adopted the WHO model's suggestion that a further 30% of staff be added for home visits and other outreach activities.

<table>
<thead>
<tr>
<th>Disorder</th>
<th>One-year prevalence (%)</th>
<th>Expected in population (N)</th>
<th>Severe cases (%)</th>
<th>Expected severe cases (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-affective psychosis</td>
<td>0.5</td>
<td>318</td>
<td>100</td>
<td>318</td>
</tr>
<tr>
<td>Bipolar affective disorder</td>
<td>1.3</td>
<td>828</td>
<td>100</td>
<td>828</td>
</tr>
<tr>
<td>Major depression</td>
<td>10.3</td>
<td>6556</td>
<td>20</td>
<td>1311</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>17.2</td>
<td>10948</td>
<td>5</td>
<td>547</td>
</tr>
<tr>
<td>Total</td>
<td>29.3</td>
<td>18650</td>
<td></td>
<td>3004</td>
</tr>
</tbody>
</table>

* Based on figures from the National Comorbidity Study, using DSM III-R.
† Non-affective psychosis includes schizophrenia, schizoaffective disorder, delusional disorder, and atypical psychosis.
‡ The figure reported indicates the prevalence of a manic episode.
§ The figure reported indicates the prevalence of a major depressive episode.
¶ This includes panic disorder, agoraphobia without panic disorder, social phobia, simple phobia, and generalised anxiety disorder.
For inpatient services, we calculated human resources for nursing staff at nurse/bed ratios of 0.5 (acute) and 0.3 (medium-long stay). These ratios and the numbers of other clinical staff are drawn from the WHO staff distribution recommendations. FTE nursing staff for inpatient care are therefore calculated as follows: FTE inpatient nursing staff = number of beds × staff/bed ratio.

The WHO model makes human resource recommendations for a 45-bed medium-long stay unit. Medium-long stay beds per 100 000 could not be served in isolation, since bed numbers would be too low for a feasible functional unit. It would therefore be necessary to combine the bed needs of several districts/regions. For this modelling process we have combined the needs of five such districts or regions.

**RESULTS**

**Ambulatory care services**

Using the above prevalence and population figures, we calculated the following numbers of annual visits: No. of visits per year = 0.03 × 63 650 × 0.3 x 12 = 6 874 (30% coverage), and no. of visits per year = 0.03 × 63 650 × 1.0 × 12 = 22 914 (100% coverage).

From the annual visits, a total of 26 DPV (30%) and 87 DPV (100%) can be calculated, assuming that there are 264 working days per year.

**Inpatient services**

We calculated that 28 acute and 10 medium-long stay inpatient beds per 100 000 population are needed (Table I). Combining estimated beds for acute and medium-long stay facilities gives a total of 38 beds per 100 000 population for patients with severe psychiatric conditions. (Thirty per cent coverage of these bed numbers yields figures of 3 medium-long stay beds, 8.4 acute beds and a total of 11.4 beds per 100 000 population.)

**Human resources**

For ambulatory care, the numbers of FTE staff required are as follows: FTE = (26 × 225) ÷ (11 × 264) = 2.78 (30% coverage), and FTE = (87 × 225) ÷ (11 × 264) = 9.27 (100% coverage).

With the additional staff to cover home visits and other outreach activities, this gives a total of approximately 12 ambulatory care staff at 100% coverage and 4 at 30% coverage to meet the ambulatory care needs of the 3004 people with severe psychiatric conditions. The breakdown of this total according to professional categories (Table II) is guided by the recommendations of the WHO model and existing services in South Africa.

In calculating the human resource requirements for the 28 acute beds that are necessary for our hypothetical population (Table II), we adapted the WHO recommendations for a 30-bed acute unit with around ten 17-day admissions per week (Table III) (30% coverage of the total acute FTE staff is 5.1).

For the 50-bed medium-long stay unit, a total of 21 clinical staff would be needed to serve 500 000 people. This total can be divided according to the following staff categories: 0.5 unit heads (psychiatrists), 1.0 registrar or medical officer (MO), 1.0 psychologist, 1.0 social worker, 0.5 occupational therapists (OTs), 2.0 occupational therapy assistants (OTAs), and 16.0 nurses (nurse/bed ratio: 0.3). Table III provides conversions to FTE staff per 100 000 population (30% coverage of the total medium-long FTE staff is 1.3).

The WHO model’s recommendations for managerial staff for a population of 500 000 can be adapted to a population of 100 000 as follows: 0.2 chief regional mental health professionals (psychiatrist, psychologist or psychiatric nurse), 1.0 nurse, 0.2 quality assurance professionals (from any relevant profession), and 0.5 co-ordinators of mental health information (from any relevant profession). In addition to managerial and administrative functions, the role of a quality assurance professional and information co-ordinator would be

<table>
<thead>
<tr>
<th>Facility</th>
<th>Disorder</th>
<th>Severe cases (N)</th>
<th>per year (%)</th>
<th>ALOS* (days)</th>
<th>Rotation factor</th>
<th>Beds (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute</td>
<td>Non-affective psychosis</td>
<td>318</td>
<td>50</td>
<td>21</td>
<td>1.15</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Bipolar affective disorder</td>
<td>828</td>
<td>30</td>
<td>14</td>
<td>1.15</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Major depression</td>
<td>1 311</td>
<td>5</td>
<td>30</td>
<td>1.15</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Anxiety disorder</td>
<td>547</td>
<td>5</td>
<td>2</td>
<td>1.15</td>
<td>0</td>
</tr>
<tr>
<td>Sub-total</td>
<td></td>
<td>3 004</td>
<td>17</td>
<td>2</td>
<td>1.05</td>
<td>28</td>
</tr>
<tr>
<td>Medium-</td>
<td>Non-affective psychosis</td>
<td>318</td>
<td>5</td>
<td>180</td>
<td>1.05</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Bipolar affective disorder</td>
<td>828</td>
<td>0.5</td>
<td>180</td>
<td>1.05</td>
<td>2</td>
</tr>
<tr>
<td>Sub-total</td>
<td></td>
<td>3 004</td>
<td>17</td>
<td>180</td>
<td>1.05</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>3 322</td>
<td>180</td>
<td>180</td>
<td>1.05</td>
<td>38</td>
</tr>
</tbody>
</table>

* Average length of stay.
to assist in the planning and monitoring of services. Because a region/ district of 100 000 is too small to support a full-time professional in this role, we propose a fraction of an FTE. We envisage that co-ordinators of information and quality assurance would take responsibility for several regions or districts.

**DISCUSSION**

The bed numbers and staffing figures proposed by this model are marginally lower than those proposed by the WHO model (Table III). Discrepancies arise from different age distributions; different methods of calculating ambulatory care attendances and staff ratios at ambulatory care level; less emphasis on care by specialised staff such as psychiatrists and psychologists, given integrated health care policy in South Africa; and more emphasis on the provision of rehabilitation staff (including OTAs) in South African mental health services. The differences highlight the way in which assumptions shift the results of any such modelling process.

The pattern and level of existing services in South Africa are significantly different from those recommended by this model. There are currently fewer acute beds (13 per 100 000 (range cross provinces: 6 - 18 per 100 000)) than those recommended by the model. However, there are considerably more long-stay beds (35 per 100 000 (range: 0 - 83 per 100 000)), with gross redistribution of resources between provinces. The model proposes a shift towards the development of rehabilitative staff, while highlighting the inadequacies of present staffing resources.

Caution should be exercised in interpreting the recommendations of this model. First, the calculation of service needs is not an exact science, and the conclusions it reaches are highly dependent on the assumptions upon which the model is based. These assumptions should be clearly stated and justified. Where appropriate, alternative scenarios should be explored. Second, in addition to the available resources, the nature of the service is highly dependent on the quality of service delivery. To this end a clear set of service standards should accompany the recommendations of any modelling process. Third, the credibility and possible implementation of these recommendations must be informed by consultation with service providers, service users, professional bodies and provincial service management.

Insofar as these cautions are adhered to, the model described in this paper provides a potentially valuable planning and management tool, both for calculating resource needs, and for lobbying for better service provision through a conceptionalisation of the service needs of patients. At minimum the model allows for a more rational approach to decision making than has previously occurred and makes the assumptions on which services are planned more explicit.

This paper reports on the initial stages of a project to develop norms and standards for the mental health care of people with severe psychiatric conditions in South Africa. The project was initiated and funded by the Department of Health, Republic of South Africa (Tender: GES 105/96-97). However, the opinions and findings reported here should not be construed as reflecting those of the Department of Health. The authors thank Marc Blecher, Elizabeth Dartnall, Immanuelle Daviaud, Karin Ensink, Melvyn Freeman, Edith Madela-Mntla, Lauren Muller and Hasina Subedar for their intellectual contributions.

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**Table III. Total human resources needed for a district/region of 100 000 people**

<table>
<thead>
<tr>
<th>Type of professional</th>
<th>Inpatient</th>
<th>Ambulatory care</th>
<th>Managerial</th>
<th>Total</th>
<th>WHO total*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acute</td>
<td>Medium-long</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurses</td>
<td>14</td>
<td>3.1</td>
<td>7</td>
<td>1</td>
<td>25.1</td>
</tr>
<tr>
<td>OT</td>
<td>-</td>
<td>0.1</td>
<td>0.5</td>
<td>-</td>
<td>0.6</td>
</tr>
<tr>
<td>OTA</td>
<td>-</td>
<td>0.4</td>
<td>1.5</td>
<td>-</td>
<td>1.9</td>
</tr>
<tr>
<td>Social workers</td>
<td>1</td>
<td>0.2</td>
<td>1</td>
<td>-</td>
<td>2.2</td>
</tr>
<tr>
<td>Clinical psychologists</td>
<td>-</td>
<td>0.2</td>
<td>1</td>
<td>-</td>
<td>1.2</td>
</tr>
<tr>
<td>Psychiatrists</td>
<td>1</td>
<td>0.1</td>
<td>0.25</td>
<td>0.2</td>
<td>1.55</td>
</tr>
<tr>
<td>Registrars/residents/MO</td>
<td>1</td>
<td>0.2</td>
<td>0.75</td>
<td>-</td>
<td>1.95</td>
</tr>
<tr>
<td>Education/info</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Quality assurance</td>
<td>-</td>
<td>-</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>4.3</td>
<td>12</td>
<td>2.2</td>
<td>19.5</td>
</tr>
</tbody>
</table>

*Figures as calculated from WHO model.* The WHO publication reports slightly lower figures, but these include arithmetical errors which were corrected to produce the figures in this table.

OT = occupational therapist; OTA = occupational therapist assistant; MO = medical officer.
PARTICIPATORY DEVELOPMENT OF A MINIMUM DATASET FOR THE KHAYELITSHA DISTRICT

B. Mash, H. Mahomed

Background. Traditional ‘data-led’ information systems have created excessive amounts of poor-quality and poorly utilised data. The Health Information Systems Pilot Project (HISPP), a Western Cape project that started in 1996, initiated a process in one of its three pilot sites to model an alternative approach to developing a district health information system.

Objectives. To develop a minimum dataset for Khayelitsha as part of an action-led district health and management information system in a participatory ‘bottom-up’ process.

Method. The HISPP, in conjunction with health workers in the proposed Khayelitsha district, developed a minimum dataset through a process of defining local goals, targets and indicators. This dataset was integrated with data requirements at regional and provincial levels.

Results. A minimum dataset was produced that defined all the data needed according to the frequency of reporting and the level at which it was required.

Conclusion. The HISPP has demonstrated an alternative model for defining health information needs at district level. This participatory process has enabled health workers to appraise their own information needs critically and has encouraged local use of information for planning and action.

In observing health information systems in developing countries it has been noted that ‘...the road to health leads through information, but the exact path to follow must be defined by local people’.1

Health information is essential in terms of achieving good health status and local involvement is crucial to a successful health information system. The problems with health information systems at the primary care level in South Africa are excessive data collection, rigid centralisation, poor-quality data, poor use of data, poor feedback and fragmented flow.2 Braa et al.3 argue that: ‘The process towards a health and

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